

# ETSI TS 129 520 V16.15.0 (2026-03)



**5G;  
5G System;  
Network Data Analytics Services;  
Stage 3  
(3GPP TS 29.520 version 16.15.0 Release 16)**



---

**Reference**

---

RTS/TSGC-0329520vgf0

---

---

**Keywords**

---

5G

---

**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

---

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° w061004871

---

**Important notice**

---

The present document can be downloaded from the  
[ETSI Search & Browse Standards](#) application.

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format on [ETSI deliver](#) repository.

Users should be aware that the present document may be revised or have its status changed,  
this information is available in the [Milestones listing](#).

If you find errors in the present document, please send your comments to  
the relevant service listed under [Committee Support Staff](#).

If you find a security vulnerability in the present document, please report it through our  
[Coordinated Vulnerability Disclosure \(CVD\)](#) program.

---

**Notice of disclaimer & limitation of liability**

---

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

---

**Copyright Notification**

---

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2026.  
All rights reserved.

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are 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 IPR online database](#).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, 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.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™**, **LTE™** and **5G™** logo are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

---

# 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 at [3GPP to ETSI numbering cross-referencing](#).

---

# 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

|                                                                      |    |
|----------------------------------------------------------------------|----|
| Intellectual Property Rights .....                                   | 2  |
| Legal Notice .....                                                   | 2  |
| Modal verbs terminology.....                                         | 2  |
| Foreword.....                                                        | 6  |
| 1 Scope .....                                                        | 7  |
| 2 References .....                                                   | 7  |
| 3 Definitions and abbreviations.....                                 | 8  |
| 3.1 Definitions.....                                                 | 8  |
| 3.2 Abbreviations .....                                              | 8  |
| 4 Services offered by the NWDAF .....                                | 9  |
| 4.1 Introduction .....                                               | 9  |
| 4.2 Nnwdaf_EventsSubscription Service .....                          | 9  |
| 4.2.1 Service Description.....                                       | 9  |
| 4.2.1.1 Overview .....                                               | 9  |
| 4.2.1.2 Service Architecture.....                                    | 10 |
| 4.2.1.3 Network Functions.....                                       | 11 |
| 4.2.1.3.1 Network Data Analytics Function (NWDAF) .....              | 11 |
| 4.2.1.3.2 NF Service Consumers .....                                 | 11 |
| 4.2.2 Service Operations .....                                       | 13 |
| 4.2.2.1 Introduction.....                                            | 13 |
| 4.2.2.2 Nnwdaf_EventsSubscription_Subscribe service operation .....  | 13 |
| 4.2.2.2.1 General .....                                              | 13 |
| 4.2.2.2.2 Subscription for event notifications.....                  | 13 |
| 4.2.2.2.3 Update subscription for event notifications.....           | 17 |
| 4.2.2.3 Nnwdaf_EventsSubscription_Unsubscribe service operation..... | 18 |
| 4.2.2.3.1 General .....                                              | 18 |
| 4.2.2.3.2 Unsubscribe from event notifications.....                  | 19 |
| 4.2.2.4 Nnwdaf_EventsSubscription_Notify service operation .....     | 19 |
| 4.2.2.4.1 General .....                                              | 19 |
| 4.2.2.4.2 Notification about subscribed event .....                  | 19 |
| 4.3 Nnwdaf_AnalyticsInfo Service .....                               | 21 |
| 4.3.1 Service Description.....                                       | 21 |
| 4.3.1.1 Overview .....                                               | 21 |
| 4.3.1.2 Service Architecture.....                                    | 21 |
| 4.3.1.3 Network Functions.....                                       | 22 |
| 4.3.1.3.1 Network Data Analytics Function (NWDAF) .....              | 22 |
| 4.3.1.3.2 NF Service Consumers .....                                 | 22 |
| 4.3.2 Service Operations .....                                       | 24 |
| 4.3.2.1 Introduction.....                                            | 24 |
| 4.3.2.2 Nnwdaf_AnalyticsInfo_Request service operation .....         | 24 |
| 4.3.2.2.1 General .....                                              | 24 |
| 4.3.2.2.2 Request and get from NWDAF Analytics information .....     | 24 |
| 5 API Definitions .....                                              | 28 |
| 5.1 Nnwdaf_EventsSubscription Service API.....                       | 28 |
| 5.1.1 Introduction.....                                              | 28 |
| 5.1.2 Usage of HTTP .....                                            | 28 |
| 5.1.2.1 General .....                                                | 28 |
| 5.1.2.2 HTTP standard headers .....                                  | 28 |
| 5.1.2.2.1 General .....                                              | 28 |
| 5.1.2.2.2 Content type .....                                         | 28 |
| 5.1.2.3 HTTP custom headers .....                                    | 28 |
| 5.1.3 Resources.....                                                 | 29 |
| 5.1.3.1 Resource Structure .....                                     | 29 |

|            |                                                      |    |
|------------|------------------------------------------------------|----|
| 5.1.3.2    | Resource: NWDAF Events Subscriptions.....            | 29 |
| 5.1.3.2.1  | Description .....                                    | 29 |
| 5.1.3.2.2  | Resource definition.....                             | 29 |
| 5.1.3.2.3  | Resource Standard Methods .....                      | 30 |
| 5.1.3.2.4  | Resource Custom Operations .....                     | 30 |
| 5.1.3.3    | Resource: Individual NWDAF Event Subscription .....  | 30 |
| 5.1.3.3.1  | Description .....                                    | 30 |
| 5.1.3.3.2  | Resource definition.....                             | 30 |
| 5.1.3.3.3  | Resource Standard Methods .....                      | 31 |
| 5.1.3.3.4  | Resource Custom Operations .....                     | 33 |
| 5.1.4      | Custom Operations without associated resources ..... | 33 |
| 5.1.5      | Notifications .....                                  | 33 |
| 5.1.5.1    | General .....                                        | 33 |
| 5.1.5.2    | Event Notification .....                             | 33 |
| 5.1.5.2.1  | Description .....                                    | 33 |
| 5.1.5.2.2  | Operation Definition.....                            | 33 |
| 5.1.6      | Data Model .....                                     | 34 |
| 5.1.6.1    | General .....                                        | 34 |
| 5.1.6.2    | Structured data types .....                          | 40 |
| 5.1.6.2.1  | Introduction .....                                   | 40 |
| 5.1.6.2.2  | Type NnwdafEventsSubscription .....                  | 41 |
| 5.1.6.2.3  | Type EventSubscription .....                         | 42 |
| 5.1.6.2.4  | Type NnwdafEventsSubscriptionNotification .....      | 45 |
| 5.1.6.2.5  | Type EventNotification .....                         | 46 |
| 5.1.6.2.6  | Type SliceLoadLevelInformation.....                  | 47 |
| 5.1.6.2.7  | Type EventReportingRequirement .....                 | 47 |
| 5.1.6.2.8  | Type TargetUeInformation.....                        | 48 |
| 5.1.6.2.9  | Void.....                                            | 48 |
| 5.1.6.2.10 | Type UeMobility .....                                | 48 |
| 5.1.6.2.11 | Type LocationInfo .....                              | 49 |
| 5.1.6.2.12 | Void.....                                            | 50 |
| 5.1.6.2.13 | Type UeCommunication.....                            | 50 |
| 5.1.6.2.14 | Type TrafficCharacterization .....                   | 52 |
| 5.1.6.2.15 | Type AbnormalBehaviour .....                         | 53 |
| 5.1.6.2.16 | Type Exception.....                                  | 53 |
| 5.1.6.2.17 | Type UserDataCongestionInfo .....                    | 54 |
| 5.1.6.2.18 | Type CongestionInfo .....                            | 54 |
| 5.1.6.2.19 | Type QosSustainabilityInfo .....                     | 55 |
| 5.1.6.2.20 | Type QosRequirement.....                             | 56 |
| 5.1.6.2.21 | Type RetainabilityThreshold .....                    | 56 |
| 5.1.6.2.22 | Type NetworkPerfRequirement.....                     | 57 |
| 5.1.6.2.23 | Type NetworkPerfInfo.....                            | 57 |
| 5.1.6.2.24 | Type ServiceExperienceInfo .....                     | 58 |
| 5.1.6.2.25 | Type BwRequirement.....                              | 59 |
| 5.1.6.2.26 | Type AdditionalMeasurement .....                     | 59 |
| 5.1.6.2.27 | Type IpEthFlowDescription .....                      | 60 |
| 5.1.6.2.28 | Type AddressList.....                                | 60 |
| 5.1.6.2.29 | Type CircumstanceDescription .....                   | 60 |
| 5.1.6.2.30 | Type ThresholdLevel.....                             | 61 |
| 5.1.6.2.31 | Type NfLoadLevelInformation .....                    | 61 |
| 5.1.6.2.32 | Type NfStatus.....                                   | 62 |
| 5.1.6.2.33 | Type NsiIdInfo .....                                 | 62 |
| 5.1.6.2.34 | Type NsiLoadLevelInfo .....                          | 62 |
| 5.1.6.2.35 | Type FailureEventInfo.....                           | 63 |
| 5.1.6.3    | Simple data types and enumerations .....             | 63 |
| 5.1.6.3.1  | Introduction .....                                   | 63 |
| 5.1.6.3.2  | Simple data types.....                               | 63 |
| 5.1.6.3.3  | Enumeration: NotificationMethod.....                 | 63 |
| 5.1.6.3.4  | Enumeration: NwdafEvent .....                        | 64 |
| 5.1.6.3.5  | Enumeration: Accuracy .....                          | 64 |
| 5.1.6.3.6  | Enumeration: ExceptionId.....                        | 64 |
| 5.1.6.3.7  | Enumeration: ExceptionTrend.....                     | 65 |

|                                                         |                                                      |            |
|---------------------------------------------------------|------------------------------------------------------|------------|
| 5.1.6.3.8                                               | Enumeration: CongestionType .....                    | 65         |
| 5.1.6.3.9                                               | Enumeration: TimeUnit .....                          | 65         |
| 5.1.6.3.10                                              | Enumeration: NetworkPerfType .....                   | 65         |
| 5.1.6.3.11                                              | Enumeration: ExpectedAnalyticsType .....             | 66         |
| 5.1.6.3.12                                              | Enumeration: MatchingDirection .....                 | 66         |
| 5.1.6.3.13                                              | Enumeration: NwdafFailureCode .....                  | 66         |
| 5.1.7                                                   | Error handling .....                                 | 66         |
| 5.1.7.1                                                 | General .....                                        | 66         |
| 5.1.7.2                                                 | Protocol Errors .....                                | 66         |
| 5.1.7.3                                                 | Application Errors .....                             | 67         |
| 5.1.8                                                   | Feature negotiation .....                            | 67         |
| 5.1.9                                                   | Security .....                                       | 67         |
| 5.2                                                     | Nnwdaf_AnalyticsInfo Service API .....               | 68         |
| 5.2.1                                                   | Introduction .....                                   | 68         |
| 5.2.2                                                   | Usage of HTTP .....                                  | 68         |
| 5.2.2.1                                                 | General .....                                        | 68         |
| 5.2.2.2                                                 | HTTP standard headers .....                          | 68         |
| 5.2.2.2.1                                               | General .....                                        | 68         |
| 5.2.2.2.2                                               | Content type .....                                   | 68         |
| 5.2.2.3                                                 | HTTP custom headers .....                            | 69         |
| 5.2.3                                                   | Resources .....                                      | 69         |
| 5.2.3.1                                                 | Resource Structure .....                             | 69         |
| 5.2.3.2                                                 | Resource: NWDAF Analytics .....                      | 69         |
| 5.2.3.2.1                                               | Description .....                                    | 69         |
| 5.2.3.2.2                                               | Resource definition .....                            | 69         |
| 5.2.3.2.3                                               | Resource Standard Methods .....                      | 69         |
| 5.2.3.2.4                                               | Resource Custom Operations .....                     | 70         |
| 5.2.4                                                   | Custom Operations without associated resources ..... | 70         |
| 5.2.5                                                   | Notifications .....                                  | 70         |
| 5.2.6                                                   | Data Model .....                                     | 70         |
| 5.2.6.1                                                 | General .....                                        | 70         |
| 5.2.6.2                                                 | Structured data types .....                          | 74         |
| 5.2.6.2.1                                               | Introduction .....                                   | 74         |
| 5.2.6.2.2                                               | Type AnalyticsData .....                             | 75         |
| 5.2.6.2.3                                               | Type EventFilter .....                               | 76         |
| 5.2.6.2.4                                               | Void .....                                           | 78         |
| 5.2.6.3                                                 | Simple data types and enumerations .....             | 78         |
| 5.2.6.3.1                                               | Introduction .....                                   | 78         |
| 5.2.6.3.2                                               | Simple data types .....                              | 78         |
| 5.2.6.3.3                                               | Enumeration: EventId .....                           | 79         |
| 5.2.7                                                   | Error handling .....                                 | 79         |
| 5.2.7.1                                                 | General .....                                        | 79         |
| 5.2.7.2                                                 | Protocol Errors .....                                | 79         |
| 5.2.7.3                                                 | Application Errors .....                             | 79         |
| 5.2.8                                                   | Feature negotiation .....                            | 80         |
| 5.2.9                                                   | Security .....                                       | 80         |
| <b>Annex A (normative): OpenAPI specification .....</b> |                                                      | <b>81</b>  |
| A.1                                                     | General .....                                        | 81         |
| A.2                                                     | Nnwdaf_EventsSubscription API .....                  | 81         |
| A.3                                                     | Nnwdaf_AnalyticsInfo API .....                       | 96         |
| <b>Annex B (informative): Change history .....</b>      |                                                      | <b>100</b> |
| History .....                                           |                                                      | 108        |

---

# Foreword

This Technical Specification has been produced by the 3<sup>rd</sup> 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".
- [2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".
- [3] Void.
- [4] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System; Stage 2".
- [5] 3GPP TS 29.513: "5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".
- [6] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".
- [7] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".
- [8] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".
- [9] IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".
- [10] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".
- [11] OpenAPI, "OpenAPI 3.0.0 Specification", <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md>.
- [12] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".
- [13] 3GPP TS 33.501: "Security architecture and procedures for 5G system".
- [14] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".
- [15] IETF RFC 7807: "Problem Details for HTTP APIs".
- [16] 3GPP TR 21.900: "Technical Specification Group working methods".

- [17] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".
- [18] 3GPP TS 29.554: "5G System; Background Data Transfer Policy Control Service; Stage 3".
- [19] 3GPP TS 29.122: "T8 reference point for Northbound APIs".
- [20] 3GPP TS 29.523: "5G System; Policy Control Event Exposure Service; Stage 3".
- [21] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".
- [22] 3GPP TS 29.517: "5G System; Application Function (AF) event exposure service".
- [23] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".
- [24] 3GPP TS 29.531: "5G System; Network Slice Selection Services; 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].

### 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, 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                     |
| CEF     | Charging Enablement Function                          |
| DNN     | Data Network Name                                     |
| GFBP    | 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 past events, or predictive information.

The following services are specified for the NWDAF:

**Table 4.1-1: Services provided by NWDAF**

| Service Name                                                                                               | Description                                                                                                                                      | Service Operations | Operation Semantics | Example Consumer(s)                    |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------|----------------------------------------|
| Nnwdaf_EventsSubscription<br>(NOTE)                                                                        | This service enables the NF service consumers to subscribe to/unsubscribe from notifications for different analytics information from the NWDAF. | Subscribe          | Subscribe / Notify  | PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF |
|                                                                                                            |                                                                                                                                                  | Unsubscribe        |                     |                                        |
|                                                                                                            |                                                                                                                                                  | Notify             |                     |                                        |
| Nnwdaf_AnalyticsInfo                                                                                       | This service enables the NF service consumers to request and get specific analytics from the NWDAF.                                              | Request            | Request / Response  | PCF, NSSF, AMF, SMF, NEF, AF, OAM      |
| NOTE: This service corresponds to the Nnwdaf_AnalyticsSubscription service defined in 3GPP TS 23.288 [17]. |                                                                                                                                                  |                    |                     |                                        |

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

**Table 4.1-2: API Descriptions**

| Service Name              | Clause | Description                          | OpenAPI Specification File              | apiName                    | Annex |
|---------------------------|--------|--------------------------------------|-----------------------------------------|----------------------------|-------|
| Nnwdaf_EventsSubscription | 5.1    | Nnwdaf Events Subscription Service.  | TS29520_Nnwdaf_Event sSubscription.yaml | nncwdaf-eventssubscription | A.2   |
| Nnwdaf_AnalyticsInfo      | 5.2    | Nnwdaf Analytics Information Service | TS29520_Nnwdaf_Analyt icsInfo.yaml      | nncwdaf-analyticsinfo      | A.3   |

## 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:

- Slice load level information;
- Network slice instance 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)
- Application Function (AF)
- Operation, Administration, and Maintenance (OAM)
- Charging Enablement Function (CEF)

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.

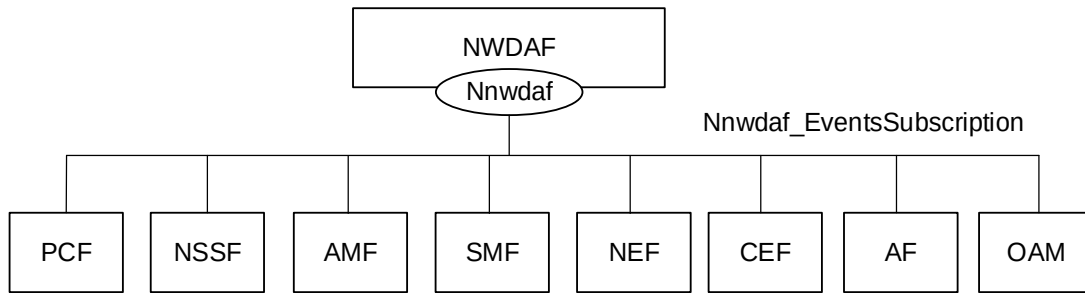


**Figure 4.2.1.2-1: Reference Architecture for the Nnwdaf\_EventsSubscription Service; SBI representation**

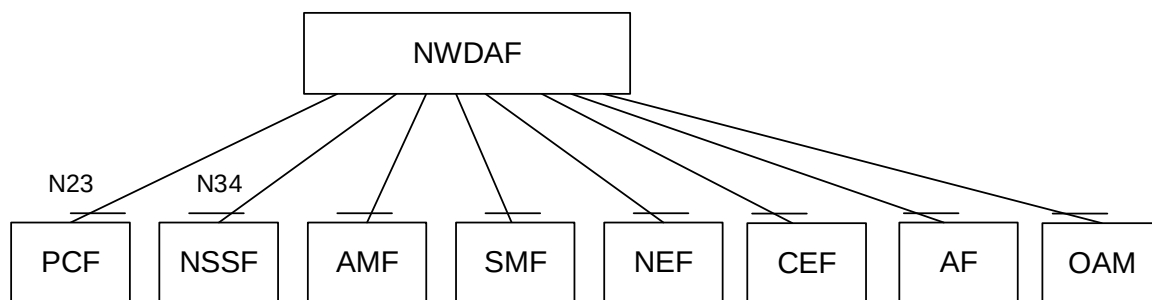


**Figure 4.2.1.2-2: Reference Architecture for the Nnwdaf\_EventsSubscription Service: reference point representation**

### 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 one-time, periodic notification 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; and
- 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 or network slice instance 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; and
- 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; and
- 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; and
- supports forwarding QoS Sustainability information from NWDAF to the AF when it is untrusted.

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; and
- 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 (UE mobility and/or UE communication) from NWDAF; and
- supports receiving abnormal UE behaviour information from NWDAF.

The Charging Enablement Function (CEF):

- supports (un)subscription to the notification of analytics information for slice load level information from the NWDAF; and
- supports (un)subscription to the notification of analytics information for service experience statistics information from the NWDAF.

## 4.2.2 Service Operations

### 4.2.2.1 Introduction

**Table 4.2.2.1-1: Operations of the Nnwdaf\_EventsSubscription Service**

| Service operation name                | Description                                                                                                                                                                                                             | Initiated by                                         |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| Nnwdaf_EventsSubscription_Subscribe   | This service operation is used by an NF to subscribe or update subscription for event notifications of the analytic information. One-time, periodic notification or notification upon event detected can be subscribed. | NF consumer (PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF) |
| Nnwdaf_EventsSubscription_Unsubscribe | This service operation is used by an NF to unsubscribe from event notifications.                                                                                                                                        | NF consumer (PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF) |
| Nnwdaf_EventsSubscription_Notify      | This service operation is used by an NWDAF to notify NF consumers about subscribed events.                                                                                                                              | NWDAF                                                |

### 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.

#### 4.2.2.2.2 Subscription for event notifications

Figure 4.2.2.2-1 shows a scenario where the NF service consumer sends a request to the NWDAF to subscribe for event notification(s) (as shown in 3GPP TS 23.288 [17]).

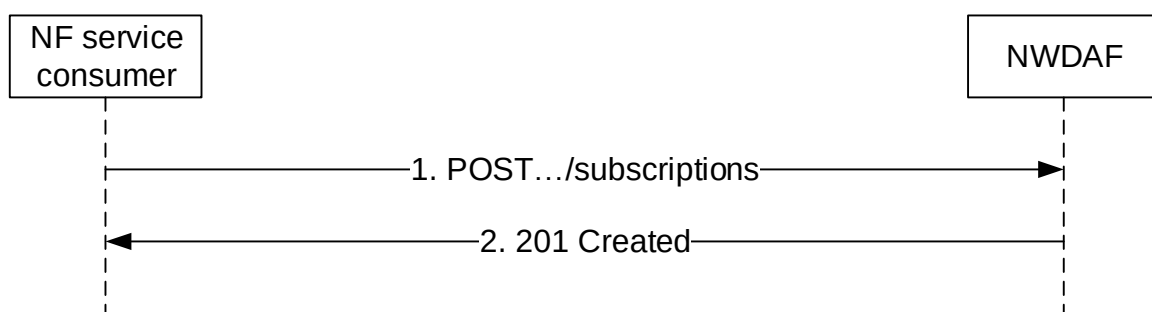


**Figure 4.2.2.2-1: NF service consumer subscribes to notifications**

The NF service consumer shall invoke the `Nnwdaf_EventsSubscription_Subscribe` service operation to subscribe to event notification(s). The NF service consumer shall send an HTTP POST request with "`{apiRoot}/nnwdaf-eventssubscription/v1/subscriptions`" as Resource URI representing the "NWDAF Events Subscriptions", as shown in figure 4.2.2.2.2-1, step 1, to create a subscription for an "Individual NWDAF Event Subscription" according to the information in message body. The `NnwdafEventsSubscription` data structure provided in the request body shall include:

- an URI where to receive the requested notifications as "notificationURI" attribute; and
- a description of the subscribed events as "eventSubscriptions" attribute that, for each event, the `EventSubscription` data type shall include
  - 1) an event identifier as "event" attribute; and
  - 2) if the event notification method "PERIODIC" is selected via the "notificationMethod" attribute, repetition period as "repetitionPeriod" attribute;and may include:
  - 1) maximum number of objects in the "maxObjectNbr" attribute; and/or
  - 2) maximum number of SUPIs expected for an analytics report in the "maxSupiNbr" attribute;
  - 3) identification of time window to which the subscription applies via identification of date-time(s) in the "startTs" and "endTs" attributes; and/or
  - 4) preferred level of accuracy of the analytics in the "accuracy" 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 1: The notification method indicated as the "notifMethod" attribute and the periodic reporting time indicated as the "repPeriod" attributes within the event reporting information as the "evtReq" attribute provided in `NnwdafEventsSubscription` data type, if present, supersedes the event notification method as the "notificationMethod" attribute and repetition period as the "repetitionPeriod" attribute respectively in the `EventSubscription` data type.

For different event types, the "eventSubscriptions" attribute:

- if the event is "SLICE\_LOAD\_LEVEL", shall provide:
  - 1) Network slice level load level threshold in the "loadLevelThreshold" attribute if the "notifMethod" attribute in "evtReq" attribute is set to "ON\_EVENT\_DETECTION" or the "notificationMethod" attribute in "eventSubscriptions" attribute is set to "THRESHOLD" or omitted; and
  - 2) identification of network slice(s) to which the subscription applies via identification of network slice(s) in the "snssais" attribute or any slices indication in the "anySlice" attribute;
- if the feature "NsiLoad" is supported and the event is "NSI\_LOAD\_LEVEL", shall provide:
  - 1) identification of network slice and the optionally associated network slice instance(s) if available, via the "nsiIdInfos" attribute or any slices indication in the "anySlice" attribute;

NOTE 2: The network slice instance of a PDU session is not available in the PCF.

