5G;
5G System;
Network Data Analytics Services;
Stage 3
(3GPP TS 29.520 version 16.4.0 Release 16)
Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: “Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards”, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (https://ipr.etsi.org/).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Legal Notice

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

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

Modal verbs terminology

In the present document "shall", "shall not", "should", "should not", "may", "need not", "will", "will not", "can" and "cannot" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"must" and "must not" are **NOT** allowed in ETSI deliverables except when used in direct citation.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intellectual Property Rights</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Legal Notice</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Modal verbs terminology</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Foreword</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>References</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Definitions and abbreviations</td>
<td>8</td>
</tr>
<tr>
<td>3.1</td>
<td>Definitions</td>
<td>8</td>
</tr>
<tr>
<td>3.2</td>
<td>Abbreviations</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Services offered by the NWDAF</td>
<td>9</td>
</tr>
<tr>
<td>4.1</td>
<td>Introduction</td>
<td>9</td>
</tr>
<tr>
<td>4.2</td>
<td>Nnwdaf_EventsSubscription Service</td>
<td>9</td>
</tr>
<tr>
<td>4.2.1</td>
<td>Service Description</td>
<td>9</td>
</tr>
<tr>
<td>4.2.1.1</td>
<td>Overview</td>
<td>9</td>
</tr>
<tr>
<td>4.2.1.2</td>
<td>Service Architecture</td>
<td>10</td>
</tr>
<tr>
<td>4.2.1.3</td>
<td>Network Functions</td>
<td>11</td>
</tr>
<tr>
<td>4.2.1.3.1</td>
<td>Network Data Analytics Function (NWDAF)</td>
<td>11</td>
</tr>
<tr>
<td>4.2.1.3.2</td>
<td>NF Service Consumers</td>
<td>11</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Service Operations</td>
<td>13</td>
</tr>
<tr>
<td>4.2.2.1</td>
<td>Introduction</td>
<td>13</td>
</tr>
<tr>
<td>4.2.2.2</td>
<td>Nnwdaf_EventsSubscription_Subscribe service operation</td>
<td>13</td>
</tr>
<tr>
<td>4.2.2.2.1</td>
<td>General</td>
<td>13</td>
</tr>
<tr>
<td>4.2.2.2.2</td>
<td>Subscription for event notifications</td>
<td>13</td>
</tr>
<tr>
<td>4.2.2.2.3</td>
<td>Update subscription for event notifications</td>
<td>17</td>
</tr>
<tr>
<td>4.2.2.3</td>
<td>Nnwdaf_EventsSubscription_Unsubscribe service operation</td>
<td>18</td>
</tr>
<tr>
<td>4.2.2.3.1</td>
<td>General</td>
<td>18</td>
</tr>
<tr>
<td>4.2.2.3.2</td>
<td>Unsubscribe from event notifications</td>
<td>18</td>
</tr>
<tr>
<td>4.2.2.4</td>
<td>Nnwdaf_EventsSubscription_Notify service operation</td>
<td>18</td>
</tr>
<tr>
<td>4.2.2.4.1</td>
<td>General</td>
<td>18</td>
</tr>
<tr>
<td>4.2.2.4.2</td>
<td>Notification about subscribed event</td>
<td>18</td>
</tr>
<tr>
<td>4.3</td>
<td>Nnwdaf_AnalyticsInfo Service</td>
<td>20</td>
</tr>
<tr>
<td>4.3.1</td>
<td>Service Description</td>
<td>20</td>
</tr>
<tr>
<td>4.3.1.1</td>
<td>Overview</td>
<td>20</td>
</tr>
<tr>
<td>4.3.1.2</td>
<td>Service Architecture</td>
<td>20</td>
</tr>
<tr>
<td>4.3.1.3</td>
<td>Network Functions</td>
<td>21</td>
</tr>
<tr>
<td>4.3.1.3.1</td>
<td>Network Data Analytics Function (NWDAF)</td>
<td>21</td>
</tr>
<tr>
<td>4.3.1.3.2</td>
<td>NF Service Consumers</td>
<td>21</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Service Operations</td>
<td>23</td>
</tr>
<tr>
<td>4.3.2.1</td>
<td>Introduction</td>
<td>23</td>
</tr>
<tr>
<td>4.3.2.2</td>
<td>Nnwdaf_AnalyticsInfo_Request service operation</td>
<td>23</td>
</tr>
<tr>
<td>4.3.2.2.1</td>
<td>General</td>
<td>23</td>
</tr>
<tr>
<td>4.3.2.2.2</td>
<td>Request and get from NWDAF Analytics information</td>
<td>23</td>
</tr>
<tr>
<td>5</td>
<td>API Definitions</td>
<td>26</td>
</tr>
<tr>
<td>5.1</td>
<td>Nnwdaf_EventsSubscription Service API</td>
<td>26</td>
</tr>
<tr>
<td>5.1.1</td>
<td>Introduction</td>
<td>26</td>
</tr>
<tr>
<td>5.1.2</td>
<td>Usage of HTTP</td>
<td>27</td>
</tr>
<tr>
<td>5.1.2.1</td>
<td>General</td>
<td>27</td>
</tr>
<tr>
<td>5.1.2.2</td>
<td>HTTP standard headers</td>
<td>27</td>
</tr>
<tr>
<td>5.1.2.2.1</td>
<td>General</td>
<td>27</td>
</tr>
<tr>
<td>5.1.2.2.2</td>
<td>Content type</td>
<td>27</td>
</tr>
<tr>
<td>5.1.2.3</td>
<td>HTTP custom headers</td>
<td>27</td>
</tr>
<tr>
<td>5.1.3</td>
<td>Resources</td>
<td>28</td>
</tr>
<tr>
<td>5.1.3.1</td>
<td>Resource Structure</td>
<td>28</td>
</tr>
</tbody>
</table>

---

**ETSI**
5.1.3.2 Resource: NWDAF Events Subscriptions ............................................................. 28
5.1.3.2.1 Description .................................................................................................. 28
5.1.3.2.2 Resource definition .................................................................................... 28
5.1.3.2.3 Resource Standard Methods ...................................................................... 29
5.1.3.2.3.1 POST ..................................................................................................... 29
5.1.3.2.4 Resource Custom Operations ................................................................. 29
5.1.3.3 Resource: Individual NWDAF Event Subscription ........................................ 29
5.1.3.3.1 Description ................................................................................................ 29
5.1.3.3.2 Resource definition .................................................................................... 29
5.1.3.3.3 Resource Standard Methods ...................................................................... 30
5.1.3.3.4 Resource Custom Operations .................................................................... 31
5.1.4 Custom Operations without associated resources .............................................. 31
5.1.5 Notifications ........................................................................................................ 31
5.1.5.1 General .......................................................................................................... 31
5.1.5.2 Event Notification ......................................................................................... 31
5.1.5.2.1 Description .............................................................................................. 31
5.1.5.2.2 Operation Definition ................................................................................ 31
5.1.6 Data Model ........................................................................................................... 32
5.1.6.1 General .......................................................................................................... 32
5.1.6.2 Structured data types ....................................................................................... 38
5.1.6.2.1 Introduction ............................................................................................. 38
5.1.6.2.2 Type NwNwafEventsSubscription ......................................................... 39
5.1.6.2.3 Type EventSubscription .......................................................................... 40
5.1.6.2.4 Type NwNwafEventsSubscriptionNotification ....................................... 43
5.1.6.2.5 Type EventNotification ............................................................................ 44
5.1.6.2.6 Type SliceLoadLevelInformation ............................................................ 45
5.1.6.2.7 Type EventReportingRequirement ......................................................... 45
5.1.6.2.8 Type TargetUEInformation ....................................................................... 46
5.1.6.2.9 Void ........................................................................................................... 46
5.1.6.2.10 Type UeMobility ..................................................................................... 46
5.1.6.2.11 Type LocationInfo .................................................................................. 47
5.1.6.2.12 Void ........................................................................................................ 48
5.1.6.2.13 Type UeCommunication ......................................................................... 48
5.1.6.2.14 Type TrafficCharacterization ............................................................... 50
5.1.6.2.15 Type AbnormalBehaviour ...................................................................... 51
5.1.6.2.16 Type Exception ....................................................................................... 51
5.1.6.2.17 Type UserDataCongestionInfo ............................................................... 52
5.1.6.2.18 Type CongestionInfo ............................................................................. 52
5.1.6.2.19 Type QoSsustainabilityInfo .................................................................... 53
5.1.6.2.20 Type QoSRequirement .......................................................................... 53
5.1.6.2.21 Type RetainabilityThreshold ................................................................. 54
5.1.6.2.22 Type NetworkPerfRequirement ............................................................ 54
5.1.6.2.23 Type NetworkPerfInfo .......................................................................... 54
5.1.6.2.24 Type ServiceExperienceInfo ................................................................. 55
5.1.6.2.25 Type BwRequirement ............................................................................. 56
5.1.6.2.26 Type AdditionalMeasurement .............................................................. 56
5.1.6.2.27 Type IpEthFlowDescription ................................................................... 57
5.1.6.2.28 Type AddressList ................................................................................... 57
5.1.6.2.29 Type CircumstanceDescription ............................................................. 57
5.1.6.2.30 Type ThresholdLevel ............................................................................. 58
5.1.6.2.31 Type NfLoadLevelInformation ............................................................... 58
5.1.6.2.32 Type NfStatus ....................................................................................... 59
5.1.6.2.33 Type NsiIdInfo ...................................................................................... 59
5.1.6.2.34 Type NsiLoadLevelInfo ........................................................................ 59
5.1.6.3 Simple data types and enumerations .............................................................. 59
5.1.6.3.1 Introduction ............................................................................................. 59
5.1.6.3.2 Simple data types .................................................................................... 60
5.1.6.3.3 Enumeration: NotificationMethod ......................................................... 60
5.1.6.3.4 Enumeration: NwNwafEvent ................................................................. 60
5.1.6.3.5 Enumeration: Accuracy ........................................................................... 61
5.1.6.3.6 Enumeration: ExceptionId ....................................................................... 61
5.1.6.3.7 Enumeration: ExceptionTrend ............................................................... 61
5.1.6.3.8 Enumeration: CongestionType ................................................................. 61
5.1.6.3.9 Enumeration: TimeUnit ........................................................................ 61
5.1.6.3.10 Enumeration: NetworkPerType .......................................................... 62
5.1.6.3.11 Enumeration: ExpectedAnalyticsType ................................................ 62
5.1.6.3.12 Enumeration: MatchingDirection ...................................................... 62
5.1.7 Error handling ............................................................................................... 62
5.1.7.1 General ..................................................................................................... 62
5.1.7.2 Protocol Errors ......................................................................................... 62
5.1.7.3 Application Errors .................................................................................. 63
5.1.8 Feature negotiation ...................................................................................... 63
5.1.9 Security ........................................................................................................ 63
5.2 Nnwdaf_AnalyticsInfo Service API ................................................................. 64
5.2.1 Introduction ................................................................................................ 64
5.2.2 Usage of HTTP ........................................................................................... 64
5.2.2.1 General .................................................................................................. 64
5.2.2.2 HTTP standard headers ......................................................................... 64
5.2.2.2.1 General ............................................................................................ 64
5.2.2.2.2 Content type ..................................................................................... 64
5.2.2.3 HTTP custom headers ........................................................................... 64
5.2.3 Resources .................................................................................................... 65
5.2.3.1 Resource Structure ................................................................................ 65
5.2.3.2 Resource: NWDAF Analytics ................................................................. 65
5.2.3.2.1 Description ....................................................................................... 65
5.2.3.2.2 Resource definition ........................................................................ 65
5.2.3.2.3 Resource Standard Methods ............................................................ 65
5.2.3.2.3.1 GET ............................................................................................ 65
5.2.3.2.4 Resource Custom Operations .......................................................... 66
5.2.4 Custom Operations without associated resources ...................................... 66
5.2.5 Notifications ............................................................................................... 66
5.2.6 Data Model .................................................................................................. 66
5.2.6.1 General .................................................................................................. 66
5.2.6.2 Structured data types ............................................................................. 70
5.2.6.2.1 Introduction ..................................................................................... 70
5.2.6.2.2 Type AnalyticsData ......................................................................... 71
5.2.6.2.3 Type EventFilter ............................................................................ 72
5.2.6.2.4 Void ................................................................................................. 74
5.2.6.3 Simple data types and enumerations ...................................................... 74
5.2.6.3.1 Introduction ..................................................................................... 74
5.2.6.3.2 Simple data types ........................................................................... 74
5.2.6.3.3 Enumeration: EventId .................................................................... 74
5.2.7 Error handling ............................................................................................. 75
5.2.7.1 General ................................................................................................ 75
5.2.7.2 Protocol Errors ..................................................................................... 75
5.2.7.3 Application Errors ................................................................................ 75
5.2.8 Feature negotiation ...................................................................................... 75
5.2.9 Security ........................................................................................................ 76
Annex A (normative): OpenAPI specification ...................................................... 77
A.1 General ........................................................................................................... 77
A.2 Nnwdaf_EventsSubscription API ................................................................. 77
A.3 Nnwdaf_AnalyticsInfo API ............................................................................. 91
Annex B (informative): Change history ............................................................... 95
History .................................................................................................................. 100
Foreword

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

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

Version x.y.z

where:

x  the first digit:
   1  presented to TSG for information;
   2  presented to TSG for approval;
   3  or greater indicates TSG approved document under change control.

y  the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z  the third digit is incremented when editorial only changes have been incorporated in the document.
1 Scope

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

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

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

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

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

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
[5] 3GPP TS 29.513: "5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".
[6] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".
[7] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".
[8] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".
3 Definitions and abbreviations

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

5QI 5G QoS Identifier
AF Application Function
AMF Access and Mobility Management Function
API Application Programming Interface
DNN Data Network Name
GFBR Guaranteed Flow Bit Rate
HTTP Hypertext Transfer Protocol
JSON JavaScript Object Notation
NEF Network Exposure Function
NF Network Function
NRF Network Repository Function
NSSF Network Slice Selection Function
NWDAF Network Data Analytics Function
OAM Operation, Administration, and Maintenance
PCF Policy Control Function
SUPI Subscription Permanent Identifier
S-NSSAI Single Network Slice Selection Assistance Information
SMF Session Management Function
UDM Unified Data Management
UPF User Plane Function
URI Uniform Resource Identifier
UTC Universal Time Coordinated
4 Services offered by the NWDAF

4.1 Introduction

The Nnwdaf services are used for the NWDAF to provide specific analytics information.

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

The following services are specified for NWDAF:

Table 4.1-1: Services provided by NWDAF

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Description</th>
<th>Service Operations</th>
<th>Operation Semantics</th>
<th>Example Consumer(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nnwdaf_EventsSubscription</td>
<td>This service enables the NF service consumers to subscribe/unsubscribe the notification for different analytics information from the NWDAF.</td>
<td>Subscribe</td>
<td>Subscribe / Notify</td>
<td>PCF, NSSF, AMF, SMF, NEF, UDM, AF, OAM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unsubscribe</td>
<td>Notify</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Notify</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.1-2: API Descriptions

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Clause</th>
<th>Description</th>
<th>OpenAPI Specification File</th>
<th>apiName</th>
<th>Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nnwdaf_EventsSubscription</td>
<td>5.2</td>
<td>Nnwdaf Events Subscription Service</td>
<td>TS29520_Nnwdaf_EventsSubscription.yaml</td>
<td>nnnwdaf-eventssubscription</td>
<td>A.2</td>
</tr>
<tr>
<td>Nnwdaf_AnalyticsInfo</td>
<td>5.2</td>
<td>Nnwdaf Analytics Information Service</td>
<td>TS29520_Nnwdaf_AnalyticsInfo.yaml</td>
<td>nnnwdaf-analyticsinfo</td>
<td>A.3</td>
</tr>
</tbody>
</table>

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

4.2 Nnwdaf_EventsSubscription Service

4.2.1 Service Description

4.2.1.1 Overview

The Nnwdaf_EventsSubscription Service corresponding to Nnwdaf_AnalyticsSubscription Service as defined in 3GPP TS 23.501 [2], 3GPP TS 23.288 [17] and 3GPP TS 23.503 [4], is provided by the Network Data Analytics Function (NWDAF).

This service:

- allows NF consumers to subscribe to and unsubscribe from different analytic events; and
- notifies NF consumers with a corresponding subscription about observed events.

The types of observed events include:

- Load level information;
- Service experience;
- NF load;
- Network performance;
- Abnormal behaviour;
- UE mobility;
- UE communication;
- User data congestion; and
- QoS sustainability.

### 4.2.1.2 Service Architecture

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

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

Known consumers of the Nnwdaf_EventsSubscription service are:

- Policy Control Function (PCF)
- Network Slice Selection Function (NSSF)
- Access and Mobility Management Function (AMF)
- Session Management Function (SMF)
- Network Exposure Function (NEF)
- Unified Data Management (UDM)
- Application Function (AF)
- Operation, Administration, and Maintenance (OAM)

The PCF accesses the Nnwdaf_EventsSubscription service at the NWDAF via the N23 Reference point. The NSSF accesses the Nnwdaf_EventsSubscription service at the NWDAF via the N34 Reference point.

---

**Figure 4.2.1.2-1: Reference Architecture for the Nnwdaf_EventsSubscription Service; SBI representation**
4.2.1.3 Network Functions

4.2.1.3.1 Network Data Analytics Function (NWDAF)

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

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

4.2.1.3.2 NF Service Consumers

The Policy Control Function (PCF):
- supports (un)subscription to the notification of analytics information for slice load level information from the NWDAF;
- supports (un)subscription to the notification of analytics information for service experience related network data from the NWDAF;
- supports (un)subscription to the notification of analytics information for network performance from the NWDAF;
- supports (un)subscription to the notification of analytics information for abnormal UE behaviour from the NWDAF;
- supports (un)subscription to the notification of analytics information for QoS sustainability from NWDAF;
- supports taking one or more above input from NWDAF into consideration for policies on assignment of network resources and/or for traffic steering policies.

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

The Network Slice Selection Function (NSSF):
- supports (un)subscription to the notification of analytics information for slice load level information from NWDAF to determine slice selection.

The Access and Mobility Management Function (AMF):
- supports (un)subscription to the notification of analytics information for SMF load information from NWDAF to determine SMF selection;
- supports (un)subscription to the notification of analytics information for expected UE behavioural information (UE mobility and/or UE communication) from NWDAF to monitor UE behaviour;
- supports (un)subscription to the notification of analytics information for abnormal UE behaviour information from NWDAF to determine adjustment of UE mobility related network parameters to solve the abnormal risk.
The Session Management Function (SMF):
- supports (un)subscription to the notification of analytics information for UPF load information from NWDAF to determine UPF selection;
- supports (un)subscription to the notification of analytics information for expected UE behavioural information (UE mobility and/or UE communication) from NWDAF to monitor UE behaviour;
- supports (un)subscription to the notification of analytics information for abnormal UE behaviour information from NWDAF to determine adjustment of UE communication-related network parameters to solve the abnormal risk.

The Network Exposure Function (NEF):
- supports forwarding UE mobility information from NWDAF to the AF when it is untrusted;
- supports forwarding UE communication information from NWDAF to the AF when it is untrusted;
- supports forwarding expected UE behavioural information (UE mobility and/or UE communication) from NWDAF to the AF when it is untrusted;
- supports forwarding abnormal behaviour information from NWDAF to the AF when it is untrusted;
- supports forwarding user data congestion information from NWDAF to the AF when it is untrusted;
- supports forwarding network performance information from NWDAF to the AF when it is untrusted;
- supports forwarding QoS Sustainability information from NWDAF to the AF when it is untrusted.

The Unified Data Management (UDM):
- supports taking expected UE behaviour information (UE mobility and/or UE communication) from NWDAF into consideration for monitoring UE behaviour.

The Application Function (AF):
- supports receiving UE mobility information from NWDAF or via the NEF;
- supports receiving UE communication information from NWDAF or via the NEF;
- supports receiving expected UE behavioural information (UE mobility and/or UE communication) from NWDAF or via the NEF;
- supports receiving abnormal behaviour information from NWDAF or via the NEF;
- supports receiving user data congestion information from NWDAF or via the NEF;
- supports receiving network performance information from NWDAF or via the NEF;
- supports receiving QoS Sustainability information from NWDAF or via the NEF.

The Operation, Administration, and Maintenance (OAM):
- supports receiving observed service experience from NWDAF;
- supports receiving NF load information from NWDAF;
- supports receiving network performance information from NWDAF;
- supports receiving UE mobility information from NWDAF;
- supports receiving UE communication information from NWDAF;
- supports receiving expected UE behaviour information from NWDAF;
- supports receiving abnormal UE behaviour information from NWDAF.
4.2.2 Service Operations

4.2.2.1 Introduction

Table 4.2.2.1-1: Operations of the Nnwdaf_EventsSubscription Service

<table>
<thead>
<tr>
<th>Service operation name</th>
<th>Description</th>
<th>Initiated by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nnwdaf_EventsSubscription_Subscribe</td>
<td>This service operation is used by an NF to subscribe or update subscription for event notifications of the analytic information. Periodic notification and notification upon event detected can be subscribed.</td>
<td>NF consumer (PCF, NSSF, AMF, SMF, NEF, UDM, AF, OAM)</td>
</tr>
<tr>
<td>Nnwdaf_EventsSubscription_UnSubscribe</td>
<td>This service operation is used by an NF to unsubscribe from event notifications.</td>
<td>NF consumer (PCF, NSSF, AMF, SMF, NEF, UDM, AF, OAM)</td>
</tr>
<tr>
<td>Nnwdaf_EventsSubscription_Notify</td>
<td>This service operation is used by an NWDAF to notify NF consumers about subscribed events.</td>
<td>NWDAF</td>
</tr>
</tbody>
</table>

4.2.2.2 Nnwdaf_EventsSubscription_Subscribe service operation

4.2.2.2.1 General

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

4.2.2.2 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]).

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

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

NOTE: 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) via the "nsiIdInfos" attribute or any slices indication in the "anySlice" attribute;
  2) the 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) 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;
  3) NF load level thresholds in the "nfLoadLvlThrds" 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;
- 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 "nwPerfReqs" 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);
- 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) via the "nsiIdInfos" attribute;
  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 "networkAreas" attribute;
  3) identification of DNN to which the subscription applies via identification of application(s) by "dnns" attribute; and
  4) identification of a user plane access to one or more DN(s) where applications are deployed by "dnais" attribute;
  5) if "appIds" attribute is provided, the bandwidth requirement of each application by "bwReqs" 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" attribut;
- 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) a 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 throughput 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;
   - 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 "excepRequ" attribute.

and may provide:
   1) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute;
   2) identification of application to which the subscription applies via identification of application(s) by "appIds" attribute;
   3) identification of DNN to which the subscription applies via identification of application(s) by "dnns" attribute;
   4) identification of network slice(s) by "snssais" attribute; and
   5) expected UE behaviour via "exptUeBehav" attribute.