- 2) the network slice or network slice instance load level thresholds in the "nsiLevelThrds" attribute if the "notifMethod" attribute in "evtReq" attribute is set to "ON\_EVENT\_DETECTION" or the "notificationMethod" attribute in "eventSubscriptions" attribute is set to "THRESHOLD" or omitted;
- if the feature "NfLoad" is supported and the event is "NF\_LOAD", shall provide:
    - 1) identification of target UE(s) to which the subscription applies by "supis" or "anyUe" in the "tgtUe" attribute; and
    - 2) NF load level thresholds in the "nfLoadLvlThds" attribute if the "notifMethod" attribute in "evtReq" attribute is set to "ON\_EVENT\_DETECTION" or the "notificationMethod" attribute in "eventSubscriptions" attribute is set to "THRESHOLD" or omitted;and may include:
    - 1) either list of NF instance IDs in the "nfInstanceIds" attribute or list of NF set IDs in the "nfSetIds" attribute if the identification of target UE(s) applies to all UEs;
    - 2) list of NF instance types in the "nfTypes" attribute;
    - 3) identification of network slice(s) by "snssais" attribute; and/or
    - 4) a matching direction in the "matchingDir" attribute if the "nfLoadLvlThds" attribute is provided.
  - if the feature "NetworkPerformance" is supported and the event is "NETWORK\_PERFORMANCE", it shall provide:
    - 1) identification of target UE(s) to which the subscription applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgtUe" attribute; and
    - 2) The network performance requirements via "nwPerfRequs" attribute;and may provide:
    - 1) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute (mandatory if "anyUe" attribute is set to true);
    - 2) a matching direction in the "matchingDir" attribute if the "nwPerfRequs" attribute is provided;
  - if the feature "ServiceExperience" is supported and the event is "SERVICE\_EXPERIENCE", shall provide:
    - 1) identification of target UE(s) to which the subscription applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgtUe" attribute;
    - 2) any slices indication in the "anySlice" attribute or identification of network slice(s) together with the optionally associated network slice instance(s) if available, via the "nsiIdInfos" attribute;

NOTE 3: The network slice instance of a PDU session is not available in the PCF.

and may provide:

- 1) identification of application to which the subscription applies via identification of application(s) by "appIds" attribute;
- 2) identification of network area to which the subscription applies via identification of network area(s) by "networkArea" attribute (mandatory if "anyUe" attribute is set to true);
- 3) identification of DNN to which the subscription applies via identification of application(s) by "dnns" attribute; and
- 4) identification of a user plane access to one or more DN(s) where applications are deployed by "dnais" attribute;
- 5) if "appIds" attribute is provided, the bandwidth requirement of each application by "bwRequs" attribute.

- if the feature "UeMobility" is supported and the event is "UE\_MOBILITY", shall provide:
  - 1) identification of target UE(s) to which the subscription applies by "supis" or "intGroupIds" attribute in the "tgtUe" attribute;and may provide:
  - 1) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute;
- if the feature "UeCommunication" is supported and the event is "UE\_COMMUNICATION", shall provide:
  - 1) identification of target UE(s) to which the subscription applies by "supis" or "intGroupIds" attribute in the "tgtUe" attribute;and may provide:
  - 1) identification of the application in the "appIds" attribute;
  - 2) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute;
  - 3) an identification of DNN in the "dnns" attribute; and/or
  - 4) identification of network slice in the "snssais" attribute;
- if the feature "QoS\_Sustainability" 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;
  - 2) a matching direction in the "matchingDir" attribute if the "qosFlowRetThds" attribute or the "ranUeThrouThds" attribute is provided;
- if the feature "AbnormalBehaviour" is supported and the event is "ABNORMAL\_BEHAVIOUR", shall provide:
  - 1) identification of target UE(s) to which the subscription applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgtUe" attribute; and
  - 2) either the expected analytics type via "exptAnaType" attribute or a list of exception Ids with the associated thresholds via "excepRequ" attribute. If the expected analytics type via "exptAnaType" attribute is provided, the NWDAF shall derive the corresponding Exception Ids from the received expected analytics type as follows:
    - a) if "exptAnaType" attribute sets to "MOBILITY", the corresponding list of Exception Ids are "UNEXPECTED\_UE\_LOCATION", "PING\_PONG\_ACROSS\_CELLS", "UNEXPECTED\_WAKEUP" and "UNEXPECTED\_RADIO\_LINK\_FAILURES";
    - b) if "exptAnaType" attribute sets to "COMMUN", the corresponding list of Exception Ids are "UNEXPECTED\_LONG\_LIVE\_FLOW", "UNEXPECTED\_LARGE\_RATE\_FLOW", "SUSPICION\_OF\_DDOS\_ATTACK", "WRONG\_DESTINATION\_ADDRESS" and "TOO\_FREQUENT\_SERVICE\_ACCESS";

- c) if "exptAnaType" attribute sets to "MOBILITY\_AND\_COMMUN", the corresponding list of Exception Ids includes all above derived exception Ids.

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

If the "anyUe" attribute in the "tgtUe" attribute sets to "true",

- a) the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via "excepRequs" attribute shall not be requested for both mobility and communication related analytics at the same time.
- b) if the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via "excepRequs" attribute is mobility related, at least one of identification of network area by "networkArea" attribute and identification of network slice(s) by "snssais" attribute should be provided;
- c) if the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via "excepRequs" attribute is communication related, at least one of identification of network area by "networkArea" attribute, identification of application(s) by "appIds" attribute, identification of DNN(s) in the "dnns" attribute and identification of network slice(s) by "snssais" attribute should be provided;

and may provide:

- 1) expected UE behaviour via "exptUeBehav" attribute.
- if the feature "UserDataCongestion" is supported and the event is "USER\_DATA\_CONGESTION", shall provide:

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

and may include:

- 1) congestion threshold by the "congThresholds" attribute if the "notifMethod" attribute in "evtReq" attribute is set to "ON\_EVENT\_DETECTION" or the "notificationMethod" attribute in "eventSubscriptions" attribute is set to "THRESHOLD" or omitted;
- 2) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute (mandatory if "anyUe" attribute is set to true);
- 3) identification of network slice(s) by "snssais" attribute; and/or
- 4) a matching direction in the "matchingDir" attribute if the "congThresholds" attribute is provided.

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

- create a new subscription;
- assign an event subscriptionId;
- store the subscription.

If the NWDAF created an "Individual NWDAF Event Subscription" resource, the NWDAF shall respond with "201 Created" with the message body containing a representation of the created subscription, as shown in figure 4.2.2.2.2-1, step 2. If not all the requested analytics events in the subscription are accepted, then the NWDAF may include the "failEventReports" attribute indicating the event(s) for which the subscription failed and the associated reason(s). The NWDAF shall include a Location HTTP header field. The Location header field shall contain the URI of the created subscription i.e. "{apiRoot}/nnwdaf-eventssubscription/v1/subscriptions/{subscriptionId}". If the immediate reporting indication in the "immRep" attribute within the "evtReq" attribute sets to true in the event subscription, the NWDAF shall include the reports of the events subscribed, if available, in the HTTP POST response.

#### 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]).

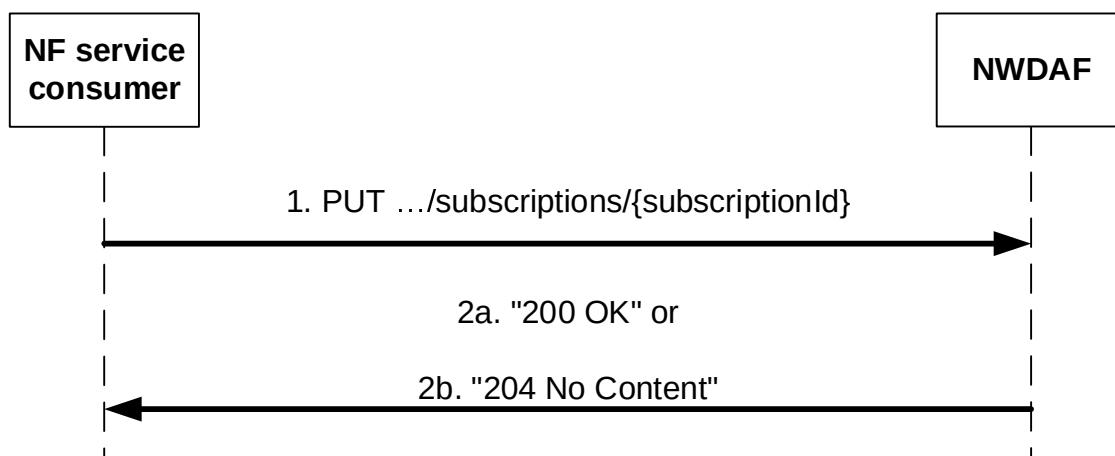


**Figure 4.2.2.3-1: NF service consumer updates subscription to notifications**

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 "{apiRoot}/nnwdaf-eventssubscription/v1/subscriptions/{subscriptionId}" as Resource URI representing the "Individual NWDAF Event Subscription", as shown in figure 4.2.2.3-1, 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: "{apiRoot}/nnwdaf-eventssubscription/v1/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.

NOTE: The "notificationURI" attribute within the `NnwdafEventsSubscription` data structure can be modified to request that subsequent notifications are sent to a new NF service consumer.

If the NWDAF successfully processed and accepted the received HTTP PUT request, the NWDAF shall update an "Individual NWDAF Event Subscription" resource, and shall respond with:

- a) HTTP "200 OK" status code with the message body containing a representation of the updated subscription, as shown in figure 4.2.2.3-1, step 2a. If not all the requested analytics events in the subscription are modified successfully, then the NWDAF may include the "failEventReports" attribute indicating the event(s) for which the modification failed and the associated reason(s); or
- b) HTTP "204 No Content" status code, as shown in figure 4.2.2.3-1, step 2b.

If errors occur when processing the HTTP PUT request, the NWDAF shall send an HTTP error response as specified in subclause 5.1.7.

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

If the feature "ES3XX" is supported, and the NWDAF determines the received HTTP PUT request needs to be redirected, the NWDAF shall send an HTTP redirect response as specified in subclause 6.10.9 of 3GPP TS 29.500 [6].

### 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]).

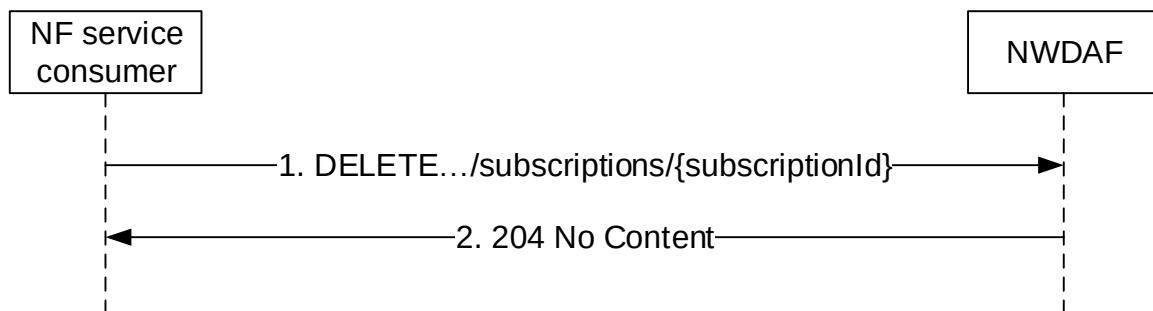


**Figure 4.2.2.3.2-1: NF service consumer unsubscribes from notifications**

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}"` as Resource URI, 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}"` as Resource URI, if the NWDAF successfully processed and accepted the received HTTP DELETE request, the NWDAF shall:

- remove the corresponding subscription;
- respond with HTTP "204 No Content" status code.

If errors occur when processing the HTTP DELETE request, the NWDAF shall send an HTTP error response as specified in subclause 5.1.7.

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

If the feature "ES3XX" is supported, and the NWDAF determines the received HTTP DELETE request needs to be redirected, the NWDAF shall send an HTTP redirect response as specified in subclause 6.10.9 of 3GPP TS 29.500 [6].

#### 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]).

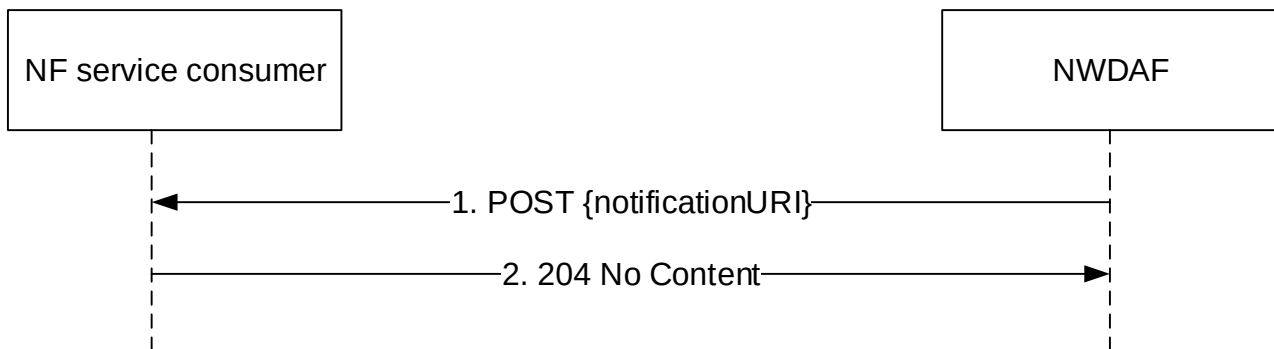


**Figure 4.2.2.4.2-1: NWDAF notifies the subscribed event**

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 that 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) network slice load level information in the "sliceLoadLevelInfo" attribute when subscribed event is "SLICE\_LOAD\_LEVEL";
  - c) service experience information as "svcExps" 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\_COMMUNICATION";
  - 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 "nfLoadLevelInfos" 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 `NnwdafEventsSubscriptionNotification` data structure as request body, if the NF service consumer successfully processed and accepted the received HTTP POST request, the NF Service Consumer shall:

- store the notification;
- respond with HTTP "204 No Content" status code.

If errors occur when processing the HTTP POST request, the NF service consumer shall send an HTTP error response as specified in subclause 5.1.7.

If the feature "ES3XX" is supported, and the NF service consumer determines the received HTTP POST request needs to be redirected, the NF service consumer shall send an HTTP redirect response as specified in subclause 6.10.9 of 3GPP TS 29.500 [6].

## 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:

- Slice load level information;
- Network slice instance 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)
- 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.

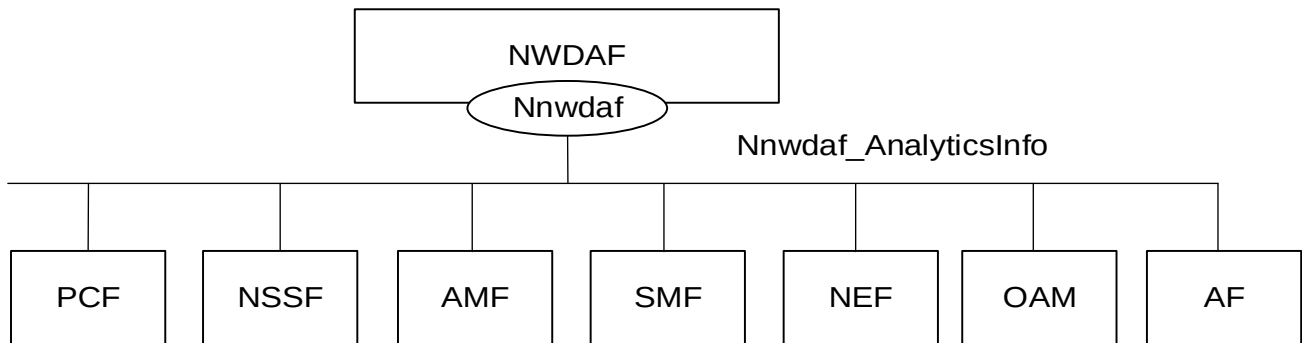


**Figure 4.3.1.2-1: Reference Architecture for the Nnwdaf\_AnalyticsInfo Service; SBI representation**

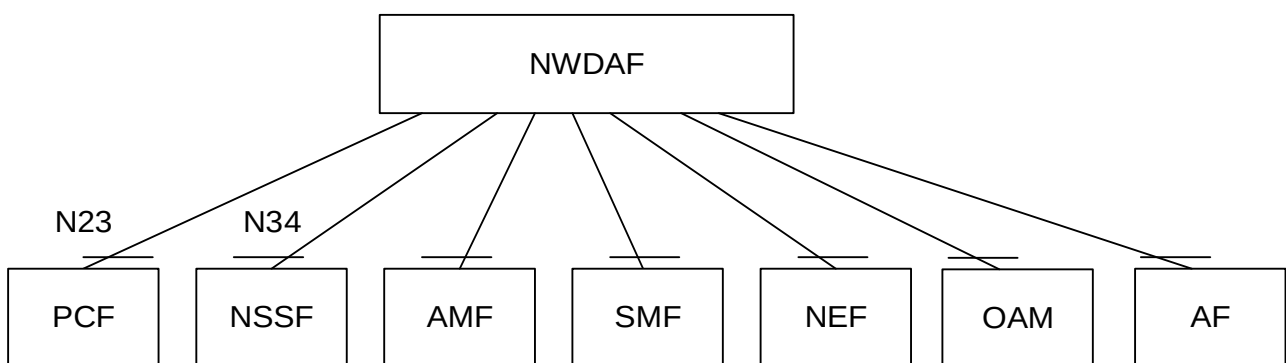


**Figure 4.3.1.2-2: Reference Architecture for the Nnwdaf\_AnalyticsInfo Service: reference point representation**

### 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 or network slice instance 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;
- supports taking abnormal UE behaviour information from NWDAF into consideration for adjustment of UE mobility related network parameters to solve the abnormal risk.

The Session Management Function (SMF):

- supports taking UPF load information from NWDAF into consideration for UPF selection;
- supports taking expected UE behaviour information (UE mobility and/or UE communication) from NWDAF into consideration for monitoring UE behaviour;
- 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 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 (UE mobility and/or UE communication) 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**

| Service operation name       | Description                                                                               | Initiated by                                    |
|------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------|
| Nnwdaf_AnalyticsInfo_Request | This service operation is used by an NF to request and get specific analytics from NWDAF. | NF consumer (PCF, NSSF, AMF, SMF, NEF, AF, OAM) |

### 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]).

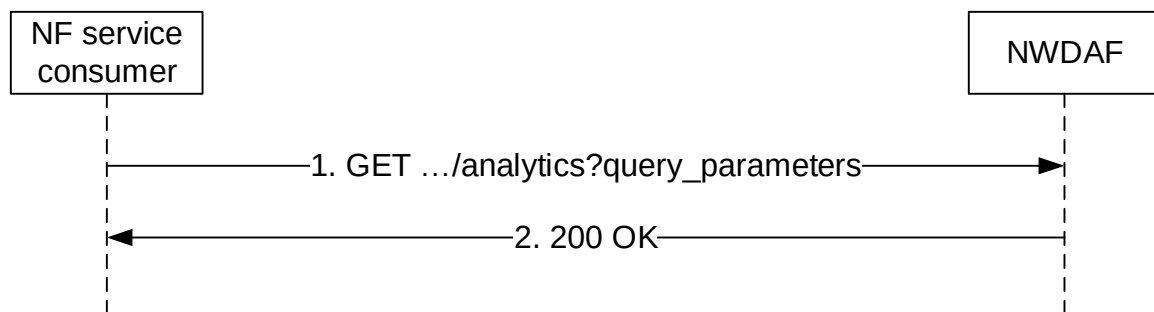


**Figure 4.3.2.2.2-1: Requesting a NWDAF Analytics information**

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 for the requested analytics data 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;
  - 5) maximum number of SUPIs expected for an analytics report in the "maxSupiNbr" attribute; and/or
  - 6) identification of time when analytics information is needed in the "timeAnaNeeded" 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) if available in the "nsiIdInfos" attribute; or
    - 2) any slices indication in the "anySlice" attribute.

NOTE 1: The network slice instance of a PDU session is not available in the PCF.

- 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; andthe "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/or
  - 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\_COMMUNICATION", 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) identification of network slice(s) 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) if available, via the "nsIdInfos" attribute; and

NOTE 2: The network slice instance of a PDU session is not available in the PCF.

the "event-filter" attribute may provide:

- a) identification of application(s) to which the subscription applies via "appIds" attribute;
- b) identification of DNN via identification of Dnn(s) by "dnns" attribute;
- c) identification of user plane accesses to one or more DN(s) where applications are deployed via "dnais" attribute;
- d) 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);
- e) if "appIds" attribute is provided, the bandwidth requirement of each application by "bwReques" attribute.
- if the feature "QoS\_Sustainability" 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 "qosRequ" 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;
- 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 "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) either the expected analytics type via "exptAnaType" attribute or a list of exception Ids via "excepIds" attribute. If the expected analytics type via "exptAnaType" attribute is provided, the NWDAF shall derive the corresponding Exception Ids from the received expected analytics type as follows:
      - if "exptAnaType" attribute sets to "MOBILITY", the corresponding list of Exception Ids are "UNEXPECTED\_UE\_LOCATION", "PING\_PONG\_ACROSS\_CELLS", "UNEXPECTED\_WAKEUP" and "UNEXPECTED\_RADIO\_LINK\_FAILURES";
      - if "exptAnaType" attribute sets to "COMMUN", the corresponding list of Exception Ids are "UNEXPECTED\_LONG\_LIVE\_FLOW", "UNEXPECTED\_LARGE\_RATE\_FLOW", "SUSPICION\_OF\_DDOS\_ATTACK", "WRONG\_DESTINATION\_ADDRESS" and "TOO\_FREQUENT\_SERVICE\_ACCESS";

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

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

If the "anyUe" attribute in the "tgt-ue" attribute sets to "true",

- a) the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via "excepIds" attribute shall not be requested for both mobility and communication related analytics at the same time.
- b) if the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via "excepIds" attribute is mobility related, at least one of identification of network area by "networkArea" attribute and identification of network slice(s) by "snssais" attribute should be provided;
- c) if the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via "excepIds" attribute is communication related, at least one of identification of network area by "networkArea" attribute, identification of application(s) by "appIds" attribute, identification of DNN(s) in the "dnns" attribute and identification of network slice(s) by "snssais" attribute should be provided;

the "event-filter" attribute may provide:

- 1) 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 target UE(s) via "supis" or "anyUe" attribute within "tgt-ue" attribute;
- and may provide:
- 1) event specific filter information in the "event-filter" attribute which may provide:
    - a) identification of network slice(s) by "snssais" attribute; and/or
    - 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 "timeAnaNeeded" attribute within EventReportingRequirement is provided during the request, if the time is reached the consumer does not need to wait for the analytics information any longer, the NWDAF may send an error response to the consumer.

---

## 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>/<apiSpecificResourceUriPart>**

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

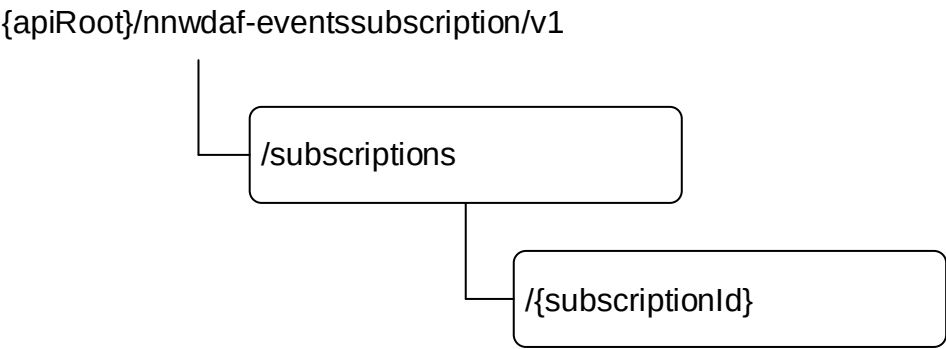


Figure 5.1.3.1-1: Resource URI structure of the Nnwdaf\_EventsSubscription API

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

| Resource name                       | Resource URI                    | HTTP method or custom operation | Description                                                                                |
|-------------------------------------|---------------------------------|---------------------------------|--------------------------------------------------------------------------------------------|
| NWDAF Events Subscriptions          | /subscriptions                  | POST                            | Creates a new Individual NWDAF Event Subscription resource.                                |
| Individual NWDAF Event Subscription | /subscriptions/{subscriptionId} | DELETE                          | Deletes an Individual NWDAF Event Subscription identified by subresource {subscriptionId}. |
|                                     |                                 | PUT                             | Modifies an existing Individual Event Subscription subresource.                            |

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

| Name    | Data type | Definition          |
|---------|-----------|---------------------|
| apiRoot | string    | See subclause 5.1.1 |

### 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 5.1.3.2.3.1-1: URI query parameters supported by the POST method on this resource**

| Name | Data type | P | Cardinality | Description |
|------|-----------|---|-------------|-------------|
| n/a  |           |   |             |             |

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.

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

| Data type                | P | Cardinality | Description                                                |
|--------------------------|---|-------------|------------------------------------------------------------|
| NnwdafEventsSubscription | M | 1           | Create a new Individual NWDAF Event Subscription resource. |

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

| Data type                                                                                                                   | P | Cardinality | Response codes | Description                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------|---|-------------|----------------|---------------------------------------------------------------------------------------------------------------------------------|
| NnwdafEventsSubscription                                                                                                    | M | 1           | 201 Created    | The creation of an Individual NWDAF Event Subscription resource is confirmed and a representation of that resource is returned. |
| 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**

| Name     | Data type | P | Cardinality | Description                                                                                                                                       |
|----------|-----------|---|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Location | string    | M | 1           | Contains the URI of the newly created resource, according to the structure: {apiRoot}/nnwdaf-eventssubscription/v1/subscriptions/{subscriptionId} |

### 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**

| Name           | Data type | Definition                                                         |
|----------------|-----------|--------------------------------------------------------------------|
| apiRoot        | string    | See subclause 5.1.1                                                |
| subscriptionId | string    | Identifies a subscription to the Nnwdaf_EventsSubscription Service |

### 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**

| Name | Data type | P | Cardinality | Description |
|------|-----------|---|-------------|-------------|
| n/a  |           |   |             |             |

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**

| Data type | P | Cardinality | Description |
|-----------|---|-------------|-------------|
| n/a       |   |             |             |

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

| Data type                                                                                                                       | P | Cardinality | Response codes         | Description                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------|---|-------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n/a                                                                                                                             |   |             | 204 No Content         | Successful case: The Individual NWDAF Event Subscription resource matching the subscriptionId was deleted.                                                                                                                                                                       |
| RedirectResponse                                                                                                                | O | 0..1        | 307 Temporary Redirect | Temporary redirection, during Individual NWDAF Event Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. Applicable if the feature "ES3XX" is supported. |
| RedirectResponse                                                                                                                | O | 0..1        | 308 Permanent Redirect | Permanent redirection, during Individual NWDAF Event Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. Applicable if the feature "ES3XX" is supported. |
| ProblemDetails                                                                                                                  | O | 0..1        | 404 Not Found          | The Individual NWDAF Event Subscription resource does not exist. (NOTE 2)                                                                                                                                                                                                        |
| 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.                                                                         |   |             |                        |                                                                                                                                                                                                                                                                                  |

**Table 5.1.3.3.3.1-4: Headers supported by the 307 Response Code on this resource**

| Name                  | Data type | P | Cardinality | Description                                                                             |
|-----------------------|-----------|---|-------------|-----------------------------------------------------------------------------------------|
| Location              | string    | M | 1           | An alternative URI of the resource located in an alternative NWDAF (service) instance.  |
| 3gpp-Sbi-Target-Nf-Id | string    | O | 0..1        | Identifier of the target NF (service) instance towards which the request is redirected. |

**Table 5.1.3.3.1-5: Headers supported by the 308 Response Code on this resource**

| Name                  | Data type | P | Cardinality | Description                                                                             |
|-----------------------|-----------|---|-------------|-----------------------------------------------------------------------------------------|
| Location              | string    | M | 1           | An alternative URI of the resource located in an alternative NWDAF (service) instance.  |
| 3gpp-Sbi-Target-Nf-Id | string    | O | 0..1        | Identifier of the target NF (service) instance towards which the request is redirected. |

#### 5.1.3.3.2 PUT

This method shall support the URI query parameters specified in table 5.1.3.3.2-1.

**Table 5.1.3.3.2-1: URI query parameters supported by the PUT method on this resource**

| Name | Data type | P | Cardinality | Description |
|------|-----------|---|-------------|-------------|
| n/a  |           |   |             |             |

This method shall support the request data structures specified in table 5.1.3.3.2-2 and the response data structures and response codes specified in table 5.1.3.3.2-3.

**Table 5.1.3.3.2-2: Data structures supported by the PUT Request Body on this resource**

| Data type                | P | Cardinality | Description                                                                |
|--------------------------|---|-------------|----------------------------------------------------------------------------|
| NnwdafEventsSubscription | M | 1           | Parameters to replace a subscription to NWDAF Event Subscription resource. |

**Table 5.1.3.3.2-3: Data structures supported by the PUT Response Body on this resource**

| Data type                                                                                                                    | P | Cardinality | Response codes         | Description                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------|---|-------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NnwdafEventsSubscription                                                                                                     | M | 1           | 200 OK                 | The Individual NWDAF Event Subscription resource was modified successfully and a representation of that resource is returned.                                                                                                                                                        |
| n/a                                                                                                                          |   |             | 204 No Content         | The Individual NWDAF Event Subscription resource was modified successfully.                                                                                                                                                                                                          |
| RedirectResponse                                                                                                             | O | 0..1        | 307 Temporary Redirect | Temporary redirection, during Individual NWDAF Event Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. Applicable if the feature "ES3XX" is supported. |
| RedirectResponse                                                                                                             | O | 0..1        | 308 Permanent Redirect | Permanent redirection, during Individual NWDAF Event Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. Applicable if the feature "ES3XX" is supported. |
| ProblemDetails                                                                                                               | O | 0..1        | 404 Not Found          | The Individual NWDAF Event Subscription resource does not exist. (NOTE 2)                                                                                                                                                                                                            |
| 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.                                                                      |   |             |                        |                                                                                                                                                                                                                                                                                      |

**Table 5.1.3.3.2-4: Headers supported by the 307 Response Code on this resource**

| Name                  | Data type | P | Cardinality | Description                                                                             |
|-----------------------|-----------|---|-------------|-----------------------------------------------------------------------------------------|
| Location              | string    | M | 1           | An alternative URI of the resource located in an alternative NWDAF (service) instance.  |
| 3gpp-Sbi-Target-Nf-Id | string    | O | 0..1        | Identifier of the target NF (service) instance towards which the request is redirected. |

**Table 5.1.3.3.2-5: Headers supported by the 308 Response Code on this resource**

| Name                  | Data type | P | Cardinality | Description                                                                             |
|-----------------------|-----------|---|-------------|-----------------------------------------------------------------------------------------|
| Location              | string    | M | 1           | An alternative URI of the resource located in an alternative NWDAF (service) instance.  |
| 3gpp-Sbi-Target-Nf-Id | string    | O | 0..1        | Identifier of the target NF (service) instance towards which the request is redirected. |

#### 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**

| Notification       | Callback URI      | HTTP method or custom operation | Description (service operation)        |
|--------------------|-------------------|---------------------------------|----------------------------------------|
| Event Notification | {notificationURI} | POST                            | Report one or several observed Events. |

### 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

Callback URI: {**notificationURI**}

The operation shall support the callback 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: Callback URI variables**

| Name            | Data type | Definition                                                                                                                                                      |
|-----------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| notificationURI | Uri       | 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). |

**Table 5.1.5.2.2-2: Data structures supported by the POST Request Body on this resource**

| Data type                                   | P | Cardinality | Description                                |
|---------------------------------------------|---|-------------|--------------------------------------------|
| array(NnwdafEventsSubscriptionNotification) | M | 1..N        | Provides Information about observed events |

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

| Data type                                                                                                                   | P | Cardinality | Response codes         | Description                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------|---|-------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n/a                                                                                                                         |   |             | 204 No Content         | The receipt of the Notification is acknowledged.                                                                                                                                                                                                                                                          |
| RedirectResponse                                                                                                            | O | 0..1        | 307 Temporary Redirect | Temporary redirection, during the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. Applicable if the feature "ES3XX" is supported. |
| RedirectResponse                                                                                                            | O | 0..1        | 308 Permanent Redirect | Permanent redirection, during the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. Applicable if the feature "ES3XX" is supported. |
| 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 5.1.5.2.2-4: Headers supported by the 307 Response Code on this resource**

| Name                  | Data type | P | Cardinality | Description                                                                                                                                         |
|-----------------------|-----------|---|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Location              | string    | M | 1           | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string    | O | 0..1        | Identifier of the target NF (service) instance towards which the notification request is redirected.                                                |

**Table 5.1.5.2.2-5: Headers supported by the 308 Response Code on this resource**

| Name                  | Data type | P | Cardinality | Description                                                                                                                                         |
|-----------------------|-----------|---|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Location              | string    | M | 1           | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string    | O | 0..1        | Identifier of the target NF (service) instance towards which the notification request is redirected.                                                |

## 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

| Data type                            | Section defined | Description                                                                                                  | Applicability                                                     |
|--------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| AdditionalMeasurement                | 5.1.6.2.26      |                                                                                                              | AbnormalBehaviour                                                 |
| AddressList                          | 5.1.6.2.28      |                                                                                                              | AbnormalBehaviour                                                 |
| Accuracy                             | 5.1.6.3.5       | Represents the preferred level of accuracy of the analytics.                                                 |                                                                   |
| AnySlice                             | 5.1.6.3.2       | Represents the any slices.                                                                                   |                                                                   |
| BwRequirement                        | 5.1.6.2.25      | Represents bandwidth requirement.                                                                            | ServiceExperience                                                 |
| CircumstanceDescription              | 5.1.6.2.29      |                                                                                                              | AbnormalBehaviour                                                 |
| CongestionInfo                       | 5.1.6.2.18      |                                                                                                              | UserDataCongestion                                                |
| CongestionType                       | 5.1.6.3.8       |                                                                                                              | UserDataCongestion                                                |
| EventNotification                    | 5.1.6.2.5       | Describes Notifications about events that occurred.                                                          |                                                                   |
| EventReportingRequirement            | 5.1.6.2.7       | Represents the type of reporting the subscription requires.                                                  |                                                                   |
| EventSubscription                    | 5.1.6.2.3       | Represents the subscription to a single event.                                                               |                                                                   |
| ExpectedAnalyticsType                | 5.1.6.3.11      |                                                                                                              | AbnormalBehaviour                                                 |
| IpEthFlowDescription                 | 5.1.6.2.27      |                                                                                                              | AbnormalBehaviour                                                 |
| LoadLevelInformation                 | 5.1.6.3.2       | Represents load level information of the network slice and the optionally associated network slice instance. |                                                                   |
| LocationInfo                         | 5.1.6.2.11      |                                                                                                              | UeMobility                                                        |
| MatchingDirection                    | 5.1.6.3.12      | Defines the matching direction when crossing a threshold                                                     | NfLoad, QoSsustainability, UserDataCongestion, NetworkPerformance |
| NetworkPerfInfo                      | 5.1.6.2.23      |                                                                                                              | NetworkPerformance                                                |
| NetworkPerfRequirement               | 5.1.6.2.22      |                                                                                                              | NetworkPerformance                                                |
| NetworkPerfType                      | 5.1.6.3.10      |                                                                                                              | NetworkPerformance                                                |
| NfLoadLevelInformation               | 5.1.6.2.31      | Represents load level information of a given NF instance.                                                    | NfLoad                                                            |
| NfStatus                             | 5.1.6.2.32      | Provides the percentage of time spent on various NF states                                                   | NfLoad                                                            |
| NwdafEvent                           | 5.1.6.3.4       | Describes the NWDAF Events.                                                                                  |                                                                   |
| NnwdafEventsSubscription             | 5.1.6.2.2       | Represents an Individual NWDAF Event Subscription resource.                                                  |                                                                   |
| NnwdafEventsSubscriptionNotification | 5.1.6.2.4       | Represents an Individual NWDAF Event Subscription Notification resource.                                     |                                                                   |
| NwdafFailureCode                     | 5.1.6.3.13      | Identifies the failure reason.                                                                               |                                                                   |
| NotificationMethod                   | 5.1.6.3.3       | Represents the notification methods that can be subscribed.                                                  |                                                                   |
| NsildInfo                            | 5.1.6.2.33      | Represents the S-NSSAI and the optionally associated Network Slice Instance Identifier(s).                   | ServiceExperience NsiLoad                                         |
| NsiLoadLevelInfo                     | 5.1.6.2.34      | Represents the load level information for an S-NSSAI and the optionally associated network slice instance.   | NsiLoad                                                           |
| QosRequirement                       | 5.1.6.2.20      |                                                                                                              | QoSsustainability                                                 |
| QosSustainabilityInfo                | 5.1.6.2.19      | Represents the QoS Sustainability information.                                                               | QoSsustainability                                                 |
| RetainabilityThreshold               | 5.1.6.2.21      |                                                                                                              | QoSsustainability                                                 |
| ServiceExperienceInfo                | 5.1.6.2.24      | Represents the service experience information.                                                               | ServiceExperience                                                 |
| SliceLoadLevelInformation            | 5.1.6.2.6       | Represents the slices and their load level information.                                                      |                                                                   |

|                         |            |                                                                    |                                                                                                                                                     |
|-------------------------|------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| TargetUeInformation     | 5.1.6.2.8  | Identifies the target UE information.                              | ServiceExperience<br>NfLoad<br>NetworkPerformance<br>UserDataCongestion<br>UeMobility<br>UeCommunication<br>AbnormalBehaviour<br>QoS Sustainability |
| ThresholdLevel          | 5.1.6.2.30 | Describe a threshold level                                         | UserDataCongestion<br>NfLoad                                                                                                                        |
| TimeUnit                | 5.1.6.3.9  |                                                                    | QoS Sustainability                                                                                                                                  |
| TrafficCharacterization | 5.1.6.2.14 |                                                                    | UeCommunication                                                                                                                                     |
| UeCommunication         | 5.1.6.2.13 |                                                                    | UeCommunication                                                                                                                                     |
| UeMobility              | 5.1.6.2.10 |                                                                    | UeMobility                                                                                                                                          |
| UserDataCongestionInfo  | 5.1.6.2.17 | Represents the user data congestion information                    | UserDataCongestion                                                                                                                                  |
| AbnormalBehaviour       | 5.1.6.2.15 | Represents the abnormal behaviour information.                     | AbnormalBehaviour                                                                                                                                   |
| Exception               | 5.1.6.2.16 | Describes the Exception information.                               | AbnormalBehaviour                                                                                                                                   |
| ExceptionId             | 5.1.6.3.6  | Describes the Exception Id.                                        | AbnormalBehaviour                                                                                                                                   |
| ExceptionTrend          | 5.1.6.3.7  | Describes the Exception Trend.                                     | AbnormalBehaviour                                                                                                                                   |
| FailureEventInfo        | 5.1.6.2.35 | Represents the failure event and the corresponding failure reason. |                                                                                                                                                     |

Table 5.1.6.1-2 specifies data types re-used by the Nnwdaf\_EventsSubscription service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nnwdaf service based interface.

Table 5.1.6.1-2: Nnwdaf\_EventsSubscription re-used Data Types

| Data type                  | Reference           | Comments                                                                                                                                                                                             | Applicability                                                                                                               |
|----------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 5Qi                        | 3GPP TS 29.571 [8]  | Identifies the 5G QoS identifier                                                                                                                                                                     | QoS Sustainability                                                                                                          |
| ApplicationId              | 3GPP TS 29.571 [8]  | Identifies the application identifier.                                                                                                                                                               | Service Experience<br>Ue Communication<br>Abnormal Behaviour                                                                |
| BitRate                    | 3GPP TS 29.571 [8]  | String representing a bit rate that shall be formatted as follows:<br><br>pattern: " <code>^\d+(\.\d+)?(bps Kbps Mbps Gbps Tbps)\$</code> "<br>Examples:<br>"125 Mbps", "0.125 Gbps", "125000 Kbps". | Service Experience<br>QoS Sustainability                                                                                    |
| DateTime                   | 3GPP TS 29.571 [8]  | Identifies the time.                                                                                                                                                                                 |                                                                                                                             |
| Dnai                       | 3GPP TS 29.571 [8]  | Identifies a user plane access to one or more DN(s).                                                                                                                                                 | Service Experience                                                                                                          |
| Dnn                        | 3GPP TS 29.571 [8]  | Identifies the DNN.                                                                                                                                                                                  | Service Experience<br>Abnormal Behaviour<br>Ue Communication                                                                |
| DurationSec                | 3GPP TS 29.571 [8]  |                                                                                                                                                                                                      |                                                                                                                             |
| EthFlowDescription         | 3GPP TS 29.514 [21] |                                                                                                                                                                                                      | Ue Communication<br>Abnormal Behaviour                                                                                      |
| ExpectedUeBehaviourData    | 3GPP TS 29.503 [23] |                                                                                                                                                                                                      | Abnormal Behaviour                                                                                                          |
| Float                      | 3GPP TS 29.571 [8]  |                                                                                                                                                                                                      |                                                                                                                             |
| FlowDescription            | 3GPP TS 29.514 [21] |                                                                                                                                                                                                      | Ue Communication<br>Abnormal Behaviour                                                                                      |
| GroupId                    | 3GPP TS 29.571 [8]  | Identifies a group of UEs.                                                                                                                                                                           | Ue Mobility<br>Ue Communication<br>Network Performance<br>Abnormal Behaviour<br>Service Experience                          |
| Ipv4Addr                   | 3GPP TS 29.571 [8]  |                                                                                                                                                                                                      |                                                                                                                             |
| Ipv6Addr                   | 3GPP TS 29.571 [8]  |                                                                                                                                                                                                      |                                                                                                                             |
| NetworkAreaInfo            | 3GPP TS 29.554 [18] | Identifies the network area.                                                                                                                                                                         | Service Experience<br>QoS Sustainability<br>Abnormal Behaviour<br>Ue Mobility<br>UserData Congestion<br>Network Performance |
| NfInstanceId               | 3GPP TS 29.571 [8]  | Identifies an NF instance                                                                                                                                                                            | Nf Load                                                                                                                     |
| NfSetId                    | 3GPP TS 29.571 [8]  | Identifies an NF Set instance                                                                                                                                                                        | Nf Load                                                                                                                     |
| NfType                     | 3GPP TS 29.510 [12] | Identifies a type of NF                                                                                                                                                                              | Nf Load                                                                                                                     |
| NsId                       | 3GPP TS 29.531 [24] | Identifies a Network Slice Instance                                                                                                                                                                  | Service Experience<br>Nsi Load                                                                                              |
| PacketDelBudget            | 3GPP TS 29.571 [8]  |                                                                                                                                                                                                      | QoS Sustainability                                                                                                          |
| PacketErrRate              | 3GPP TS 29.571 [8]  |                                                                                                                                                                                                      | QoS Sustainability                                                                                                          |
| ProblemDetails             | 3GPP TS 29.571 [8]  | Used in error responses to provide more detailed information about an error.                                                                                                                         |                                                                                                                             |
| QosResourceType            | 3GPP TS 29.571 [8]  | Identifies the resource type in QoS characteristics.                                                                                                                                                 | QoS Sustainability                                                                                                          |
| RedirectResponse           | 3GPP TS 29.571 [8]  | Contains redirection related information.                                                                                                                                                            | ES3XX                                                                                                                       |
| ReportingInformation       | 3GPP TS 29.523 [20] | Represents the type of reporting the subscription requires.                                                                                                                                          |                                                                                                                             |
| SamplingRatio              | 3GPP TS 29.571 [8]  |                                                                                                                                                                                                      |                                                                                                                             |
| ScheduledCommunicationTime | 3GPP TS 29.122 [19] |                                                                                                                                                                                                      | Ue Mobility<br>Ue Communication                                                                                             |
| Snssai                     | 3GPP TS 29.571 [8]  | Identifies the S-NSSAI (Single Network Slice Selection Assistance Information).                                                                                                                      |                                                                                                                             |

|                   |                     |                                                                                        |                                                                                                                                 |
|-------------------|---------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Supi              | 3GPP TS 29.571 [8]  | The SUPI for an UE.                                                                    | ServiceExperience,<br>NfLoad<br>NetworkPerformance,<br>UserDataCongestion<br>UeMobility<br>UeCommunication<br>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                                                                                                                      |
| Volume            | 3GPP TS 29.122 [19] |                                                                                        | UeCommunication<br>AbnormalBehaviour                                                                                            |

## 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

| Attribute name                                                                                                                                                                                                                                                                                                                        | Data type                | P | Cardinality | Description                                                                                                                                                                                                                                                                                     | Applicability |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|---|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| eventSubscriptions                                                                                                                                                                                                                                                                                                                    | array(EventSubscription) | M | 1..N        | Subscribed events                                                                                                                                                                                                                                                                               |               |
| evtReq                                                                                                                                                                                                                                                                                                                                | ReportingInformation     | O | 0..1        | Represents the reporting requirements of the event subscription. (NOTE 1, NOTE 2)<br>If omitted, the default values within the ReportingInformation data type apply.                                                                                                                            |               |
| notificationURI                                                                                                                                                                                                                                                                                                                       | Uri                      | C | 0..1        | Identifies the recipient of Notifications sent by the NWDAF.<br>This parameter shall be supplied by the NF service consumer in the HTTP POST requests that create the subscriptions for event notifications and in the HTTP PUT requests that update the subscriptions for event notifications. |               |
| eventNotifications                                                                                                                                                                                                                                                                                                                    | array(EventNotification) | C | 1..N        | Notifications about Individual Events.<br>Shall only be present if the immediate reporting indication in the "immRep" attribute within the "evtReq" attribute sets to true in the event subscription, and the reports are available.                                                            |               |
| failEventReports                                                                                                                                                                                                                                                                                                                      | array(FailureEventInfo)  | O | 1..N        | Supplied by the NWDAF When available, shall contain the event(s) for which the subscription is not successful including the failure reason(s).                                                                                                                                                  |               |
| supportedFeatures                                                                                                                                                                                                                                                                                                                     | SupportedFeatures        | C | 0..1        | List of Supported features used as described in subclause 5.1.8.<br>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.   |               |
| NOTE 1: 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 2: If the "evtReq" attribute in the ReportingInformation data type is provided, the periodic reporting time indicated by the "repPeriod" attribute 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**

| Attribute name     | Data type                 | P | Cardinality | Description                                                                                                                                                                                                                                                          | Applicability                                                                                                                            |
|--------------------|---------------------------|---|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| anySlice           | AnySlice                  | C | 0..1        | Default is "false". (NOTE 1)                                                                                                                                                                                                                                         |                                                                                                                                          |
| applds             | array(ApplicationId)      | C | 1..N        | Identification(s) of application to which the subscription applies. The absence of applds means subscription to all applications. (NOTE 8)                                                                                                                           | ServiceExperience<br>UeCommunication<br>AbnormalBehaviour                                                                                |
| dnns               | array(Dnn)                | C | 1..N        | Identification(s) of DNN to which the subscription applies. Each DNN is a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. The absence of dnns means subscription to all DNNs (NOTE 8)                  | ServiceExperience,<br>AbnormalBehaviour<br>UeCommunication                                                                               |
| dnais              | array(Dnai)               | C | 1..N        | Identification(s) of user plane access to DN(s) which the subscription applies.                                                                                                                                                                                      | ServiceExperience                                                                                                                        |
| event              | NwdafEvent                | M | 1           | Event that is subscribed.                                                                                                                                                                                                                                            |                                                                                                                                          |
| extraReportReq     | EventReportingRequirement | O | 0..1        | The extra event reporting requirement information.                                                                                                                                                                                                                   |                                                                                                                                          |
| loadLevelThreshold | integer                   | C | 0..1        | Indicates that the NWDAF shall report the corresponding network slice load level to the NF service consumer where the load level of the network slice identified by snssais is reached. (NOTE 4)<br><br>May be included when subscribed event is "SLICE_LOAD_LEVEL". |                                                                                                                                          |
| matchingDir        | MatchingDirection         | O | 0..1        | A matching direction may be provided alongside a threshold. If omitted, the default value is CROSSED.                                                                                                                                                                | NfLoad,<br>QoSSustainability,<br>UserDataCongestion,<br>NetworkPerformance                                                               |
| nfLoadLvlThds      | array(ThresholdLevel)     | C | 1..N        | Shall be supplied in order to start reporting when an average load level is reached.(NOTE 4)                                                                                                                                                                         | NfLoad                                                                                                                                   |
| networkArea        | NetworkAreaInfo           | C | 0..1        | Identification of network area to which the subscription applies. The absence of networkArea means subscription to all network areas. (NOTE 7), (NOTE 8)                                                                                                             | ServiceExperience<br>UeMobility<br>UeCommunication<br>QoSSustainability<br>AbnormalBehaviour<br>UserDataCongestion<br>NetworkPerformance |
| nfInstanceIds      | array(NfInstanceId)       | O | 1..N        | Identification(s) of NF instances.                                                                                                                                                                                                                                   | NfLoad                                                                                                                                   |
| nfSetIds           | array(NfSetId)            | O | 1..N        | Identification(s) of NF instance sets.                                                                                                                                                                                                                               | NfLoad                                                                                                                                   |
| nfTypes            | array(NFType)             | O | 1..N        | Identification(s) of NF types.                                                                                                                                                                                                                                       | NfLoad                                                                                                                                   |
| notificationMethod | NotificationMethod        | O | 0..1        | Indicate the notification method. (NOTE 2)                                                                                                                                                                                                                           |                                                                                                                                          |