- if the feature "UserDataCongestion" is supported and the event is "USER_DATA_CONGESTION", shall provide:
   1) identification of a specific UE via "supis" 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).

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 4.2.2.2.1, step 2. The NWDAF shall include a Location HTTP header field. The Location header field shall contain the URI of the created subscription i.e. "[{apiRoot}/nnwdaf-eventssubscription/v1/subscriptions/{subscriptionId}". If the 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.
If the feature "AbnormalBehaviour" is supported and the expected analytics type via "exptAnaType" attribute is received in figure 4.2.2.2.2-1, step 1, the NWDAF shall derive the corresponding Exception Ids from the expected analytics type as follows:

- if "exptAnaType" attribute sets to "MOBILITY", the corresponding list of Exception Ids are "UNEXPECTED_UE_LOCATION" and "PING_PONG_ACROSS CELLS";
- if "exptAnaType" attribute sets to "COMMUN", the corresponding list of Exception Ids are "UNEXPECTED_LONG_LIVE_FLOW", "UNEXPECTED_LARGE_RATE_FLOW", "UNEXPECTED_WAKEUP", "SUSPICION_OF_DDOS_ATTACK", "WRONG_DESTINATION_ADDRESS", "TOO_FREQUENT_SERVICE_ACCESS" and "UNEXPECTED_RADIO_LINK_FAILURES";
- if "exptAnaType" attribute sets to "MOBILITY_AND_COMMUN", the corresponding list of Exception Ids includes all above derived exception Ids.

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

### 4.2.2.2.3 Update subscription for event notifications

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

The NF service consumer shall invoke the Nnwdaf_EventsSubscription_Subscribe service operation to update subscription to event notifications. The NF service consumer shall send an HTTP PUT request with "/subscriptions/{subscriptionId}" as Resource URI representing the "NWDAF Events Subscriptions", as shown in figure 4.2.2.2.3-1, step 1, to update the subscription for an "Individual NWDAF Event Subscription" resource identified by the {subscriptionId}. The NnwdafEventsSubscription data structure provided in the request body shall include the same contents as described in subclause 4.2.2.2.2:

Upon the reception of an HTTP PUT request with: "/subscriptions/{subscriptionId}" as Resource URI and NnwdafEventsSubscription data structure as request body, the NWDAF shall:

- update the subscription of corresponding subscriptionId; and
- store the subscription.

If the NWDAF updated an "Individual NWDAF Event Subscription" resource, the NWDAF shall respond with:

- a) HTTP "200 OK" status code with the message body containing a representation of the updated subscription, as shown in figure 4.2.2.2.3-1, step 2a; or
- b) HTTP "204 No Content" status code, as shown in figure 4.2.2.2.3-1, step 2b.
If the Individual NWDAF Event Subscription resource does not exist, the NWDAF shall respond with "404 Not Found".

4.2.2.3 Nnwdaf_EventsSubscription_Unsubscribe service operation

4.2.2.3.1 General

The Nnwdaf_EventsSubscription_Unsubscribe service operation is used by an NF service consumer to unsubscribe from event notifications.

4.2.2.3.2 Unsubscribe from event notifications

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

The NF service consumer shall invoke the Nnwdaf_EventsSubscription_UnSubscribe service operation to unsubscribe to event notifications. The NF service consumer shall send an HTTP DELETE request with: 

```
{apiRoot}/nnwdaf-eventssubscription/v1/subscriptions/{subscriptionId}
```

where "{subscriptionId}" is the event subscriptionId of the existing subscription that is to be deleted.

Upon the reception of an HTTP DELETE request with:

```
{apiRoot}/nnwdaf-eventssubscription/v1/subscriptions/{subscriptionId}
```

the NWDAF shall:

- remove the corresponding subscription.

If the HTTP request message from the NF service consumer is accepted, the NWDAF shall respond with "204 No Content".

If the Individual NWDAF Event Subscription resource does not exist, the NWDAF shall respond with "404 Not Found".

4.2.2.4 Nnwdaf_EventsSubscription_Notify service operation

4.2.2.4.1 General

The Nnwdaf_EventsSubscription_Notify service operation is used by an NWDAF to notify NF consumers about subscribed events.

4.2.2.4.2 Notification about subscribed event

Figure 4.2.2.4.2-1 shows a scenario where the NWDAF sends a request to the NF Service Consumer to notify for event notifications (see also 3GPP TS 23.288 [17]).
The NWDAF shall invoke the Nnwdaf_EventsSubscription_Notify service operation to notify the subscribed event. The NWDAF shall send an HTTP POST request with "{notificationURI}" received in the Nnwdaf_EventsSubscription_Subscribe service operation as Resource URI, as shown in figure 4.2.2.4.2-1, step 1. The NnwdafEventsSubscriptionNotification data structure provided in the request body shall include:

- a description of the notified event as "eventNotifications" attribute that for each event shall include:
  a) an event identifier as "event" attribute;
  b) identification(s) of network slice to which the notification applies as "snssais" attribute and load level information in the "loadLevelInformation" attribute when subscribed event is "SLICE_LOAD_LEVEL";
  c) service experience information as "svcExpInfo" attribute when subscribed event is "SERVICE_EXPERIENCE";
  d) UE mobility information in the "ueMobs" attribute when subscribed event is "UE_MOBILITY";
  e) UE communication information in the "ueComms" attribute when subscribed event is "UE_COMM";
  f) Abnormal behaviour information in the "abnorBehavrs" attribute when subscribed event is "ABNORMAL_BEHAVIOUR";
  g) User data congestion information in the "userDataCongInfos" attribute when subscribed event is "USER_DATA_CONGESTION";
  h) QoS sustainability information in the "qosSustainInfos" attribute when subscribed event is "QOS_SUSTAINABILITY";
  i) NF load information in "nfLoadLevelInfo" attribute when subscribed event is "NF_LOAD";
  j) Network performance information in the "nwPerfs" attribute when subscribed event is "NETWORK_PERFORMANCE"; and
  k) Load level information for the network slice(s) and the optionally associated network slice instance(s) in "nsiLoadLevelInfos" attribute when subscribed event is "NSI_LOAD_LEVEL";

- an event subscriptionId as "subscriptionId" attribute.

Upon the reception of an HTTP POST request with: "{notificationURI}" as Resource URI and NnwdafEventsSubscriptionSubscriptionNotification data structure as request body, the NF Service Consumer shall:

- store the notification.

If the HTTP request message from the NWDAF is accepted, the NF Service Consumer shall respond with "204 No Content".

---

**Figure 4.2.2.4.2-1: NWDAF notifies the subscribed event**

1. POST {notificationURI}
2. 204 No Content
4.3 Nnwdaf_AnalyticsInfo Service

4.3.1 Service Description

4.3.1.1 Overview

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

This service:

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

The types of observed events include:

- Load level information;
- Service experience;
- NF load;
- Network performance;
- Abnormal behaviour;
- UE mobility;
- UE communication;
- User data congestion; and
- QoS sustainability.

4.3.1.2 Service Architecture

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

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

Known consumers of the Nnwdaf_AnalyticsInfo service are:

- Policy Control Function (PCF)
- Network Slice Selection Function (NSSF)
- Access and Mobility Management Function (AMF)
- Session Management Function (SMF)
- Network Exposure Function (NEF)
- Unified Data Management (UDM)
- Application Function (AF)
- Operation, Administration, and Maintenance (OAM)

The PCF accesses the Nnwdaf_AnalyticsInfo service at the NWDAF via the N23 Reference point. The NSSF accesses the Nnwdaf_AnalyticsInfo service at the NWDAF via the N34 Reference point.
4.3.1.3 Network Functions

4.3.1.3.1 Network Data Analytics Function (NWDAF)

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

4.3.1.3.2 NF Service Consumers

The Policy Control Function (PCF):
- supports taking analytics information for slice load level information from the NWDAF;
- supports taking analytics information for service experience related network data from the NWDAF;
- supports taking analytics information for network performance from the NWDAF;
- supports taking analytics information for abnormal UE behaviour from the NWDAF;
- supports taking one or more above input from NWDAF into consideration for policies on assignment of network resources and/or for traffic steering policies.

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

The Network Slice Selection Function (NSSF):
- supports taking slice load level information from NWDAF into consideration for slice selection.

The Access and Mobility Management Function (AMF):
- supports taking SMF load information from NWDAF into consideration for SMF selection;
- supports taking expected UE behaviour information (UE mobility and/or UE communication) from NWDAF into consideration for monitoring UE behaviour;
The Session Management Function (SMF):
- supports taking abnormal UE behaviour information from NWDAF into consideration for adjustment of UE mobility related network parameters to solve the abnormal risk.

The Network Exposure Function (NEF):
- supports forwarding UE mobility information from NWDAF to the AF when it is untrusted;
- supports forwarding UE communication information from NWDAF to the AF when it is untrusted;
- supports forwarding expected UE behavioural information (UE mobility and/or UE communication) from NWDAF to the AF when it is untrusted;
- supports forwarding abnormal behaviour information from NWDAF to the AF when it is untrusted;
- supports forwarding user data congestion information from NWDAF to the AF when it is untrusted;
- supports forwarding network performance information from NWDAF to the AF when it is untrusted;
- supports forwarding QoS Sustainability information from NWDAF to the AF when it is untrusted.

The Unified Data Management (UDM):
- supports taking expected UE behaviour information (UE mobility and/or UE communication) from NWDAF into consideration for monitoring UE behaviour.

The Application Function (AF):
- supports receiving UE mobility information from NWDAF or via the NEF;
- supports receiving UE communication information from NWDAF or via the NEF;
- supports receiving expected UE behavioural information (UE mobility and/or UE communication) from NWDAF or via the NEF;
- supports receiving abnormal behaviour information from NWDAF or via the NEF;
- supports receiving user data congestion information from NWDAF or via the NEF;
- supports receiving network performance information from NWDAF or via the NEF;
- supports receiving QoS Sustainability information from NWDAF or via the NEF.

The Operation, Administration, and Maintenance (OAM):
- supports receiving observed service experience from NWDAF;
- supports receiving NF load information from NWDAF;
- supports receiving network performance information from NWDAF;
- supports receiving UE mobility information from NWDAF;
- supports receiving UE communication information from NWDAF;
- supports receiving expected UE behaviour information from NWDAF;
- supports receiving abnormal UE behaviour information from NWDAF.
4.3.2 Service Operations

4.3.2.1 Introduction

Table 4.3.2.1-1: Operations of the Nnwdaf_AnalyticsInfo Service

<table>
<thead>
<tr>
<th>Service operation name</th>
<th>Description</th>
<th>Initiated by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nnwdaf_AnalyticsInfo_Request</td>
<td>This service operation is used by an NF to request and get specific analytics from NWDAF.</td>
<td>NF consumer (PCF, NSSF, AMF, SMF, NEF, UDM, AF, OAM)</td>
</tr>
</tbody>
</table>

4.3.2.2 Nnwdaf_AnalyticsInfo_Request service operation

4.3.2.2.1 General

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

4.3.2.2.2 Request and get from NWDAF Analytics information

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

```
1. GET …/analytics?query_parameters

2. 200 OK
```

Figure 4.3.2.2.2-1: Requesting a NWDAF Analytics information

The NF service consumer (e.g. PCF) shall invoke the Nnwdaf_AnalyticsInfo_Request service operation when requesting the NWDAF analytics information. The NF service consumer shall send an HTTP GET request on the resource URI "[apiRoot]/nnwdaf-analyticsinfo/v1/analytics" representing the "NWDAF Analytics" (as shown in figure 4.3.2.2.2-1, step 1), to request analytics data according to the query parameter value of the "event-id" attribute. In addition, the following information may be provided:

- common reporting requirement in the "ana-req" attribute as follows:
  1) identification of time window to which the subscription applies via identification of date-time(s) in the "startTs" and "endTs" attributes;
  2) preferred level of accuracy of the analytics in "accuracy" attribute;
  3) percentage of sampling among impacted UEs in the "sampRatio" attribute;
  4) maximum number of objects in the “maxObjectNbr” attribute; and/or
  5) maximum number of SUPIs expected for an analytics report in the "maxSupiNbr" attribute;

For different event types:

- if the event is "LOAD_LEVEL_INFORMATION", it shall provide the event specific filter information within "event-filter" attribute including identification(s) of the network slice via:
1) identification of network slice(s) in the "snssais" attribute; or

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

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

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

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

- if the feature "NfLoad" is supported and the event is "NF_LOAD", it shall provide:

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

the "event-filter" attribute may provide:

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

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

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

- if the feature "UeMobility" is supported and the event is "UE_MOBILITY", it shall provide:

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

and may provide:

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

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

- if the feature "UeCommunication" is supported and the event is "UE_COMM", it shall provide:

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

and may provide:

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

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

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

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

d) network slice in the "snssais" attribute;

- 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 "tgt-ue" attribute; and

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

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

the "event-filter" attribute may provide:
a) 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).

- if the feature "ServiceExperience" is supported and the event is "SERVICE_EXPERIENCE", it shall provide:
  1) identification of target UE(s) to which the subscription applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgt-ue" attribute;
  2) event specific filter information in the "event-filter" attribute which shall provide:
     a) any slices indication in the "anySlice" attribute or identification of network slice(s) together with the optionally associated network slice instance(s) via the "nsiIdInfos" attribute; and
     b) if "appIds" attribute is provided, the bandwidth requirement of each application by "bwReqs" attribute.

- if the feature "QoSSustainability" is supported and the event is "QOS_SUSTAINABILITY", it shall provide:
  1) event specific filter information in the "event-filter" attribute which shall provide:
     a) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute;
     b) QoS requirements via "qosReqs" attribute; and
  2) identification of target UE(s) to which the subscription applies by "anyUe" in the "tgt-ue" attribute;
     the "event-filter" attribute may provide:
     a) identification of network slice(s) by "snssais" attribute; and

- if the feature "AbnormalBehaviour" is supported and the event is "ABNORMAL_BEHAVIOUR", it shall provide:
  1) identification of target UE(s) to which the subscription applies by "supi", "intGroupId" or "anyUe" attribute in the "tgt-ue" attribute; and
  2) event specific filter information in the "event-filter" attribute which shall provide:
     a) either the expected analytics type via "exptAnaType" attribute or a list of exception Ids via "exptIds" attribute.
     the "event-filter" attribute may provide:
     a) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute;
     b) identification of application to which the subscription applies via identification of application(s) by "appIds" attribute;
     c) identification of DNN to which the subscription applies via identification of application(s) by "dnns" attribute;
     d) identification of network slice(s) by "snssais" attribute; and
     e) expected UE behaviour via "exptUeBehav" attribute.
- if the feature "UserDataCongestion" is supported and the event is "USER_DATA_CONGESTION", it shall provide one of the following attributes:

  1) identification of UE via "supis" attribute within "tgt-ue" attribute; and

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

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

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

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

- analyse the requested analytic data according to the requested event

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

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

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

If the feature "AbnormalBehaviour" is supported and the expected analytics type via "exptAnaType" attribute is received in figure 4.3.2.2.2-1, step 1, the NWDAF shall derive the corresponding Exception Ids from the expected analytics type as follows:

- if "exptAnaType" attribute sets to "MOBILITY", the corresponding list of Exception Ids are "UNEXPECTED_UE_LOCATION" and "PING_PONG_ACROSS_CELLS";

- if "exptAnaType" attribute sets to "COMMUN", the corresponding list of Exception Ids are "UNEXPECTED_LONG_LIVE_FLOW", "UNEXPECTED_LARGE_RATE_FLOW", "UNEXPECTED_WAKEUP", "SUSPICION_OF_DDOS_ATTACK", "WRONG_DESTINATION_ADDRESS", "TOO_FREQUENT_SERVICE_ACCESS", "ABNORMAL_TRAFFIC_VOLUME" and "UNEXPECTED_RADIO_LINK_FAILURES";

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

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

5 API Definitions

5.1 Nnwdaf_EventsSubscription Service API

5.1.1 Introduction

The Nnwdaf_EventsSubscription Service shall use the Nnwdaf_EventsSubscription API.

The API URI of the Nnwdaf_EventsSubscription API shall be:

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

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

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

with the following components:
- The {apiRoot} shall be set as described in 3GPP TS 29.501 [7].
- The <apiName> shall be "nnwdaf-eventssubscription".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in subclause 5.1.3.

5.1.2 Usage of HTTP

5.1.2.1 General

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

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

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

5.1.2.2 HTTP standard headers

5.1.2.2.1 General

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

5.1.2.2.2 Content type

JSON, IETF RFC 8259 [10], shall be used as content type of the HTTP bodies specified in the present specification as specified in subclause 5.4 of 3GPP TS 29.500 [6]. The use of the JSON format shall be signalled by the content type "application/json".

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

5.1.2.3 HTTP custom headers

The Nnwdaf_EventsSubscription Service API shall support HTTP custom header fields specified in subclause 5.2.3.2 of 3GPP TS 29.500 [6].

In this release of the specification, no specific custom headers are defined for the Nnwdaf_EventsSubscription Service API.
5.1.3 Resources

5.1.3.1 Resource Structure

![Diagram of resource structure]

Figure 5.1.3.1-1: Resource URI structure of the Nnwdaf_EventsSubscription API

Table 5.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 5.1.3.1-1: Resources and methods overview**

<table>
<thead>
<tr>
<th>Resource name</th>
<th>Resource URI</th>
<th>HTTP method or custom operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWDAF Events Subscriptions</td>
<td>{apiRoot}/nnwdaf-eventssubscription/v1/subscriptions</td>
<td>POST</td>
<td>Creates a new Individual NWDAF Event Subscription resource.</td>
</tr>
<tr>
<td>Individual NWDAF Event Subscription</td>
<td>{apiRoot}/nnwdaf-eventssubscription/v1/subscriptions/{subscriptionId}</td>
<td>DELETE</td>
<td>Deletes an Individual NWDAF Event Subscription identified by subresource {subscriptionId}.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PUT</td>
<td>Modifies an existing Individual Event Subscription subresource.</td>
</tr>
</tbody>
</table>

5.1.3.2 Resource: NWDAF Events Subscriptions

5.1.3.2.1 Description

The NWDAF Events Subscriptions resource represents all subscriptions to the Nnwdaf_EventsSubscription Service at a given NWDAF. The resource allows an NF service consumer to create a new Individual NWDAF Event Subscription resource.

5.1.3.2.2 Resource definition

Resource URI: {apiRoot}/nnwdaf-eventssubscription/v1/subscriptions

This resource shall support the resource URI variables defined in table 5.1.3.2.2-1.

**Table 5.1.3.2.2-1: Resource URI variables for this resource**

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>apiRoot</td>
<td>string</td>
<td>See subclause 5.1.1</td>
</tr>
</tbody>
</table>
5.1.3.2.3 Resource Standard Methods

5.1.3.2.3.1 POST

This method shall support the URI query parameters specified in table 5.1.3.2.3.1-1.

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This method shall support the request data structures specified in table 5.1.3.2.3.1-2 and the response data structures and response codes specified in table 5.1.3.2.3.1-3.

5.1.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

<table>
<thead>
<tr>
<th>Data type</th>
<th>M</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NnwdafEventsSubscription</td>
<td>1</td>
<td>1</td>
<td>Create a new Individual NWDAF Event Subscription resource.</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.1.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

<table>
<thead>
<tr>
<th>Data type</th>
<th>M</th>
<th>P</th>
<th>Cardinality</th>
<th>Response codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NnwdafEventsSubscription</td>
<td>1</td>
<td>201</td>
<td>Created</td>
<td>The creation of an Individual NWDAF Event Subscription resource is confirmed and a representation of that resource is returned.</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply.

Table 5.1.3.2.3.1-4: Headers supported by the 201 Response Code on this resource

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>string</td>
<td>M</td>
<td>1</td>
<td>Contains the URI of the newly created resource, according to the structure: {apiRoot}/nnwdaf-eventssubscription/v1/subscriptions/{subscriptionId}</td>
</tr>
</tbody>
</table>

5.1.3.2.4 Resource Custom Operations

None in this release of the specification.

5.1.3.3 Resource: Individual NWDAF Event Subscription

5.1.3.3.1 Description

The Individual NWDAF Event Subscription resource represents a single subscription to the Nnwdaf_EventsSubscription Service at a given NWDAF.

5.1.3.3.2 Resource definition

Resource URI: {apiRoot}/nnwdaf-eventssubscription/v1/subscriptions/{subscriptionId}

This resource shall support the resource URI variables defined in table 5.1.3.3.2-1.
Table 5.1.3.3.2-1: Resource URI variables for this resource

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>apiRoot</td>
<td>string</td>
<td>See subclause 5.1.1</td>
</tr>
<tr>
<td>subscriptionId</td>
<td>string</td>
<td>Identifies a subscription to the NnwdafEventsSubscription Service</td>
</tr>
</tbody>
</table>

5.1.3.3.3 Resource Standard Methods

5.1.3.3.3.1 DELETE

This method shall support the URI query parameters specified in table 5.1.3.3.3.1-1.

Table 5.1.3.3.3.1-1: URI query parameters supported by the DELETE method on this resource

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This method shall support the request data structures specified in table 5.1.3.3.3.1-2 and the response data structures and response codes specified in table 5.1.3.3.3.1-3.

Table 5.1.3.3.3.1-2: Data structures supported by the DELETE Request Body on this resource

<table>
<thead>
<tr>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.1.3.3.3.1-3: Data structures supported by the DELETE Response Body on this resource

<table>
<thead>
<tr>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Response codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/a</td>
<td></td>
<td></td>
<td>204 No Content</td>
<td>Successful case: The Individual NWDAF Event Subscription resource matching the subscriptionId was deleted.</td>
</tr>
<tr>
<td>ProblemDetails</td>
<td>O</td>
<td>0..1</td>
<td>404 Not Found</td>
<td>The Individual NWDAF Event Subscription resource does not exist. (NOTE 2)</td>
</tr>
</tbody>
</table>

NOTE 1: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply.

NOTE 2: Failure cases are described in subclause 5.1.7.

5.1.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 5.1.3.3.3.2-1.

Table 5.1.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This method shall support the request data structures specified in table 5.1.3.3.3.2-2 and the response data structures and response codes specified in table 5.1.3.3.3.2-3.

Table 5.1.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

<table>
<thead>
<tr>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NnwdafEventsSubscription</td>
<td>M</td>
<td>1</td>
<td>Parameters to replace a subscription to NWDAF Event Subscription resource.</td>
</tr>
</tbody>
</table>
Table 5.1.3.3.2-3: Data structures supported by the PUT Response Body on this resource

<table>
<thead>
<tr>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Response codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NnwdafEventsSubscription</td>
<td>M</td>
<td>1</td>
<td>200 OK</td>
<td>The Individual NWDAF Event Subscription resource was modified successfully and a representation of that resource is returned.</td>
</tr>
<tr>
<td>n/a</td>
<td></td>
<td></td>
<td>204 No Content</td>
<td>The Individual NWDAF Event Subscription resource was modified successfully.</td>
</tr>
<tr>
<td>ProblemDetails</td>
<td>O</td>
<td>0..1</td>
<td>404 Not Found</td>
<td>The Individual NWDAF Event Subscription resource does not exist. (NOTE 2)</td>
</tr>
</tbody>
</table>

NOTE 1: The mandatory HTTP error status codes for the PUT method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply.
NOTE 2: Failure cases are described in subclause 5.1.7.