|                  |                               |   |      |                                                                                                                                                                                                 |                              |
|------------------|-------------------------------|---|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| nsildInfos       | array(NsildInfo)              | O | 1..N | Each element identifies the S-NSSAI and the optionally associated network slice instance(s). May be included when subscribed event is "NSI_LOAD_LEVEL" or "SERVICE_EXPERIENCE". (NOTE 1)        | ServiceExperience<br>NsiLoad |
| nsiLevelThrds    | array(Uinteger)               | O | 1..N | Identifies the load threshold for each S-NSSAI or S-NSSAI and the optionally associated network slice instance identified by the "nsilds" attribute within the "nsildInfos" attribute. (NOTE 4) | NsiLoad                      |
| qosRequ          | QosRequirement                | C | 0..1 | Indicates the QoS requirements. It shall be included when subscribed event is "QOS_SUSTAINABILITY".                                                                                             | QoSSustainability            |
| qosFlowRetThds   | array(RetainabilityThreshold) | C | 1..N | Represents the QoS flow retainability thresholds. Shall be supplied for the 5QI ("5qi" in "qosRequ") or resource type ("resType" in "qosRequ") of GBR resource type. (NOTE 4)                   | QoSSustainability            |
| ranUeThrouThds   | array(BitRate)                | C | 1..N | Represents the RAN UE throughput thresholds. Shall be supplied for the 5QI ("5qi" in "qosRequ") or resource type ("resType" in "qosRequ") of non-GBR resource type. (NOTE 4)                    | QoSSustainability            |
| repetitionPeriod | DurationSec                   | C | 0..1 | Shall be supplied for notification Method "PERIODIC" by the "notificationMethod" attribute.                                                                                                     |                              |
| snssais          | array(Snssai)                 | C | 1..N | Identification(s) of network slice to which the subscription applies. (NOTE 1), (NOTE 8)                                                                                                        |                              |
| tgtUe            | TargetUeInformation           | O | 0..1 | Identifies target UE information. (NOTE 3)                                                                                                                                                      |                              |
| congThresholds   | array(ThresholdLevel)         | C | 1..N | Represents the congestion threshold levels. (NOTE 4)                                                                                                                                            | UserDataCongestion           |
| nwPerfRequs      | array(NetworkPerfRequirement) | C | 1..N | Represents the network performance requirements. This attribute shall be included when subscribed event is "NETWORK_PERFORMANCE".                                                               | NetworkPerformance           |
| bwRequs          | array(BwRequirement)          | O | 1..N | Represents the bandwidth requirement for each application.                                                                                                                                      | ServiceExperience            |
| excepRequs       | array(Exception)              | C | 1..N | Represents a list of Exception Ids with associated thresholds. May only be present when subscribed event is "ABNORMAL_BEHAVIOUR". (NOTE 5, NOTE 6)                                              | AbnormalBehaviour            |
| exptAnaType      | ExpectedAnalyticsType         | C | 0..1 | Represents expected UE analytics type. It shall not be present if the "excepRequs" attribute is provided. (NOTE 6)                                                                              | AbnormalBehaviour            |
| exptUeBehav      | ExpectedUeBehaviourData       | O | 0..1 | Represents expected UE behaviour.                                                                                                                                                               | AbnormalBehaviour            |

- NOTE 1: The "anySlice" attribute is not applicable to features "UeMobility" and "NetworkPerformance". The "snssais" attribute is not applicable to features "ServiceExperience", "NsiLoad", "UeMobility" and "NetworkPerformance". When subscribed event is "SLICE\_LOAD\_LEVEL", the identifications of network slices, either information about slice(s) identified by "snssais", or "anySlice" set to "true" shall be included. When subscribed event is "QOS\_SUSTAINABILITY", "NF\_LOAD", "UE\_COMMUNICATION", "ABNORMAL\_BEHAVIOUR" or "USER\_DATA\_CONGESTION", the identifications of network slices identified by "snssais" is optional. When subscribed event is "NSI\_LOAD\_LEVEL" or "SERVICE\_EXPERIENCE", either the "nsildInfos" 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 "exceptId" and "exceptLevel" within the Exception data type apply to the "exceptRequs" attribute within EventSubscription data type.
- NOTE 6: Either "exceptRequs" or "exptAnaType" shall be provided if subscribed event is "ABNORMAL\_BEHAVIOUR".
- NOTE 7: For "NETWORK\_PERFORMANCE", "SERVICE\_EXPERIENCE" or "USER\_DATA\_CONGESTION" event, this attribute shall be provided if the event applied for all UEs (i.e. "anyUe" attribute set to true within the "tgtUe" attribute). For "QOS\_SUSTAINABILITY", this attribute shall be provided.
- NOTE 8: For "ABNORMAL\_BEHAVIOUR" event with "anyUe" attribute in "tgtUe" attribute sets to true,
- at least one of the "networkArea" and the "snssais" attribute should be included, if the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via the "exceptRequs" attribute is mobility related;
  - at least one of the "networkArea", "applIds", "dnns" and "snssais" attribute should be included, if the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via the "exceptRequs" attribute is communication related;
  - the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via "exceptRequs" attribute shall not be requested for both mobility and communication related analytics at the same time.

#### 5.1.6.2.4 Type NnwdafEventsSubscriptionNotification

**Table 5.1.6.2.4-1: Definition of type NnwdafEventsSubscriptionNotification**

| Attribute name     | Data type                 | P | Cardinality | Description                                                                | Applicability |
|--------------------|---------------------------|---|-------------|----------------------------------------------------------------------------|---------------|
| eventNotifications | array(EventNotifications) | M | 1..N        | Notifications about Individual Events                                      |               |
| subscriptionId     | string                    | M | 1           | String identifying a subscription to the Nnwdaf_EventsSubscription Service |               |

## 5.1.6.2.5 Type EventNotification

Table 5.1.6.2.5-1: Definition of type EventNotification

| Attribute name     | Data type                     | P | Cardinality | Description                                                                                                                                                                            | Applicability      |
|--------------------|-------------------------------|---|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| event              | NwdafEvent                    | M | 1           | Event that is notified.                                                                                                                                                                |                    |
| expiry             | DateTime                      | O | 0..1        | It defines the expiration time after which the analytics information will become invalid.                                                                                              |                    |
| timeStampGen       | DateTime                      | O | 0..1        | It defines the timestamp of analytics generation.                                                                                                                                      |                    |
| nwPerfs            | array(NetworkPerfInfo)        | C | 1..N        | The network performance information.                                                                                                                                                   | NetworkPerformance |
| nfLoadLevelInfos   | array(NfLoadLevelInformation) | C | 1..N        | The NF load level information. When subscribed event is "NF_LOAD", the nfLoadLevelInfos shall be included.                                                                             | NfLoad             |
| nsiLoadLevelInfos  | array(NsiLoadLevelInfo)       | C | 1..N        | 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 "NSI_LOAD_LEVEL". | NsiLoad            |
| qosSustainInfos    | array(QosSustainabilityInfo)  | C | 1..N        | The QoS sustainability information. When subscribed event is "QOS_SUSTAINABILITY", the qosSustainInfos shall be included.                                                              | QoSsustainability  |
| sliceLoadLevelInfo | SliceLoadLevelInformation     | C | 0..1        | The slices and the load level information. When subscribed event is "SLICE_LOAD_LEVEL", the sliceLoadLevelInfo shall be included.                                                      |                    |
| svcExps            | array(ServiceExperienceInfo)  | C | 1..N        | The service experience information. When subscribed event is "SERVICE_EXPERIENCE", the svcExps shall be included.                                                                      | ServiceExperience  |
| ueComms            | array(UeCommunication)        | C | 1..N        | The UE communication information. When subscribed event is "UE_COMMUNICATION", the ueComms shall be included.                                                                          | UeCommunication    |
| ueMobs             | array(UeMobility)             | C | 1..N        | The UE mobility information. When subscribed event is "UE_MOBILITY", the ueMobs shall be included.                                                                                     | UeMobility         |
| abnorBehavrs       | array(AbnormalBehaviour)      | C | 1..N        | The Abnormal Behaviour information. When subscribed event is "ABNORMAL_BEHAVIOUR", the abnorBehavrs shall be included.                                                                 | AbnormalBehaviour  |
| userDataConglInfo  | array(UserDataCongestionInfo) | C | 1..N        | The location and user data congestion information. Shall be present if the subscribed event is "USER_DATA_CONGESTION".                                                                 | UserDataCongestion |

## 5.1.6.2.6 Type SliceLoadLevelInformation

**Table 5.1.6.2.6-1: Definition of type SliceLoadLevelInformation**

| Attribute name       | Data type            | P | Cardinality | Description                                                                        | Applicability |
|----------------------|----------------------|---|-------------|------------------------------------------------------------------------------------|---------------|
| loadLevelInformation | LoadLevelInformation | M | 1           | Load level information which applies for each network slice identified by snssais. |               |
| snssais              | array(Snssai)        | M | 1..N        | Identification(s) of network slice to which the subscription applies.              |               |

## 5.1.6.2.7 Type EventReportingRequirement

**Table 5.1.6.2.7-1: Definition of type EventReportingRequirement**

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

| Attribute name                                                                                                               | Data type      | P | Cardinality | Description                                                                        | Applicability                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------|----------------|---|-------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| anyUe                                                                                                                        | boolean        | O | 0..1        | Identifies any UE when setting to true.                                            | ServiceExperience<br>NetworkPerformance<br>NfLoad<br>UserDataCongestion<br>AbnormalBehaviour<br>QoSsustainability             |
| supis                                                                                                                        | array(Supi)    | O | 1..N        | Identifies a SUPI for an UE.<br>(NOTE 2)                                           | UeMobility<br>UeCommunication<br>NetworkPerformance<br>AbnormalBehaviour<br>UserDataCongestion<br>NfLoad<br>ServiceExperience |
| intGroupIds                                                                                                                  | array(GroupId) | O | 1..N        | Represents an internal group identifier and identifies a group of UEs.<br>(NOTE 2) | UeMobility<br>UeCommunication<br>NetworkPerformance<br>AbnormalBehaviour<br>ServiceExperience                                 |
| NOTE 1: For an applicable feature, only one attribute identifying the target UE shall be provided.                           |                |   |             |                                                                                    |                                                                                                                               |
| NOTE 2: Only one element in the attribute shall be provided for the applicable events except the "SERVICE_EXPERIENCE" event. |                |   |             |                                                                                    |                                                                                                                               |

## 5.1.6.2.9 Void

## 5.1.6.2.10 Type UeMobility

Table 5.1.6.2.10-1: Definition of type UeMobility

| Attribute name                                                                                                                                                                | Data type                  | P | Cardinality | Description                                                                                                                                                                              | Applicability |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| ts                                                                                                                                                                            | DateTime                   | C | 0..1        | This attribute identifies the timestamp when the UE arrives the location. (NOTE 1)                                                                                                       |               |
| recurringTime                                                                                                                                                                 | ScheduledCommunicationTime | C | 0..1        | 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)                                                         |               |
| duration                                                                                                                                                                      | DurationSec                | M | 1           | This attribute identifies the time duration the UE stays in the location.<br>If the analytics result applies for a group of UEs, it indicates the average duration for the group of UEs. |               |
| durationVariance                                                                                                                                                              | Float                      | C | 0..1        | 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.                           |               |
| locInfos                                                                                                                                                                      | array(LocationInfo)        | M | 1..N        | This attribute includes a list of UE location information during the time duration.                                                                                                      |               |
| 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. |                            |   |             |                                                                                                                                                                                          |               |

## 5.1.6.2.11 Type LocationInfo

Table 5.1.6.2.11-1: Definition of type LocationInfo

| Attribute name | Data type     | P | Cardinality | Description                                                                                                                                                 | Applicability |
|----------------|---------------|---|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| loc            | UserLocation  | M | 1           | This attribute contains the detailed location, the ueLocationTimestamp attribute in the 3GPP access type of UserLocation data type shall not be provided.   |               |
| ratio          | SamplingRatio | C | 0..1        | 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. |               |
| confidence     | UInteger      | C | 0..1        | Indicates the confidence of the prediction. (NOTE)<br>Shall be present if the analytics result is a prediction.<br>Minimum = 0. Maximum = 100.              |               |

NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence.

|            |                      |
|------------|----------------------|
| 5.1.6.2.12 | Void                 |
| 5.1.6.2.13 | Type UeCommunication |

Table 5.1.6.2.13-1: Definition of type UeCommunication

| Attribute name    | Data type                  | P | Cardinality | Description                                                                                                                                                                                                                                                                          | Applicability |
|-------------------|----------------------------|---|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| commDur           | DurationSec                | M | 0..1        | Identifies the duration of the communication.<br>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.                                                                                |               |
| commDurVariance   | Float                      | C | 0..1        | 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.                                                                              |               |
| perioTime         | DurationSec                | O | 0..1        | Identifies interval time of periodic communication, e.g. every 10 minutes or 1 hour. (NOTE 2)<br>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. |               |
| perioTimeVariance | Float                      | C | 0..1        | 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.                                                    |               |
| ts                | DateTime                   | C | 0..1        | Identifies the start time of the communication. (NOTE 1)                                                                                                                                                                                                                             |               |
| tsVariance        | Float                      | O | 0..1        | 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.                                                                                             |               |
| recurringTime     | ScheduledCommunicationTime | C | 0..1        | Identifies time of the day and day of the week which are valid within the observation period when the UE has communication.<br>Providing the end time in ScheduledCommunicationTime data type is not required. (NOTE 1, NOTE 3)                                                      |               |
| trafChar          | TrafficCharacterization    | M | 1           | Identifies the detailed traffic characterization.                                                                                                                                                                                                                                    |               |
| ratio             | SamplingRatio              | C | 0..1        | 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.                                                                                                                          |               |
| confidence        | UInteger                   | C | 0..1        | Indicates the confidence of the prediction. (NOTE 4)<br>Shall be present if the analytics result is a prediction.<br>Minimum = 0. Maximum = 100.                                                                                                                                     |               |

|         |                                                                                                                                                                                                                                                                                                                                                                                               |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence.                                              |

#### 5.1.6.2.14 Type TrafficCharacterization

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

| Attribute name                                         | Data type                   | P | Cardinality | Description                                                                                                                                                                                                                                                    | Applicability |
|--------------------------------------------------------|-----------------------------|---|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| appld                                                  | ApplicationId               | O | 0..1        | Contains the application identifier.                                                                                                                                                                                                                           |               |
| dnn                                                    | Dnn                         | O | 0..1        | 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. |               |
| snssai                                                 | Snssai                      | C | 0..1        | Identifies the network slice. Shall be present if the "snssais" was provided within EventSubscription during the subscription for event notification procedure.                                                                                                |               |
| fDescs                                                 | array(lpEthFlowDescription) | O | 1..2        | Contains the flow description for the Uplink and/or Downlink flows.                                                                                                                                                                                            |               |
| ulVol                                                  | Volume                      | C | 0..1        | Identifies the uplink traffic volume. (NOTE)<br>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.                                              |               |
| ulVolVariance                                          | Float                       | C | 0..1        | 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.                                                    |               |
| dVol                                                   | Volume                      | C | 0..1        | Identifies the downlink traffic volume. (NOTE)<br>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.                                          |               |
| dVolVariance                                           | Float                       | C | 0..1        | 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.                                                  |               |
| NOTE: At least one of ulVol or dVol shall be provided. |                             |   |             |                                                                                                                                                                                                                                                                |               |

## 5.1.6.2.15 Type AbnormalBehaviour

Table 5.1.6.2.15-1: Definition of type AbnormalBehaviour

| Attribute name                                                                                                                                                                                                                                                                                                                                         | Data type             | P | Cardinality | Description                                                                                                                                                                                                                                                    | Applicability |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| supis                                                                                                                                                                                                                                                                                                                                                  | array(Supi)           | C | 1..N        | Each element identifies a UE which is affected with the Exception. Shall be present if the subscription request applies to more than one UE.                                                                                                                   |               |
| dnn                                                                                                                                                                                                                                                                                                                                                    | Dnn                   | C | 0..1        | 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. |               |
| excep                                                                                                                                                                                                                                                                                                                                                  | Exception             | M | 1           | Contains the exception information.                                                                                                                                                                                                                            |               |
| snssai                                                                                                                                                                                                                                                                                                                                                 | Snssai                | C | 0..1        | Identifies the network slice information. Shall be present if the "snssais" was provided within EventSubscription during the subscription for event notification procedure.                                                                                    |               |
| ratio                                                                                                                                                                                                                                                                                                                                                  | SamplingRatio         | C | 0..1        | 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.                                                                                        |               |
| confidence                                                                                                                                                                                                                                                                                                                                             | UInteger              | C | 0..1        | Indicates the confidence of the prediction. (NOTE) Shall be present if the analytics result is a prediction. Minimum = 0. Maximum = 100.                                                                                                                       |               |
| addtMeasInfo                                                                                                                                                                                                                                                                                                                                           | AdditionalMeasurement | O | 0..1        | Additional measurement.                                                                                                                                                                                                                                        |               |
| NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. |                       |   |             |                                                                                                                                                                                                                                                                |               |

## 5.1.6.2.16 Type Exception

Table 5.1.6.2.16-1: Definition of type Exception

| Attribute name | Data type      | P | Cardinality | Description                               | Applicability |
|----------------|----------------|---|-------------|-------------------------------------------|---------------|
| exceptId       | ExceptionId    | M | 1           | Indicating the Exception ID.              |               |
| exceptLevel    | integer        | O | 0..1        | Measured level, compared to the threshold |               |
| exceptTrend    | ExceptionTrend | O | 0..1        | Measured trend                            |               |

## 5.1.6.2.17 Type UserDataCongestionInfo

**Table 5.1.6.2.17-1: Definition of type UserDataCongestionInfo**

| Attribute name | Data type       | P | Cardinality | Description                                                                                                                                              | Applicability |
|----------------|-----------------|---|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| networkArea    | NetworkAreaInfo | M | 1           | Identification of network area to which the subscription applies.                                                                                        |               |
| congestionInfo | CongestionInfo  | M | 1           | The congestion information of the specific location.                                                                                                     |               |
| snssai         | Snssai          | C | 0..1        | Identifies an S-NSSAI. Shall be present if the "snssais" was provided within EventSubscription during the subscription for event notification procedure. |               |

## 5.1.6.2.18 Type CongestionInfo

**Table 5.1.6.2.18-1: Definition of type CongestionInfo**

| Attribute name                                                                                                                                                                                                                                                                                                                                       | Data type      | P | Cardinality | Description                                                                                                                              | Applicability |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---|-------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| congType                                                                                                                                                                                                                                                                                                                                             | CongestionType | M | 1           | Identification congestion analytics type.                                                                                                |               |
| timeIntev                                                                                                                                                                                                                                                                                                                                            | TimeWindow     | M | 1           | Represents the start time and the stop time to which the congestion information applies.                                                 |               |
| nsi                                                                                                                                                                                                                                                                                                                                                  | ThresholdLevel | M | 1           | Network Status Indication.                                                                                                               |               |
| confidence                                                                                                                                                                                                                                                                                                                                           | UInteger       | C | 0..1        | Indicates the confidence of the prediction. (NOTE) Shall be present if the analytics result is a prediction. Minimum = 0. Maximum = 100. |               |
| NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the EventReportingRequirement type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. |                |   |             |                                                                                                                                          |               |

## 5.1.6.2.19 Type QoSustainabilityInfo

Table 5.1.6.2.19-1: Definition of type QoSustainabilityInfo

| Attribute name                                                                                                                                                                                                                                                                                                                                         | Data type              | P | Cardinality | Description                                                                                                                                              | Applicability |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| areaInfo                                                                                                                                                                                                                                                                                                                                               | NetworkAreaInfo        | M | 1           | Identification(s) of applicable location areas to which the subscription.                                                                                |               |
| startTs                                                                                                                                                                                                                                                                                                                                                | DateTime               | M | 1           | Represents the start time of the applicable observing period.                                                                                            |               |
| endTs                                                                                                                                                                                                                                                                                                                                                  | DateTime               | M | 1           | Represents the end time of the applicable observing period.                                                                                              |               |
| qosFlowRetThd                                                                                                                                                                                                                                                                                                                                          | RetainabilityThreshold | C | 0..1        | The reporting QoS Flow Retainability Threshold that are met or crossed for 5QI of GBR resource type. (NOTE 1)                                            |               |
| ranUeThrouThd                                                                                                                                                                                                                                                                                                                                          | BitRate                | C | 0..1        | The reporting RAN UE Throughput Threshold that are met or crossed for 5QI of non-GBR resource type. (NOTE 1)                                             |               |
| snssai                                                                                                                                                                                                                                                                                                                                                 | Snssai                 | C | 0..1        | Identifies an S-NSSAI. Shall be present if the "snssais" was provided within EventSubscription during the subscription for event notification procedure. |               |
| confidence                                                                                                                                                                                                                                                                                                                                             | UInteger               | C | 0..1        | Indicates the confidence of the prediction. (NOTE 2)<br>Shall be present if the analytics result is a prediction.<br>Minimum = 0. Maximum = 100.         |               |
| NOTE 1: Either "qosFlowRetThd" or "ranUeThrouThd" attribute 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. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. |                        |   |             |                                                                                                                                                          |               |

## 5.1.6.2.20 Type QosRequirement

Table 5.1.6.2.20-1: Definition of type QosRequirement

| Attribute name                                                                                             | Data type       | P | Cardinality | Description                                                                                                 | Applicability |
|------------------------------------------------------------------------------------------------------------|-----------------|---|-------------|-------------------------------------------------------------------------------------------------------------|---------------|
| 5qi                                                                                                        | 5Qi             | C | 0..1        | Represents a 5G QoS Identifier. It shall be included for standardized or preconfigured 5QIs. (NOTE)         |               |
| gfbrUL                                                                                                     | BitRate         | C | 0..1        | Indicates GFBR in the uplink. It shall be included for GBR 5QIs.                                            |               |
| gfbrDL                                                                                                     | BitRate         | C | 0..1        | Indicates GFBR in the downlink. It shall be included for GBR 5QIs.                                          |               |
| resType                                                                                                    | QosResourceType | C | 0..1        | Resource type. Shall be provided for the non-standardized and non-preconfigured QoS characteristics. (NOTE) |               |
| pdb                                                                                                        | PacketDelBudget | O | 0..1        | Packet Delay Budget. May be supplied for the non-standardized and non-pre-configured QoS characteristics.   |               |
| per                                                                                                        | PacketErrRate   | O | 0..1        | Packet Error Rate. May be supplied for the non-standardized and non-pre-configured QoS characteristics.     |               |
| NOTE: Either 5QI within "5qi" attribute or the resource type within "resType" attribute shall be provided. |                 |   |             |                                                                                                             |               |