5.1.3.3.4 Resource Custom Operations
None in this release of the specification.

5.1.4 Custom Operations without associated resources
None in this release of the specification.

5.1.5 Notifications

5.1.5.1 General
Notifications shall comply with subclause 6.2 of 3GPP TS 29.500 [6] and subclause 4.6.2.3 of 3GPP TS 29.501 [7].

Table 5.3.3.4.1-1: Notifications overview

<table>
<thead>
<tr>
<th>Notification</th>
<th>Custom operation URI</th>
<th>Mapped HTTP method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event Notification</td>
<td>{notificationURI}</td>
<td>POST</td>
<td>Report one or several observed Events.</td>
</tr>
</tbody>
</table>

5.1.5.2 Event Notification

5.1.5.2.1 Description
The Event Notification is used by the NWDAF to report one or several observed Events to a NF service consumer that has subscribed to such Notifications via the Individual NWDAF Event Subscription Resource.

5.1.5.2.2 Operation Definition

URI: {notificationURI}
The operation shall support the URI variables defined in table 5.1.5.2.2-1, the request data structures specified in table 5.1.5.2.2-2 and the response data structure and response codes specified in table 5.1.5.2.2-3.

Table 5.1.5.2.2-1: URI variables

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>notificationURI</td>
<td>Uri</td>
<td>The Notification Uri as assigned within the Individual NWDAF Event Subscription and described within the NnwdafEventsSubscription type (see table 5.1.6.2.2-1).</td>
</tr>
</tbody>
</table>
Table 5.1.5.2.2-2: Data structures supported by the POST Request Body on this resource

<table>
<thead>
<tr>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>array(NnwdafEventsSubscriptionNotification)</td>
<td>M</td>
<td>1..N</td>
<td>Provides Information about observed events</td>
</tr>
</tbody>
</table>

Table 5.1.5.2.2-3: Data structures supported by the POST Response Body on this resource

<table>
<thead>
<tr>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Response codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/a</td>
<td></td>
<td></td>
<td>204 No Content</td>
<td>The receipt of the Notification is acknowledged.</td>
</tr>
</tbody>
</table>

NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply.

5.1.6 Data Model

5.1.6.1 General

This subclause specifies the application data model supported by the API.

Table 5.1.6.1-1 specifies the data types defined for the Nnwdaf_EventsSubscription service based interface protocol.
Table 5.1.6.1-1: Nnwdaf_EventsSubscription specific Data Types
<table>
<thead>
<tr>
<th>Data type</th>
<th>Section defined</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>AdditionalMeasurement</td>
<td>5.1.6.2.26</td>
<td>Represents the preferred level of accuracy of the analytics.</td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>AddressList</td>
<td>5.4.6.2.28</td>
<td></td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>Accuracy</td>
<td>5.1.6.3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AnySlice</td>
<td>5.1.6.3.2</td>
<td>Represents the any slices.</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>BwRequirement</td>
<td>5.1.6.2.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CircumstanceDescription</td>
<td>5.1.6.2.29</td>
<td></td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>CongestionInfo</td>
<td>5.1.6.2.18</td>
<td></td>
<td>UserDataCongestion</td>
</tr>
<tr>
<td>CongestionType</td>
<td>5.1.6.3.7</td>
<td></td>
<td>UserDataCongestion</td>
</tr>
<tr>
<td>EventNotification</td>
<td>5.1.6.2.5</td>
<td>Describes Notifications about events that occurred.</td>
<td></td>
</tr>
<tr>
<td>EventNotification</td>
<td>5.1.6.2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EventReportingRequirement</td>
<td>5.1.6.2.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EventSubscription</td>
<td>5.1.6.2.3</td>
<td>Represents the subscription to a single event.</td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>ExpectedAnalyticsType</td>
<td>5.1.6.3.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IpEthFlowDescription</td>
<td>5.1.6.2.27</td>
<td></td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>LoadLevelInformation</td>
<td>5.1.6.3.2</td>
<td>Represents load level information of the network slice instance</td>
<td></td>
</tr>
<tr>
<td>LocationInfo</td>
<td>5.1.6.2.11</td>
<td></td>
<td>UeMobility</td>
</tr>
<tr>
<td>MatchingDirection</td>
<td>5.1.6.3.12</td>
<td>Defines the matching direction when crossing a threshold</td>
<td>NfLoad, QoSsustainability, NetworkPerformance</td>
</tr>
<tr>
<td>NetworkPerfInfo</td>
<td>5.1.6.2.23</td>
<td></td>
<td>NetworkPerformance</td>
</tr>
<tr>
<td>NetworkPerfRequirement</td>
<td>5.1.6.2.22</td>
<td></td>
<td>NetworkPerformance</td>
</tr>
<tr>
<td>NetworkPerfType</td>
<td>5.1.6.3.10</td>
<td></td>
<td>NetworkPerformance</td>
</tr>
<tr>
<td>NfLoadLevelInformation</td>
<td>5.1.6.2.31</td>
<td>Represents load level information of a given NF instance.</td>
<td>NfLoad</td>
</tr>
<tr>
<td>NfStatus</td>
<td>5.1.6.2.32</td>
<td>Provides the percentage of time spent on various NF states</td>
<td>NfLoad</td>
</tr>
<tr>
<td>NwdafEvent</td>
<td>5.1.6.3.4</td>
<td>Describes the NWDAF Events.</td>
<td></td>
</tr>
<tr>
<td>NwdfafEventsSubscription</td>
<td>5.1.6.2.2</td>
<td>Represents an Individual NWDAF Event Subscription resource.</td>
<td></td>
</tr>
<tr>
<td>NwdfafEventsSubscriptionNotification</td>
<td>5.1.6.2.4</td>
<td>Represents an Individual NWDAF Event Subscription Notification resource.</td>
<td></td>
</tr>
<tr>
<td>NotificationMethod</td>
<td>5.1.6.3.3</td>
<td>Represents the notification methods that can be subscribed.</td>
<td></td>
</tr>
<tr>
<td>NsidInfo</td>
<td>5.1.6.2.33</td>
<td>Represents the S-NSSAI and the optionally associated Network Slice Instance Identifier(s).</td>
<td>ServiceExperience NsiLoad</td>
</tr>
<tr>
<td>NsiLoadLevelInfo</td>
<td>5.1.6.2.34</td>
<td>Represents the load level information for an S-NSSAI and the optionally associated network slice instance.</td>
<td>NsiLoad</td>
</tr>
<tr>
<td>QosRequirement</td>
<td>5.1.6.2.20</td>
<td></td>
<td>QoSsustainability</td>
</tr>
<tr>
<td>QoSsustainabilityInfo</td>
<td>5.1.6.2.19</td>
<td>Represents the QoS Sustainability information.</td>
<td>QoSsustainability</td>
</tr>
<tr>
<td>RetainabilityThreshold</td>
<td>5.1.6.2.21</td>
<td></td>
<td>QoSsustainability</td>
</tr>
<tr>
<td>ServiceExperienceInfo</td>
<td>5.1.6.2.24</td>
<td>Represents the service experience information.</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>SliceLoadLevelInformation</td>
<td>5.1.6.2.24</td>
<td>Represents the slices and the load level information.</td>
<td>ServiceExperience NfLoad, NetworkPerformance, UserDataCongestion, UeMobility, UeCommunication, AbnormalBehaviour, QoSsustainability</td>
</tr>
<tr>
<td>TargetUeInformation</td>
<td>5.1.6.2.8</td>
<td>Identifies the target UE information.</td>
<td></td>
</tr>
<tr>
<td>ThresholdLevel</td>
<td>5.1.6.2.30</td>
<td>Describe a threshold level</td>
<td>UserDataCongestion</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------</td>
<td>---------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>TimeUnit</td>
<td>5.1.6.3.9</td>
<td></td>
<td>NLoad</td>
</tr>
<tr>
<td>TrafficCharacterization</td>
<td>5.1.6.2.14</td>
<td></td>
<td>QoS Sustainability</td>
</tr>
<tr>
<td>UeCommunication</td>
<td>5.1.6.2.13</td>
<td></td>
<td>UeCommunication</td>
</tr>
<tr>
<td>UeMobility</td>
<td>5.1.6.2.10</td>
<td></td>
<td>UeMobility</td>
</tr>
<tr>
<td>UserDataCongestionInfo</td>
<td>5.1.6.2.17</td>
<td>Represents the user data</td>
<td>UserDataCongestion</td>
</tr>
<tr>
<td>AbnormalBehaviour</td>
<td>5.1.6.2.15</td>
<td>congestion information</td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>Exception</td>
<td>5.1.6.2.16</td>
<td>Describes the Exception</td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>ExceptionId</td>
<td>5.1.6.3.6</td>
<td>Id.</td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>ExceptionTrend</td>
<td>5.1.6.3.7</td>
<td>Describes the Exception</td>
<td>AbnormalBehaviour</td>
</tr>
</tbody>
</table>

Table 5.1.6.1-2 specifies data types re-used by the Nnwdaf_EventsSubscription service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nnwdaf service based interface.
Table 5.1.6.1-2: Nnwdaf_EventsSubscription re-used Data Types
<table>
<thead>
<tr>
<th>Data type</th>
<th>Reference</th>
<th>Comments</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>5QI</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the 5G QoS identifier</td>
<td>QoS Sustainability</td>
</tr>
<tr>
<td>ApplicationId</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the application identifier.</td>
<td>Service Experience, UeCommunication, Abnormal Behaviour</td>
</tr>
<tr>
<td>BitRate</td>
<td>3GPP TS 29.571 [8]</td>
<td>String representing a bit rate that shall be formatted as follows:</td>
<td>Service Experience, QoS Sustainability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pattern: &quot;^\d+(\d+)?(bps</td>
<td>Kbps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Examples: &quot;125 Mbps&quot;, &quot;0.125 Gbps&quot;, &quot;125000 Kbps&quot;.</td>
<td></td>
</tr>
<tr>
<td>DateTime</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the time.</td>
<td>Service Experience</td>
</tr>
<tr>
<td>Dnai</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the time.</td>
<td>Service Experience</td>
</tr>
<tr>
<td>Dnn</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies a user plane access to one or more DN(s).</td>
<td>Service Experience, Abnormal Behaviour, UeCommunication</td>
</tr>
<tr>
<td>DurationSec</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the DNN.</td>
<td>Abnormal Behaviour</td>
</tr>
<tr>
<td>EthFlowDescription</td>
<td>3GPP TS 29.514 [21]</td>
<td>Represents the type of reporting the subscription requires.</td>
<td>Abnormal Behaviour</td>
</tr>
<tr>
<td>ExpectedUeBehaviourData</td>
<td>3GPP TS 29.503 [23]</td>
<td>Identifies the expected Ue Behaviour Data.</td>
<td>Abnormal Behaviour</td>
</tr>
<tr>
<td>FlowDuration</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies a group of UEs.</td>
<td>UeMobility, UeCommunication, Network Performance, Abnormal Behaviour, Service Experience</td>
</tr>
<tr>
<td>Ipv4Addr</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the network area.</td>
<td>Service Experience, QoS Sustainability, Abnormal Behaviour, UeMobility, User Data Congestion, Network Performance</td>
</tr>
<tr>
<td>Ipv6Addr</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the network area.</td>
<td>Service Experience, QoS Sustainability, Abnormal Behaviour, UeMobility, User Data Congestion, Network Performance</td>
</tr>
<tr>
<td>NetworkAreaInfo</td>
<td>3GPP TS 29.554 [18]</td>
<td>Identifies the network area.</td>
<td>Service Experience, QoS Sustainability, Abnormal Behaviour, UeMobility, User Data Congestion, Network Performance</td>
</tr>
<tr>
<td>NfInstanceId</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies an NF instance</td>
<td>NfLoad</td>
</tr>
<tr>
<td>NfSetId</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies an NF Set instance</td>
<td>NfLoad</td>
</tr>
<tr>
<td>NFType</td>
<td>3GPP TS 29.510 [12]</td>
<td>Identifies a type of NF</td>
<td>NfLoad</td>
</tr>
<tr>
<td>NsId</td>
<td>3GPP TS 29.531 [24]</td>
<td>Identifies a Network Slice Instance</td>
<td>Service Experience, NsI Load</td>
</tr>
<tr>
<td>PacketDelBudget</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the network area.</td>
<td>QoS Sustainability</td>
</tr>
<tr>
<td>PacketErrRate</td>
<td>3GPP TS 29.571 [8]</td>
<td>Used in error responses to provide more detailed information about an error.</td>
<td>QoS Sustainability</td>
</tr>
<tr>
<td>ProblemDetails</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the resource type in QoS characteristics.</td>
<td>QoS Sustainability</td>
</tr>
<tr>
<td>ReportingInformation</td>
<td>3GPP TS 29.523 [20]</td>
<td>Represents the type of reporting the subscription requires.</td>
<td></td>
</tr>
<tr>
<td>SamplingRatio</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the sampling ratio</td>
<td>UeMobility</td>
</tr>
<tr>
<td>ScheduledCommunicationTime</td>
<td>3GPP TS 29.122 [19]</td>
<td>Represents the type of reporting the subscription requires.</td>
<td>UeMobility, UeCommunication</td>
</tr>
</tbody>
</table>
Supi 3GPP TS 29.571 [8]  The SUPI for an UE.  ServiceExperience, NfLoad, NetworkPerformance, UserDataCongestion, UeMobility, UeCommunication, AbnormalBehaviour

SupportedFeatures 3GPP TS 29.571 [8]  Used to negotiate the applicability of the optional features defined in table 5.1.8-1.

SvcExperience 3GPP TS 29.517 [22]  ServiceExperience

TimeWindow 3GPP TS 29.122 [19]

Uinteger 3GPP TS 29.571 [8]  Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.

Uri 3GPP TS 29.571 [8]

UserLocation 3GPP TS 29.571 [8]  UeMobility


5.1.6.2 Structured data types

5.1.6.2.1 Introduction

This subclause defines the structures to be used in resource representations.
### 5.1.6.2.2 Type NnwdafEventsSubscription

#### Table 5.1.6.2.2-1: Definition of type NnwdafEventsSubscription

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>eventSubscriptions</td>
<td>array(EventSubscription)</td>
<td>M</td>
<td>1..N</td>
<td>Subscribed events</td>
<td></td>
</tr>
<tr>
<td>evtReq</td>
<td>ReportingInformation</td>
<td>O</td>
<td>0..1</td>
<td>Represents the reporting requirements of the event subscription. (NOTE 1, NOTE 2, NOTE 3)</td>
<td></td>
</tr>
<tr>
<td>notificationURI</td>
<td>Uri</td>
<td>C</td>
<td>0..1</td>
<td>Identifies the recipient of Notifications sent by the NWDAF. This parameter shall be supplied by the NF service consumer in the HTTP POST requests that include an object of EventSubscription type.</td>
<td></td>
</tr>
<tr>
<td>eventNotifications</td>
<td>array(EventNotification)</td>
<td>C</td>
<td>1..N</td>
<td>Notifications about Individual Events. Shall only be present if the immediate reporting indication in the &quot;immRep&quot; attribute within the &quot;evtReq&quot; attribute sets to true in the event subscription, and the reports are available.</td>
<td></td>
</tr>
<tr>
<td>supportedFeatures</td>
<td>SupportedFeatures</td>
<td>C</td>
<td>0..1</td>
<td>List of Supported features used as described in subclause 5.1.8. This parameter shall be supplied by NF service consumer in the POST request that request the creation of an NWDAF Event Subscriptions resource, and shall be supplied by the NWDAF in the reply of corresponding request.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1:** If the "evtReq" attribute in the ReportingInformation data type is provided, the "ON_EVENT_DETECTION" value for the "notifMethod" attribute in the ReportingInformation data type is equivalent to the "THRESHOLD" value for the "notificationMethod" attribute in the EventSubscription data type.

**NOTE 2:** If the "evtReq" attribute in the ReportingInformation data type is provided, the notification method indicated by the "notifMethod" attribute within the ReportingInformation data type takes preference over the notification method indicated by the "notificationMethod" attribute within the EventSubscription data type.

**NOTE 3:** If the "evtReq" attribute the ReportingInformation data type is provided, the periodic reporting time indicated by the "repPeriod" attributes in the ReportingInformation data type takes preference over the periodic reporting time indicated by the "repetitionPeriod" attributes in the EventSubscription data type.
5.1.6.2.3 Type EventSubscription

Table 5.1.6.2.3-1: Definition of type EventSubscription
<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>anySlice</td>
<td>AnySlice</td>
<td>C</td>
<td>0..1</td>
<td>Default is &quot;FALSE&quot;. (NOTE 1)</td>
<td>ServiceExperience, UeCommunication, AbnormalBehaviour</td>
</tr>
<tr>
<td>applIds</td>
<td>array(ApplicationId)</td>
<td>C</td>
<td>1..N</td>
<td>Identification(s) of application to which the subscription applies. The absence of applIds means subscription to all applications.</td>
<td>ServiceExperience, AbnormalBehaviour, UeCommunication</td>
</tr>
<tr>
<td>dnns</td>
<td>array(Dnn)</td>
<td>C</td>
<td>1..N</td>
<td>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</td>
<td>ServiceExperience, AbnormalBehaviour, UeCommunication</td>
</tr>
<tr>
<td>dnais</td>
<td>array(Dnai)</td>
<td>C</td>
<td>1..N</td>
<td>Identification(s) of user plane access to DN(s) which the subscription applies.</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>event</td>
<td>NwdafEvent</td>
<td>M</td>
<td>1</td>
<td>Event that is subscribed.</td>
<td></td>
</tr>
<tr>
<td>extraReportReq</td>
<td>EventReportingRequirement</td>
<td>O</td>
<td>0..1</td>
<td>The extra event reporting requirement information.</td>
<td></td>
</tr>
<tr>
<td>loadLevelThreshold</td>
<td>integer</td>
<td>C</td>
<td>0..1</td>
<td>Indicates that the NWDAF shall report the corresponding network slice load level to the NF service consumer where the load level of the network slice instance identified by snssais is reached. (NOTE 4)</td>
<td>NfLoad, QoSsustainability, UserDataCongestion, NetworkPerformance</td>
</tr>
<tr>
<td>matchingDir</td>
<td>MatchingDirection</td>
<td>O</td>
<td>0..1</td>
<td>A matching direction may be provided alongside a threshold. If omitted, the default value is CROSSED.</td>
<td>NfLoad, QoSsustainability, UserDataCongestion, NetworkPerformance</td>
</tr>
<tr>
<td>nfiInstanceIds</td>
<td>array(NfInstanceId)</td>
<td>O</td>
<td>1..N</td>
<td>Identification(s) of NF instances.</td>
<td>NfLoad</td>
</tr>
<tr>
<td>nfiSetIds</td>
<td>array(NfSetId)</td>
<td>O</td>
<td>1..N</td>
<td>Identification(s) of NF instance sets.</td>
<td>NfLoad</td>
</tr>
<tr>
<td>nfiTypes</td>
<td>array(NFType)</td>
<td>O</td>
<td>1..N</td>
<td>Identification(s) of NF types.</td>
<td>NfLoad</td>
</tr>
<tr>
<td>notificationMethod</td>
<td>NotificationMethod</td>
<td>O</td>
<td>0..1</td>
<td>Indicate the notification method. (NOTE 2)</td>
<td></td>
</tr>
<tr>
<td>nsiIdInfos</td>
<td>array(NsiIdInfo)</td>
<td>O</td>
<td>1..N</td>
<td>Each element identifies the S-NSSAI and the optionally associated network slice instance(s). May be included when subscribed event is &quot;NSI_LOAD_LEVEL&quot; or &quot;SERVICE_EXPERIENCE&quot;. (NOTE 1)</td>
<td>ServiceExperience, NsiLoad</td>
</tr>
<tr>
<td>nsiLevelThrsds</td>
<td>array(UInteger)</td>
<td>O</td>
<td>1..N</td>
<td>Identifies the load threshold for each S-NSSAI or S-NSSAI and the optionally associated network slice instance identified by the &quot;nsiIds&quot; attribute within the &quot;nsiIdInfos&quot; attribute. (NOTE 4)</td>
<td>ServiceExperience, NsiLoad</td>
</tr>
<tr>
<td>qosRequ</td>
<td>QosRequirement</td>
<td>C</td>
<td>0..1</td>
<td>Indicates the QoS requirements. It shall be included when subscribed event is &quot;QOS_SUSTAINABILITY&quot;.</td>
<td>QoSsustainability</td>
</tr>
<tr>
<td>Property</td>
<td>Type</td>
<td>Description</td>
<td>Notes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>qosFlowRetThds</td>
<td>array(RetainabilityThreshold)</td>
<td>C 1..N Represents the QoS flow retainability thresholds. Shall be supplied for the 5QI (&quot;5qi&quot; in &quot;qosRequ&quot;) or resource type (&quot;resType&quot; in &quot;qosRequ&quot;) of GBR resource type. (NOTE 4)</td>
<td>QoSSustainability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ranUeThrouThds</td>
<td>array(BitRate)</td>
<td>C 1..N Represents the RAN UE throughput thresholds. Shall be supplied for the 5QI (&quot;5qi&quot; in &quot;qosRequ&quot;) or resource type (&quot;resType&quot; in &quot;qosRequ&quot;) of non-GBR resource type. (NOTE 4)</td>
<td>QoSSustainability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>repetitionPeriod</td>
<td>DurationSec</td>
<td>C 0..1 Shall be supplied for notification Method &quot;PERIODIC&quot; by the &quot;notificationMethod&quot; attribute.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>snssais</td>
<td>array(Snssai)</td>
<td>C 1..N Identification(s) of network slice to which the subscription applies. (NOTE 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tgtUe</td>
<td>TargetUeInformation</td>
<td>O 0..1 Identifies target UE information</td>
<td>(NOTE 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>congThresholds</td>
<td>array(ThresholdLevel)</td>
<td>C 1..N Represents the congestion threshold levels. (NOTE 4)</td>
<td>UserDataCongestion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nwPerfReqs</td>
<td>array(NetworkPerfRequirement)</td>
<td>C 1..N Represents the network performance requirements. This attribute shall be included when subscribed events &quot;NETWORK_PERFORMANCE&quot;.</td>
<td>NetworkPerformance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bwReqs</td>
<td>array(BwRequirement)</td>
<td>O 1..N Represents the bandwidth requirement for each application.</td>
<td>ServiceExperience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>excepReqs</td>
<td>array(Exception)</td>
<td>C 1..N Represents a list of Exception Ids with associated thresholds. May only be present when subscribed event is &quot;ABNORMAL_BEHAVIOUR&quot;. (NOTE 5, NOTE 6)</td>
<td>AbnormalBehaviour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>exptAnaType</td>
<td>ExpectedAnalyticsType</td>
<td>C 0..1 Represents expected UE analytics type. It shall not be present if the &quot;excepReqs&quot; attribute is provided. (NOTE 6)</td>
<td>AbnormalBehaviour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>exptUeBehav</td>
<td>ExpectedUeBehaviourData</td>
<td>O 0..1 Represents expected UE behaviour.</td>
<td>AbnormalBehaviour</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1:** 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 is optional. When subscribed event is "NSI_LOAD_LEVEL" or "SERVICE_EXPERIENCE", either the "nsilInfos" 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 "excepReqs" attribute within EventSubscription data type.