## 5.1.6.2.21 Type RetainabilityThreshold

Table 5.1.6.2.21-1: Definition of type RetainabilityThreshold

| Attribute name                                                                                                                                                                                                                                                                           | Data type     | P | Cardinality | Description                                                                                                            | Applicability |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---|-------------|------------------------------------------------------------------------------------------------------------------------|---------------|
| relFlowNum                                                                                                                                                                                                                                                                               | UInteger      | C | 0..1        | Represents the number of abnormally released QoS flows. (NOTE)                                                         |               |
| relTimeUnit                                                                                                                                                                                                                                                                              | TimeUnit      | C | 0..1        | Represents the unit for the session active time, shall be present if relFlowNum is present. (NOTE)                     |               |
| relFlowRatio                                                                                                                                                                                                                                                                             | SamplingRatio | C | 0..1        | Represents the ratio of abnormally released QoS flows to the total released QoS flows, expressed in percentage. (NOTE) |               |
| NOTE: Either "relFlowNum" and its associated "relTimeUnit" attributes or "relFlowRatio" attribute shall be provided. "relFlowNum" and "relTimeUnit" attributes together represent 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 5.1.6.2.22-1: Definition of type NetworkPerfRequirement**

| Attribute name                                                                                                                                                                                                | Data type       | P | Cardinality | Description                                        | Applicability |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---|-------------|----------------------------------------------------|---------------|
| nwPerfType                                                                                                                                                                                                    | NetworkPerfType | M | 1           | The type of the network performance.               |               |
| relativeRatio                                                                                                                                                                                                 | SamplingRatio   | C | 0..1        | The relative ratio expressed in percentage. (NOTE) |               |
| absoluteNum                                                                                                                                                                                                   | UInteger        | C | 0..1        | The absolute number (NOTE)                         |               |
| 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 5.1.6.2.23-1: Definition of type NetworkPerfInfo**

| Attribute name                                                                                                                                                                                                                                                                                                                                           | Data type       | P | Cardinality | Description                                                                                                                                      | Applicability |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| networkArea                                                                                                                                                                                                                                                                                                                                              | NetworkAreaInfo | M | 1           | Identification of network area to which the subscription applies.                                                                                |               |
| nwPerfType                                                                                                                                                                                                                                                                                                                                               | NetworkPerfType | M | 1           | The type of the network performance                                                                                                              |               |
| relativeRatio                                                                                                                                                                                                                                                                                                                                            | SamplingRatio   | C | 0..1        | The reported relative ratio expressed in percentage. (NOTE 1)                                                                                    |               |
| absoluteNum                                                                                                                                                                                                                                                                                                                                              | UInteger        | C | 0..1        | The reported absolute number (NOTE 1)                                                                                                            |               |
| confidence                                                                                                                                                                                                                                                                                                                                               | UInteger        | C | 0..1        | Indicates the confidence of the prediction. (NOTE 2)<br>Shall be present if the analytics result is a prediction.<br>Minimum = 0. Maximum = 100. |               |
| 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. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. |                 |   |             |                                                                                                                                                  |               |

## 5.1.6.2.24 Type ServiceExperienceInfo

Table 5.1.6.2.24-1: Definition of type ServiceExperienceInfo

| Attribute name                                                                                                                                                                                                                                                                                                                                         | Data type       | P | Cardinality | Description                                                                                                                                                                                                                                                    | Applicability |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| svcExprc                                                                                                                                                                                                                                                                                                                                               | SvcExperience   | M | 1           | Service experience                                                                                                                                                                                                                                             |               |
| svcExprcVariance                                                                                                                                                                                                                                                                                                                                       | Float           | O | 0..1        | This attribute indicates the variance .                                                                                                                                                                                                                        |               |
| supis                                                                                                                                                                                                                                                                                                                                                  | array(Supi)     | O | 1..N        | Each element identifies a UE. May only be present if the subscription request applies to more than one UE.                                                                                                                                                     |               |
| snssai                                                                                                                                                                                                                                                                                                                                                 | Snssai          | C | 0..1        | Identifies an S-NSSAI. Shall be presented if the "snssais" was provided within EventSubscription during the subscription for event notification procedure.                                                                                                     |               |
| appld                                                                                                                                                                                                                                                                                                                                                  | ApplicationId   | C | 0..1        | Identifies an application. Shall be present if the "applds" was provided within EventSubscription during the subscription for event notification procedure.                                                                                                    |               |
| confidence                                                                                                                                                                                                                                                                                                                                             | UInteger        | C | 0..1        | Indicates the confidence of the prediction. (NOTE) Shall be present if the analytics result is a prediction. Minimum = 0. Maximum = 100.                                                                                                                       |               |
| dnn                                                                                                                                                                                                                                                                                                                                                    | Dnn             | C | 0..1        | 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. |               |
| networkArea                                                                                                                                                                                                                                                                                                                                            | NetworkAreaInfo | C | 0..1        | Identifies the network area where the service experience applies. Shall be presented if the "networkArea" was provided within EventSubscription during the subscription for event notification procedure.                                                      |               |
| nsild                                                                                                                                                                                                                                                                                                                                                  | Nsild           | C | 0..1        | Identifies a network slice instance which is associated with the S-NSSAI identified by the "snssai" attribute. Shall be presented if the "nsilds" was provided within the NsildInfo data in the EventSubscription data during the subscription.                |               |
| ratio                                                                                                                                                                                                                                                                                                                                                  | SamplingRatio   | C | 0..1        | 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.                                                                                        |               |
| NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. |                 |   |             |                                                                                                                                                                                                                                                                |               |

## 5.1.6.2.25 Type BwRequirement

Table 5.1.6.2.25-1: Definition of type BwRequirement

| Attribute name                                                                                                                          | Data type     | P | Cardinality | Description                                   | Applicability |
|-----------------------------------------------------------------------------------------------------------------------------------------|---------------|---|-------------|-----------------------------------------------|---------------|
| appld                                                                                                                                   | ApplicationId | M | 1           | Represents an application.<br>(NOTE)          |               |
| marBwUI                                                                                                                                 | BitRate       | O | 0..1        | Maximum requested bandwidth for the Uplink.   |               |
| marBwDI                                                                                                                                 | BitRate       | O | 0..1        | Maximum requested bandwidth for the Downlink. |               |
| mirBwUI                                                                                                                                 | BitRate       | O | 0..1        | Minimum requested bandwidth for the Uplink.   |               |
| mirBwDI                                                                                                                                 | BitRate       | O | 0..1        | Minimum requested bandwidth for the Downlink. |               |
| NOTE: If the "applds" attribute is provided within EventSubscription data, this attribute shall be indicated by the "applds" attribute. |               |   |             |                                               |               |

## 5.1.6.2.26 Type AdditionalMeasurement

Table 5.1.6.2.26-1: Definition of type AdditionalMeasurement

| Attribute name | Data type                      | P | Cardinality | Description                                                                                                                                                                                                    | Applicability |
|----------------|--------------------------------|---|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| unexpLoc       | NetworkAreaInfo                | C | 0..1        | The unexpected locations which the UE stays.<br>It may only be present when the "exceptId" within the Exception data sets to "UNEXPECTED_UE_LOCATION".                                                         |               |
| unexpFlowTeps  | array(IpEthFlowDescription)    | C | 1..N        | Unexpected IP or Ethernet flow templates.<br>It may only be present when the "exceptId" within the Exception data sets to "UNEXPECTED_LONG_LIVE_FLOW" or "UNEXPECTED_LARGE_RATE_FLOW".                         |               |
| unexpWakes     | array(DateTime)                | C | 1..N        | Unexpected wake up times.<br>It may only be present when the "exceptId" within the Exception data sets to "UNEXPECTED_WAKEUP".                                                                                 |               |
| ddosAttack     | AddressList                    | C | 0..1        | Victim's address list.<br>It may only be present when the "exceptId" within the Exception data sets to "SUSPICION_OF_DDOS_ATTACK".                                                                             |               |
| wrgDest        | AddressList                    | C | 0..1        | Wrong destination address list.<br>It may only be present when the "exceptId" within the Exception data sets to "WRONG_DESTINATION_ADDRESSES".                                                                 |               |
| circums        | array(CircumstanceDescription) | C | 1..N        | The description of circumstances.<br>It may only be present when the "exceptId" 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**

| Attribute name                                                          | Data type          | P | Cardinality | Description                              | Applicability |
|-------------------------------------------------------------------------|--------------------|---|-------------|------------------------------------------|---------------|
| ipTrafficFilter                                                         | FlowDescription    | C | 0..1        | Identifies IP packet filter.(NOTE)       |               |
| ethTrafficFilter                                                        | EthFlowDescription | C | 0..1        | Identifies Ethernet packet filter.(NOTE) |               |
| 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**

| Attribute name                                                      | Data type       | P | Cardinality | Description                              | Applicability |
|---------------------------------------------------------------------|-----------------|---|-------------|------------------------------------------|---------------|
| ipv4Addrs                                                           | array(Ipv4Addr) | O | 1..N        | Each element identifies an IPv4 address. |               |
| ipv6Addrs                                                           | array(Ipv6Addr) | O | 1..N        | Each element identifies an IPv6 address. |               |
| 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**

| Attribute name | Data type       | P | Cardinality | Description                                                                                                                                                        | Applicability |
|----------------|-----------------|---|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| freq           | Float           | O | 0..1        | Communication frequency of the UE in units of MHz.                                                                                                                 |               |
| tm             | DateTime        | O | 0..1        | Time when UE enters the location.                                                                                                                                  |               |
| locArea        | NetworkAreaInfo | C | 0..1        | The location of the UE.<br>It shall be present when the "exceptId" within the Exception data sets to "UNEXPECTED_RADIO_LINK_FAILURES" or "PING_PONG_ACROSS_CELLS". |               |
| vol            | Volume          | C | 0..1        | The traffic volume.<br>It shall be present when the "exceptId" within the Exception data sets to "TOO_FREQUENT_SERVICE_ACCESS" or "UNEXPECTED_LARGE_RATE_FLOW".    |               |

## 5.1.6.2.30 Type ThresholdLevel

Table 5.1.6.2.30 -1: Definition of type ThresholdLevel

| Attribute name | Data type | P | Cardinality | Description                                               | Applicability      |
|----------------|-----------|---|-------------|-----------------------------------------------------------|--------------------|
| congLevel      | integer   | C | 0..1        | Value of Congestion that triggers notification (NOTE 1)   | UserDataCongestion |
| nfLoadLevel    | integer   | C | 0..1        | Value of NF Load that triggers notification (NOTE 2)      | NfLoad             |
| nfCpuUsage     | integer   | C | 0..1        | Value of NF CPU Usage that triggers notification (NOTE 2) | NfLoad             |
| nfMemoryUsage  | integer   | C | 0..1        | Average usage of memory (NOTE 2)                          | NfLoad             |
| nfStorageUsage | integer   | C | 0..1        | Average usage of storage (NOTE 2)                         | NfLoad             |

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

| Attribute name     | Data type    | P | Cardinality | Description                                                                                                                                              | Applicability |
|--------------------|--------------|---|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| nfType             | NFType       | M | 1           | Type of the NF instance                                                                                                                                  |               |
| nfInstanceId       | NfInstanceId | M | 1           | Identification of the NF instance                                                                                                                        |               |
| nfSetId            | NfSetId      | O | 0..1        | Identification of the NF instance set                                                                                                                    |               |
| nfStatus           | NfStatus     | C | 0..1        | Availability status of the NF (NOTE 1)                                                                                                                   |               |
| nfCpuUsage         | integer      | C | 0..1        | Average usage CPU (NOTE 1) (NOTE 2)                                                                                                                      |               |
| nfMemoryUsage      | integer      | C | 0..1        | Average usage of memory (NOTE 1) (NOTE 2)                                                                                                                |               |
| nfStorageUsage     | integer      | C | 0..1        | Average usage of storage (NOTE 1) (NOTE 2)                                                                                                               |               |
| nfLoadLevelAverage | integer      | C | 0..1        | Average load information (NOTE 1) (NOTE 2)                                                                                                               |               |
| nfLoadLevelpeak    | integer      | C | 0..1        | Peak load information (NOTE 1) (NOTE 2)                                                                                                                  |               |
| snssai             | Snssai       | C | 0..1        | Identifies an S-NSSAI. Shall be present if the "snssais" was provided within EventSubscription during the subscription for event notification procedure. |               |
| confidence         | UInteger     | C | 0..1        | Indicates the confidence of the prediction. (NOTE 3) Shall be present if the analytics result is a prediction. Minimum = 0. Maximum = 100.               |               |

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. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence.

## 5.1.6.2.32 Type NfStatus

Table 5.1.6.2.32-1: Definition of type NfStatus

| Attribute name                                                                                                                                                                                                       | Data type     | P | Cardinality | Description                                            | Applicability |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---|-------------|--------------------------------------------------------|---------------|
| statusRegistered                                                                                                                                                                                                     | SamplingRatio | C | 0..1        | Percentage of time with status "registered" (NOTE)     |               |
| statusUnregistered                                                                                                                                                                                                   | SamplingRatio | C | 0..1        | Percentage of time with status "unregistered" (NOTE)   |               |
| statusUndiscoverable                                                                                                                                                                                                 | SamplingRatio | C | 0..1        | Percentage of time with status "undiscoverable" (NOTE) |               |
| 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 NsildInfo

Table 5.1.6.2.33-1: Definition of type NsildInfo

| Attribute name                                                                     | Data type    | P | Cardinality | Description                                                                                                                                                                                                              | Applicability |
|------------------------------------------------------------------------------------|--------------|---|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| snssai                                                                             | Snssai       | M | 1           | Identification of network slice to which the subscription for event notification procedure applies.                                                                                                                      |               |
| nsilds                                                                             | array(Nsild) | O | 1..N        | Identification of network slice instance(s) associated with the subscribed S-NSSAI identified by the "snssai" attribute.<br>May be included when subscribed event is "NSI_LOAD_LEVEL" or "SERVICE_EXPERIENCE".<br>(NOTE) |               |
| NOTE: This attribute is not applicable when the NF service consumer is CEF or PCF. |              |   |             |                                                                                                                                                                                                                          |               |

## 5.1.6.2.34 Type NsiLoadLevelInfo

Table 5.1.6.2.34-1: Definition of type NsiLoadLevelInfo

| Attribute name       | Data type            | P | Cardinality | Description                                                                                                                                                                                                                                              | Applicability |
|----------------------|----------------------|---|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| loadLevelInformation | LoadLevelInformation | M | 1           | Load level information of the network slice identified by the "snssai" attribute and if provided, the associated NSI ID identified by the "nsild" attribute.                                                                                             |               |
| snssai               | Snssai               | M | 1           | Identification of network slice to which the subscription applies.                                                                                                                                                                                       |               |
| nsild                | Nsild                | C | 0..1        | Identification of network slice instance associated with the S-NSSAI identified by the "snssai" attribute.<br>Shall be presented if the "nsilds" attribute was provided within the NsildInfo data in the EventSubscription data during the subscription. |               |

## 5.1.6.2.35 Type FailureEventInfo

**Table 5.1.6.2.35-1: Definition of type FailureEventInfo**

| Attribute name | Data type        | P | Cardinality | Description                   | Applicability |
|----------------|------------------|---|-------------|-------------------------------|---------------|
| event          | NwdafEvent       | M | 1           | Event that is subscribed.     |               |
| failureCode    | NwdafFailureCode | M | 1           | Identifies the failure reason |               |

## 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**

| Type Name            | Type Definition | Description                                                                                       | Applicability |
|----------------------|-----------------|---------------------------------------------------------------------------------------------------|---------------|
| AnySlice             | boolean         | "false" represents not applicable for all slices.<br>"true" represents applicable for all slices. |               |
| LoadLevelInformation | integer         | Load level information of the network slice and the optionally associated network slice instance. |               |

## 5.1.6.3.3 Enumeration: NotificationMethod

**Table 5.1.6.3.3-1: Enumeration NotificationMethod**

| Enumeration value | Description                                                                                                                                         | Applicability |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| PERIODIC          | The subscription of NWDAF Event is periodically. The periodic of the notification is identified by repetitionPeriod defined in subclause 5.1.6.2.3. |               |
| THRESHOLD         | The subscription of NWDAF Event is upon threshold exceeded.                                                                                         |               |

## 5.1.6.3.4 Enumeration: NwdafEvent

Table 5.1.6.3.4-1: Enumeration NwdafEvent

| Enumeration value    | Description                                                                                                                         | Applicability      |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| NF_LOAD              | Indicates that the event subscribed is NF Load.                                                                                     | NfLoad             |
| QOS_SUSTAINABILITY   | Indicates that the event subscribed is QoS sustainability.                                                                          | QoSSustainability  |
| SLICE_LOAD_LEVEL     | Indicates that the event subscribed is load level information of Network Slice                                                      |                    |
| SERVICE_EXPERIENCE   | Indicates that the event subscribed is service experience.                                                                          | ServiceExperience  |
| UE_MOBILITY          | Indicates that the event subscribed is UE mobility information.                                                                     | UeMobility         |
| UE_COMMUNICATION     | Indicates that the event subscribed is UE communication information.                                                                | UeCommunication    |
| ABNORMAL_BEHAVIOUR   | Indicates that the event subscribed is abnormal behaviour information.                                                              | AbnormalBehaviour  |
| USER_DATA_CONGESTION | Indicates that the event subscribed is user data congestion information                                                             | UserDataCongestion |
| NETWORK_PERFORMANCE  | Indicates that the event subscribed is network performance information                                                              | NetworkPerformance |
| NSI_LOAD_LEVEL       | Indicates that the event subscribed is load level information of Network Slice and the optionally associated Network Slice Instance | NsiLoad            |

## 5.1.6.3.5 Enumeration: Accuracy

Table 5.1.6.3.5-1: Enumeration Accuracy

| Enumeration value | Description    | Applicability |
|-------------------|----------------|---------------|
| LOW               | Low accuracy.  |               |
| HIGH              | High accuracy. |               |

## 5.1.6.3.6 Enumeration: ExceptionId

Table 5.1.6.3.6-1: Enumeration ExceptionId

| Enumeration value              | Description                            | Applicability |
|--------------------------------|----------------------------------------|---------------|
| UNEXPECTED_UE_LOCATION         | Unexpected UE location                 |               |
| UNEXPECTED_LONG_LIVE_FLOW      | Unexpected long-live rate flows        |               |
| UNEXPECTED_LARGE_RATE_FLOW     | Unexpected large rate flows            |               |
| UNEXPECTED_WAKEUP              | Unexpected wakeup                      |               |
| SUSPICION_OF_DDOS_ATTACK       | Suspicion of DDoS attack               |               |
| WRONG_DESTINATION_ADDRESS      | Wrong destination address              |               |
| TOO_FREQUENT_SERVICE_ACCESS    | Too frequent Service Access            |               |
| UNEXPECTED_RADIO_LINK_FAILURES | Unexpected radio link failures         |               |
| PING_PONG_ACROSS_CELLS         | Ping-ponging across neighbouring cells |               |

## 5.1.6.3.7 Enumeration: ExceptionTrend

**Table 5.1.6.3.7-1: Enumeration ExceptionTrend**

| Enumeration value | Description                           | Applicability |
|-------------------|---------------------------------------|---------------|
| UP                | Up trend of the exception level.      |               |
| DOWN              | Down trend of the exception level.    |               |
| UNKNOWN           | Unknown trend of the exception level. |               |
| STABLE            | Stable trend of the exception level.  |               |

## 5.1.6.3.8 Enumeration: CongestionType

**Table 5.1.6.3.8-1: Enumeration CongestionType**

| Enumeration value      | Description                                                    | Applicability |
|------------------------|----------------------------------------------------------------|---------------|
| USER_PLANE             | The congestion analytics type is User Plane.                   |               |
| CONTROL_PLANE          | The congestion analytics type is Control Plane.                |               |
| USER_AND_CONTROL_PLANE | The congestion analytics type is User Plane and Control Plane. |               |

## 5.1.6.3.9 Enumeration: TimeUnit

**Table 5.1.6.3.9-1: Enumeration TimeUnit**

| Enumeration value | Description              | Applicability |
|-------------------|--------------------------|---------------|
| MINUTE            | Time unit is per minute. |               |
| HOURL             | Time unit is per hour.   |               |
| DAY               | Time unit is per day.    |               |

## 5.1.6.3.10 Enumeration: NetworkPerfType

**Table 5.1.6.3.10-1: Enumeration NetworkPerfType**

| Enumeration value   | Description                                                                                | Applicability |
|---------------------|--------------------------------------------------------------------------------------------|---------------|
| GNB_ACTIVE_RATIO    | Indicates the ratio of gNB active (i.e. up and running) number to the total number of gNB. |               |
| GNB_COMPUTING_USAGE | Indicates gNodeB computing resource usage.                                                 |               |
| GNB_MEMORY_USAGE    | Indicates gNodeB memory usage.                                                             |               |
| GNB_DISK_USAGE      | Indicates gNodeB disk usage.                                                               |               |
| NUM_OF_UE           | Indicates number of UEs.                                                                   |               |
| SESS_SUCC_RATIO     | Indicates ratio of successful setup of PDU sessions to total PDU session setup attempts.   |               |
| HO_SUCC_RATIO       | Indicates Ratio of successful handovers to the total handover attempts.                    |               |

## 5.1.6.3.11 Enumeration: ExpectedAnalyticsType

**Table 5.1.6.3.11-1: Enumeration ExpectedAnalyticsType**

| Enumeration value   | Description                                                                                      | Applicability |
|---------------------|--------------------------------------------------------------------------------------------------|---------------|
| MOBILITY            | Mobility related abnormal behaviour analytics is expected by the consumer                        |               |
| COMMUN              | Communication related abnormal behaviour analytics is expected by the consumer                   |               |
| MOBILITY_AND_COMMUN | Both mobility and communication related abnormal behaviour analytics is expected by the consumer |               |

## 5.1.6.3.12 Enumeration: MatchingDirection

**Table 5.1.6.3.12-1: Enumeration MatchingDirection**

| Enumeration value | Description                                                       | Applicability |
|-------------------|-------------------------------------------------------------------|---------------|
| ASCENDING         | Threshold is crossed in ascending direction.                      |               |
| DESCENDING        | Threshold is crossed in descending direction.                     |               |
| CROSSED           | Threshold is crossed either in ascending or descending direction. |               |

## 5.1.6.3.13 Enumeration: NwdafFailureCode

**Table 5.1.6.3.13-1: Enumeration NwdafFailureCode**

| Enumeration value          | Description                                                                                                                                                                                                                                   | Applicability |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| UNAVAILABLE_DATA           | Indicates the requested statistics information for the event is rejected since necessary data to perform the service is unavailable.                                                                                                          |               |
| BOTH_STAT_PRED_NOT_ALLOWED | Indicates the requested analysis information for the event is rejected since the start time is in the past and the end time is in the future, which means the NF service consumer requested both statistics and prediction for the analytics. |               |
| OTHER                      | Indicates the requested analysis information for the event is rejected due to other reasons.                                                                                                                                                  |               |

## 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.

**Table 5.1.7.3-1: Application errors**

| Application Error                                                                                                                                                               | HTTP status code          | Description                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SUBSCRIPTION_NOT_FOUND                                                                                                                                                          | 404 Not Found             | Indicates the Individual NWDAF Event Subscription resource does not exist. (NOTE)                                                                                                                      |
| BOTH_STAT_PRED_NOT_ALLOWED                                                                                                                                                      | 400 Bad Request           | 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. |
| UNAVAILABLE_DATA                                                                                                                                                                | 500 Internal Server Error | Indicates the requested statistics in the past is rejected since necessary data to perform the service is unavailable.                                                                                 |
| NOTE 1: This application error is only applicable for the responses to the PUT request (see subclause 4.2.2.3) and the DELETE request (see subclause 4.2.2.3.2).                |                           |                                                                                                                                                                                                        |
| NOTE 2: Including a "ProblemDetails" data structure with the "cause" attribute in the HTTP response is optional unless explicitly mandated in the service operation subclauses. |                           |                                                                                                                                                                                                        |

### 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 5.1.8-1: Supported Features**

| Feature number | Feature Name       | Description                                                                                                                                                                                                                                                                                                                                                    |
|----------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1              | ServiceExperience  | This feature indicates support for the event related to service experience.                                                                                                                                                                                                                                                                                    |
| 2              | UeMobility         | This feature indicates the support of analytics based on UE mobility information.                                                                                                                                                                                                                                                                              |
| 3              | UeCommunication    | This feature indicates the support of analytics based on UE communication information.                                                                                                                                                                                                                                                                         |
| 4              | QoSsustainability  | This feature indicates support for the event related to QoS sustainability.                                                                                                                                                                                                                                                                                    |
| 5              | AbnormalBehaviour  | This feature indicates support for the event related to abnormal behaviour information.                                                                                                                                                                                                                                                                        |
| 6              | UserDataCongestion | This feature indicates support for the event related to user data congestion.                                                                                                                                                                                                                                                                                  |
| 7              | NfLoad             | This feature indicates the support of the analytics related to the load of NF instances.                                                                                                                                                                                                                                                                       |
| 8              | NetworkPerformance | This feature indicates the support of analytics based on network performance.                                                                                                                                                                                                                                                                                  |
| 9              | NsiLoad            | This feature indicates the support of the event related to the load level of Network Slice and the optionally associated Network Slice Instance.                                                                                                                                                                                                               |
| 10             | ES3XX              | Extended Support for 3xx redirections. This feature indicates the support of redirection for any service operation, according to Stateless NF procedures as specified in subclauses 6.5.3.2 and 6.5.3.3 of 3GPP TS 29.500 [6] and according to HTTP redirection principles for indirect communication, as specified in subclause 6.10.9 of 3GPP TS 29.500 [6]. |

### 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, a n 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

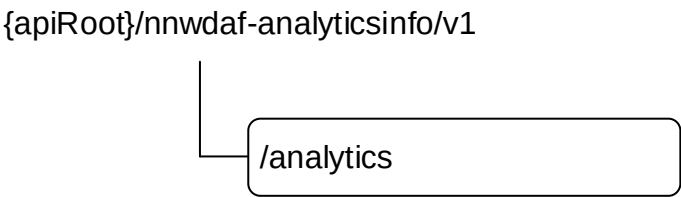


Figure 5.2.3.1-1: Resource URI structure of the Nnwdaf\_AnalyticsInfo API

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

Table 5.2.3.1-1: Resources and methods overview

| Resource name   | Resource URI | HTTP method or custom operation | Description                  |
|-----------------|--------------|---------------------------------|------------------------------|
| NWDAF Analytics | /analytics   | GET                             | Retrieve the NWDAF analytics |

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 5.2.3.2.2-1: Resource URI variables for this resource

| Name    | Data type | Definition          |
|---------|-----------|---------------------|
| apiRoot | string    | See subclause 5.2.1 |

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**

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

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**

| Data type | P | Cardinality | Description |
|-----------|---|-------------|-------------|
| n/a       |   |             |             |

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

| Data type                                                                                                                  | P | Cardinality | Response codes | Description                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------|---|-------------|----------------|-----------------------------------------------------------------------------------------------------|
| AnalyticsData                                                                                                              | M | 1           | 200 OK         | Containing the analytics with parameters as relevant for the requesting NF service consumer         |
| n/a                                                                                                                        |   |             | 204 No Content | If the request NWDAF Analytics data does not exist, the NWDAF shall respond with "204 No Content ". |
| 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**

| Data type     | Section defined | Description                                                            | Applicability |
|---------------|-----------------|------------------------------------------------------------------------|---------------|
| AnalyticsData | 5.2.6.2.2       | Describes analytics with parameters indicated in the request           |               |
| EventFilter   | 5.2.6.2.3       | Represents the event filters used to identify the requested analytics. |               |
| EventId       | 5.2.6.3.3       | Describes the type of analytics.                                       |               |

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.

Re-used data types of clause 5.1.6 refer here to requests instead of subscriptions.

Table 5.2.6.1-2: Nnwdaf\_AnalyticsInfo re-used Data Types

| Data type                 | Reference           | Comments                                                                                        | Applicability                                                                                                                  |
|---------------------------|---------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Accuracy                  | 5.1.6.3.5           | Represents the preferred level of accuracy of the analytics.                                    |                                                                                                                                |
| AnySlice                  | 5.1.6.3.2           |                                                                                                 |                                                                                                                                |
| ApplicationId             | 3GPP TS 29.571 [8]  | Identifies the application.                                                                     | ServiceExperience<br>UeCommunication<br>AbnormalBehaviour                                                                      |
| BwRequirement             | 5.1.6.2.25          |                                                                                                 | ServiceExperience                                                                                                              |
| DateTime                  | 3GPP TS 29.571 [8]  | Identifies the time.                                                                            |                                                                                                                                |
| Dnn                       | 3GPP TS 29.571 [8]  | Identifies the DNN.                                                                             | ServiceExperience<br>AbnormalBehaviour<br>UeCommunication                                                                      |
| Dnai                      | 3GPP TS 29.571 [8]  | Identifies a user plane access to one or more DN(s)                                             | ServiceExperience                                                                                                              |
| EventReportingRequirement | 5.1.6.2.7           |                                                                                                 |                                                                                                                                |
| ExceptionId               | 5.1.6.3.6           |                                                                                                 | AbnormalBehaviour                                                                                                              |
| ExpectedUeBehaviourData   | 3GPP TS 29.503 [23] |                                                                                                 | AbnormalBehaviour                                                                                                              |
| ExpectedAnalyticsType     | 5.1.6.3.11          |                                                                                                 | AbnormalBehaviour                                                                                                              |
| GroupId                   | 3GPP TS 29.571 [8]  | Internal Group Identifier of a group of UEs                                                     | UeMobility<br>UeCommunication<br>NetworkPerformance<br>AbnormalBehaviour<br>ServiceExperience                                  |
| NetworkAreaInfo           | 3GPP TS 29.554 [18] | The network area information.                                                                   | UeMobility<br>NetworkPerformance<br>QoSsustainability<br>ServiceExperience<br>UserDataCongestion<br>AbnormalBehaviour          |
| NetworkPerfInfo           | 5.1.6.2.23          |                                                                                                 | NetworkPerformance                                                                                                             |
| NetworkPerfType           | 5.1.6.3.10          | Represents the network performance types.                                                       | NetworkPerformance                                                                                                             |
| NfLoadLevelInformation    | 5.1.6.2.31          | Represents load level information of a given NF instance.                                       | NfLoad                                                                                                                         |
| NfInstanceId              | 3GPP TS 29.571 [8]  | Identifies an NF instance                                                                       | NfLoad                                                                                                                         |
| NfSetId                   | 3GPP TS 29.571 [8]  | Identifies an NF Set instance                                                                   | NfLoad                                                                                                                         |
| NFType                    | 3GPP TS 29.510 [12] | Identifies a type of NF                                                                         | NfLoad                                                                                                                         |
| NsId                      | 3GPP TS 29.531 [24] | Identifies a Network Slice Instance                                                             | ServiceExperience<br>NsiLoad                                                                                                   |
| NsIdInfo                  | 5.1.6.2.33          | Identify the S-NSSAI and the associated Network Slice Instance(s).                              | ServiceExperience<br>NsiLoad                                                                                                   |
| NsiLoadLevelInfo          | 5.1.6.2.34          | Represents the load level information for an S-NSSAI and the associated network slice instance. | NsiLoad                                                                                                                        |
| ProblemDetails            | 3GPP TS 29.571 [8]  | Used in error responses to provide more detailed information about an error.                    |                                                                                                                                |
| QosRequirement            | 5.1.6.2.20          |                                                                                                 | QoSsustainability                                                                                                              |
| QosSustainabilityInfo     | 5.1.6.2.19          |                                                                                                 | QoSsustainability                                                                                                              |
| SamplingRatio             | 3GPP TS 29.571 [8]  |                                                                                                 |                                                                                                                                |
| ServiceExperienceInfo     | 5.1.6.2.24          |                                                                                                 | ServiceExperience                                                                                                              |
| Supi                      | 3GPP TS 29.571 [8]  | Identifies the UE.                                                                              | ServiceExperience,<br>NfLoad<br>NetworkPerformance<br>UserDataCongestion<br>UeMobility<br>UeCommunication<br>AbnormalBehaviour |

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

## 5.2.6.2 Structured data types

### 5.2.6.2.1 Introduction

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

## 5.2.6.2.2 Type AnalyticsData

Table 5.2.6.2.2-1: Definition of type AnalyticsData

| Attribute name                                                                                                  | Data type                        | P | Cardinality | Description                                                                                                                                                                                                                                   | Applicability      |
|-----------------------------------------------------------------------------------------------------------------|----------------------------------|---|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| expiry                                                                                                          | DateTime                         | O | 0..1        | It defines the expiration time after which the analytics information will become invalid.                                                                                                                                                     |                    |
| timeStampGen                                                                                                    | DateTime                         | O | 0..1        | It defines the timestamp of analytics generation.                                                                                                                                                                                             |                    |
| sliceLoadLevelInfos                                                                                             | array(SliceLoadLevelInformation) | C | 1..N        | The slices and the load level information. Shall be present when the requested event is "LOAD_LEVEL_INFORMATION".                                                                                                                             |                    |
| nsiLoadLevelInfos                                                                                               | array(NsiLoadLevelInfo)          | C | 1..N        | 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 "NSI_LOAD_LEVEL"                                                       | NsiLoad            |
| nwPerfs                                                                                                         | array(NetworkPerfInfo)           | C | 1..N        | The network performance information. Shall be present when the requested event is "NETWORK_PERFORMANCE".                                                                                                                                      | NetworkPerformance |
| nfLoadLevelInfos                                                                                                | array(NfLoadLevelInformation)    | C | 1..N        | The NF load information. When the requested event is "NF_LOAD", the nfLoadLevelInfos shall be included.                                                                                                                                       | NfLoad             |
| qosSustainInfos                                                                                                 | array(QosSustainabilityInfo)     | C | 1..N        | The QoS sustainability informations in the certain geographic areas. It shall present if the requested event is "QOS_SUSTAINABILITY". (NOTE)                                                                                                  | QoS Sustainability |
| ueMobs                                                                                                          | array(UeMobility)                | C | 1..N        | The UE mobility information. When the requested event is "UE_MOBILITY", the "ueMobs" attribute shall be included.                                                                                                                             | UeMobility         |
| ueComms                                                                                                         | array(UeCommunication)           | C | 1..N        | The UE communication information. When the requested event is "UE_COMMUNICATION", the "ueComms" attribute shall be included.                                                                                                                  | UeCommunication    |
| userDataCongInfos                                                                                               | array(UserDataCongestionInfo)    | C | 1..N        | The user data congestion information. Shall be present when the requested event is "USER_DATA_CONGESTION".                                                                                                                                    | UserDataCongestion |
| suppFeat                                                                                                        | SupportedFeatures                | C | 0..1        | List of Supported features used as described in subclause 5.2.8. This parameter shall be supplied by NWDAF in the reply of GET request that request the analytics resource, if the consumer includes "supported-features" in the GET request. |                    |
| svcExps                                                                                                         | array(ServiceExperienceInfo)     | C | 1..N        | The service experience information.                                                                                                                                                                                                           | ServiceExperience  |
| abnorBehavrs                                                                                                    | array(AbnormalBehaviour)         | C | 1..N        | The abnormal behaviour information.                                                                                                                                                                                                           | AbnormalBehaviour  |
| NOTE: The "qosFlowRetThd" and "ranUeThrouThd" attributes in QosSustainabilityInfo data type are not applicable. |                                  |   |             |                                                                                                                                                                                                                                               |                    |

5.2.6.2.3           Type EventFilter

**Table 5.2.6.2.3-1: Definition of type EventFilter**

| Attribute name | Data type                     | P | Cardinality | Description                                                                                                                                                                                                      | Applicability                                                                                                                            |
|----------------|-------------------------------|---|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| anySlice       | AnySlice                      | C | 0..1        | Default is "false". (NOTE 1)                                                                                                                                                                                     |                                                                                                                                          |
| applds         | array(ApplicationId)          | C | 1..N        | Identification(s) of application. The absence of applds means applicable to all applications. (NOTE 4)                                                                                                           | ServiceExperience<br>UeCommunication<br>AbnormalBehaviour                                                                                |
| dnns           | array(Dnn)                    | C | 1..N        | 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. The absence of dnns means applicable to all DNNs. (NOTE 4) | ServiceExperience<br>UeCommunication<br>AbnormalBehaviour                                                                                |
| dnais          | array(Dnai)                   | C | 1..N        | Identification(s) of user plane accesses to DN(s) where applications are deployed. It may be included when event-id is "SERVICE_EXPERIENCE".                                                                     | ServiceExperience                                                                                                                        |
| snssais        | array(Snssai)                 | C | 1..N        | Identification(s) of network slice. (NOTE 1), (NOTE 4)                                                                                                                                                           |                                                                                                                                          |
| nfInstancelds  | array(NfInstanceId)           | O | 1..N        | Identification(s) of NF instances.                                                                                                                                                                               | NfLoad                                                                                                                                   |
| nfSetlds       | array(NfSetId)                | O | 1..N        | Identification(s) of NF instance sets.                                                                                                                                                                           | NfLoad                                                                                                                                   |
| nfTypes        | array(NFType)                 | O | 1..N        | Identification(s) of NF types.                                                                                                                                                                                   | NfLoad                                                                                                                                   |
| networkArea    | NetworkAreaInfo               | C | 0..1        | This IE represents the network area where the NF service consumer wants to know the analytics result. (NOTE 2), (NOTE 4)                                                                                         | UeMobility<br>UeCommunication<br>NetworkPerformance<br>QoSSustainability<br>ServiceExperience<br>UserDataCongestion<br>AbnormalBehaviour |
| nsildInfos     | array(NsildInfo)              | O | 1..N        | Each element identifies the S-NSSAI and the optionally associated network slice instance(s). May be included when subscribed event is "NSI_LOAD_LEVEL" or "SERVICE_EXPERIENCE". (NOTE 1)                         | ServiceExperience<br>NsiLoad                                                                                                             |
| nwPerfTypes    | array(NetworkPerformanceType) | C | 1..N        | Represents the network performance types. This attribute shall be included when event-id is "NETWORK_PERFORMANCE".                                                                                               | NetworkPerformance                                                                                                                       |
| qosRequ        | QoSRequirement                | C | 0..1        | Represents the QoS requirements. This attribute shall be included when event-id is "QOS_SUSTAINABILITY".                                                                                                         | QoSSustainability                                                                                                                        |
| bwRequs        | array(BwRequirement)          | O | 1..N        | Represents the media/application bandwidth requirement for each application. It may only be present if "applds" attribute is provided.                                                                           | ServiceExperience                                                                                                                        |
| exceplds       | array(ExceptionId)            | C | 1..N        | Represents a list of Exception Ids. (NOTE 3)                                                                                                                                                                     | AbnormalBehaviour                                                                                                                        |
| exptAnaType    | ExpectedAnalyticsType         | C | 0..1        | Represents expected UE analytics type. (NOTE 3)                                                                                                                                                                  | AbnormalBehaviour                                                                                                                        |
| exptUeBehav    | ExpectedUeBehaviourData       | O | 0..1        | Represents expected UE behaviour.                                                                                                                                                                                | AbnormalBehaviour                                                                                                                        |

|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NOTE 1: | The "anySlice" attribute is not applicable to features "UeMobility" and "NetworkPerformance". The "snssais" attribute is not applicable to features "ServiceExperience", "NsiLoad", "UeMobility" and "NetworkPerformance". When event-id in the request is "LOAD_LEVEL_INFORMATION", the identifications of network slices, either information about slice(s) identified by the "snssais" attribute, or "anySlice" set to "true", shall be included. When subscribed event is "NSI_LOAD_LEVEL" or "SERVICE_EXPERIENCE", teither the "nsildInfos" attribute or anySlice set to "true" shall be included. When subscribed event is "QOS_SUSTAINABILITY", "NF_LOAD", "UE_COMMUNICATION", "ABNORMAL_BEHAVIOUR" or "USER_DATA_CONGESTION", the identifications of network slices identified by the "snssais" attribute is optional.                                             |
| NOTE 2: | For "NETWORK_PERFORMANCE", "SERVICE_EXPERIENCE" or "USER_DATA_CONGESTION" event, this attribute shall be provided if the event applied for all UEs (i.e. "anyUe" attribute set to true). 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".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| NOTE 4: | For "ABNORMAL_BEHAVIOUR" event with "anyUe" attribute in "tgt-ue" attribute sets to true, <ul style="list-style-type: none"> <li>- at least one of the "networkArea" and the "snssais" attribute should be included, if the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via the "exceptIds" attribute is mobility related;</li> <li>- at least one of the "networkArea", "applds", "dnns" and "snssais" attribute should be included, if the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via the "exceptIds" attribute is communication related;</li> <li>- the expected analytics type via the "exptAnaType" attribute or the list of Exception Ids via "exceptIds" attribute shall not be requested for both mobility and communication related analytics at the same time.</li> </ul> |

#### 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**

| Type Name | Type Definition | Description | Applicability |
|-----------|-----------------|-------------|---------------|
| n/a       |                 |             |               |

## 5.2.6.3.3 Enumeration: EventId

**Table 5.2.6.3.3-1: Enumeration EventId**

| Enumeration value      | Description                                                                                                              | Applicability      |
|------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------|
| LOAD_LEVEL_INFORMATION | Represents the analytics of load level information of corresponding network slice.                                       |                    |
| NETWORK_PERFORMANCE    | Represents the analytics of network performance information                                                              | NetworkPerformance |
| NF_LOAD                | Represents the analytics of NF Load information.                                                                         | NfLoad             |
| QOS_SUSTAINABILITY     | Represents the analytics of QoS sustainability in the certain area.                                                      | QoSSustainability  |
| SERVICE_EXPERIENCE     | Represents the analytics of service experience of corresponding application and/or network slice.                        | ServiceExperience  |
| UE_MOBILITY            | Represents the analytics of UE mobility.                                                                                 | UeMobility         |
| UE_COMMUNICATION       | Represents the analytics of UE communication.                                                                            | UeCommunication    |
| USER_DATA_CONGESTION   | Represents the analytics of the user data congestion in the certain area.                                                | UserDataCongestion |
| ABNORMAL_BEHAVIOUR     | Represents the analytics of abnormal behaviour information.                                                              | AbnormalBehaviour  |
| NSI_LOAD_LEVEL         | Represents the analytics of load level information of Network Slice and the optionally associated Network Slice Instance | NsiLoad            |

## 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.

**Table 5.2.7.3-1: Application errors**

| Application Error                                                                                                                                                             | HTTP status code          | Description                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BOTH_STAT_PRED_NOT_ALLOWED                                                                                                                                                    | 400 Bad Request           | 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. |
| UNAVAILABLE_DATA                                                                                                                                                              | 500 Internal Server Error | Indicates the requested statistics in the past is rejected since necessary data to perform the service is unavailable.                                                                                 |
| NOTE: Including a "ProblemDetails" data structure with the "cause" attribute in the HTTP response is optional unless explicitly mandated in the service operation subclauses. |                           |                                                                                                                                                                                                        |

## 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**

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

## 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, a n 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 APIs.

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, that uses the GitLab software version control system (see clause 5B of the 3GPP TR 21.900 [16] and subclause 5.3.1 of the 3GPP TS 29.501 [7] for further information).

## A.2 Nnwdaf\_EventsSubscription API

```

openapi: 3.0.0
info:
  version: 1.1.0
  title: Nnwdaf_EventsSubscription
  description: |
    Nnwdaf_EventsSubscription Service API.
    © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.520 V16.15.0; 5G System; Network Data Analytics Services.
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.520/'
security:
  - {}
  - oAuth2ClientCredentials:
      - nnwdaf-eventssubscription
servers:
  - url: '{apiRoot}/nnwdaf-eventssubscription/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 4.4 of 3GPP TS 29.501.
paths:
  /subscriptions:
    post:
      summary: Create a new Individual NWDAF Events Subscription
      operationId: CreateNWDAFEventsSubscription
      tags:
        - NWDAF Events Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NnwdafEventsSubscription'
      responses:
        '201':
          description: Create a new Individual NWDAF Event Subscription resource.
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nnwdaf-eventssubscription/v1/subscriptions/{subscriptionId}'
              required: true
              schema:
                type: string
          content:
            application/json:

```

```

    schema:
      $ref: '#/components/schemas/NnwdafEventsSubscription'
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '401':
    $ref: 'TS29571_CommonData.yaml#/components/responses/401'
  '403':
    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '411':
    $ref: 'TS29571_CommonData.yaml#/components/responses/411'
  '413':
    $ref: 'TS29571_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29571_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29571_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'
callbacks:
  myNotification:
    '{$request.body#/notificationURI}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/NnwdafEventsSubscriptionNotification'
                minItems: 1
        responses:
          '204':
            description: The receipt of the Notification is acknowledged.
          '307':
            $ref: 'TS29571_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29571_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29571_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29571_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29571_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29571_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29571_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29571_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29571_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29571_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29571_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29571_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29571_CommonData.yaml#/components/responses/default'
/subscriptions/{subscriptionId}:
  delete:
    summary: Delete an existing Individual NWDAF Events Subscription
    operationId: DeleteNWDafEventsSubscription
    tags:
      - Individual NWDAF Events Subscription (Document)
    parameters:
      - name: subscriptionId
        in: path
        description: String identifying a subscription to the Nnwdaf_EventsSubscription Service
        required: true
        schema:

```

```

      type: string
    responses:
      '204':
        description: No Content. The Individual NWDAF Event Subscription resource matching the
subscriptionId was deleted.
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        description: The Individual NWDAF Event Subscription resource does not exist.
        content:
          application/problem+json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '501':
        $ref: 'TS29571_CommonData.yaml#/components/responses/501'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
    default:
      $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  put:
    summary: Update an existing Individual NWDAF Events Subscription
    operationId: UpdateNWDAFEventsSubscription
    tags:
      - Individual NWDAF Events Subscription (Document)
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/NnwdafeventsSubscription'
    parameters:
      - name: subscriptionId
        in: path
        description: String identifying a subscription to the NnwdafeventsSubscription Service
        required: true
        schema:
          type: string
    responses:
      '200':
        description: The Individual NWDAF Event Subscription resource was modified successfully
and a representation of that resource is returned.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NnwdafeventsSubscription'
      '204':
        description: The Individual NWDAF Event Subscription resource was modified successfully.
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        description: The Individual NWDAF Event Subscription resource does not exist.
        content:
          application/problem+json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':

```

```

    $ref: 'TS29571_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29571_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29571_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '501':
    $ref: 'TS29571_CommonData.yaml#/components/responses/501'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nnwdaf-eventssubscription: Access to the Nnwdaf_EventsSubscription API
  schemas:
    NnwdafEventsSubscription:
      type: object
      properties:
        eventSubscriptions:
          type: array
          items:
            $ref: '#/components/schemas/EventSubscription'
          minItems: 1
          description: Subscribed events
        evtReq:
          $ref: 'TS29523_Npcf_EventExposure.yaml#/components/schemas/ReportingInformation'
        notificationURI:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        eventNotifications:
          type: array
          items:
            $ref: '#/components/schemas/EventNotification'
          minItems: 1
        failEventReports:
          type: array
          items:
            $ref: '#/components/schemas/FailureEventInfo'
          minItems: 1
      required:
        - eventSubscriptions
    EventSubscription:
      type: object
      properties:
        anySlice:
          $ref: '#/components/schemas/AnySlice'
        appIds:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
          minItems: 1
          description: Identification(s) of application to which the subscription applies.
        dnns:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
          minItems: 1
          description: Identification(s) of DNN to which the subscription applies.
        dnais:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnai'
          minItems: 1
        event:
          $ref: '#/components/schemas/NwdafEvent'
        extraReportReq:
          $ref: '#/components/schemas/EventReportingRequirement'
        loadLevelThreshold:
          type: integer

```

description: Indicates that the NWDAF shall report the corresponding network slice load level to the NF service consumer where the load level of the network slice identified by snssais is reached.