**NOTE 6:** Either "excepReqs" or "exptAnaType" shall be provided if subscribed event is "ABNORMAL_BEHAVIOUR".

**NOTE 7:** This property should be provided if the "notifMethod" in "evtReq" is set to "ON_EVENT_DETECTION" or "notificationMethod" in "eventSubscriptions" is set to "THRESHOLD" or omitted.

**NOTE 8:** For "NETWORK_PERFORMANCE" 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 "tgt-ue" attribute). For "QOS_SUSTAINABILITY", this attribute shall be provided.
5.1.6.2.4 Type NnwdafEventsSubscriptionNotification

Table 5.1.6.2.4-1: Definition of type NnwdafEventsSubscriptionNotification

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>eventNotifications</td>
<td>array(EventNotification)</td>
<td>M</td>
<td>1..N</td>
<td>Notifications about Individual Events</td>
<td></td>
</tr>
<tr>
<td>subscriptionId</td>
<td>string</td>
<td>M</td>
<td>1</td>
<td>String identifying a subscription to the Nnwdaf_EventsSubscription Service</td>
<td></td>
</tr>
</tbody>
</table>
### 5.1.6.2.5 Type EventNotification

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>event</td>
<td>NwdafEvent</td>
<td>M</td>
<td>1</td>
<td>Event that is notified.</td>
<td></td>
</tr>
<tr>
<td>expiry</td>
<td>DateTime</td>
<td>O</td>
<td>0..1</td>
<td>It defines the expiration time after which the analytics information will become invalid.</td>
<td></td>
</tr>
<tr>
<td>nwPerfs</td>
<td>array(NetworkPerformance)</td>
<td>C</td>
<td>1..N</td>
<td>The network performance information.</td>
<td>NetworkPerformance</td>
</tr>
<tr>
<td>nfLoadLevelInfos</td>
<td>array(NfLoadLevelInformation)</td>
<td>C</td>
<td>1..N</td>
<td>The NF load level information.</td>
<td>NfLoad</td>
</tr>
<tr>
<td>nsiLoadLevelInfos</td>
<td>array(NsiLoadLevelInfo)</td>
<td>C</td>
<td>1..N</td>
<td>Each element identifies the load level information for each S-NSSAI and the optionally associated network slice instance. Shall be included when subscribed event is &quot;NSI_LOAD_LEVEL&quot;.</td>
<td>NsiLoad</td>
</tr>
<tr>
<td>qosSustainInfos</td>
<td>array(QoSStabilityInfo)</td>
<td>C</td>
<td>1..N</td>
<td>The QoS sustainability information. When subscribed event is &quot;QOS_SUSTAINABILITY&quot;, the qosSustainInfos shall be included.</td>
<td>QoSStability</td>
</tr>
<tr>
<td>sliceLoadLevelInfo</td>
<td>SliceLoadLevelInformation</td>
<td>C</td>
<td>0..1</td>
<td>The slices and the load level information. When subscribed event is &quot;SLICE_LOAD_LEVEL&quot;, the sliceLoadLevelInfo shall be included.</td>
<td></td>
</tr>
<tr>
<td>svcExps</td>
<td>array(ServiceExperienceInfo)</td>
<td>C</td>
<td>1..N</td>
<td>The service experience information. When subscribed event is &quot;SERVICE_EXPERIENCE&quot;, the svcExps shall be included.</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>ueComms</td>
<td>array(UeCommunication)</td>
<td>C</td>
<td>1..N</td>
<td>The UE communication information. When subscribed event is &quot;UE_COMM&quot;, the ueComms shall be included.</td>
<td>UeCommunication</td>
</tr>
<tr>
<td>ueMobs</td>
<td>array(UeMobility)</td>
<td>C</td>
<td>1..N</td>
<td>The UE mobility information. When subscribed event is &quot;UE_MOBILITY&quot;, the ueMobs shall be included.</td>
<td>UeMobility</td>
</tr>
<tr>
<td>abnorBehavrs</td>
<td>array(AbnormalBehaviour)</td>
<td>C</td>
<td>1..N</td>
<td>The Abnormal Behaviour information. When subscribed event is &quot;ABNORMAL_BEHAVIOUR&quot;, the abnorBehavrs shall be included.</td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>user-dataCongInfos</td>
<td>array(UserDataCongestionInfo)</td>
<td>C</td>
<td>1..N</td>
<td>The location and user data congestion information. Shall be present if the subscribed event is &quot;USER_DATA_CONGESTION&quot;.</td>
<td>UserDataCongestion</td>
</tr>
</tbody>
</table>
5.1.6.2.6 Type SliceLoadLevelInformation

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>loadLevelInforma</td>
<td>tion</td>
<td></td>
<td>M</td>
<td>Load level information of the network slice instance identified by snssai.</td>
<td></td>
</tr>
<tr>
<td>snssais</td>
<td>array(Snssai)</td>
<td></td>
<td>M 1..N</td>
<td>Identification(s) of network slice to which the subscription.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.2.7 Type EventReportingRequirement

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>accuracy</td>
<td>Accuracy</td>
<td>O</td>
<td>0..1</td>
<td>Preferred level of accuracy of the analytics.</td>
<td></td>
</tr>
<tr>
<td>startTs</td>
<td>DateTime</td>
<td>O</td>
<td>0..1</td>
<td>UTC time indicating the start time of the observation period. The absence of this attribute means subscription at the present time.</td>
<td></td>
</tr>
<tr>
<td>endTs</td>
<td>DateTime</td>
<td>O</td>
<td>0..1</td>
<td>UTC time indicating the end time of the observation period. The absence of this attribute means subscription at the present time. If provided, it shall not be less than the start time.</td>
<td></td>
</tr>
<tr>
<td>sampRatio</td>
<td>SamplingRatio</td>
<td>O</td>
<td>0..1</td>
<td>Percentage of sampling (1%...100%) among impacted UEs. Applicable to event targeting a group of UEs or any UE. (NOTE)</td>
<td></td>
</tr>
<tr>
<td>maxSupiNbr</td>
<td>Uinteger</td>
<td>O</td>
<td>0..1</td>
<td>Represents the maximum number of SUPIs expected in an object. Applicable for the event(s) providing a list of SUPIs during the analytics response.</td>
<td></td>
</tr>
<tr>
<td>maxObjectNbr</td>
<td>Uinteger</td>
<td>O</td>
<td>0..1</td>
<td>Maximum number of objects expected for an analytics report. It's only applicable for the event(s) which may provide more than one entries or objects during event notification.</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The "sampRatio" attribute within EventReportingRequirement data type is not applicable for the Nnwdaf_EventsSubscription API.
5.1.6.2.8 Type TargetUeInformation

Table 5.1.6.2.8-1: Definition of type TargetUeInformation

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>anyUe</td>
<td>boolean</td>
<td>O</td>
<td>0..1</td>
<td>Identifies any UE when setting to true.</td>
<td>ServiceExperience, NetworkPerformance, NFLoad, UserDataCongestion, AbnormalBehaviour, QoSResponsibility</td>
</tr>
<tr>
<td>supis</td>
<td>array(Supi)</td>
<td>O</td>
<td>1..N</td>
<td>Identifies a SUPI for an UE.</td>
<td>UeMobility, UeCommunication, NetworkPerformance, AbnormalBehaviour, UserDataCongestion, NFLoad, ServiceExperience</td>
</tr>
<tr>
<td>intGroupIds</td>
<td>array(GroupId)</td>
<td>O</td>
<td>1..N</td>
<td>Represents an internal group identifier and identifies a group of UEs.</td>
<td>UeMobility, UeCommunication, NetworkPerformance, AbnormalBehaviour, ServiceExperience</td>
</tr>
</tbody>
</table>

NOTE: For an applicable feature, only one attribute identifying the target UE shall be provided.

5.1.6.2.9 Void

5.1.6.2.10 Type UeMobility

Table 5.1.6.2.10-1: Definition of type UeMobility

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ts</td>
<td>DateTime</td>
<td>O</td>
<td>0..1</td>
<td>This attribute identifies the timestamp when the UE arrives the location. (NOTE 1)</td>
<td></td>
</tr>
<tr>
<td>recurringTime</td>
<td>ScheduledCommunTime</td>
<td>O</td>
<td>0..1</td>
<td>Identifies time of the day and day of the week which are valid within the observation period when the UE moves. (NOTE 1, NOTE 2)</td>
<td></td>
</tr>
<tr>
<td>duration</td>
<td>DurationSec</td>
<td>M</td>
<td>1</td>
<td>This attribute identifies the time duration the UE stays in the location. If the analytics result applies for a group of UEs, it indicates the average duration for the group of UEs.</td>
<td></td>
</tr>
<tr>
<td>durationVariance</td>
<td>Float</td>
<td>C</td>
<td>0..1</td>
<td>This attribute indicates the variance of the analysed durations for the group of UEs. It shall be provided if the analytics result applies for a group of UEs.</td>
<td></td>
</tr>
<tr>
<td>locInfos</td>
<td>array(LocationInfo)</td>
<td>M</td>
<td>1..N</td>
<td>This attribute includes a list of UE location information during the time duration.</td>
<td></td>
</tr>
<tr>
<td>confidence</td>
<td>Uinteger</td>
<td>C</td>
<td>0..1</td>
<td>Indicates the confidence of the prediction. (NOTE 3)</td>
<td>confidence</td>
</tr>
</tbody>
</table>

NOTE 1: Either ts or recurringTime shall be provided.
NOTE 2: If this attribute is present, it indicates the UE movement is periodic. This attribute is suitable to be present for a recurring mobility in a long observation time.
NOTE 3: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction.
### 5.1.6.2.11 Type LocationInfo

**Table 5.1.6.2.11-1: Definition of type LocationInfo**

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>loc</td>
<td>UserLocation</td>
<td>M</td>
<td>1</td>
<td>This attribute contains the detailed location, the ueLocationTimestamp attribute in the 3GPP access type of UserLocation data type shall not be provided.</td>
<td></td>
</tr>
<tr>
<td>ratio</td>
<td>SamplingRatio</td>
<td>C</td>
<td>0..1</td>
<td>This attribute contains the percentage of UEs with same analytics result in the group. Shall be present if the analytics result applies for a group of UEs.</td>
<td></td>
</tr>
<tr>
<td>confidence</td>
<td>Uinteger</td>
<td>C</td>
<td>0..1</td>
<td>If the analytics result is a prediction, it indicates the confidence of the prediction.</td>
<td></td>
</tr>
</tbody>
</table>
5.1.6.2.12 Void

5.1.6.2.13 Type UeCommunication

Table 5.1.6.2.13-1: Definition of type UeCommunication
<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>commDur</td>
<td>DurationSec</td>
<td>M</td>
<td>0..1</td>
<td>Identifies the duration of the communication. If the analytics result applies for a group of UEs, it indicates the average duration for the subset of UEs indicated by a given ratio in the group.</td>
<td></td>
</tr>
<tr>
<td>commDurVariance</td>
<td>Float</td>
<td>C</td>
<td>0..1</td>
<td>This attribute indicates the variance of the analysed durations for the subset of UEs indicated by a given ratio in the group. It shall be provided if the analytics result applies for a group of UEs.</td>
<td></td>
</tr>
<tr>
<td>perioTime</td>
<td>DurationSec</td>
<td>O</td>
<td>0..1</td>
<td>Identifies interval time of periodic communication, e.g. every 10 minutes or 1 hour. (NOTE 2) If the analytics result applies for a group of UEs, it indicates the average interval time of periodic communication for the subset of UEs indicated by a given ratio in the group.</td>
<td></td>
</tr>
<tr>
<td>perioTimeVariance</td>
<td>Float</td>
<td>C</td>
<td>0..1</td>
<td>This attribute indicates the variance of the analysed intervals of periodic communication for the subset of UEs indicated by a given ratio in the group. It shall be provided if the analytics result applies for a group of UEs.</td>
<td></td>
</tr>
<tr>
<td>ts</td>
<td>DateTime</td>
<td>C</td>
<td>0..1</td>
<td>Identifies the start time of the communication. (NOTE 1)</td>
<td></td>
</tr>
<tr>
<td>tsVariance</td>
<td>Float</td>
<td>O</td>
<td>0..1</td>
<td>This attribute indicates the variance of the analysed start time for the subset of UEs indicated by a given ratio in the group. It may only be provided if the ts attribute is provided.</td>
<td></td>
</tr>
<tr>
<td>recurringTime</td>
<td>ScheduledCommunicationTime</td>
<td>C</td>
<td>0..1</td>
<td>Identifies time of the day and day of the week which are valid within the observation period when the UE has communication. Providing the end time in ScheduledCommunicationTime data type is not required. (NOTE 1, NOTE 3)</td>
<td></td>
</tr>
<tr>
<td>trafChar</td>
<td>TrafficCharacterization</td>
<td>M</td>
<td>1</td>
<td>Identifies the detailed traffic characterization.</td>
<td></td>
</tr>
<tr>
<td>ratio</td>
<td>SamplingRatio</td>
<td>C</td>
<td>0..1</td>
<td>This attribute contains the percentage of UEs with same analytics result in the group. Shall be present if the analytics result applies for a group of UEs.</td>
<td></td>
</tr>
<tr>
<td>confidence</td>
<td>Uinteger</td>
<td>C</td>
<td>0..1</td>
<td>Indicates the confidence of the prediction. (NOTE 4) Shall be present if the analytics result is a prediction.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1:** Either ts or recurringTime shall be provided.
**NOTE 2:** If this attribute is present, it indicates the communication is periodic and its value shall be larger than the commDur value. If this attribute is present with the ts attribute, it indicates the periodic communication time valid within the observation period; if it is present with the recurringTime attribute, it indicates the periodic communication time valid within the day(s).
**NOTE 3:** If this attribute is present, it indicates the communication is periodic. This attribute is suitable to be present for a recurring communication in a long observation time.
**NOTE 4:** If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction.
### 5.1.6.2.14 Type TrafficCharacterization

#### Table 5.1.6.2.14-1: Definition of type TrafficCharacterization

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>appld</td>
<td>ApplicationId</td>
<td>O</td>
<td>0..1</td>
<td>Contains the application identifier.</td>
<td></td>
</tr>
<tr>
<td>dnn</td>
<td>Dnn</td>
<td>O</td>
<td>0..1</td>
<td>Identifies DNN, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. Shall be present if the “dnns” was provided within EventSubscription during the subscription for event notification procedure.</td>
<td></td>
</tr>
<tr>
<td>snssai</td>
<td>Snssai</td>
<td>C</td>
<td>0..1</td>
<td>Identifies the network slice. Shall be present if the “snssais” was provided within EventSubscription during the subscription for event notification procedure.</td>
<td></td>
</tr>
<tr>
<td>fDescs</td>
<td>array(IpEthFlowDescription)</td>
<td>O</td>
<td>1..2</td>
<td>Contains the flow description for the Uplink and/or Downlink flows.</td>
<td></td>
</tr>
<tr>
<td>ulVol</td>
<td>Volume</td>
<td>O</td>
<td>0..1</td>
<td>Identifies the uplink traffic volume. (NOTE) If the analytics result applies for a group of UEs, it indicates the average uplink traffic volume for the subset of UEs indicated by a given ratio in the group.</td>
<td></td>
</tr>
<tr>
<td>ulVolVariance</td>
<td>Float</td>
<td>C</td>
<td>0..1</td>
<td>This attribute indicates the variance of the uplink traffic volumes for the subset of UEs indicated by a given ratio in the group. It shall be provided if the analytics result applies for a group of UEs.</td>
<td></td>
</tr>
<tr>
<td>dlVol</td>
<td>Volume</td>
<td>O</td>
<td>0..1</td>
<td>Identifies the downlink traffic volume. (NOTE) If the analytics result applies for a group of UEs, it indicates the average downlink traffic volume for the subset of UEs indicated by a given ratio in the group.</td>
<td></td>
</tr>
<tr>
<td>dlVolVariance</td>
<td>Float</td>
<td>C</td>
<td>0..1</td>
<td>This attribute indicates the variance of the downlink traffic volumes for the subset of UEs indicated by a given ratio in the group. It shall be provided if the analytics result applies for a group of UEs.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** At least one of ulVol or dlVol shall be provided.
5.1.6.2.15 Type AbnormalBehaviour

Table 5.1.6.2.15-1: Definition of type AbnormalBehaviour

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>supis</td>
<td>array(Supi)</td>
<td>C</td>
<td>1..N</td>
<td>Each element identifies a UE which is affected with the Exception. Shall be present if the subscription request applies to more than one UE.</td>
<td></td>
</tr>
<tr>
<td>dnn</td>
<td>Dnn</td>
<td>C</td>
<td>0..1</td>
<td>Identifies DNN, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. Shall be present if the &quot;dnns&quot; was provided within EventSubscription during the subscription for event notification procedure.</td>
<td></td>
</tr>
<tr>
<td>except</td>
<td>Exception</td>
<td>M</td>
<td>1</td>
<td>Contains the exception information.</td>
<td></td>
</tr>
<tr>
<td>snssai</td>
<td>Snssai</td>
<td>C</td>
<td>0..1</td>
<td>Identifies the network slice information. Shall be present if the &quot;snssais&quot; was provided within EventSubscription during the subscription for event notification procedure.</td>
<td></td>
</tr>
<tr>
<td>ratio</td>
<td>SamplingRatio</td>
<td>C</td>
<td>0..1</td>
<td>Contains the percentage of UEs with same analytics result in the group or among all UEs. Shall be present if the analytics result applies for a group of UEs or any UE.</td>
<td></td>
</tr>
<tr>
<td>confidence</td>
<td>Uinteger</td>
<td>C</td>
<td>0..1</td>
<td>Indicates the confidence of the prediction. (NOTE) Shall be present if the analytics result is a prediction.</td>
<td></td>
</tr>
<tr>
<td>addtMeasInfo</td>
<td>AdditionalMeasur-</td>
<td>O</td>
<td>0..1</td>
<td>Additional measurement.</td>
<td></td>
</tr>
</tbody>
</table>

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.

5.1.6.2.16 Type Exception

Table 5.1.6.2.16-1: Definition of type Exception

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>exceptId</td>
<td>ExceptionId</td>
<td>M</td>
<td>1</td>
<td>Indicating the Exception ID.</td>
<td></td>
</tr>
<tr>
<td>exceptLevel</td>
<td>integer</td>
<td>O</td>
<td>0..1</td>
<td>Measured level, compared to the threshold</td>
<td></td>
</tr>
<tr>
<td>exceptTrend</td>
<td>ExceptionTrend</td>
<td>O</td>
<td>0..1</td>
<td>Measured trend</td>
<td></td>
</tr>
</tbody>
</table>
5.1.6.2.17 Type UserDataCongestionInfo

Table 5.1.6.2.17-1: Definition of type UserDataCongestionInfo

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>networkArea</td>
<td>NetworkAreaInfo</td>
<td>M</td>
<td>1</td>
<td>Identification of network area to which the subscription applies.</td>
<td></td>
</tr>
<tr>
<td>congestionInfo</td>
<td>CongestionInfo</td>
<td>M</td>
<td>1</td>
<td>The congestion information of the specific location.</td>
<td></td>
</tr>
<tr>
<td>snssai</td>
<td>Snssai</td>
<td>C</td>
<td>0..1</td>
<td>Identifies an S-NSSAI. Shall be present if the &quot;snssais&quot; was provided within EventSubscription during the subscription for event notification procedure.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.2.18 Type CongestionInfo

Table 5.1.6.2.18-1: Definition of type CongestionInfo

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>congType</td>
<td>CongestionType</td>
<td>M</td>
<td>1</td>
<td>Identification congestion analytics type.</td>
<td></td>
</tr>
<tr>
<td>timeIntev</td>
<td>TimeWindow</td>
<td>M</td>
<td>1</td>
<td>Represents a start time and a stop time requested for the congestion information.</td>
<td></td>
</tr>
<tr>
<td>nsi</td>
<td>ThresholdLevel</td>
<td>M</td>
<td>1</td>
<td>Network Status Indication.</td>
<td></td>
</tr>
<tr>
<td>confidence</td>
<td>UInteger</td>
<td>C</td>
<td>0..1</td>
<td>Indicates the confidence of the prediction. (NOTE)</td>
<td>Shall be present if the analytics result is a prediction.</td>
</tr>
</tbody>
</table>

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.
### Type QosSustainabilityInfo

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>areaInfo</td>
<td>NetworkAreaInfo</td>
<td>M</td>
<td>1</td>
<td>Identification(s) of applicable location areas to which the subscription.</td>
<td></td>
</tr>
<tr>
<td>startTs</td>
<td>DateTime</td>
<td>M</td>
<td>1</td>
<td>Represents the start time of the applicable observing period.</td>
<td></td>
</tr>
<tr>
<td>endTs</td>
<td>DateTime</td>
<td>M</td>
<td>1</td>
<td>Represents the end time of the applicable observing period.</td>
<td></td>
</tr>
<tr>
<td>qosFlowRetThd</td>
<td>RetainabilityThreshold</td>
<td>O</td>
<td>0..1</td>
<td>The reporting QoS Flow Retainability Threshold that are met or crossed for 5QI of GBR resource type. (NOTE 1)</td>
<td></td>
</tr>
<tr>
<td>ranUeThrouThd</td>
<td>BitRate</td>
<td>O</td>
<td>0..1</td>
<td>The reporting RAN UE Throughput Threshold that are met or crossed for 5QI of non-GBR resource type. (NOTE 1)</td>
<td></td>
</tr>
<tr>
<td>snssai</td>
<td>Snssai</td>
<td>C</td>
<td>0..1</td>
<td>Identifies an S-NSSAI. Shall be present if the &quot;snssais&quot; was provided within EventSubscription during the subscription for event notification procedure.</td>
<td></td>
</tr>
<tr>
<td>confidence</td>
<td>UInteger</td>
<td>C</td>
<td>0..1</td>
<td>Indicates the confidence of the prediction. (NOTE 2) Shall be present if the analytics result is a prediction.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1:** Either qosFlowRetThd or ranUeThrouThd shall be provided.

**NOTE 2:** If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction.

### Type QosRequirement

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>5qi</td>
<td>5Qi</td>
<td>C</td>
<td>1</td>
<td>Represents a 5G QoS Identifier. It shall be included for GBR 5QIs. (NOTE)</td>
<td></td>
</tr>
<tr>
<td>gfbrUL</td>
<td>BitRate</td>
<td>C</td>
<td>0..1</td>
<td>Indicates GFBR in the uplink. It shall be included for GBR 5QIs.</td>
<td></td>
</tr>
<tr>
<td>gfbrDL</td>
<td>BitRate</td>
<td>C</td>
<td>0..1</td>
<td>Indicates GFBR in the downlink. It shall be included for GBR 5QIs.</td>
<td></td>
</tr>
<tr>
<td>resType</td>
<td>QosResourceType</td>
<td>C</td>
<td>0..1</td>
<td>Resource type. Shall be provided for the non-standardized and non-preconfigured QoS characteristics. (NOTE)</td>
<td></td>
</tr>
<tr>
<td>pdb</td>
<td>PacketDelBudget</td>
<td>C</td>
<td>0..1</td>
<td>Packet Delay Budget. May be supplied for the non-standardized and non-preconfigured QoS characteristics.</td>
<td></td>
</tr>
<tr>
<td>per</td>
<td>PacketErrRate</td>
<td>C</td>
<td>0..1</td>
<td>Packet Error Rate. May be supplied for the non-standardized and non-preconfigured QoS characteristics.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Either 5QI within "5qi" attribute or the resource type within "resType" attribute shall be provided.
5.1.6.2.21 Type RetainabilityThreshold

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>relFlowNum</td>
<td>Uinteger</td>
<td>O</td>
<td>0..1</td>
<td>Represents the number of abnormally released QoS flows. (NOTE)</td>
<td></td>
</tr>
<tr>
<td>relTimeUnit</td>
<td>TimeUnit</td>
<td>C</td>
<td>0..1</td>
<td>Represents the unit for the session active time, shall be present if relFlowNum is present. (NOTE)</td>
<td></td>
</tr>
<tr>
<td>relFlowRatio</td>
<td>SamplingRatio</td>
<td>O</td>
<td>0..1</td>
<td>Represents the ratio of abnormally released QoS flows to the total released QoS flows, expressed in percentage. (NOTE)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Either relFlowNum and its associated relTimeUnit or relFlowRatio shall be provided. relFlowNum and relTimeUnit together represents the number of abnormally released QoS flows (i.e. relFlowNum) within the time unit (i.e. relTimeUnit).

5.1.6.2.22 Type NetworkPerfRequirement

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>nwPerfType</td>
<td>NetworkPerfTyp</td>
<td>M</td>
<td>1</td>
<td>The type of the network performance.</td>
<td></td>
</tr>
<tr>
<td>relativeRatio</td>
<td>SamplingRatio</td>
<td>C</td>
<td>0..1</td>
<td>The relative ratio expressed in percentage. (NOTE)</td>
<td></td>
</tr>
<tr>
<td>absoluteNum</td>
<td>Uinteger</td>
<td>C</td>
<td>0..1</td>
<td>The absolute number (NOTE)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Either relativeRatio or absoluteNum shall be provided if the "notifMethod" in "evtReq" is set to "ON_EVENT_DETECTION" or "notificationMethod" in "eventSubscriptions" is set to "THRESHOLD" or omitted.

5.1.6.2.23 Type NetworkPerfInfo

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>networkArea</td>
<td>NetworkAreaInf</td>
<td>M</td>
<td>1</td>
<td>Identification of network area to which the subscription applies.</td>
<td></td>
</tr>
<tr>
<td>nwPerfType</td>
<td>NetworkPerfTyp</td>
<td>M</td>
<td>1</td>
<td>The type of the network performance</td>
<td></td>
</tr>
<tr>
<td>relativeRatio</td>
<td>SamplingRatio</td>
<td>O</td>
<td>0..1</td>
<td>The reported relative ratio expressed in percentage. (NOTE 1)</td>
<td></td>
</tr>
<tr>
<td>absoluteNum</td>
<td>Uinteger</td>
<td>O</td>
<td>0..1</td>
<td>The reported absolute number (NOTE 1)</td>
<td></td>
</tr>
<tr>
<td>confidence</td>
<td>Uinteger</td>
<td>C</td>
<td>0..1</td>
<td>Indicates the confidence of the prediction. (NOTE 2)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE 1: Either relativeRatio or absoluteNum shall be provided.
NOTE 2: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction.
### 5.1.6.2.24 Type ServiceExperienceInfo

#### Table 5.1.6.2.24-1: Definition of type ServiceExperienceInfo

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>svcExprc</td>
<td>SvcExperience</td>
<td>M</td>
<td>1</td>
<td>Service experience</td>
<td></td>
</tr>
<tr>
<td>svcExprcVariance</td>
<td>Float</td>
<td>O</td>
<td>0..1</td>
<td>This attribute indicates the variance.</td>
<td></td>
</tr>
<tr>
<td>snssai</td>
<td>Snssai</td>
<td>C</td>
<td>0..1</td>
<td>Identifies an S-NSSAI. Shall be presented if the &quot;snssais&quot; was provided within EventSubscription during the subscription for event notification procedure.</td>
<td></td>
</tr>
<tr>
<td>appld</td>
<td>ApplicationId</td>
<td>C</td>
<td>0..1</td>
<td>Identifies an application. Shall be present if the &quot;applds&quot; was provided within EventSubscription during the subscription for event notification procedure.</td>
<td></td>
</tr>
<tr>
<td>confidence</td>
<td>Uinteger</td>
<td>C</td>
<td>0..1</td>
<td>Indicates the confidence of the prediction. (NOTE) Shall be present if the analytics result is a prediction.</td>
<td></td>
</tr>
<tr>
<td>dnn</td>
<td>Dnn</td>
<td>C</td>
<td>0..1</td>
<td>Identifies DNN, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. Shall be present if the &quot;dnns&quot; was provided within EventSubscription during the subscription for event notification procedure.</td>
<td></td>
</tr>
<tr>
<td>networkArea</td>
<td>NetworkAreaInfo</td>
<td>C</td>
<td>0..1</td>
<td>Identifies the network area where the service experience applies. Shall be presented if the &quot;networkArea&quot; was provided within EventSubscription during the subscription for event notification procedure.</td>
<td></td>
</tr>
<tr>
<td>nsild</td>
<td>Nsild</td>
<td>C</td>
<td>0..1</td>
<td>Identifies a network slice instance which is associated with the S-NSSAI identified by the &quot;snssai&quot; attribute. Shall be present if the &quot;nsilids&quot; was provided within the NsildInfo data in the EventSubscription data during the subscription.</td>
<td></td>
</tr>
<tr>
<td>ratio</td>
<td>SamplingRatio</td>
<td>C</td>
<td>0..1</td>
<td>Contains the percentage of UEs with same analytics result in the group or among all UEs. Shall be present if the analytics result applies for a group of UEs or any UE.</td>
<td></td>
</tr>
</tbody>
</table>

**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.
5.1.6.2.25 Type BwRequirement

Table 5.1.6.2.25-1: Definition of type BwRequirement

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>appId</td>
<td>ApplicationId</td>
<td>M</td>
<td>1</td>
<td>Represents an application. (NOTE)</td>
<td></td>
</tr>
<tr>
<td>marBwUl</td>
<td>BitRate</td>
<td>O</td>
<td>0..1</td>
<td>Maximum requested bandwidth for the Uplink.</td>
<td></td>
</tr>
<tr>
<td>marBwDl</td>
<td>BitRate</td>
<td>O</td>
<td>0..1</td>
<td>Maximum requested bandwidth for the Downlink.</td>
<td></td>
</tr>
<tr>
<td>mirBwUl</td>
<td>BitRate</td>
<td>O</td>
<td>0..1</td>
<td>Minimum requested bandwidth for the Uplink.</td>
<td></td>
</tr>
<tr>
<td>mirBwDl</td>
<td>BitRate</td>
<td>O</td>
<td>0..1</td>
<td>Minimum requested bandwidth for the Downlink.</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: If the "appId" attribute is provided within EventSubscription data, this attribute shall be indicated by the "appId" attribute.

5.1.6.2.26 Type AdditionalMeasurement

Table 5.1.6.2.26-1: Definition of type AdditionalMeasurement

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>unexpLoc</td>
<td>NetworkAreaInfo</td>
<td>C</td>
<td>0..1</td>
<td>The unexpected locations which the UE stays. It may only be present when the &quot;excepId&quot; within the Exception data sets to &quot;UNEXPECTED_UE_LOCATION&quot;</td>
<td></td>
</tr>
<tr>
<td>unexpFlowTeps</td>
<td>array(IpEthFlowDescription)</td>
<td>C</td>
<td>1..N</td>
<td>Unexpected IP or Ethernet flow templates. It may only be present when the &quot;excepId&quot; within the Exception data sets to &quot;UNEXPECTED_LONG_LIVE_FLOW&quot; or &quot;UNEXPECTED_LARGE_RATE_FLOW&quot;.</td>
<td></td>
</tr>
<tr>
<td>unexpWakes</td>
<td>array(DateTime)</td>
<td>C</td>
<td>1..N</td>
<td>Unexpected wake up times. It may only be present when the &quot;excepId&quot; within the Exception data sets to &quot;UNEXPECTED_WAKEUP&quot;.</td>
<td></td>
</tr>
<tr>
<td>ddosAttack</td>
<td>AddressList</td>
<td>C</td>
<td>0..1</td>
<td>Victim's address list. It may only be present when the &quot;excepId&quot; within the Exception data sets to &quot;SUSPICION_OF_DDOS_ATTACK&quot;.</td>
<td></td>
</tr>
<tr>
<td>wrgDest</td>
<td>AddressList</td>
<td>C</td>
<td>0..1</td>
<td>Wrong destination address list. It may only be present when the &quot;excepId&quot; within the Exception data sets to &quot;WRONG_DESTINATION_ADDRESS&quot;.</td>
<td></td>
</tr>
</tbody>
</table>
| circums        | array(CircumstanceDescription) | C | 1..N        | The description of circumstances. It may only be present when the "excepId" within the Exception data sets to "TOO_FREQUENT_SERVICE_ACCESS", "UNEXPECTED_RADIO_LINK_FAILURES" or "PING_PONG_ACROSS.Cells".
5.1.6.2.27 Type IpEthFlowDescription

Table 5.1.6.2.27-1: Definition of type FlowDescription

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ipTrafficFilter</td>
<td>FlowDescription</td>
<td>O</td>
<td>0..1</td>
<td>Identifies IP packet filter. (NOTE)</td>
<td></td>
</tr>
<tr>
<td>ethTrafficFilter</td>
<td>EthFlowDescription</td>
<td>O</td>
<td>0..1</td>
<td>Identifies Ethernet packet filter. (NOTE)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Either "ipTrafficFilter" or "ethTrafficFilter" shall be provided.

5.1.6.2.28 Type AddressList

Table 5.1.6.2.28-1: Definition of type AddressList

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ipv4Addrs</td>
<td>array(Ipv4Addr)</td>
<td>O</td>
<td>1..N</td>
<td>Each element identifies an IPv4 address.</td>
<td></td>
</tr>
<tr>
<td>ipv6Addrs</td>
<td>array(Ipv6Addr)</td>
<td>O</td>
<td>1..N</td>
<td>Each element identifies an IPv6 address.</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: At least one of "ipv4Addrs" or "ipv6Addrs" shall be provided.

5.1.6.2.29 Type CircumstanceDescription

Table 5.1.6.2.29-1: Definition of type CircumstanceDescription

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>freq</td>
<td>Float</td>
<td>O</td>
<td>0..1</td>
<td>Communication frequency of the UE in units of MHz.</td>
<td></td>
</tr>
<tr>
<td>tm</td>
<td>DateTime</td>
<td>O</td>
<td>0..1</td>
<td>Time when UE enters the location.</td>
<td></td>
</tr>
<tr>
<td>locArea</td>
<td>NetworkAreaInfo</td>
<td>C</td>
<td>0..1</td>
<td>The location of the UE. It shall be present when the &quot;exceptionId&quot; within the Exception data sets to &quot;UNEXPECTED_RADIO_LINK_FAILURE&quot; or &quot;PING_PONG_ACROSS_CELLS&quot;.</td>
<td></td>
</tr>
<tr>
<td>vol</td>
<td>Volume</td>
<td>C</td>
<td>0..1</td>
<td>The traffic volume. It shall be present when the &quot;exceptionId&quot; within the Exception data sets to &quot;TOO_FREQUENT_SERVICE_ACCESS&quot; or &quot;UNEXPECTED_LARGE_RATE_FLOW&quot;.</td>
<td></td>
</tr>
</tbody>
</table>
5.1.6.2.30  Type ThresholdLevel

Table 5.1.6.2.30-1: Definition of type ThresholdLevel

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>congLevel</td>
<td>integer</td>
<td>C</td>
<td>0..1</td>
<td>Value of Congestion that triggers notification (NOTE 1)</td>
<td>UserDataCongestion</td>
</tr>
<tr>
<td>nfLoadLevel</td>
<td>integer</td>
<td>C</td>
<td>0..1</td>
<td>Value of NF Load that triggers notification (NOTE 2)</td>
<td>NfLoad</td>
</tr>
<tr>
<td>nfCpuUsage</td>
<td>integer</td>
<td>C</td>
<td>0..1</td>
<td>Value of NF CPU Usage that triggers notification (NOTE 2)</td>
<td>NfLoad</td>
</tr>
<tr>
<td>nfMemoryUsage</td>
<td>integer</td>
<td>C</td>
<td>0..1</td>
<td>Average usage of memory (NOTE 2)</td>
<td>NfLoad</td>
</tr>
<tr>
<td>nfStorageUsage</td>
<td>integer</td>
<td>C</td>
<td>0..1</td>
<td>Average usage of storage (NOTE 2)</td>
<td>NfLoad</td>
</tr>
</tbody>
</table>

NOTE 1: This attribute shall be provided when subscribed event is "USER_DATA_CONGESTION".
NOTE 2: At least one attribute should be provided when subscribed event is "NF_LOAD".

5.1.6.2.31  Type NfLoadLevelInformation

Table 5.1.6.2.31-1: Definition of type NfLoadLevelInformation

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>nfType</td>
<td>NFType</td>
<td>M</td>
<td>1</td>
<td>Type of the NF instance</td>
<td></td>
</tr>
<tr>
<td>nfInstanceId</td>
<td>NfInstanceId</td>
<td>M</td>
<td>1</td>
<td>Identification of the NF instance</td>
<td></td>
</tr>
<tr>
<td>nfSetId</td>
<td>NfSetId</td>
<td>O</td>
<td>0..1</td>
<td>Identification of the NF instance set</td>
<td></td>
</tr>
<tr>
<td>nfStatus</td>
<td>NfStatus</td>
<td>O</td>
<td>0..1</td>
<td>Availability status of the NF</td>
<td></td>
</tr>
<tr>
<td>nfCpuUsage</td>
<td>integer</td>
<td>C</td>
<td>0..1</td>
<td>Average usage CPU (NOTE 1) (NOTE 2)</td>
<td></td>
</tr>
<tr>
<td>nfMemoryUsage</td>
<td>integer</td>
<td>C</td>
<td>0..1</td>
<td>Average usage of memory (NOTE 1) (NOTE 2)</td>
<td></td>
</tr>
<tr>
<td>nfStorageUsage</td>
<td>integer</td>
<td>C</td>
<td>0..1</td>
<td>Average usage of storage (NOTE 1) (NOTE 2)</td>
<td></td>
</tr>
<tr>
<td>nfLoadLevelAverage</td>
<td>integer</td>
<td>C</td>
<td>0..1</td>
<td>Average load information (NOTE 1) (NOTE 2)</td>
<td></td>
</tr>
<tr>
<td>nfLoadLevelPeak</td>
<td>integer</td>
<td>O</td>
<td>0..1</td>
<td>Peak load information (NOTE 2)</td>
<td></td>
</tr>
<tr>
<td>snssai</td>
<td>Snssai</td>
<td>C</td>
<td>0..1</td>
<td>Identifies an S-NSSAI. Shall be present if the &quot;snssais&quot; was provided within EventSubscription during the subscription for event notification procedure.</td>
<td></td>
</tr>
<tr>
<td>confidence</td>
<td>Uinteger</td>
<td>C</td>
<td>0..1</td>
<td>Indicates the confidence of the prediction. (NOTE 3) Shall be present if the analytics result is a prediction.</td>
<td></td>
</tr>
</tbody>
</table>

NOTE 1: At least one value shall be provided.
NOTE 2: The values are percentages which are provided as estimated over a given period.
NOTE 3: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction.
5.1.6.2.32 Type NfStatus

Table 5.1.6.2.32-1: Definition of type NfStatus

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>statusRegistered</td>
<td>SamplingRatio</td>
<td>C</td>
<td>0..1</td>
<td>Percentage of time with status &quot;registered&quot; (NOTE)</td>
<td></td>
</tr>
<tr>
<td>statusUnregistered</td>
<td>SamplingRatio</td>
<td>C</td>
<td>0..1</td>
<td>Percentage of time with status &quot;unregistered&quot; (NOTE)</td>
<td></td>
</tr>
<tr>
<td>statusUndiscoverable</td>
<td>SamplingRatio</td>
<td>C</td>
<td>0..1</td>
<td>Percentage of time with status &quot;undiscoverable&quot; (NOTE)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The availability statuses of the NF on the Analytics target period are expressed as a percentage of time. The total of status values should be equal or lower than 100%. At least one value shall be provided.

5.1.6.2.33 Type NsIdInfo

Table 5.1.6.2.33-1: Definition of type NsIdInfo

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>snssai</td>
<td>Snssai</td>
<td>M</td>
<td>1</td>
<td>Identification of network slice to which the subscription for event notification procedure applies.</td>
<td></td>
</tr>
<tr>
<td>nsilds</td>
<td>array(Nsild)</td>
<td>O</td>
<td>1..N</td>
<td>Identification of network slice instance(s) associated with the subscribed S-NSSAI identified by the &quot;snssai&quot; attribute. May be included when subscribed event is &quot;NSI_LOAD_LEVEL&quot; or &quot;SERVICE_EXPERIENCE&quot;.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.2.34 Type NsiLoadLevelInfo

Table 5.1.6.2.34-1: Definition of type NsiLoadLevelInfo

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>loadLevelInformation</td>
<td>LoadLevelInformation</td>
<td>M</td>
<td>1</td>
<td>Load level information of the network slice instance identified by the &quot;snssai&quot; attribute and if provided, the associated NSI ID identified by the &quot;nsild&quot; attribute.</td>
<td></td>
</tr>
<tr>
<td>snssai</td>
<td>Snssai</td>
<td>M</td>
<td>1</td>
<td>Identification of network slice to which the subscription.</td>
<td></td>
</tr>
<tr>
<td>nsild</td>
<td>Nsild</td>
<td>C</td>
<td>0..1</td>
<td>Identification of network slice instance associated with the S-NSSAI identified by the &quot;snssai&quot; attribute. Shall be presented if the &quot;nsilds&quot; attribute was provided within the NsIdInfo data in the EventSubscription data during the subscription.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.3 Simple data types and enumerations

5.1.6.3.1 Introduction

This subclause defines simple data types and enumerations that can be referenced from data structures defined in the previous subclauses.
5.1.6.3.2 Simple data types

The simple data types defined in table 5.1.6.3.2-1 shall be supported.

Table 5.1.6.3.2-1: Simple data types

<table>
<thead>
<tr>
<th>Type Name</th>
<th>Type Definition</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>AnySlice</td>
<td>boolean</td>
<td>&quot;FALSE&quot; represents not applicable for all slices. &quot;TRUE&quot; represents applicable for all slices.</td>
<td></td>
</tr>
<tr>
<td>LoadLevelInformation</td>
<td>integer</td>
<td>Load level information of the network slice instance.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.3.3 Enumeration: NotificationMethod

Table 5.1.6.3.3-1: Enumeration NotificationMethod

<table>
<thead>
<tr>
<th>Enumeration value</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERIODIC</td>
<td>The subscription of NWDAF Event is periodically. The periodic of the notification is identified by repetitionPeriod defined in subclause 5.1.6.2.3.</td>
<td></td>
</tr>
<tr>
<td>THRESHOLD</td>
<td>The subscription of NWDAF Event is upon threshold exceeded. The threshold of the notification is identified by loadLevelThreshold defined in subclause 5.1.6.2.3.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.3.4 Enumeration: NwdafEvent

Table 5.1.6.3.4-1: Enumeration NwdafEvent

<table>
<thead>
<tr>
<th>Enumeration value</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>NF_LOAD</td>
<td>Indicates that the event subscribed is NF Load.</td>
<td>NFLoad</td>
</tr>
<tr>
<td>QOS_SUSTAINABILITY</td>
<td>Indicates that the event subscribed is QoS sustainability.</td>
<td>QoSSustainability</td>
</tr>
<tr>
<td>SLICE_LOAD_LEVEL</td>
<td>Indicates that the event subscribed is load level information of Network Slice</td>
<td></td>
</tr>
<tr>
<td>SERVICE_EXPERIENCE</td>
<td>Indicates that the event subscribed is service experience.</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>UE_MOBILITY</td>
<td>Indicates that the event subscribed is UE mobility information.</td>
<td>UeMobility</td>
</tr>
<tr>
<td>UE_COMM</td>
<td>Indicates that the event subscribed is UE communication information.</td>
<td>UeCommunication</td>
</tr>
<tr>
<td>ABNORMAL_BEHAVIOUR</td>
<td>Indicates that the event subscribed is abnormal behaviour information.</td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>USER_DATA_CONGESTION</td>
<td>Indicates that the event subscribed is user data congestion information</td>
<td>UserDataCongestion</td>
</tr>
<tr>
<td>NETWORK_PERFORMANCE</td>
<td>Indicates that the event subscribed is network performance information</td>
<td>NetworkPerformance</td>
</tr>
<tr>
<td>NSI_LOAD_LEVEL</td>
<td>Indicates that the event subscribed is load level information of Network Slice and the optionally associated Network Slice Instance</td>
<td>NsiLoad</td>
</tr>
</tbody>
</table>
5.1.6.3.5 **Enumeration: Accuracy**

<table>
<thead>
<tr>
<th>Enumeration value</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW</td>
<td>Low accuracy.</td>
<td></td>
</tr>
<tr>
<td>HIGH</td>
<td>High accuracy.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.3.6 **Enumeration: ExceptionId**