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

matchingDir:  
\$ref: '#/components/schemas/MatchingDirection'

nfLoadLvlThds:  
type: array  
items:  
\$ref: '#/components/schemas/ThresholdLevel'

minItems: 1

description: Shall be supplied in order to start reporting when an average load level is reached.

nfInstanceIds:  
type: array  
items:  
\$ref: 'TS29571\_CommonData.yaml#/components/schemas/NfInstanceId'  
minItems: 1

nfSetIds:  
type: array  
items:  
\$ref: 'TS29571\_CommonData.yaml#/components/schemas/NfSetId'  
minItems: 1

nfTypes:  
type: array  
items:  
\$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/NFType'  
minItems: 1

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

nsiIdInfos:  
type: array  
items:  
\$ref: '#/components/schemas/NsiIdInfo'  
minItems: 1

nsiLevelThrs:  
type: array  
items:  
\$ref: 'TS29571\_CommonData.yaml#/components/schemas/UInteger'  
minItems: 1

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

qosFlowRetThds:  
type: array  
items:  
\$ref: '#/components/schemas/RetainabilityThreshold'  
minItems: 1

ranUeThrouThds:  
type: array  
items:  
\$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'  
minItems: 1

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

snssaia:  
type: array  
items:  
\$ref: 'TS29571\_CommonData.yaml#/components/schemas/Snssai'  
minItems: 1

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

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

congThresholds:  
type: array  
items:  
\$ref: '#/components/schemas/ThresholdLevel'  
minItems: 1

nwPerfRequs:  
type: array  
items:  
\$ref: '#/components/schemas/NetworkPerfRequirement'  
minItems: 1

bwRequs:

```
    type: array
    items:
      $ref: '#/components/schemas/BwRequirement'
    minItems: 1
  excepReqs:
    type: array
    items:
      $ref: '#/components/schemas/Exception'
    minItems: 1
  exptAnaType:
    $ref: '#/components/schemas/ExpectedAnalyticsType'
  exptUeBehav:
    $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/ExpectedUeBehaviourData'
  required:
    - event
NnwdafEventsSubscriptionNotification:
  type: object
  properties:
    eventNotifications:
      type: array
      items:
        $ref: '#/components/schemas/EventNotification'
      minItems: 1
      description: Notifications about Individual Events
    subscriptionId:
      type: string
      description: String identifying a subscription to the Nnwdaf_EventsSubscription Service
  required:
    - eventNotifications
    - subscriptionId
EventNotification:
  type: object
  properties:
    event:
      $ref: '#/components/schemas/NwdafEvent'
    expiry:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
    timeStampGen:
      $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'
      supis:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        minItems: 1
      snssai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      appId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
      confidence:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/UInteger'
      dnn:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
      networkArea:
        $ref: 'TS29554_Npcf_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'
      nsiId:
        $ref: 'TS29531_Nnssf_NSSelection.yaml#/components/schemas/NsiId'
      ratio:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SamplingRatio'
    required:
      - svcExprc
  BwRequirement:
    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 applies.
    required:
      - loadLevelInformation
      - snssais
  NsiLoadLevelInfo:
    description: Represents the network slice and optionally the associated network slice instance
    and the load level information.
    type: object
    properties:
      loadLevelInformation:
        $ref: '#/components/schemas/LoadLevelInformation'
      snssai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      nsiId:
        $ref: 'TS29531_Nnssf_NSSelection.yaml#/components/schemas/NsiId'

```

```

    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'
      timeAnaNeeded:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
  TargetUeInformation:
    type: object
    properties:
      anyUe:
        type: boolean
      supis:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        minItems: 1
      intGroupIds:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
        minItems: 1
  UeMobility:
    type: object
    properties:
      ts:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      recurringTime:
        $ref: 'TS29122_CpProvisioning.yaml#/components/schemas/ScheduledCommunicationTime'
      duration:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
      durationVariance:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Float'
      locInfos:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/LocationInfo'
        minItems: 1
    allof:
      - required: [duration]
      - required: [locInfos]
      - oneOf:
          - required: [ts]
          - required: [recurringTime]
  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/UInteger'
  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:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/UInteger'
    allOf:
      - required: [commDur]
      - required: [trafChar]
      - oneOf:
          - required: [ts]
          - required: [recurringTime]
  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'
    anyOf:
      - required: [ulVol]
      - required: [dlVol]
  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
  QoSustainabilityInfo:
    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'
    oneOf:
      - required: [qosFlowRetThd]
      - required: [ranUeThrouThd]
  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:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/QoSResourceType'
      pdb:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PacketDelBudget'
      per:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PacketErrRate'
    oneOf:
      - required: [5qi]
      - required: [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'
  allOf:
    - required: [nfType]
    - required: [nfInstanceId]
    - anyOf:
      - required: [nfStatus]
      - required: [nfCpuUsage]
      - required: [nfMemoryUsage]
      - required: [nfStorageUsage]
      - required: [nfLoadLevelAverage]
      - required: [nfLoadLevelpeak]
  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'
    anyOf:
      - required: [statusRegistered]
      - required: [statusUnregistered]
      - required: [statusUndiscoverable]
  AnySlice:
    type: boolean
    description: false represents not applicable for all slices. true represents applicable for
all slices.
  LoadLevelInformation:
    type: integer
    description: Load level information of the network slice and the optionally associated network
slice instance.
  AbnormalBehaviour:
    type: object
    properties:
      supis:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        minItems: 1
      excep:
        $ref: '##/components/schemas/Exception'
      dnn:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
      snssai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      ratio:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SamplingRatio'
      confidence:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/UInteger'
      addtMeasInfo:
        $ref: '##/components/schemas/AdditionalMeasurement'
    required:
      - excep
  Exception:
    type: object
    properties:
      excepId:
        $ref: '##/components/schemas/ExceptionId'
      excepLevel:
        type: integer
      excepTrend:
        $ref: '##/components/schemas/ExceptionTrend'
    required:
      - excepId
  AdditionalMeasurement:
    type: object
    properties:
      unexpLoc:
        $ref: 'TS29554_Npcf_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'
      unexpFlowTeps:
        type: array
        items:
          $ref: '##/components/schemas/IpEthFlowDescription'
        minItems: 1
      unexpWakes:
        type: array

```

```

      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      minItems: 1
    ddosAttack:
      $ref: '##/components/schemas/AddressList'
    wrgDest:
      $ref: '##/components/schemas/AddressList'
    circums:
      type: array
      items:
        $ref: '##/components/schemas/CircumstanceDescription'
      minItems: 1
  IpEthFlowDescription:
    type: object
    properties:
      ipTrafficFilter:
        $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/FlowDescription'
      ethTrafficFilter:
        $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
    oneOf:
      - required: [ipTrafficFilter]
      - required: [ethTrafficFilter]
  AddressList:
    type: object
    properties:
      ipv4Addrs:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        minItems: 1
      ipv6Addrs:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
        minItems: 1
  CircumstanceDescription:
    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/Uinteger'
      relTimeUnit:
        $ref: '##/components/schemas/TimeUnit'
      relFlowRatio:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SamplingRatio'
    oneOf:
      - allOf:
          - required: [relFlowNum]
          - required: [relTimeUnit]
          - required: [relFlowRatio]
  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'
    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'
  allOf:
    - required: [networkArea]
    - required: [nwPerfType]
    - oneOf:
      - required: [relativeRatio]
      - required: [absoluteNum]
FailureEventInfo:
  type: object
  properties:
    event:
      $ref: '#/components/schemas/NwdafEvent'
    failureCode:
      $ref: '#/components/schemas/NwdafFailureCode'
  required:
    - event
    - failureCode
NotificationMethod:
  anyOf:
    - type: string
      enum:
        - PERIODIC
        - THRESHOLD
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
      description: >
        Possible values are
        - PERIODIC: The subscribe of NWDAF Event is periodically. The periodic of the notification
is identified by repetitionPeriod defined in subclause 5.1.6.2.3.
        - THRESHOLD: The subscribe of NWDAF Event is upon threshold exceeded. The threshold of the
notification is identified by loadLevelThreshold defined in subclause 5.1.6.2.3.
NwdafEvent:
  anyOf:
    - type: string
      enum:
        - SLICE_LOAD_LEVEL
        - NETWORK_PERFORMANCE
        - NF_LOAD
        - SERVICE_EXPERIENCE
        - UE_MOBILITY
        - UE_COMMUNICATION
        - QOS_SUSTAINABILITY
        - ABNORMAL_BEHAVIOUR
        - USER_DATA_CONGESTION
        - NSI_LOAD_LEVEL
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
      description: >
        Possible values are
        - SLICE_LOAD_LEVEL: Indicates that the event subscribed is load level information of Network
Slice
        - NETWORK_PERFORMANCE: Indicates that the event subscribed is network performance
information.
        - NF_LOAD: Indicates that the event subscribed is load level and status of one or several
Network Functions.
        - SERVICE_EXPERIENCE: Indicates that the event subscribed is service experience.
        - UE_MOBILITY: Indicates that the event subscribed is UE mobility information.
        - UE_COMMUNICATION: Indicates that the event subscribed is UE communication information.
        - QOS_SUSTAINABILITY: Indicates that the event subscribed is QoS sustainability.
        - ABNORMAL_BEHAVIOUR: Indicates that the event subscribed is abnormal behaviour.
        - USER_DATA_CONGESTION: Indicates that the event subscribed is user data congestion
information.
        - NSI_LOAD_LEVEL: Indicates that the event subscribed is load level information of Network
Slice and the optionally associated Network Slice Instance
  Accuracy:
    anyOf:
      - type: string

```

```

enum:
  - LOW
  - HIGH
- type: string
description: >
  This string provides forward-compatibility with future
  extensions to the enumeration but is not used to encode
  content defined in the present version of this API.
description: >
  Possible values are
  - LOW: Low accuracy.
  - HIGH: High accuracy.
CongestionType:
  anyOf:
    - type: string
      enum:
        - USER_PLANE
        - CONTROL_PLANE
        - USER_AND_CONTROL_PLANE
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
      description: >
        Possible values are
        - USER_PLANE: The congestion analytics type is User Plane.
        - CONTROL_PLANE: The congestion analytics type is Control Plane.
        - USER_AND_CONTROL_PLANE: The congestion analytics type is User Plane and Control Plane.
ExceptionId:
  anyOf:
    - type: string
      enum:
        - UNEXPECTED_UE_LOCATION
        - UNEXPECTED_LONG_LIVE_FLOW
        - UNEXPECTED_LARGE_RATE_FLOW
        - UNEXPECTED_WAKEUP
        - SUSPICION_OF_DDOS_ATTACK
        - WRONG_DESTINATION_ADDRESS
        - TOO_FREQUENT_SERVICE_ACCESS
        - UNEXPECTED_RADIO_LINK_FAILURES
        - PING_PONG_ACROSS_CELLS
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
      description: >
        Possible values are
        - UNEXPECTED_UE_LOCATION: Unexpected UE location
        - UNEXPECTED_LONG_LIVE_FLOW: Unexpected long-live rate flows
        - UNEXPECTED_LARGE_RATE_FLOW: Unexpected large rate flows
        - UNEXPECTED_WAKEUP: Unexpected wakeup
        - SUSPICION_OF_DDOS_ATTACK: Suspicion of DDos attack
        - WRONG_DESTINATION_ADDRESS: Wrong destination address
        - TOO_FREQUENT_SERVICE_ACCESS: Too frequent Service Access
        - UNEXPECTED_RADIO_LINK_FAILURES: Unexpected radio link failures
        - PING_PONG_ACROSS_CELLS: Ping-ponging across neighbouring cells
ExceptionTrend:
  anyOf:
    - type: string
      enum:
        - UP
        - DOWN
        - UNKNOW
        - STABLE
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
      description: >
        Possible values are
        - UP: Up trend of the exception level.
        - DOWN: Down trend of the exception level.
        - UNKNOW: Unknown trend of the exception level.
        - STABLE: Stable trend of the exception level.
TimeUnit:

```

```

anyOf:
- type: string
  enum:
    - MINUTE
    - HOUR
    - DAY
- type: string
  description: >
    This string provides forward-compatibility with future
    extensions to the enumeration but is not used to encode
    content defined in the present version of this API.
description: >
  Possible values are
  - MINUTE: Time unit is per minute.
  - HOUR: Time unit is per hour.
  - DAY: Time unit is per day.
NetworkPerfType:
anyOf:
- type: string
  enum:
    - GNB_ACTIVE_RATIO
    - GNB_COMPUTING_USAGE
    - GNB_MEMORY_USAGE
    - GNB_DISK_USAGE
    - NUM_OF_UE
    - SESS_SUCC_RATIO
    - HO_SUCC_RATIO
- type: string
  description: >
    This string provides forward-compatibility with future
    extensions to the enumeration but is not used to encode
    content defined in the present version of this API.
description: >
  Possible values are
  - GNB_ACTIVE_RATIO: Indicates that the network performance requirement is gNodeB active
(i.e. up and running) rate. Indicates the ratio of gNB active (i.e. up and running) number to the
total number of gNB
  - GNB_COMPUTING_USAGE: Indicates gNodeB computing resource usage.
  - GNB_MEMORY_USAGE: Indicates gNodeB memory usage.
  - GNB_DISK_USAGE: Indicates gNodeB disk usage.
  - NUM_OF_UE: Indicates number of UEs.
  - SESS_SUCC_RATIO: Indicates ratio of successful setup of PDU sessions to total PDU
session setup attempts.
  - HO_SUCC_RATIO: Indicates Ratio of successful handovers to the total handover attempts.
ExpectedAnalyticsType:
anyOf:
- type: string
  enum:
    - MOBILITY
    - COMMUN
    - MOBILITY_AND_COMMUN
- type: string
  description: >
    This string provides forward-compatibility with future
    extensions to the enumeration but is not used to encode
    content defined in the present version of this API.
description: >
  Possible values are
  - MOBILITY: Mobility related abnormal behaviour analytics is expected by the consumer.
  - COMMUN: Communication related abnormal behaviour analytics is expected by the consumer.
  - MOBILITY_AND_COMMUN: Both mobility and communication related abnormal behaviour
analytics is expected by the consumer.
MatchingDirection:
anyOf:
- type: string
  enum:
    - ASCENDING
    - DESCENDING
    - CROSSED
- type: string
  description: >
    This string provides forward-compatibility with future
    extensions to the enumeration but is not used to encode
    content defined in the present version of this API.
description: >
  Possible values are
  - ASCENDING: Threshold is crossed in ascending direction.
  - DESCENDING: Threshold is crossed in descending direction.

```

- CROSSED: Threshold is crossed either in ascending or descending direction.

NwdafFailureCode:

anyOf:

- type: string
- enum:
  - UNAVAILABLE\_DATA
  - BOTH\_STAT\_PRED\_NOT\_ALLOWED
  - OTHER
- type: string

description: >

This string provides forward-compatibility with future extensions to the enumeration but is not used to encode content defined in the present version of this API.

description: >

Possible values are

- UNAVAILABLE\_DATA: Indicates the requested statistics information for the event is rejected since necessary data to perform the service is unavailable.
- BOTH\_STAT\_PRED\_NOT\_ALLOWED: Indicates the requested analysis information for the event is rejected since the start time is in the past and the end time is in the future, which means the NF service consumer requested both statistics and prediction for the analytics.
- OTHER: Indicates the requested analysis information for the event is rejected due to other reasons.

---

## A.3 Nnwdaf\_AnalyticsInfo API

openapi: 3.0.0

info:

version: 1.1.6

title: Nnwdaf\_AnalyticsInfo

description: |

Nnwdaf\_AnalyticsInfo Service API.

© 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

All rights reserved.

externalDocs:

description: 3GPP TS 29.520 V16.15.0; 5G System; Network Data Analytics Services.

url: 'https://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

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:
        $ref:
'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/TargetUeInformation'
  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:
        expiry:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        timeStampGen:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        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
    suppFeat:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
  EventFilter:
    description: Represents the event filters used to identify the requested analytics.
    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.
      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
    bwRequ:
      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'
  not:
    required: [anySlice, snssais]
  EventId:
    anyOf:
      - type: string
      - 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
      - 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
      - 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

| Change history |        |           |      |     |     |                                                                                                                                                                     |        |
|----------------|--------|-----------|------|-----|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Date           | TSG #  | TSG Doc.  | CR   | Rev | Cat | Subject/Comment                                                                                                                                                     | New    |
| 2017-10        |        |           |      |     |     | TS skeleton of Network Data Analytics Services.                                                                                                                     | 0.0.0  |
| 2017-11        | CT3#92 |           |      |     |     | Inclusion of documents agreed in CT3#92 C3-175356.                                                                                                                  | 0.1.0  |
| 2017-12        | CT3#93 |           |      |     |     | Inclusion of documents agreed in CT3#93 C3-176166, C3-176260, C3-176324, C3-176325, C3-176326, and C3-176327.                                                       | 0.2.0  |
| 2018-01        | CT3#94 |           |      |     |     | 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. | 0.3.0  |
| 2018-03        | CT3#95 |           |      |     |     | Inclusion of documents agreed in CT3#95 C3-181253, C3-181255, C3-181256, C3-181257, C3-181260, C3-181312, C3-181342 and C3-181343.                                  | 0.4.0  |
| 2018-03        | CT3#96 |           |      |     |     | Inclusion of documents agreed in CT3#96 C3-182379 and C3-182380.                                                                                                    | 0.5.0  |
| 2018-05        | CT3#97 |           |      |     |     | Inclusion of documents agreed in CT3#97 C3-183285, C3-183532, C3-183533, C3-183534 and C3-183535.                                                                   | 0.6.0  |
| 2018-06        | CT#80  | CP-181032 |      |     |     | TS sent to plenary for approval                                                                                                                                     | 1.0.0  |
| 2018-06        | CT#80  | CP-181032 |      |     |     | TS approved by plenary                                                                                                                                              | 15.0.0 |
| 2018-09        | CT#81  | CP-182015 | 0001 | 3   | F   | Clarification on mandatory HTTP error status codes                                                                                                                  | 15.1.0 |
| 2018-09        | CT#81  | CP-182209 | 0002 | 4   | B   | OpenAPI for TS 29.520                                                                                                                                               | 15.1.0 |
| 2018-09        | CT#81  | CP-182015 | 0003 | 1   | F   | Description of Structured data types                                                                                                                                | 15.1.0 |
| 2018-09        | CT#81  | CP-182015 | 0004 | 1   | F   | Resource structure presentation                                                                                                                                     | 15.1.0 |
| 2018-12        | CT#82  | CP-183205 | 0006 |     | F   | Default value for apiRoot                                                                                                                                           | 15.2.0 |
| 2018-12        | CT#82  | CP-183205 | 0007 | 2   | F   | Correct Nnwdaf service                                                                                                                                              | 15.2.0 |
| 2018-12        | CT#82  | CP-183205 | 0008 | 1   | F   | Cardinality                                                                                                                                                         | 15.2.0 |
| 2018-12        | CT#82  | CP-183205 | 0009 |     | F   | API version                                                                                                                                                         | 15.2.0 |
| 2018-12        | CT#82  | CP-183205 | 0010 |     | F   | ExternalDocs OpenAPI field                                                                                                                                          | 15.2.0 |
| 2018-12        | CT#82  | CP-183205 | 0011 | 1   | F   | Security                                                                                                                                                            | 15.2.0 |
| 2018-12        | CT#82  | CP-183205 | 0012 | 1   | F   | Supported content types                                                                                                                                             | 15.2.0 |
| 2018-12        | CT#82  | CP-183205 | 0013 | 2   | F   | HTTP Error responses                                                                                                                                                | 15.2.0 |
| 2018-12        | CT#82  | CP-183205 | 0014 | 2   | F   | Correct NWDAF resource                                                                                                                                              | 15.2.0 |
| 2018-12        | CT#82  | CP-183205 | 0016 | 1   | F   | Adding HTTP status code "204 No Content"                                                                                                                            | 15.2.0 |
| 2018-12        | CT#82  | CP-183205 | 0019 |     | F   | Location header field in OpenAPI                                                                                                                                    | 15.2.0 |
| 2019-03        | CT#83  | CP-190113 | 0020 |     | F   | Support of NSSF as the service consumer                                                                                                                             | 15.3.0 |
| 2019-03        | CT#83  | CP-190113 | 0021 | 1   | F   | Formatting of structured data types in query                                                                                                                        | 15.3.0 |
| 2019-03        | CT#83  | CP-190113 | 0022 |     | F   | OpenAPI info version update                                                                                                                                         | 15.3.0 |
| 2019-03        | CT#83  | CP-190213 | 0023 | 1   | F   | Correction of Location header in Nnwdaf_EventsSubscription OpenAPI                                                                                                  | 15.3.0 |
| 2019-06        | CT#84  | CP-191078 | 24   | 1   | F   | Correction of Nnwdaf_EventsSubscription OpenAPI                                                                                                                     | 15.4.0 |
| 2019-06        | CT#84  | CP-191078 | 29   | 7   | F   | Corrections on TS 29.520                                                                                                                                            | 15.4.0 |
| 2019-06        | CT#84  | CP-191078 | 35   | 1   | F   | Precedence of OpenAPI file                                                                                                                                          | 15.4.0 |
| 2019-06        | CT#84  | CP-191078 | 37   | 1   | F   | Copyright Note in YAML files                                                                                                                                        | 15.4.0 |
| 2019-06        | CT#84  | CP-191090 | 25   | 1   | B   | Reference update and service representation                                                                                                                         | 16.0.0 |
| 2019-06        | CT#84  | CP-191090 | 27   | 3   | B   | Support of more consumers                                                                                                                                           | 16.0.0 |
| 2019-06        | CT#84  | CP-191090 | 28   | 1   | B   | Support of more analytic events                                                                                                                                     | 16.0.0 |
| 2019-06        | CT#84  | CP-191225 | 31   | 9   | B   | Subscribing of service experience for the application                                                                                                               | 16.0.0 |
| 2019-06        | CT#84  | CP-191090 | 33   | 2   | B   | Delete the subscription of service experience for the application                                                                                                   | 16.0.0 |
| 2019-06        | CT#84  | CP-191090 | 34   | 5   | B   | Notification of service experience for the application                                                                                                              | 16.0.0 |
| 2019-06        | CT#84  | CP-191090 | 39   | 2   | F   | Copyright Note in YAML files                                                                                                                                        | 16.0.0 |
| 2019-09        | CT#85  | CP-192146 | 0041 | 2   | F   | Correct cardinality in NnwdafEventsSubscription                                                                                                                     | 16.1.0 |
| 2019-09        | CT#85  | CP-192157 | 0042 | 4   | B   | UE mobility and communication analytics                                                                                                                             | 16.1.0 |
| 2019-09        | CT#85  | CP-192157 | 0043 | 2   | B   | Support of network performance analytics in Nnwdaf_AnalyticsInfo_Request                                                                                            | 16.1.0 |
| 2019-09        | CT#85  | CP-192157 | 0047 | 1   | B   | OAM as service consumer                                                                                                                                             | 16.1.0 |
| 2019-09        | CT#85  | CP-192157 | 0048 | 1   | B   | Update Nnwdaf_EventSubscription service for service experience                                                                                                      | 16.1.0 |
| 2019-09        | CT#85  | CP-192261 | 0049 | 1   | B   | Enhance the Nnwdaf_AnalyticsInfo service to support service experience                                                                                              | 16.1.0 |
| 2019-09        | CT#85  | CP-192177 | 0050 | 2   | B   | Enhance the Nnwdaf_EventsSubscription service to support QoS sustainability                                                                                         | 16.1.0 |
| 2019-09        | CT#85  | CP-192177 | 0051 | 2   | B   | Enhance the Nnwdaf_AnalyticsInfo service to support QoS sustainability                                                                                              | 16.1.0 |
| 2019-09        | CT#85  | CP-192173 | 0054 | 2   | F   | OpenAPI version update TS 29.520 Rel-16                                                                                                                             | 16.1.0 |
| 2019-12        | CT#86  | CP-193198 | 0055 | 3   | B   | Abnormal behaviour analytics                                                                                                                                        | 16.2.0 |
| 2019-12        | CT#86  | CP-193198 | 0056 | 4   | B   | Enhance the Nnwdaf_EventsSubscription service to support User Data Congestion                                                                                       | 16.2.0 |
| 2019-12        | CT#86  | CP-193198 | 0057 | 2   | B   | Enhance the Nnwdaf_AnalyticsInfo service to support user data congestion                                                                                            | 16.2.0 |
| 2019-12        | CT#86  | CP-193198 | 0058 | 1   | B   | Defination of QoS sustainability information                                                                                                                        | 16.2.0 |