<table>
<thead>
<tr>
<th>Enumeration value</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNEXPECTED_UE_LOCATION</td>
<td>Unexpected UE location</td>
<td></td>
</tr>
<tr>
<td>UNEXPECTED_LONG_LIVE_FLOW</td>
<td>Unexpected long-live rate flows</td>
<td></td>
</tr>
<tr>
<td>UNEXPECTED_LARGE_RATE_FLOW</td>
<td>Unexpected large rate flows</td>
<td></td>
</tr>
<tr>
<td>UNEXPECTED_WAKEUP</td>
<td>Unexpected wakeup</td>
<td></td>
</tr>
<tr>
<td>SUSPICION_OF_DDOS_ATTACK</td>
<td>Suspicion of DDoS attack</td>
<td></td>
</tr>
<tr>
<td>WRONG_DESTINATION_ADDRESS</td>
<td>Wrong destination address</td>
<td></td>
</tr>
<tr>
<td>TOO_FREQUENT_SERVICE_ACCESS</td>
<td>Too frequent Service Access</td>
<td></td>
</tr>
<tr>
<td>UNEXPECTED_RADIO_LINK_FAILURES</td>
<td>Unexpected radio link failures</td>
<td></td>
</tr>
<tr>
<td>PING_PONG_ACROSS.Cells</td>
<td>Ping-ponging across neighbouring cells</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.3.7 **Enumeration: ExceptionTrend**

<table>
<thead>
<tr>
<th>Enumeration value</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP</td>
<td>Up trend of the exception level.</td>
<td></td>
</tr>
<tr>
<td>DOWN</td>
<td>Down trend of the exception level.</td>
<td></td>
</tr>
<tr>
<td>UNKNOWN</td>
<td>Unknown trend of the exception level.</td>
<td></td>
</tr>
<tr>
<td>STABLE</td>
<td>Stable trend of the exception level.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.3.8 **Enumeration: CongestionType**

<table>
<thead>
<tr>
<th>Enumeration value</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>USER_PLANE</td>
<td>The congestion analytics type is User Plane.</td>
<td></td>
</tr>
<tr>
<td>CONTROL_PLANE</td>
<td>The congestion analytics type is Control Plane.</td>
<td></td>
</tr>
<tr>
<td>USER_AND_CONTROL_PLANE</td>
<td>The congestion analytics type is User Plane and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control Plane.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.3.9 **Enumeration: TimeUnit**

<table>
<thead>
<tr>
<th>Enumeration value</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINUTE</td>
<td>Time unit is per minute.</td>
<td></td>
</tr>
<tr>
<td>HOUR</td>
<td>Time unit is per hour.</td>
<td></td>
</tr>
<tr>
<td>DAY</td>
<td>Time unit is per day.</td>
<td></td>
</tr>
</tbody>
</table>
5.1.6.3.10  Enumeration: NetworkPerfType

Table 5.1.6.3.10-1: Enumeration NetworkPerfType

<table>
<thead>
<tr>
<th>Enumeration value</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNB_ACTIVE_RATIO</td>
<td>Indicates the ratio of gNB active (i.e. up and running) number to the total number of gNB.</td>
<td></td>
</tr>
<tr>
<td>GNB_COMPUTING_USAGE</td>
<td>Indicates gNodeB computing resource usage.</td>
<td></td>
</tr>
<tr>
<td>GNB_MEMORY_USAGE</td>
<td>Indicates gNodeB memory usage.</td>
<td></td>
</tr>
<tr>
<td>GNB_DISK_USAGE</td>
<td>Indicates gNodeB disk usage.</td>
<td></td>
</tr>
<tr>
<td>NUMBER_OF_U_E</td>
<td>Indicates number of UEs.</td>
<td></td>
</tr>
<tr>
<td>SESS_SUCC_RATIO</td>
<td>Indicates ratio of successful setup of PDU sessions to total PDU session setup attempts.</td>
<td></td>
</tr>
<tr>
<td>HO_SUCC_RATIO</td>
<td>Indicates Ratio of successful handovers to the total handover attempts.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.3.11  Enumeration: ExpectedAnalyticsType

Table 5.1.6.3.11-1: Enumeration ExpectedAnalyticsType

<table>
<thead>
<tr>
<th>Enumeration value</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOBILITY</td>
<td>Mobility related abnormal behaviour analytics is expected by the consumer</td>
<td></td>
</tr>
<tr>
<td>COMMUN</td>
<td>Communication related abnormal behaviour analytics is expected by the consumer</td>
<td></td>
</tr>
<tr>
<td>MOBILITY_AND_COMMUN</td>
<td>Both mobility and communication related abnormal behaviour analytics is expected by the consumer</td>
<td></td>
</tr>
</tbody>
</table>

5.1.6.3.12  Enumeration: MatchingDirection

Table 5.1.6.3.12-1: Enumeration MatchingDirection

<table>
<thead>
<tr>
<th>Enumeration value</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCENDING</td>
<td>Threshold is crossed in ascending direction.</td>
<td></td>
</tr>
<tr>
<td>DESCENDING</td>
<td>Threshold is crossed in descending direction.</td>
<td></td>
</tr>
<tr>
<td>CROSSED</td>
<td>Threshold is crossed either in ascending or descending direction.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.7  Error handling

5.1.7.1  General

HTTP error handling shall be supported as specified in subclause 5.2.4 of 3GPP TS 29.500 [6].

For the Nnwdaf_EventsSubscription API, HTTP error responses shall be supported as specified in subclause 4.8 of 3GPP TS 29.501 [7]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [6] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [6]. In addition, the requirements in the following subclauses shall apply.

5.1.7.2  Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the Nnwdaf_EventsSubscription API.
5.1.7.3 Application Errors

The application errors defined for the Nnwdaf_EventsSubscription API are listed in table 5.1.7.3-1. The NWDAF shall include in the HTTP status code a “ProblemDetails” data structure with the "cause" attribute indicating the application error as listed in table 5.7.3-1.

<table>
<thead>
<tr>
<th>Application Error</th>
<th>HTTP status code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBSCRIPTION_NOT_FOUND</td>
<td>404 Not Found</td>
<td>Indicates that the modification or deletion has failed because the specified Individual NWDAF Event Subscription resource does not exist. (NOTE)</td>
</tr>
<tr>
<td>BOTH_STAT_PRED_NOT_ALLOWED</td>
<td>400 Bad Request</td>
<td>For the requested observation period, the start time is in the past and the end time is in the future, which means the NF service consumer requested both statistics and prediction for the analytics.</td>
</tr>
</tbody>
</table>

NOTE: This application error is included in the responses to the GET and the DELETE requests.

5.1.8 Feature negotiation

The optional features in table 5.1.8-1 are defined for the Nnwdaf_EventsSubscription API. They shall be negotiated using the extensibility mechanism defined in subclause 6.6 of 3GPP TS 29.500 [6].

<table>
<thead>
<tr>
<th>Feature number</th>
<th>Feature Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ServiceExperience</td>
<td>This feature indicates support for the event related to service experience.</td>
</tr>
<tr>
<td>2</td>
<td>UeMobility</td>
<td>This feature indicates the support of analytics based on UE mobility information.</td>
</tr>
<tr>
<td>3</td>
<td>UeCommunication</td>
<td>This feature indicates the support of analytics based on UE communication information.</td>
</tr>
<tr>
<td>4</td>
<td>QoSSustainability</td>
<td>This feature indicates support for the event related to QoS sustainability.</td>
</tr>
<tr>
<td>5</td>
<td>AbnormalBehaviour</td>
<td>This feature indicates support for the event related to abnormal behaviour information.</td>
</tr>
<tr>
<td>6</td>
<td>UserDataCongestion</td>
<td>This feature indicates support for the event related to user data congestion.</td>
</tr>
<tr>
<td>7</td>
<td>NfLoad</td>
<td>This feature indicates the support of the analytics related to the load of NF instances.</td>
</tr>
<tr>
<td>8</td>
<td>NetworkPerformance</td>
<td>This feature indicates the support of analytics based on network performance.</td>
</tr>
<tr>
<td>9</td>
<td>NsiLoad</td>
<td>This feature indicates the support of the event related to the load level of Network Slice and the optionally associated Network Slice Instance.</td>
</tr>
</tbody>
</table>

5.1.9 Security

As indicated in 3GPP TS 33.501 [13] and 3GPP TS 29.500 [6], the access to the Nnwdaf_EventsSubscription API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [14]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [12]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nnwdaf_EventsSubscription API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [12], subclause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Nnwdaf_EventsSubscription service.
The Nnwdaf_EventsSubscription API defines a single scope "nnwdaf-eventssubscription" for the entire service, and it does not define any additional scopes at resource or operation level.

5.2 Nnwdaf_AnalyticsInfo Service API

5.2.1 Introduction

The Nnwdaf_AnalyticsInfo Service shall use the Nnwdaf_AnalyticsInfo API.

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

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

with the following components:
- The {apiRoot} shall be set as described in 3GPP TS 29.501 [7].
- The <apiName> shall be "nnwdaf-analyticsinfo".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in subclause 5.2.3.

5.2.2 Usage of HTTP

5.2.2.1 General

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

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

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

5.2.2.2 HTTP standard headers

5.2.2.2.1 General

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

5.2.2.2.2 Content type

JSON, IETF RFC 8259 [10], shall be used as content type of the HTTP bodies specified in the present specification as specified in subclause 5.4 of 3GPP TS 29.500 [6]. The use of the JSON format shall be signalled by the content type "application/json".

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

5.2.2.3 HTTP custom headers

The Nnwdaf_AnalyticsInfo Service API shall support HTTP custom header fields specified in subclause 5.2.3.2 of 3GPP TS 29.500 [6].

In this release of the specification, no specific custom headers are defined for the Nnwdaf_AnalyticsInfo Service API.
5.2.3 Resources

5.2.3.1 Resource Structure

{apiRoot}/nnwdaf-analyticsinfo/v1

Figure 5.2.3.1-1: Resource URI structure of the Nnwdaf_AnalyticsInfo API

Table 5.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

<table>
<thead>
<tr>
<th>Resource name</th>
<th>Resource URI</th>
<th>HTTP method or custom operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWDAF Analytics</td>
<td>{apiRoot}/nnwdaf-analyticsinfo/v1/analytics</td>
<td>GET</td>
<td>Retrieve the NWDAF analytics</td>
</tr>
</tbody>
</table>

5.2.3.2 Resource: NWDAF Analytics

5.2.3.2.1 Description

The NWDAF Analytics resource represents the analytics to the Nnwdaf_AnalyticsInfo Service at a given NWDAF.

5.2.3.2.2 Resource definition

Resource URI: {apiRoot}/nnwdaf-analyticsinfo/v1/analytics

This resource shall support the resource URI variables defined in table 5.2.3.2.2-1.

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>apiRoot</td>
<td>string</td>
<td>See subclause 5.2.1</td>
</tr>
</tbody>
</table>

5.2.3.2.3 Resource Standard Methods

5.2.3.2.3.1 GET

This method shall support the URI query parameters specified in table 5.2.3.2.3.1-1.
Table 5.2.3.2.3.1-1: URI query parameters supported by the GET method on this resource

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ana-req</td>
<td>EventReportingRequirement</td>
<td>O</td>
<td>0..1</td>
<td>Identifies the analytics reporting requirement information.</td>
</tr>
<tr>
<td>event-id</td>
<td>EventId</td>
<td>M</td>
<td>1</td>
<td>Shall be included to identify the analytics.</td>
</tr>
<tr>
<td>event-filter</td>
<td>EventFilter</td>
<td>C</td>
<td>0..1</td>
<td>Shall be included to identify the analytics when filter information is needed for the related event.</td>
</tr>
<tr>
<td>supported-features</td>
<td>SupportedFeatures</td>
<td>O</td>
<td>0..1</td>
<td>To filter irrelevant responses related to unsupported features.</td>
</tr>
<tr>
<td>tgt-ue</td>
<td>TargetUeInformation</td>
<td>O</td>
<td>0..1</td>
<td>Identifies the target UE information.</td>
</tr>
</tbody>
</table>

This method shall support the request data structures specified in table 5.2.3.2.3.1-2 and the response data structures and response codes specified in table 5.2.3.2.3.1-3.

Table 5.2.3.2.3.1-2: Data structures supported by the GET Request Body on this resource

<table>
<thead>
<tr>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.2.3.2.3.1-3: Data structures supported by the GET Response Body on this resource

<table>
<thead>
<tr>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Response codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AnalyticsData</td>
<td>M</td>
<td>1</td>
<td>200 OK</td>
<td>Containing the analytics with parameters as relevant for the requesting NF service consumer</td>
</tr>
<tr>
<td>n/a</td>
<td></td>
<td></td>
<td>204 No Content</td>
<td>If the request NWDAF Analytics data does not exist, the NWDAF shall respond with “204 No Content”.</td>
</tr>
</tbody>
</table>

NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply.

5.2.3.2.4 Resource Custom Operations

None in this release of the specification.

5.2.4 Custom Operations without associated resources

None in this release of the specification.

5.2.5 Notifications

None in this release of the specification.

5.2.6 Data Model

5.2.6.1 General

This subclause specifies the application data model supported by the API.
Table 5.2.6.1-1 specifies the data types defined for the Nnwdaf_AnalyticsInfo service based interface protocol.

Table 5.2.6.1-1: Nnwdaf_AnalyticsInfo specific Data Types

<table>
<thead>
<tr>
<th>Data type</th>
<th>Section defined</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>AnalyticsData</td>
<td>5.2.6.2.2</td>
<td>Describes analytics with parameters indicated in the request</td>
<td></td>
</tr>
<tr>
<td>EventFilter</td>
<td>5.2.6.2.3</td>
<td>Also missing in release 15.</td>
<td></td>
</tr>
<tr>
<td>EventId</td>
<td>5.2.6.3.3</td>
<td>Describes the type of analytics.</td>
<td></td>
</tr>
</tbody>
</table>
Table 5.2.6.1-2 specifies data types re-used by the Nnwdaf_AnalyticsInfo service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nnwdaf service based interface.
Table 5.2.6.1-2: Nnwdaf_AnalyticsInfo re-used Data Types
<table>
<thead>
<tr>
<th>Data type</th>
<th>Reference</th>
<th>Comments</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>5.1.6.3.5</td>
<td>Represents the preferred level of accuracy of the analytics.</td>
<td></td>
</tr>
<tr>
<td>AnySlice</td>
<td>5.1.6.3.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ApplicationId</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the application.</td>
<td>ServiceExperience, UeCommunication, AbnormalBehaviour</td>
</tr>
<tr>
<td>BwRequirement</td>
<td>5.1.6.2.25</td>
<td></td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>DateTime</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the time.</td>
<td></td>
</tr>
<tr>
<td>Dnn</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the DNN.</td>
<td>ServiceExperience, AbnormalBehaviour, UeCommunication</td>
</tr>
<tr>
<td>Dnai</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies a user plane access to one or more DN(s)</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>EventReportingRequirement</td>
<td>5.1.6.2.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ExceptionId</td>
<td>5.1.6.3.6</td>
<td></td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>ExpectedUeBehaviourData</td>
<td>3GPP TS 29.503 [23]</td>
<td></td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>ExpectedAnalyticsType</td>
<td>5.1.6.3.11</td>
<td></td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>GroupId</td>
<td>3GPP TS 29.571 [8]</td>
<td>Internal Group Identifier of a group of UEs</td>
<td>UeMobility, UeCommunication, NetworkPerformance, AbnormalBehaviour, ServiceExperience</td>
</tr>
<tr>
<td>NetworkAreaInfo</td>
<td>3GPP TS 29.554 [18]</td>
<td>The network area information.</td>
<td>UeMobility, NetworkPerformance, QoS Sustainability, ServiceExperience, UserDataCongestion, AbnormalBehaviour</td>
</tr>
<tr>
<td>NfLoadLevelInformation</td>
<td>5.1.6.2.31</td>
<td>Represents load level information of a given NF instance.</td>
<td>NfLoad</td>
</tr>
<tr>
<td>NfInstanceId</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies an NF instance</td>
<td>NfLoad</td>
</tr>
<tr>
<td>NfSetId</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies an NF Set instance</td>
<td>NfLoad</td>
</tr>
<tr>
<td>NFType</td>
<td>3GPP TS 29.510 [12]</td>
<td>Identifies a type of NF</td>
<td>NfLoad</td>
</tr>
<tr>
<td>NsId</td>
<td>3GPP TS 29.531 [24]</td>
<td>Identifies a Network Slice Instance</td>
<td>ServiceExperience, NsiLoad</td>
</tr>
<tr>
<td>NsIdInfo</td>
<td>5.1.6.2.33</td>
<td>Identify the S-NSSAI and the associated Network Slice Instance(s).</td>
<td>ServiceExperience, NsiLoad</td>
</tr>
<tr>
<td>NsiLoadLevelInfo</td>
<td>5.1.6.2.34</td>
<td>Represents the load level information for an S-NSSAI and the associated network slice instance.</td>
<td>NsiLoad</td>
</tr>
<tr>
<td>ProblemDetails</td>
<td>3GPP TS 29.571 [8]</td>
<td>Used in error responses to provide more detailed information about an error.</td>
<td></td>
</tr>
<tr>
<td>QosRequirement</td>
<td>5.1.6.2.20</td>
<td></td>
<td>QoS Sustainability</td>
</tr>
<tr>
<td>QoS SustainabilityInfo</td>
<td>5.1.6.2.19</td>
<td></td>
<td>QoS Sustainability</td>
</tr>
<tr>
<td>SamplingRatio</td>
<td>3GPP TS 29.571 [8]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ServiceExperienceInfo</td>
<td>5.1.6.2.24</td>
<td></td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>Supi</td>
<td>3GPP TS 29.571 [8]</td>
<td>Identifies the UE.</td>
<td>ServiceExperience, NfLoad, NetworkPerformance, UserDataCongestion, UeMobility, UeCommunication, AbnormalBehaviour</td>
</tr>
</tbody>
</table>

ETSI
<table>
<thead>
<tr>
<th>SupportedFeatures</th>
<th>3GPP TS 29.571 [8]</th>
<th>Used to negotiate the applicability of the optional features defined in table 5.2.8-1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snsai</td>
<td>3GPP TS 29.571 [8]</td>
<td></td>
</tr>
<tr>
<td>SliceLoadLevelInformation</td>
<td>5.1.6.2.6</td>
<td></td>
</tr>
<tr>
<td>TargetUeInformation</td>
<td>5.1.6.2.8</td>
<td>Identifies the target UE information.</td>
</tr>
<tr>
<td></td>
<td>ServiceExperience</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NfLoad</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NetworkPerformance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UserDataCongestion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UeMobility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UeCommunication</td>
<td></td>
</tr>
<tr>
<td>UeCommunication</td>
<td>5.1.6.2.13</td>
<td></td>
</tr>
<tr>
<td>UeMobility</td>
<td>5.1.6.2.10</td>
<td></td>
</tr>
<tr>
<td>Uinteger</td>
<td>3GPP TS 29.571 [8]</td>
<td>Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.</td>
</tr>
<tr>
<td>UserDataCongestionInfo</td>
<td>5.1.6.2.17</td>
<td></td>
</tr>
<tr>
<td>AbnormalBehaviour</td>
<td>5.1.6.2.15</td>
<td>Represents the abnormal behaviour information.</td>
</tr>
<tr>
<td></td>
<td>AbnormalBehaviour</td>
<td></td>
</tr>
</tbody>
</table>

5.2.6.2 Structured data types

5.2.6.2.1 Introduction

This subclause defines the structures to be used in resource representations.
### Type AnalyticsData

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>sliceLoadLevelInfos</td>
<td>array(SliceLoadLevelInformation)</td>
<td>C</td>
<td>1..N</td>
<td>The slices and the load level information. Shall be present when the requested event is &quot;LOAD_LEVEL_INFORMATION&quot;</td>
<td></td>
</tr>
<tr>
<td>nsiLoadLevelInfos</td>
<td>array(NsiLoadLevelInfo)</td>
<td>C</td>
<td>1..N</td>
<td>Each element identifies the load level information for an S-NSSAI and the optionally associated network slice instance. Shall be presented when the requested event is &quot;NSI_LOAD_LEVEL&quot;</td>
<td>NsiLoad</td>
</tr>
<tr>
<td>nwPerfs</td>
<td>array(NetworkPerfInfo)</td>
<td>C</td>
<td>1..N</td>
<td>The network performance information. Shall be present when the requested event is &quot;NETWORK_PERFORMANCE&quot;</td>
<td>NetworkPerforomance</td>
</tr>
<tr>
<td>nfLoadLevelInfos</td>
<td>array(NfLoadLevelInfo)</td>
<td>C</td>
<td>1..N</td>
<td>The NF load information. When the requested event is &quot;NF_LOAD&quot;, the nfLoadLevelInfos shall be included.</td>
<td>NfLoad</td>
</tr>
<tr>
<td>qosSustainInfos</td>
<td>array(QosSustainabilityInfo)</td>
<td>C</td>
<td>1..N</td>
<td>The QoS sustainability information in the certain geographic areas. It shall present if the requested event is &quot;QOS_SUSTAINABILITY&quot;</td>
<td>QoSsustainability</td>
</tr>
<tr>
<td>ueMobs</td>
<td>array(UeMobility)</td>
<td>C</td>
<td>1..N</td>
<td>The UE mobility information. When the requested event is &quot;UE_MOBILITY&quot;, the &quot;ueMobs&quot; attribute shall be included.</td>
<td>UeMobility</td>
</tr>
<tr>
<td>ueComms</td>
<td>array(UeCommunication)</td>
<td>C</td>
<td>1..N</td>
<td>The UE communication information. When the requested event is &quot;UE_COMM&quot;, the &quot;ueComms&quot; attribute shall be included.</td>
<td>UeCommunication</td>
</tr>
<tr>
<td>userDataCongInfos</td>
<td>array(UserDataCongestionInfo)</td>
<td>C</td>
<td>1..N</td>
<td>The user data congestion information. Shall be present when the requested event is &quot;USER_DATA_CONGESTION&quot;</td>
<td>UserDataCongestion</td>
</tr>
<tr>
<td>suppFeat</td>
<td>SupportedFeatures</td>
<td>C</td>
<td>0..1</td>
<td>List of Supported features used as described in subclause 5.1.8. This parameter shall be supplied by NWDAF in the reply of GET request that request the analytics resource, if the consumer includes &quot;supported-features&quot; in the GET request.</td>
<td>ServiceExperi</td>
</tr>
</tbody>
</table>
5.2.6.2.3 Type EventFilter

Table 5.2.6.2.3-1: Definition of type EventFilter
<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Data type</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>anySlice</td>
<td>AnySlice</td>
<td>C</td>
<td>0..1</td>
<td>Default is “FALSE”. (NOTE 1)</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>appIds</td>
<td>array(ApplicationId)</td>
<td>C</td>
<td>1..N</td>
<td>Identification(s) of application. It may be included when event-id is “SERVICE_EXPERIENCE”.</td>
<td>UeCommunication</td>
</tr>
<tr>
<td>dnns</td>
<td>array(Dnn)</td>
<td>C</td>
<td>1..N</td>
<td>Identification(s) of DNN. Each DNN is a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. It may be included when event-id is “SERVICE_EXPERIENCE”.</td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>dnais</td>
<td>array(Dnai)</td>
<td>C</td>
<td>1..N</td>
<td>Identification(s) of user plane accesses to DN(s) which the subscription applies. It may be included when event-id is “SERVICE_EXPERIENCE”.</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>snssais</td>
<td>array(Snssai)</td>
<td>C</td>
<td>1..N</td>
<td>Identification(s) of network slice to which the subscription belongs. (NOTE 1)</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>nfInstanceIds</td>
<td>array(NFInstanceId)</td>
<td>O</td>
<td>1..N</td>
<td>Identification(s) of NF instances.</td>
<td>NfLoad</td>
</tr>
<tr>
<td>nfSetIds</td>
<td>array(NFSetId)</td>
<td>O</td>
<td>1..N</td>
<td>Identification(s) of NF instance sets.</td>
<td>NfLoad</td>
</tr>
<tr>
<td>nfTypes</td>
<td>array(NFType)</td>
<td>O</td>
<td>1..N</td>
<td>Identification(s) of NF types.</td>
<td>NfLoad</td>
</tr>
<tr>
<td>networkArea</td>
<td>NetworkAreaInfo</td>
<td>C</td>
<td>0..1</td>
<td>This IE represents the network area where the NF service consumer wants to know the analytics result. (NOTE 2)</td>
<td>UeMobility</td>
</tr>
<tr>
<td>nsIdInfos</td>
<td>array(NsIdInfo)</td>
<td>O</td>
<td>1..N</td>
<td>Each element identifies the S-NSSAI and the optionally associated network slice instance(s). May be included when subscribed event is &quot;NSI_LOAD_LEVEL&quot; or &quot;SERVICE_EXPERIENCE&quot;. (NOTE 1)</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>nwPerfTypes</td>
<td>array(NetworkPerformanceType)</td>
<td>C</td>
<td>1..N</td>
<td>Represents the network performance types. This attribute shall be included when event-id is &quot;NETWORK_PERFORMANCE&quot;.</td>
<td>NetworkPerformance</td>
</tr>
<tr>
<td>qosRequ</td>
<td>QoSRequirements</td>
<td>C</td>
<td>0..1</td>
<td>Represents the QoS requirements. This attribute shall be included when event-id is &quot;QOS_SUSTAINABILITY&quot;.</td>
<td>QoS Sustainability</td>
</tr>
<tr>
<td>bwRequ</td>
<td>array(BwRequirement)</td>
<td>O</td>
<td>1..N</td>
<td>Represents the media/application bandwidth requirement for each application. It may only be present if “appIds” attribute is provided.</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>excepIds</td>
<td>array(ExceptionId)</td>
<td>C</td>
<td>1..N</td>
<td>Represents a list of Exception Ids. (NOTE 3)</td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>exptAnaType</td>
<td>ExpectedAnalyticsType</td>
<td>C</td>
<td>0..1</td>
<td>Represents expected UE analytics type. (NOTE 3)</td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>exptUeBehav</td>
<td>ExpectedUeBehaviourData</td>
<td>O</td>
<td>0..1</td>
<td>Represents expected UE behaviour.</td>
<td>AbnormalBehaviour</td>
</tr>
</tbody>
</table>
NOTE 1: When event-id in the request is "LOAD_LEVEL_INFORMATION", 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 "NSI_LOAD_LEVEL" or "SERVICE_EXPERIENCE", either the "nsiIdInfos" attribute or anySlice set to "TRUE" shall be included. When subscribed event is "QOS_SUSTAINABILITY", "NF_LOAD", "UE_COMM", "ABNORMAL_BEHAVIOUR" or "USER_DATA_CONGESTION", the identifications of network slices is optional.

NOTE 2: For "NETWORK_PERFORMANCE" or "USER_DATA_CONGESTION" event, this attribute shall be provided if the event applied for all UEs (i.e. "anyUe" attribute set to true). For "QOS_SUSTAINABILITY", this attribute shall be provided.

NOTE 3: Either "exceptIds" or "exptAnaType" shall be provided if event-id in the request is "ABNORMAL_BEHAVIOUR".

5.2.6.2.4 Void

5.2.6.3 Simple data types and enumerations

5.2.6.3.1 Introduction

This subclause defines simple data types and enumerations that can be referenced from data structures defined in the previous subclauses.

5.2.6.3.2 Simple data types

The simple data types defined in table 5.2.6.3.2-1 shall be supported.

Table 5.2.6.3.2-1: Simple data types

<table>
<thead>
<tr>
<th>Type Name</th>
<th>Type Definition</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.2.6.3.3 Enumeration: EventId

Table 5.2.6.3.3-1: Enumeration EventId

<table>
<thead>
<tr>
<th>Enumeration value</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOAD_LEVEL_INFORMATION</td>
<td>Represents the analytics of load level information of corresponding network slice instance.</td>
<td></td>
</tr>
<tr>
<td>NETWORK_PERFORMANCE</td>
<td>Represents the analytics of network performance information</td>
<td>NetworkPerformance</td>
</tr>
<tr>
<td>NF_LOAD</td>
<td>Represents the analytics of NF Load information.</td>
<td>NfLoad</td>
</tr>
<tr>
<td>QOS_SUSTAINABILITY</td>
<td>Represents the analytics of QoS sustainability in the certain area.</td>
<td>QoS_Sustainability</td>
</tr>
<tr>
<td>SERVICE_EXPERIENCE</td>
<td>Represents the analytics of service experience of corresponding application and/or network slice</td>
<td>ServiceExperience</td>
</tr>
<tr>
<td>UE_MOBILITY</td>
<td>Represents the analytics of UE mobility.</td>
<td>UeMobility</td>
</tr>
<tr>
<td>UE_COMM</td>
<td>Represents the analytics of UE communication.</td>
<td>UeCommunication</td>
</tr>
<tr>
<td>USER_DATA_CONGESTION</td>
<td>Represents the analytics of the user data congestion in the certain area.</td>
<td>UserDataCongestion</td>
</tr>
<tr>
<td>ABNORMAL_BEHAVIOUR</td>
<td>Represents the analytics of abnormal behaviour information.</td>
<td>AbnormalBehaviour</td>
</tr>
<tr>
<td>NSI_LOAD_LEVEL</td>
<td>Represents the analytics of load level information of Network Slice and the optionally associated Network Slice Instance</td>
<td>NsiLoad</td>
</tr>
</tbody>
</table>
5.2.7 Error handling

5.2.7.1 General

HTTP error handling shall be supported as specified in subclause 5.2.4 of 3GPP TS 29.500 [6].

For the Nnwdaf_AnalyticsInfo API, HTTP error responses shall be supported as specified in subclause 4.8 of 3GPP TS 29.501 [7]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [6] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [6]. In addition, the requirements in the following subclauses shall apply.

5.2.7.2 Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the Nnwdaf_AnalyticsInfo API.

5.2.7.3 Application Errors

The application errors defined for the Nnwdaf_AnalyticsInfo API are listed in table 5.2.7.3-1. The NWDAF shall include in the HTTP status code a “ProblemDetails” data structure with the "cause" attribute indicating the application error as listed in table 5.2.7.3-1.

Table 5.2.7.3-1: Application errors

<table>
<thead>
<tr>
<th>Application Error</th>
<th>HTTP status code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOTH_STAT_PRED_NOT_ALLOWED</td>
<td>400 Bad Request</td>
<td>For the requested observation period, the start time is in the past and the end time is in the future, which means the NF service consumer requested both statistics and prediction for the analytics.</td>
</tr>
</tbody>
</table>

5.2.8 Feature negotiation

The optional features in table 5.2.8-1 are defined for the Nnwdaf_AnalyticsInfo API. They shall be negotiated using the extensibility mechanism defined in subclause 6.6 of 3GPP TS 29.500 [6].

Table 5.2.8-1: Supported Features

<table>
<thead>
<tr>
<th>Feature number</th>
<th>Feature Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UeMobility</td>
<td>This feature indicates the support of analytics based on UE mobility information.</td>
</tr>
<tr>
<td>2</td>
<td>UeCommunication</td>
<td>This feature indicates the support of analytics based on UE communication information.</td>
</tr>
<tr>
<td>3</td>
<td>NetworkPerformance</td>
<td>This feature indicates the support of analytics based on network performance.</td>
</tr>
<tr>
<td>4</td>
<td>ServiceExperience</td>
<td>This feature indicates support for the event related to service experience.</td>
</tr>
<tr>
<td>5</td>
<td>QoSsustainability</td>
<td>This feature indicates support for the event related to QoS sustainability.</td>
</tr>
<tr>
<td>6</td>
<td>AbnormalBehaviour</td>
<td>This feature indicates support for the event related to abnormal behaviour information.</td>
</tr>
<tr>
<td>7</td>
<td>UserDataCongestion</td>
<td>This feature indicates the support of the analytics related on user data congestion.</td>
</tr>
<tr>
<td>8</td>
<td>NfLoad</td>
<td>This feature indicates the support of the analytics related to the load of NF instances.</td>
</tr>
<tr>
<td>9</td>
<td>NsiLoad</td>
<td>This feature indicates the support of the analytics related to the load level of Network Slice and the optionally associated Network Slice Instance.</td>
</tr>
</tbody>
</table>
5.2.9 Security

As indicated in 3GPP TS 33.501 [13] and 3GPP TS 29.500 [6], the access to the Nnwdaf_AnalyticsInfo API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [14]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [12]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nnwdaf_AnalyticsInfo API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [12], subclause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Nnwdaf_AnalyticsInfo service.

The Nnwdaf_AnalyticsInfo API defines a single scope "nnwdaf-analyticsinfo" for the entire service, and it does not define any additional scopes at resource or operation level.
Annex A (normative):  
OpenAPI specification

A.1 General

The present Annex contains an OpenAPI [11] specification of HTTP messages and content bodies used by the  
Nnwdaf_EventsSubscription and the Nnwdaf_AnalyticsInfo API.

This Annex shall take precedence when being discrepant to other parts of the specification with respect to the encoding  
of information elements and methods within the API(s).

NOTE: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations  
of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the  
specification also apply.

Informative copies of the OpenAPI specification files contained in this 3GPP Technical Specification are available on a  
Git-based repository hosted in ETSI Forge, that uses the GitLab software version control system (see clause 5B of the  

A.2 Nnwdaf_EventsSubscription API

openapi: 3.0.0  
info:  
  version: 1.1.0  
  title: Nnwdaf_EventsSubscription  
  description: Nnwdaf_EventsSubscription Service API.  
© 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.  
  externalDocs:  
    description: 3GPP TS 29.520 V16.4.0; 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:  
              $ref: '#/components/schemas/NnwdafEventsSubscription'  
      responses:  
        '201':  
          description: Create a new Individual NWDAF Event Subscription resource.  
          headers:  
            Location:  
              description: 'Contains the URI of the newly created resource, according to the  
              structure: (apiRoot)/nnwdaf-eventssubscription/v1/subscriptions/{subscriptionId}'  
              required: true  
              schema:  
                type: string  
              content:  
                application/json:
callbacks:
  myNotification:
    '({$request.body#/notificationURI})':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/NnwdafEventsSubscriptionNotification'
                minItems: 1
        responses:
          '204':
            description: The receipt of the Notification is acknowledged.
          '400':
            $ref: 'TS29571_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29571_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29571_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29571_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29571_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29571_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29571_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29571_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29571_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  /subscriptions/{subscriptionId}:
    delete:
      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.

'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'
'404':
  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
'411':
  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
'413':
  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
'415':
  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
'429':
  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
'500':
  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
'501':
  $ref: 'TS29571_CommonData.yaml#/components/responses/501'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29571_CommonData.yaml#/components/responses/default'

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.
    $ref: 'TS29571_CommonData.yaml#/components/responses/204'
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '401':
    $ref: 'TS29571_CommonData.yaml#/components/responses/401'
  '403':
    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    description: The Individual NWDAF Event Subscription resource does not exist.
    content:
      application/problem+json:
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
  '411':
    $ref: 'TS29571_CommonData.yaml#/components/responses/411'
  '413':
    $ref: 'TS29571_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29571_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29571_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '501':
    $ref: 'TS29571_CommonData.yaml#/components/responses/501'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nnwdaf-eventsSubscription: Access to the Nnwdaf_EventsSubscription API
  schemas:
    NnwdafEventsSubscription:
      type: object
      properties:
        eventSubscriptions:
          type: array
          items:
            $ref: '#/components/schemas/EventSubscription'
          minItems: 1
          description: Subscribed events
        eventReq:
          $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
        required:
          - eventSubscriptions

EventSubscription:
  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. When
      subscribed event is "SERVICE_EXPERIENCE", the absence of applicationIds means subscription to all
      applications.
    dnns:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
      minItems: 1
      description: Identification(s) of DNN to which the subscription applies. When subscribed
      event is "SERVICE_EXPERIENCE", the absence of dnns means subscription to all DNNs.
    dnais:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnai'
      minItems: 1
      description: Identification(s) of Dnai to which the subscription applies. When subscribed
      event is "SERVICE_EXPERIENCE", the absence of dnais means subscription to all Dnais.
    event:
      $ref: '#/components/schemas/NwdaEvent'
    extraReportReq:
      $ref: '#/components/schemas/EventReportingRequirement'
    loadLevelThreshold:
      type: integer
      description: Shall be supplied for notification method "THRESHOLD". Indicates that the
      NWDAF shall report the corresponding network slice load level to the NF service consumer where the
      load level of the network slice instance identified by snssai is reached.
    notificationMethod:
      $ref: '#/components/schemas/NotificationMethod'
    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
  - $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
  - minItems: 1

- **nfSetIds**: type: array
  - $ref: 'TS29571_CommonData.yaml#/components/schemas/NfSetId'
  - minItems: 1

- **nfTypes**: type: array
  - $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/NFType'
  - minItems: 1

- **networkArea**: $ref: 'TS29554_Npcf_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

- **nsiIdInfos**: type: array
  - $ref: '#/components/schemas/NsiIdInfo'
  - minItems: 1

- **nsiLevelThrsds**: type: array
  - $ref: 'TS29571_CommonData.yaml#/components/schemas/UInteger'
  - minItems: 1

- **qosRequ**: $ref: '#/components/schemas/QosRequirement'

- **qosFlowRetThds**: type: array
  - $ref: '#/components/schemas/RetainabilityThreshold'
  - minItems: 1

- **ranUeThrouThds**: type: array
  - $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
  - minItems: 1

- **repetitionPeriod**: $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'

- **snssaia**: type: array
  - $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
  - minItems: 1

- **tgtUe**: $ref: '#/components/schemas/TargetUeInformation'

- **congThresholds**: type: array
  - $ref: '#/components/schemas/ThresholdLevel'
  - minItems: 1

- **nwPerfRequ**: type: array
  - $ref: '#/components/schemas/NetworkPerfRequirement'
  - minItems: 1

- **bwRequ**: type: array
  - $ref: '#/components/schemas/BwRequirement'
  - minItems: 1

- **excepRequ**: type: array
  - $ref: '#/components/schemas/Exception'
  - minItems: 1

- **exptAnaType**: $ref: '#/components/schemas/ExpectedAnalyticsType'

- **exptUeBehav**:
$ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/ExpectedUeBehaviourData'
required:
- event

NnwdafEventsSubscriptionNotification:
type: object
properties:
eventNotifications:
type: array
items:
  $ref: '#/components/schemas/EventNotification'
minItems: 1
description: Notifications about Individual Events
subscriptionId:
type: string
description: String identifying a subscription to the Nnwdaf_EventsSubscription Service
required:
- eventNotifications
- subscriptionId

EventNotification:
type: object
properties:
event:
  $ref: '#/components/schemas/NwdafEvent'
expiry:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'

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:
type: object
properties:
svcExprc:
$ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/SvcExperience'
svcExprcVariance:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/Float'
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:
  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:
  type: object
  properties:
    loadLevelInformation:
      $ref: '#/components/schemas/LoadLevelInformation'
    snssais:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      minItems: 1
      description: Identification(s) of network slice to which the subscription.
    required:
      - loadLevelInformation
      - snssais

NsiLoadLevelInfo:
  description: Represents the 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'
    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:
  type: object
  properties:
    accuracy:
$ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/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'

TargetUeInformation:
type: object
properties:
  anyUe:
type: boolean
  supis:
type: array
  items:
$ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  intGroupIds:
type: array
  items:
$ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'

UeMobility:
type: object
properties:
s:
$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
confidence:
$ref: 'TS29571_CommonData.yaml#/components/schemas/Integer'
required:
  - duration
  - locInfos

LocationInfo:
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/Integer'
required:
  - loc

UeCommunication:
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:
TrafficCharacterization:
   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:
   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:
   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'
   required:
     - congType
     - timeIntev
     - nsi

QosSustainabilityInfo:
   type: object
   properties:
     areaInfo:
       $ref: 'TS29554_Npcf_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'
     startTs:
       $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
     endTs:
       $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
     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:
   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:
ThresholdLevel:
  type: object
  properties:
    congLevel:
      type: integer
    nfLoadLevel:
      type: integer
    nfCpuUsage:
      type: integer
    nfMemoryUsage:
      type: integer
    nfStorageUsage:
      type: integer

NfLoadLevelInformation:
  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'

NfStatus:
  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 instance.

AbnormalBehaviour:
  type: object
  properties:
    supis:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      minItems: 1
    except:
      $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'
**ETSI TS 129 520 V16.4.0 (2020-08)**

**3GPP TS 29.520 version 16.4.0 Release 16**

- **Confidence:**
  - $ref: 'TS29571_CommonData.yaml#/components/schemas/UnsignedInteger'

- **AddMeasInfo:**
  - $ref: '#/components/schemas/AdditionalMeasurement'

- **Exception:**
  - type: object
    properties:
      - **ExceptionId:**
        - $ref: '#/components/schemas/ExceptionId'
      - **ExceptLevel:**
        - type: integer
      - **ExceptTrend:**
        - $ref: '#/components/schemas/ExceptionTrend'

- **AdditionalMeasurement:**
  - type: object
    properties:
      - **UnexpLoc:**
        - $ref: 'TS29554_Npcf_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'
      - **UnexpFlowTeps:**
        - type: array
          items:
            - $ref: '#/components/schemas/IpEthFlowDescription'

      - **UnexpWakes:**
        - type: array
          items:
            - $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'

      - **DDoSAttack:**
        - $ref: '#/components/schemas/AddressList'
      - **WrgDest:**
        - $ref: '#/components/schemas/AddressList'
      - **Circums:**
        - type: array
          items:
            - $ref: '#/components/schemas/CircumstanceDescription'

- **IpEthFlowDescription:**
  - type: object
    properties:
      - **IpTrafficFilter:**
        - $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/FlowDescription'
      - **EthTrafficFilter:**
        - $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'

- **AddressList:**
  - type: object
    properties:
      - **Ipv4Addrs:**
        - type: array
          items:
            - $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
      - **Ipv6Addrs:**
        - type: array
          items:
            - $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'

- **CircumstanceDescription:**
  - type: object
    properties:
      - **FREQ:**
        - $ref: 'TS29571_CommonData.yaml#/components/schemas/Float'
      - **TM:**
        - $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      - **LOCAREA:**
        - $ref: 'TS29554_Npcf_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'
      - **VOL:**
        - $ref: 'TS29122_CommonData.yaml#/components/schemas/Volume'

- **RetainabilityThreshold:**
  - type: object
    properties:
      - **RelFlowNum:**
        - $ref: 'TS29571_CommonData.yaml#/components/schemas/UnsignedInteger'
      - **RelTimeUnit:
NetworkPerfRequirement:
  type: object
  properties:
    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:
    - nwPerfType

NetworkPerfInfo:
  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

NotificationMethod:
  anyOf:
    - type: string
      enum:
        - PERIODIC
        - THRESHOLD
      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.
    - type: string
      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
      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**
- type: string
  - enum:
    - LOW
    - HIGH
  - 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.

**CongestionType**
- type: string
  - enum:
    - USER_PLANE
    - CONTROL_PLANE
    - USER_AND_CONTROL_PLANE
  - 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.

**ExceptionId**
- type: string
  - enum:
    - UNEXPECTED_UE_LOCATION
    - UNEXPECTED_LONG_LIVE_FLOW
    - UNEXPECTED_LARGE_RATE_FLOW
    - UNEXPECTED_WAKEUP
    - SUSPICION_OF_DDOoS_ATTACK
    - WRONG_DESTINATION_ADDRESS
    - TOO_FREQUENT_SERVICE_ACCESS
    - UNEXPECTED_RADIO_LINK_FAILURES
    - PING_PONG ACROSS CELLS
  - 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.

**ExceptionTrend**
- type: string
  - enum:
    - UP
    - DOWN
    - UNKNOW
    - STABLE
  - 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
elem:
    - 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
elem:
    - GNB_ACTIVE_RATIO
    - GNB_COMPUTING_USAGE
    - GNB_MEMORY_USAGE
    - GNB_DISK_USAGE
    - NUM_OF_UE
    - SESS_SUCCEED_RATIO
    - HO_SUCCEED_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_SUCCEED_RATIO: Indicates ratio of successful setup of PDU sessions to total PDU session setup attempts.
- HO_SUCCEED_RATIO: Indicates Ratio of successful handovers to the total handover attempts.

ExpectedAnalyticsType:
anyOf:
  - type: string
elem:
    - 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
elem:
    - ASCENDING
    - DESCENDING
    - CROSSED
  - type: string
A.3 Nnwdaf_AnalyticsInfo API

openapi: 3.0.0
info:
  version: 1.1.0
  title: Nnwdaf_AnalyticsInfo
  description: Nnwdaf_AnalyticsInfo Service API.
  © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.
externalDocs: 
  description: 3GPP TS 29.520 V16.4.0; 5G System; Network Data Analytics Services.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.520/
security:
- {}
- oAuth2ClientCredentials:
  - nnwdaf-analyticsinfo
servers:
  - url: '{apiRoot}/nnwdaf-analyticsinfo/v1'
variables:
  apiRoot:
    default: https://example.com
    description: apiRoot as defined in subclause 4.4 of 3GPP TS 29.501.
paths:
  /analytics:
    get:
      summary: Read a NWDAF Analytics
      description: GetNWDAFAnalytics
      operationId: GetNWDAFAnalytics
      tags:
        - NWDAF Analytics (Document)
      parameters:
        - name: event-id
          in: query
          description: Identify the analytics.
          required: true
          schema:
            $ref: '#/components/schemas/EventId'
        - name: ana-req
          in: query
          description: Identifies the analytics reporting requirement information.
          required: false
          content:
            application/json:
              schema:
                $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/EventReportingRequirement'
        - name: event-filter
          in: query
          description: Identify the analytics.
          required: false
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/EventFilter'
        - name: supported-features
          in: query
          description: To filter irrelevant responses related to unsupported features
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        - name: tgt-ue
          in: query
          description: Identify the target UE information.
          required: false
          content:
            application/json:
              schema:
responses:
  '200':
    description: Containing the analytics with parameters as relevant for the requesting NF service consumer.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/AnalyticsData'
  '204':
    description: No Content (The request NWDAF Analytics data does not exist)
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '401':
    $ref: 'TS29571_CommonData.yaml#/components/responses/401'
  '403':
    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    description: Indicates that the NWDAF Analytics resource does not exist.
    content:
      application/problem+json:
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
  '406':
    $ref: 'TS29571_CommonData.yaml#/components/responses/406'
  '414':
    $ref: 'TS29571_CommonData.yaml#/components/responses/414'
  '429':
    $ref: 'TS29571_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nnwdaf-analyticsinfo: Access to the Nnwdaf_AnalyticsInfo API
  schemas:
    AnalyticsData:
      type: object
      properties:
        sliceLoadLevelInfos:
          type: array
          items:
            $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/SliceLoadLevelInformation'
          minItems: 1
          description: The slices and their load level information.
        nsiLoadLevelInfos:
          type: array
          items:
            $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/NsiLoadLevelInfo'
          minItems: 1
        nfLoadLevelInfos:
          type: array
          items:
            $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/NfLoadLevelInformation'
          minItems: 1
        nwPerfs:
          type: array
          items:
            $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/NetworkPerfInfo'
          minItems: 1
        svcExps:
          type: array
          items:
            $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/ServiceExperienceInfo'
          minItems: 1
        qosSustainInfos:
type: array
items:
  $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/QosSustainabilityInfo'
  minItems: 1
ueMobs:
  type: array
  items:
    $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/UeMobility'
    minItems: 1
ueComms:
  type: array
  items:
    $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/UeCommunication'
    minItems: 1
userDataCongInfos:
  type: array
  items:
    $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/UserDataCongestionInfo'
    minItems: 1
abnorBehavrs:
  type: array
  items:
    $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/AbnormalBehaviour'
    minItems: 1
EventFilter:
  type: object
  properties:
    anySlice:
      $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/AnySlice'
    snssais:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        minItems: 1
description: Identification(s) of network slice to which the subscription belongs.
    appIds:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
        minItems: 1
    dnns:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        minItems: 1
    dnais:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnai'
        minItems: 1
    networkArea:
      $ref: 'TS29554_Npcf_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'
    nfInstanceIds:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
        minItems: 1
    nfSetIds:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfSetId'
        minItems: 1
    nfTypes:
      type: array
      items:
        $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/NFType'
        minItems: 1
    nsiIdInfos:
      type: array
      items:
        $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/NsiIdInfo'
        minItems: 1
    qosRequ:
      $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/QosRequirement'
    nwPerfTypes:
      type: array
      items:
$ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/NetworkPerfType'
minItems: 1
bwRequs:
type: array
items:
  $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/BwRequirement'
minItems: 1
excepIds:
type: array
items:
  $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/ExceptionId'
minItems: 1
exptAnaType:
  $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/ExpectedAnalyticsType'
exptUeBehav:
  $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/ExpectedUeBehaviourData'
suppFeat:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'

not:
required: [anySlice, snssais]

EventId:
  anyOf:
    - type: string
      enum:
        - LOAD_LEVEL_INFORMATION
        - NETWORK_PERFORMANCE
        - NF_LOAD
        - SERVICE_EXPERIENCE
        - UE_MOBILITY
        - UE_COMMUNICATION
        - QOS_SUSTAINABILITY
        - ABNORMAL_BEHAVIOUR
        - USER_DATA_CONGESTION
        - NSI_LOAD_LEVEL
      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.

Possible values are:
- LOAD_LEVEL_INFORMATION: Represent the analytics of load level information of corresponding network slice.
- NETWORK_PERFORMANCE: Represent the analytics of network performance information.
- NF_LOAD: Indicates that the event subscribed is NF Load.
- SERVICE_EXPERIENCE: Represent the analytics of service experience information of the specific applications.
- UE_MOBILITY: Represent the analytics of UE mobility.
- UE_COMMUNICATION: Represent the analytics of UE communication.
- QOS_SUSTAINABILITY: Represent the analytics of QoS sustainability information in the certain area.
- ABNORMAL_BEHAVIOUR: Indicates that the event subscribed is abnormal behaviour information.
- USER_DATA_CONGESTION: Represent the analytics of the user data congestion in the certain area.
- NSI_LOAD_LEVEL: Represent the analytics of Network Slice and the optionally associated Network Slice Instance.
Annex B (informative):
Change history
<table>
<thead>
<tr>
<th>Date</th>
<th>TSG #</th>
<th>TSG Doc.</th>
<th>CR</th>
<th>Rev</th>
<th>Cat</th>
<th>Subject/Comment</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TS skeleton of Network Data Analytics Services.</td>
<td></td>
</tr>
<tr>
<td>2017-11</td>
<td>CT3#92</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inclusion of documents agreed in CT3#92 C3-175356.</td>
<td>0.1.0</td>
</tr>
<tr>
<td>2017-12</td>
<td>CT3#93</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inclusion of documents agreed in CT3#93 C3-176166, C3-176260, C3-176324, C3-176325, C3-176326, and C3-176327.</td>
<td>0.2.0</td>
</tr>
<tr>
<td>2018-01</td>
<td>CT3#94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inclusion of documents agreed in CT3#94 C3-180252, C3-180253, C3-180254, C3-180255, C3-180256, C3-180257, C3-180344, C3-180345, C3-180346, C3-180323 and C3-180347.</td>
<td>0.3.0</td>
</tr>
<tr>
<td>2018-03</td>
<td>CT3#95</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inclusion of documents agreed in CT3#95 C3-181253, C3-181255, C3-181256, C3-181257, C3-181260, C3-181312, C3-181342 and C3-181343.</td>
<td>0.4.0</td>
</tr>
<tr>
<td>2018-03</td>
<td>CT3#96</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inclusion of documents agreed in CT3#96 C3-182379 and C3-182380.</td>
<td>0.5.0</td>
</tr>
<tr>
<td>2018-05</td>
<td>CT3#97</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inclusion of documents agreed in CT3#97 C3-183285, C3-183532, C3-183533, C3-183534 and C3-183535.</td>
<td>0.6.0</td>
</tr>
<tr>
<td>2018-06</td>
<td>CT#80</td>
<td>CP-181032</td>
<td></td>
<td></td>
<td></td>
<td>TS sent to plenary for approval</td>
<td>1.0.0</td>
</tr>
<tr>
<td>2018-06</td>
<td>CT#80</td>
<td>CP-181032</td>
<td></td>
<td></td>
<td></td>
<td>TS approved by plenary</td>
<td>15.0.0</td>
</tr>
<tr>
<td>2018-09</td>
<td>CT#81</td>
<td>CP-182015</td>
<td>0001</td>
<td>3</td>
<td>F</td>
<td>Clarification on mandatory HTTP error status codes</td>
<td>15.1.0</td>
</tr>
<tr>
<td>2018-09</td>
<td>CT#81</td>
<td>CP-182209</td>
<td>0002</td>
<td>4</td>
<td>B</td>
<td>OpenAPI for TS 29.520</td>
<td>15.1.0</td>
</tr>
<tr>
<td>2018-09</td>
<td>CT#81</td>
<td>CP-182015</td>
<td>0003</td>
<td>1</td>
<td>F</td>
<td>Description of Structured data types</td>
<td>15.1.0</td>
</tr>
<tr>
<td>2018-09</td>
<td>CT#81</td>
<td>CP-182015</td>
<td>0004</td>
<td>1</td>
<td>F</td>
<td>Resource structure presentation</td>
<td>15.1.0</td>
</tr>
<tr>
<td>2018-12</td>
<td>CT#82</td>
<td>CP-183205</td>
<td>0006</td>
<td>F</td>
<td>Default value for apiRoot</td>
<td>15.2.0</td>
<td></td>
</tr>
<tr>
<td>2018-12</td>
<td>CT#82</td>
<td>CP-183205</td>
<td>0007</td>
<td>2</td>
<td>F</td>
<td>Correct Nnwdaf service</td>
<td>15.2.0</td>
</tr>
<tr>
<td>2018-12</td>
<td>CT#82</td>
<td>CP-183205</td>
<td>0008</td>
<td>1</td>
<td>F</td>
<td>Cardinality</td>
<td>15.2.0</td>
</tr>
<tr>
<td>2018-12</td>
<td>CT#82</td>
<td>CP-183205</td>
<td>0009</td>
<td>F</td>
<td>API version</td>
<td>15.2.0</td>
<td></td>
</tr>
<tr>
<td>2018-12</td>
<td>CT#82</td>
<td>CP-183205</td>
<td>0010</td>
<td>F</td>
<td>ExternalDocs OpenAPI field</td>
<td>15.2.0</td>
<td></td>
</tr>
<tr>
<td>2018-12</td>
<td>CT#82</td>
<td>CP-183205</td>
<td>0011</td>
<td>1</td>
<td>F</td>
<td>Security</td>
<td>15.2.0</td>
</tr>
<tr>
<td>2018-12</td>
<td>CT#82</td>
<td>CP-183205</td>
<td>0012</td>
<td>1</td>
<td>F</td>
<td>Supported content types</td>
<td>15.2.0</td>
</tr>
<tr>
<td>2018-12</td>
<td>CT#82</td>
<td>CP-183205</td>
<td>0013</td>
<td>2</td>
<td>F</td>
<td>HTTP Error responses</td>
<td>15.2.0</td>
</tr>
<tr>
<td>2018-12</td>
<td>CT#82</td>
<td>CP-183205</td>
<td>0014</td>
<td>2</td>
<td>F</td>
<td>Correct NWDAF resource</td>
<td>15.2.0</td>
</tr>
<tr>
<td>2018-12</td>
<td>CT#82</td>
<td>CP-183205</td>
<td>0016</td>
<td>1</td>
<td>F</td>
<td>Adding HTTP status code “204 No Content”</td>
<td>15.2.0</td>
</tr>
<tr>
<td>2018-12</td>
<td>CT#82</td>
<td>CP-183205</td>
<td>0019</td>
<td>F</td>
<td>Location header field in OpenAPI</td>
<td>15.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-03</td>
<td>CT#83</td>
<td>CP-190113</td>
<td>0020</td>
<td>F</td>
<td>Support of NSSF as the service consumer</td>
<td>15.3.0</td>
<td></td>
</tr>
<tr>
<td>2019-03</td>
<td>CT#83</td>
<td>CP-190113</td>
<td>0021</td>
<td>1</td>
<td>F</td>
<td>Formatting of structured data types in query</td>
<td>15.3.0</td>
</tr>
<tr>
<td>2019-03</td>
<td>CT#83</td>
<td>CP-190113</td>
<td>0022</td>
<td>F</td>
<td>OpenAPI info version update</td>
<td>15.3.0</td>
<td></td>
</tr>
<tr>
<td>2019-03</td>
<td>CT#83</td>
<td>CP-190213</td>
<td>0023</td>
<td>1</td>
<td>F</td>
<td>Correction of Location header in Nnwdaf_EventsSubscription OpenAPI</td>
<td>15.3.0</td>
</tr>
<tr>
<td>2019-06</td>
<td>CT#84</td>
<td>CP-191078</td>
<td>24</td>
<td>1</td>
<td>F</td>
<td>Correction of Nnwdaf_EventsSubscription OpenAPI</td>
<td>15.4.0</td>
</tr>
<tr>
<td>2019-06</td>
<td>CT#84</td>
<td>CP-191078</td>
<td>29</td>
<td>7</td>
<td>F</td>
<td>Corrections on TS 29.520</td>
<td>15.4.0</td>
</tr>
<tr>
<td>Date</td>
<td>CT#</td>
<td>CP-</td>
<td>Page</td>
<td>Priority</td>
<td>Description</td>
<td>TS Version</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td>-------</td>
<td>------</td>
<td>----------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>2019-06</td>
<td>CT#84</td>
<td>CP-191078</td>
<td>35</td>
<td>1</td>
<td>Precedence of OpenAPI file</td>
<td>15.4.0</td>
<td></td>
</tr>
<tr>
<td>2019-06</td>
<td>CT#84</td>
<td>CP-191078</td>
<td>37</td>
<td>1</td>
<td>Copyright Note in YAML files</td>
<td>15.4.0</td>
<td></td>
</tr>
<tr>
<td>2019-06</td>
<td>CT#84</td>
<td>CP-191090</td>
<td>25</td>
<td>1</td>
<td>Reference update and service representation</td>
<td>16.0.0</td>
<td></td>
</tr>
<tr>
<td>2019-06</td>
<td>CT#84</td>
<td>CP-191090</td>
<td>27</td>
<td>3</td>
<td>Support of more consumers</td>
<td>16.0.0</td>
<td></td>
</tr>
<tr>
<td>2019-06</td>
<td>CT#84</td>
<td>CP-191090</td>
<td>28</td>
<td>1</td>
<td>Support of more analytic events</td>
<td>16.0.0</td>
<td></td>
</tr>
<tr>
<td>2019-06</td>
<td>CT#84</td>
<td>CP-191225</td>
<td>31</td>
<td>9</td>
<td>Subscribing of service experience for the application</td>
<td>16.0.0</td>
<td></td>
</tr>
<tr>
<td>2019-06</td>
<td>CT#84</td>
<td>CP-191090</td>
<td>33</td>
<td>2</td>
<td>Delete the subscription of service experience for the application</td>
<td>16.0.0</td>
<td></td>
</tr>
<tr>
<td>2019-06</td>
<td>CT#84</td>
<td>CP-191090</td>
<td>34</td>
<td>5</td>
<td>Notification of service experience for the application</td>
<td>16.0.0</td>
<td></td>
</tr>
<tr>
<td>2019-06</td>
<td>CT#84</td>
<td>CP-191090</td>
<td>39</td>
<td>2</td>
<td>Copyright Note in YAML files</td>
<td>16.0.0</td>
<td></td>
</tr>
<tr>
<td>2019-09</td>
<td>CT#85</td>
<td>CP-192146</td>
<td>0041</td>
<td>2</td>
<td>Correct cardinality in NnwdafEventsSubscription</td>
<td>16.1.0</td>
<td></td>
</tr>
<tr>
<td>2019-09</td>
<td>CT#85</td>
<td>CP-192157</td>
<td>0042</td>
<td>4</td>
<td>UE mobility and communication analytics</td>
<td>16.1.0</td>
<td></td>
</tr>
<tr>
<td>2019-09</td>
<td>CT#85</td>
<td>CP-192157</td>
<td>0043</td>
<td>2</td>
<td>Support of network performance analytics in Nnwdaf_AnalyticsInfo_Request</td>
<td>16.1.0</td>
<td></td>
</tr>
<tr>
<td>2019-09</td>
<td>CT#85</td>
<td>CP-192157</td>
<td>0047</td>
<td>1</td>
<td>OAM as service consumer</td>
<td>16.1.0</td>
<td></td>
</tr>
<tr>
<td>2019-09</td>
<td>CT#85</td>
<td>CP-192157</td>
<td>0048</td>
<td>1</td>
<td>Update Nnwdaf_EventSubscription service for service experience</td>
<td>16.1.0</td>
<td></td>
</tr>
<tr>
<td>2019-09</td>
<td>CT#85</td>
<td>CP-192261</td>
<td>0049</td>
<td>1</td>
<td>Enhance the Nnwdaf_AnalyticsInfo service to support service experience</td>
<td>16.1.0</td>
<td></td>
</tr>
<tr>
<td>2019-09</td>
<td>CT#85</td>
<td>CP-192177</td>
<td>0050</td>
<td>2</td>
<td>Enhance the Nnwdaf_EventsSubscription service to support QoS sustainability</td>
<td>16.1.0</td>
<td></td>
</tr>
<tr>
<td>2019-09</td>
<td>CT#85</td>
<td>CP-192177</td>
<td>0051</td>
<td>2</td>
<td>Enhance the Nnwdaf_AnalyticsInfo service to support QoS sustainability</td>
<td>16.1.0</td>
<td></td>
</tr>
<tr>
<td>2019-09</td>
<td>CT#85</td>
<td>CP-192173</td>
<td>0054</td>
<td>2</td>
<td>OpenAPI version update TS 29.520 Rel-16</td>
<td>16.1.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193198</td>
<td>0055</td>
<td>3</td>
<td>Abnormal behaviour analytics</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193198</td>
<td>0056</td>
<td>4</td>
<td>Enhance the Nnwdaf_EventsSubscription service to support User Data Congestion</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193198</td>
<td>0057</td>
<td>2</td>
<td>Enhance the Nnwdaf_AnalyticsInfo service to support user data congestion</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193198</td>
<td>0058</td>
<td>1</td>
<td>Definition of QoS sustainability information</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193198</td>
<td>0059</td>
<td>4</td>
<td>Inclusion of QoS requirements and thresholds for QoS Sustainability</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193198</td>
<td>0062</td>
<td>2</td>
<td>Clarify references to QoS sustainability analytics</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193198</td>
<td>0063</td>
<td>2</td>
<td>Clarifications on NWDAF generalities</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193267</td>
<td>0102</td>
<td>3</td>
<td>OpenAPI file Update for Nnwdaf_EventsSubscription API</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193198</td>
<td>0103</td>
<td>1</td>
<td>OpenAPI file Update for Nnwdaf_AnalyticsInfo API</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193198</td>
<td>0104</td>
<td>1</td>
<td>Slice identification for all analytics types</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193234</td>
<td>0106</td>
<td>2</td>
<td>NF Load analytics generalities</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2019-12</td>
<td>CT#86</td>
<td>CP-193212</td>
<td>0107</td>
<td>1</td>
<td>Update of API version and TS version in OpenAPI file</td>
<td>16.2.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>CP-200208</td>
<td>0109</td>
<td>1</td>
<td>Definition of QoS Requirement</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>CP-200208</td>
<td>0110</td>
<td>1</td>
<td>Description of consumer functionalities</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>CP-200208</td>
<td>0111</td>
<td>1</td>
<td>Update the types of analytics events</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>CT#</td>
<td>CP-</td>
<td>Number</td>
<td>Type</td>
<td>Issue Description</td>
<td>Version</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>---------</td>
<td>--------</td>
<td>------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200207</td>
<td>0114</td>
<td>B</td>
<td>DNN Clarification</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200208</td>
<td>0115</td>
<td>F</td>
<td>Update Feature applicability for Rel-16 new data types</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200208</td>
<td>0118</td>
<td>D</td>
<td>Corrections in TS29.520</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200208</td>
<td>0120</td>
<td>F</td>
<td>Clarify start time and end time</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200182</td>
<td>0121</td>
<td>F</td>
<td>Correct QoS sustainability</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200232</td>
<td>0122</td>
<td>F</td>
<td>Correct UE mobility and communication</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200208</td>
<td>0123</td>
<td>B</td>
<td>Support network performance analytics</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200208</td>
<td>0124</td>
<td>F</td>
<td>Correcting QoS sustainability information</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200214</td>
<td>0125</td>
<td>F</td>
<td>OpenAPI: usage of the &quot;tags&quot; keyword</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200208</td>
<td>0126</td>
<td>F</td>
<td>Corrections on resource name</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200208</td>
<td>0127</td>
<td>F</td>
<td>Data used for area of interest</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200208</td>
<td>0128</td>
<td>F</td>
<td>Any UE possibility for UE mobility and UE communication</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200208</td>
<td>0129</td>
<td>B</td>
<td>Nnwdaf_EventsSubscription API, Support of Service experience</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200208</td>
<td>0130</td>
<td>B</td>
<td>Nnwdaf_EventsSubscription API, Support of Service experience</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200236</td>
<td>0131</td>
<td>B</td>
<td>Nnwdaf_EventsSubscription API, Support of abnormal behaviour</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200224</td>
<td>0132</td>
<td>B</td>
<td>Nnwdaf_AnalyticsInfo API, Support of abnormal behaviour</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200228</td>
<td>0136</td>
<td>B</td>
<td>Support of NF Load analytics</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-03</td>
<td>CT#87e</td>
<td>200216</td>
<td>0140</td>
<td>F</td>
<td>Update of OpenAPI version and TS version in externalDocs field</td>
<td>16.3.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0142</td>
<td>F</td>
<td>Condition description for threshold related attributes</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0143</td>
<td>F</td>
<td>Some corrections to Nnwdaf_AnalyticsInfo Service</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0144</td>
<td>F</td>
<td>Clarification on applicability for network slice information</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0145</td>
<td>F</td>
<td>Analytics result per DNN</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0146</td>
<td>F</td>
<td>Maximum number of SUPIs</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0147</td>
<td>F</td>
<td>Correction on FlowDescription</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0149</td>
<td>F</td>
<td>Support of Abnormal Behaviour</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0150</td>
<td>F</td>
<td>Confidence for User Data Congestion Information.</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0151</td>
<td>F</td>
<td>Data types used for NWDAF services</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0153</td>
<td>F</td>
<td>Adding maxObjectNbr attribute in related feature of NWDAF analytics service</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0154</td>
<td>F</td>
<td>Adding UDM as consumer of services provided by NWDAF</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0155</td>
<td>F</td>
<td>Corrections on descriptions of NF service consumers offered by NWDAF</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0157</td>
<td>D</td>
<td>Updates to Abbreviations</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0158</td>
<td>B</td>
<td>Support NSI ID</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>201234</td>
<td>0163</td>
<td>B</td>
<td>Support Service Experience Variance</td>
<td>16.4.0</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>CT#</td>
<td>CT# Details</td>
<td>Issue Description</td>
<td>Version</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-----</td>
<td>-------------</td>
<td>-------------------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0165</td>
<td>Correction to Service Description</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0166</td>
<td>Correction to description of consumer functionalities</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0167</td>
<td>Correction to variance of Start time in UE Communication</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0169</td>
<td>Correct supported feature in AnalyticsData</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0170</td>
<td>Clarify service experience data</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0171</td>
<td>Correct threshold</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0172</td>
<td>Resource type in QoS requirement</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0173</td>
<td>Storage of YAML files in ETSI Forge</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0176</td>
<td>Analytics result per S-NSSAI</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0177</td>
<td>Corrections on confidence for other NWDAF events</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0179</td>
<td>URI of the Nnwdaf services</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0180</td>
<td>Default value for matching direction</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0181</td>
<td>Support of immediate reporting</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0182</td>
<td>Optionality of ProblemDetails</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0183</td>
<td>Correction to abnormal traffic volume</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0186</td>
<td>Corrections on ratio of UEs in NWDAF event reports</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0187</td>
<td>Corrections to TargetUeInformation</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0188</td>
<td>Corrections on AbnormalBehaviour</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0189</td>
<td>Plural of NF load level information related attribute</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0190</td>
<td>locInfo attribute within the UeMobility data</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0191</td>
<td>Corrections on NfLoadLevelInformation</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0192</td>
<td>Supported headers, Resource Data type, Operation Name and yaml mapping</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-06</td>
<td>CT#88e</td>
<td>0193</td>
<td>Update of OpenAPI version and TS version in externalDocs field</td>
<td>16.4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## History

**Document history**

<table>
<thead>
<tr>
<th>V16.4.0</th>
<th>August 2020</th>
<th>Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>