|         |        |           |      |   |   |                                                                             |        |
|---------|--------|-----------|------|---|---|-----------------------------------------------------------------------------|--------|
| 2019-12 | CT#86  | CP-193198 | 0059 | 4 | B | Inclusion of QoS requirements and thresholds for QoS Sustainability         | 16.2.0 |
| 2019-12 | CT#86  | CP-193198 | 0062 | 2 | F | Clarify references to QoS sustainability analytics                          | 16.2.0 |
| 2019-12 | CT#86  | CP-193198 | 0063 | 2 | F | Clarifications on NWDAF generalities                                        | 16.2.0 |
| 2019-12 | CT#86  | CP-193267 | 0102 | 3 | B | OpenAPI file Update for Nnwdaf_EventsSubscription API                       | 16.2.0 |
| 2019-12 | CT#86  | CP-193198 | 0103 |   | B | OpenAPI file Update for Nnwdaf_AnalyticsInfo API                            | 16.2.0 |
| 2019-12 | CT#86  | CP-193198 | 0104 | 1 | B | Slice identification for all analytics types                                | 16.2.0 |
| 2019-12 | CT#86  | CP-193234 | 0106 | 2 | B | NF Load analytics generalities                                              | 16.2.0 |
| 2019-12 | CT#86  | CP-193212 | 0107 | 1 | F | Update of API version and TS version in OpenAPI file                        | 16.2.0 |
| 2020-03 | CT#87e | CP-200208 | 0109 | 1 | B | Definition of QoS Requirement                                               | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0110 | 1 | B | Description of consumer functionalities                                     | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0111 | 1 | B | Update the types of analytics events                                        | 16.3.0 |
| 2020-03 | CT#87e | CP-200207 | 0114 |   | B | DNN Clarification                                                           | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0115 | 1 | F | Update Feature applicability for Rel-16 new data types                      | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0118 | 2 | D | Corrections in TS29.520                                                     | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0120 | 1 | F | Clarify start time and end time                                             | 16.3.0 |
| 2020-03 | CT#87e | CP-200182 | 0121 | 2 | F | Correct QoS sustainability                                                  | 16.3.0 |
| 2020-03 | CT#87e | CP-200232 | 0122 | 1 | F | Correct UE mobility and communication                                       | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0123 | 1 | B | Support network performance analytics                                       | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0124 | 1 | F | Correcting QoS sustainability information                                   | 16.3.0 |
| 2020-03 | CT#87e | CP-200214 | 0125 |   | F | OpenAPI: usage of the "tags" keyword                                        | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0126 | 1 | F | Corrections on resource name                                                | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0127 | 1 | F | Data used for area of interest                                              | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0128 | 1 | F | Any UE possibility for UE mobility and UE communication                     | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0129 | 1 | B | Nnwdaf_EventsSubscription API, Support of Service experience                | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0130 | 1 | B | Nnwdaf_EventsSubscription API, Support of Service experience                | 16.3.0 |
| 2020-03 | CT#87e | CP-200236 | 0131 | 2 | B | Nnwdaf_EventsSubscription API, Support of abnormal behaviour                | 16.3.0 |
| 2020-03 | CT#87e | CP-200224 | 0132 | 1 | B | Nnwdaf_AnalyticsInfo API, Support of abnormal behaviour                     | 16.3.0 |
| 2020-03 | CT#87e | CP-200228 | 0136 | 2 | B | Support of NF Load analytics                                                | 16.3.0 |
| 2020-03 | CT#87e | CP-200216 | 0140 |   | F | Update of OpenAPI version and TS version in externalDocs field              | 16.3.0 |
| 2020-06 | CT#88e | CP-201234 | 0142 | 1 | F | Condition description for threshold related attributes                      | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0143 | 1 | F | Some corrections to Nnwdaf_AnalyticsInfo Service                            | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0144 | 1 | F | Clarification on applicability for network slice information                | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0145 | 1 | F | Analytics result per DNN                                                    | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0146 | 3 | F | Maximum number of SUPIs                                                     | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0147 | 1 | F | Correction on FlowDescription                                               | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0149 | 3 | F | Support of Abnormal Behaviour                                               | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0150 | 2 | F | Confidence for User Data Congestion Information.                            | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0151 | 1 | F | Data types used for NWDAF services                                          | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0153 | 2 | F | Adding maxObjectNbr attribute in related feature of NWDAF analytics service | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0154 | 1 | F | Adding UDM as consumer of services provided by NWDAF                        | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0155 |   | F | Corrections on descriptions of NF service consumers offered by NWDAF        | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0157 | 1 | D | Updates to Abbreviations                                                    | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0158 | 2 | B | Support NSI ID                                                              | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0163 | 3 | B | Support Service Experience Variance                                         | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0165 | 1 | F | Correction to Service Description                                           | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0166 | 1 | F | Correction to description of consumer functionalities                       | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0167 | 1 | F | Correction to variance of Start time in UE Communication                    | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0169 | 1 | B | Correct supported feature in AnalyticsData                                  | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0170 | 1 | F | Clarify service experience data                                             | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0171 |   | F | Correct threshold                                                           | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0172 | 1 | F | Resource type in QoS requirement                                            | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0173 | 1 | F | Storage of YAML files in ETSI Forge                                         | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0176 | 2 | F | Analytics result per S-NSSAI                                                | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0177 | 1 | F | Corrections on confidence for other NWDAF events                            | 16.4.0 |
| 2020-06 | CT#88e | CP-201256 | 0179 | 1 | F | URI of the Nnwdaf services                                                  | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0180 | 1 | F | Default value for matching direction                                        | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0181 |   | F | Support of immediate reporting                                              | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0182 | 1 | F | Optionality of ProblemDetails                                               | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0183 | 1 | F | Correction to abnormal traffic volume                                       | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0186 | 2 | F | Corrections on ratio of UEs in NWDAF event reports                          | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0187 | 1 | F | Corrections to TargetUeInformation                                          | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0188 |   | F | Corrections on AbnormalBehaviour                                            | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0189 |   | F | Plural of NF load level information related attribute                       | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0190 | 1 | F | locInfo attribute within the UeMobility data                                | 16.4.0 |

|         |        |           |      |   |   |                                                                             |         |
|---------|--------|-----------|------|---|---|-----------------------------------------------------------------------------|---------|
| 2020-06 | CT#88e | CP-201234 | 0191 |   | F | Corrections on NfLoadLevelInformation                                       | 16.4.0  |
| 2020-06 | CT#88e | CP-201244 | 0192 | 1 | F | Supported headers, Resource Data type, Operation Name and yaml mapping      | 16.4.0  |
| 2020-06 | CT#88e | CP-201255 | 0193 |   | F | Update of OpenAPI version and TS version in externalDocs field              | 16.4.0  |
| 2020-09 | CT#89e | CP-202066 | 0196 | 1 | F | Description for NWDAF services                                              | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0197 | 1 | F | Zero confidence                                                             | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0199 |   | F | Correct QoS sustainability requirement                                      | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0200 |   | F | Validity period for analytics information                                   | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0201 | 1 | F | Timestamp of analytics generation                                           | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0202 |   | F | Notification about subscribed event                                         | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0204 | 1 | F | Omitted event reporting information                                         | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0205 |   | F | Optional network slice identification                                       | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0206 |   | F | Slice load level information                                                | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0207 | 1 | F | Matching direction                                                          | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0208 |   | F | Time when analytics information is needed                                   | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0209 | 1 | F | Confidence for UE mobility                                                  | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0210 |   | F | Supported feature in Nnwdaf_AnalyticsInfo API                               | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0211 |   | F | Target UE identification                                                    | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0212 |   | F | Correction on NetworkPerfType                                               | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0214 |   | F | Corrections on applds and dnns                                              | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0215 | 1 | F | Corrections to networkArea with anyUE                                       | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0216 | 1 | F | Corrections to abnormal behaviour for any UE                                | 16.5.0  |
| 2020-09 | CT#89e | CP-202054 | 0218 |   | A | ResourceURI correction during subscription update                           | 16.5.0  |
| 2020-09 | CT#89e | CP-202084 | 0221 | 1 | F | Update of OpenAPI version and TS version in externalDocs field              | 16.5.0  |
| 2020-12 | CT#90e |           |      |   |   | Missing OpenAPI files added                                                 | 16.5.1  |
| 2020-12 | CT#90e | CP-203139 | 0222 | 1 | F | Essential corrections and alignments                                        | 16.6.0  |
| 2020-12 | CT#90e | CP-203117 | 0225 | 1 | A | Correction to notificationURI attribute                                     | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0227 |   | F | Mapping of expected analytics types and exception Ids                       | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0229 | 1 | F | Analytics report correction                                                 | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0231 | 1 | F | Error response for statistics request                                       | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0233 |   | F | S-NSSAI applicability                                                       | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0235 | 1 | F | Revomal of Service Experience feature for nsiLevelThrds attribute           | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0237 | 1 | F | Correction to supis of Service Experience Analytics                         | 16.6.0  |
| 2020-12 | CT#90e | CP-203155 | 0239 | 1 | F | Updates CEF as NWDAF consumer of Nnwdaf_EventsSubscription service          | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0243 | 1 | F | Corrections to Threshold                                                    | 16.6.0  |
| 2020-12 | CT#90e | CP-203152 | 0245 |   | F | Update of OpenAPI version and TS version in externalDocs field              | 16.6.0  |
| 2021-03 | CT#91e | CP-210191 | 0247 | 1 | F | Support of stateless NFs                                                    | 16.7.0  |
| 2021-03 | CT#91e | CP-210217 | 0249 |   | F | Storage of YAML files in ETSI Forge                                         | 16.7.0  |
| 2021-03 | CT#91e | CP-210206 | 0252 | 1 | F | Correction to S-NSSAI applicability                                         | 16.7.0  |
| 2021-03 | CT#91e | CP-210206 | 0254 | 1 | F | Adding network slice instance load level information                        | 16.7.0  |
| 2021-03 | CT#91e | CP-210206 | 0260 |   | F | Any Slice applicability                                                     | 16.7.0  |
| 2021-03 | CT#91e | CP-210206 | 0262 | 1 | F | Partial failure during event subscription                                   | 16.7.0  |
| 2021-03 | CT#91e | CP-210206 | 0264 |   | F | Supported feature                                                           | 16.7.0  |
| 2021-03 | CT#91e | CP-210239 | 0266 |   | F | Update of OpenAPI version and TS version in externalDocs field              | 16.7.0  |
| 2021-06 | CT#92e | CP-211220 | 0268 | 3 | F | Adding missing description for partial failure operation                    | 16.8.0  |
| 2021-06 | CT#92e | CP-211206 | 0277 | 1 | A | Correction on 404 Not Found                                                 | 16.8.0  |
| 2021-06 | CT#92e | CP-211220 | 0279 |   | F | Missing attributes in subscription procedure                                | 16.8.0  |
| 2021-06 | CT#92e | CP-211220 | 0281 | 1 | F | Correction on the value of confidence                                       | 16.8.0  |
| 2021-06 | CT#92e | CP-211206 | 0284 | 1 | A | Correction to Load Level Information                                        | 16.8.0  |
| 2021-06 | CT#92e | CP-211220 | 0286 | 1 | F | Correction to NSI Load Level Information                                    | 16.8.0  |
| 2021-06 | CT#92e | CP-211200 | 0296 | 1 | F | Redirect responses with "application/json" media type                       | 16.8.0  |
| 2021-06 | CT#92e | CP-211264 | 0304 |   | F | Update of OpenAPI version and TS version in externalDocs field              | 16.8.0  |
| 2021-09 | CT#93e | CP-212202 | 0316 |   | F | Removal of NSI ID from PCF as consumer of NWDAF                             | 16.9.0  |
| 2021-09 | CT#93e | CP-212222 | 0319 |   | F | Update of OpenAPI version and TS version in externalDocs field              | 16.9.0  |
| 2021-12 | CT#94e | CP-213226 | 0343 |   | F | Remove QoS sustainability as analytics for PCF                              | 16.10.0 |
| 2022-03 | CT#95e | CP-220173 | 0408 | 1 | F | Correction of the description of end time                                   | 16.11.0 |
| 2022-03 | CT#95e | CP-220176 | 0416 | 1 | F | Alignment of "Application Errors" clauses with SBI TS template              | 16.11.0 |
| 2022-03 | CT#95e | CP-220177 | 0425 |   | F | Update of info and externalDocs fields                                      | 16.11.0 |
| 2022-06 | CT#96  | CP-221128 | 0475 |   | F | Removing UDM from the list of service consumers for Analytics Subscriptions | 16.12.0 |
| 2022-06 | CT#96  | CP-221128 | 0477 |   | F | Removing UDM from the list of service consumers for Analytics Information   | 16.12.0 |

|         |       |           |      |   |   |                                                                                |         |
|---------|-------|-----------|------|---|---|--------------------------------------------------------------------------------|---------|
| 2022-06 | CT#96 | CP-221128 | 0508 |   | F | Presence condition on data types of UE related analytics                       | 16.12.0 |
| 2022-06 | CT#96 | CP-221128 | 0511 |   | F | Presence condition on Network Performance and Flow Description data types      | 16.12.0 |
| 2022-06 | CT#96 | CP-221128 | 0513 | 1 | F | Presence condition on NF load data types                                       | 16.12.0 |
| 2022-06 | CT#96 | CP-221128 | 0515 |   | F | Presence condition on QoS Sustainability data types                            | 16.12.0 |
| 2022-06 | CT#96 | CP-221128 | 0527 | 1 | F | Correction to Threshold value in QoS SustainabilityInfo                        | 16.12.0 |
| 2022-06 | CT#96 | CP-221128 | 0529 |   | F | Correction to time period in CongestionInfo                                    | 16.12.0 |
| 2022-06 | CT#96 | CP-221119 | 0535 | 1 | A | Correction to the re-used data types for the re-using Nnwdaf_AnalyticsInfo API | 16.12.0 |
| 2022-06 | CT#96 | CP-221150 | 0539 |   | F | Update of the info and externalDocs field                                      | 16.12.0 |
| 2023-03 | CT#99 | CP-230129 | 0653 |   | A | Invalid JSON value                                                             | 16.13.0 |
| 2023-03 | CT#99 | CP-230159 | 0685 |   | F | Update of the info and externalDocs field                                      | 16.13.0 |

| Change history |         |           |      |     |     |                                                                                                                                                                     |             |
|----------------|---------|-----------|------|-----|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Date           | Meeting | TDoc      | CR   | Rev | Cat | Subject/Comment                                                                                                                                                     | New version |
| 2017-10        |         |           |      |     |     | TS skeleton of Network Data Analytics Services.                                                                                                                     | 0.0.0       |
| 2017-11        | CT3#92  |           |      |     |     | Inclusion of documents agreed in CT3#92 C3-175356.                                                                                                                  | 0.1.0       |
| 2017-12        | CT3#93  |           |      |     |     | Inclusion of documents agreed in CT3#93 C3-176166, C3-176260, C3-176324, C3-176325, C3-176326, and C3-176327.                                                       | 0.2.0       |
| 2018-01        | CT3#94  |           |      |     |     | 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. | 0.3.0       |
| 2018-03        | CT3#95  |           |      |     |     | Inclusion of documents agreed in CT3#95 C3-181253, C3-181255, C3-181256, C3-181257, C3-181260, C3-181312, C3-181342 and C3-181343.                                  | 0.4.0       |
| 2018-03        | CT3#96  |           |      |     |     | Inclusion of documents agreed in CT3#96 C3-182379 and C3-182380.                                                                                                    | 0.5.0       |
| 2018-05        | CT3#97  |           |      |     |     | Inclusion of documents agreed in CT3#97 C3-183285, C3-183532, C3-183533, C3-183534 and C3-183535.                                                                   | 0.6.0       |
| 2018-06        | CT#80   | CP-181032 |      |     |     | TS sent to plenary for approval                                                                                                                                     | 1.0.0       |
| 2018-06        | CT#80   | CP-181032 |      |     |     | TS approved by plenary                                                                                                                                              | 15.0.0      |
| 2018-09        | CT#81   | CP-182015 | 0001 | 3   | F   | Clarification on mandatory HTTP error status codes                                                                                                                  | 15.1.0      |
| 2018-09        | CT#81   | CP-182209 | 0002 | 4   | B   | OpenAPI for TS 29.520                                                                                                                                               | 15.1.0      |
| 2018-09        | CT#81   | CP-182015 | 0003 | 1   | F   | Description of Structured data types                                                                                                                                | 15.1.0      |
| 2018-09        | CT#81   | CP-182015 | 0004 | 1   | F   | Resource structure presentation                                                                                                                                     | 15.1.0      |
| 2018-12        | CT#82   | CP-183205 | 0006 |     | F   | Default value for apiRoot                                                                                                                                           | 15.2.0      |
| 2018-12        | CT#82   | CP-183205 | 0007 | 2   | F   | Correct Nnwdaf service                                                                                                                                              | 15.2.0      |
| 2018-12        | CT#82   | CP-183205 | 0008 | 1   | F   | Cardinality                                                                                                                                                         | 15.2.0      |
| 2018-12        | CT#82   | CP-183205 | 0009 |     | F   | API version                                                                                                                                                         | 15.2.0      |
| 2018-12        | CT#82   | CP-183205 | 0010 |     | F   | ExternalDocs OpenAPI field                                                                                                                                          | 15.2.0      |
| 2018-12        | CT#82   | CP-183205 | 0011 | 1   | F   | Security                                                                                                                                                            | 15.2.0      |
| 2018-12        | CT#82   | CP-183205 | 0012 | 1   | F   | Supported content types                                                                                                                                             | 15.2.0      |
| 2018-12        | CT#82   | CP-183205 | 0013 | 2   | F   | HTTP Error responses                                                                                                                                                | 15.2.0      |
| 2018-12        | CT#82   | CP-183205 | 0014 | 2   | F   | Correct NWDAF resource                                                                                                                                              | 15.2.0      |
| 2018-12        | CT#82   | CP-183205 | 0016 | 1   | F   | Adding HTTP status code "204 No Content"                                                                                                                            | 15.2.0      |
| 2018-12        | CT#82   | CP-183205 | 0019 |     | F   | Location header field in OpenAPI                                                                                                                                    | 15.2.0      |
| 2019-03        | CT#83   | CP-190113 | 0020 |     | F   | Support of NSSF as the service consumer                                                                                                                             | 15.3.0      |
| 2019-03        | CT#83   | CP-190113 | 0021 | 1   | F   | Formatting of structured data types in query                                                                                                                        | 15.3.0      |
| 2019-03        | CT#83   | CP-190113 | 0022 |     | F   | OpenAPI info version update                                                                                                                                         | 15.3.0      |
| 2019-03        | CT#83   | CP-190213 | 0023 | 1   | F   | Correction of Location header in Nnwdaf_EventsSubscription OpenAPI                                                                                                  | 15.3.0      |
| 2019-06        | CT#84   | CP-191078 | 24   | 1   | F   | Correction of Nnwdaf_EventsSubscription OpenAPI                                                                                                                     | 15.4.0      |
| 2019-06        | CT#84   | CP-191078 | 29   | 7   | F   | Corrections on TS 29.520                                                                                                                                            | 15.4.0      |
| 2019-06        | CT#84   | CP-191078 | 35   | 1   | F   | Precedence of OpenAPI file                                                                                                                                          | 15.4.0      |
| 2019-06        | CT#84   | CP-191078 | 37   | 1   | F   | Copyright Note in YAML files                                                                                                                                        | 15.4.0      |
| 2019-06        | CT#84   | CP-191090 | 25   | 1   | B   | Reference update and service representation                                                                                                                         | 16.0.0      |
| 2019-06        | CT#84   | CP-191090 | 27   | 3   | B   | Support of more consumers                                                                                                                                           | 16.0.0      |
| 2019-06        | CT#84   | CP-191090 | 28   | 1   | B   | Support of more analytic events                                                                                                                                     | 16.0.0      |
| 2019-06        | CT#84   | CP-191225 | 31   | 9   | B   | Subscribing of service experience for the application                                                                                                               | 16.0.0      |
| 2019-06        | CT#84   | CP-191090 | 33   | 2   | B   | Delete the subscription of service experience for the application                                                                                                   | 16.0.0      |
| 2019-06        | CT#84   | CP-191090 | 34   | 5   | B   | Notification of service experience for the application                                                                                                              | 16.0.0      |
| 2019-06        | CT#84   | CP-191090 | 39   | 2   | F   | Copyright Note in YAML files                                                                                                                                        | 16.0.0      |
| 2019-09        | CT#85   | CP-192146 | 0041 | 2   | F   | Correct cardinality in NnwdafEventsSubscription                                                                                                                     | 16.1.0      |
| 2019-09        | CT#85   | CP-192157 | 0042 | 4   | B   | UE mobility and communication analytics                                                                                                                             | 16.1.0      |
| 2019-09        | CT#85   | CP-192157 | 0043 | 2   | B   | Support of network performance analytics in Nnwdaf_AnalyticsInfo Request                                                                                            | 16.1.0      |
| 2019-09        | CT#85   | CP-192157 | 0047 | 1   | B   | OAM as service consumer                                                                                                                                             | 16.1.0      |
| 2019-09        | CT#85   | CP-192157 | 0048 | 1   | B   | Update Nnwdaf_EventSubscription service for service experience                                                                                                      | 16.1.0      |
| 2019-09        | CT#85   | CP-192261 | 0049 | 1   | B   | Enhance the Nnwdaf_AnalyticsInfo service to support service experience                                                                                              | 16.1.0      |
| 2019-09        | CT#85   | CP-192177 | 0050 | 2   | B   | Enhance the Nnwdaf_EventsSubscription service to support QoS sustainability                                                                                         | 16.1.0      |
| 2019-09        | CT#85   | CP-192177 | 0051 | 2   | B   | Enhance the Nnwdaf_AnalyticsInfo service to support QoS sustainability                                                                                              | 16.1.0      |
| 2019-09        | CT#85   | CP-192173 | 0054 | 2   | F   | OpenAPI version update TS 29.520 Rel-16                                                                                                                             | 16.1.0      |
| 2019-12        | CT#86   | CP-193198 | 0055 | 3   | B   | Abnormal behaviour analytics                                                                                                                                        | 16.2.0      |
| 2019-12        | CT#86   | CP-193198 | 0056 | 4   | B   | Enhance the Nnwdaf_EventsSubscription service to support User Data Congestion                                                                                       | 16.2.0      |
| 2019-12        | CT#86   | CP-193198 | 0057 | 2   | B   | Enhance the Nnwdaf_AnalyticsInfo service to support user data congestion                                                                                            | 16.2.0      |
| 2019-12        | CT#86   | CP-193198 | 0058 | 1   | B   | Defination of QoS sustainability information                                                                                                                        | 16.2.0      |
| 2019-12        | CT#86   | CP-193198 | 0059 | 4   | B   | Inclusion of QoS requirements and thresholds for QoS Sustainability                                                                                                 | 16.2.0      |
| 2019-12        | CT#86   | CP-193198 | 0062 | 2   | F   | Clarify references to QoS sustainability analytics                                                                                                                  | 16.2.0      |

|         |        |           |      |   |   |                                                                             |        |
|---------|--------|-----------|------|---|---|-----------------------------------------------------------------------------|--------|
| 2019-12 | CT#86  | CP-193198 | 0063 | 2 | F | Clarifications on NWDAF generalities                                        | 16.2.0 |
| 2019-12 | CT#86  | CP-193267 | 0102 | 3 | B | OpenAPI file Update for Nnwdaf_EventsSubscription API                       | 16.2.0 |
| 2019-12 | CT#86  | CP-193198 | 0103 |   | B | OpenAPI file Update for Nnwdaf_AnalyticsInfo API                            | 16.2.0 |
| 2019-12 | CT#86  | CP-193198 | 0104 | 1 | B | Slice identification for all analytics types                                | 16.2.0 |
| 2019-12 | CT#86  | CP-193234 | 0106 | 2 | B | NF Load analytics generalities                                              | 16.2.0 |
| 2019-12 | CT#86  | CP-193212 | 0107 | 1 | F | Update of API version and TS version in OpenAPI file                        | 16.2.0 |
| 2020-03 | CT#87e | CP-200208 | 0109 | 1 | B | Definition of QoS Requirement                                               | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0110 | 1 | B | Description of consumer functionalities                                     | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0111 | 1 | B | Update the types of analytics events                                        | 16.3.0 |
| 2020-03 | CT#87e | CP-200207 | 0114 |   | B | DNN Clarification                                                           | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0115 | 1 | F | Update Feature applicability for Rel-16 new data types                      | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0118 | 2 | D | Corrections in TS29.520                                                     | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0120 | 1 | F | Clarify start time and end time                                             | 16.3.0 |
| 2020-03 | CT#87e | CP-200182 | 0121 | 2 | F | Correct QoS sustainability                                                  | 16.3.0 |
| 2020-03 | CT#87e | CP-200232 | 0122 | 1 | F | Correct UE mobility and communication                                       | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0123 | 1 | B | Support network performance analytics                                       | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0124 | 1 | F | Correcting QoS sustainability information                                   | 16.3.0 |
| 2020-03 | CT#87e | CP-200214 | 0125 |   | F | OpenAPI: usage of the "tags" keyword                                        | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0126 | 1 | F | Corrections on resource name                                                | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0127 | 1 | F | Data used for area of interest                                              | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0128 | 1 | F | Any UE possibility for UE mobility and UE communication                     | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0129 | 1 | B | Nnwdaf_EventsSubscription API, Support of Service experience                | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0130 | 1 | B | Nnwdaf_EventsSubscription API, Support of Service experience                | 16.3.0 |
| 2020-03 | CT#87e | CP-200236 | 0131 | 2 | B | Nnwdaf_EventsSubscription API, Support of abnormal behaviour                | 16.3.0 |
| 2020-03 | CT#87e | CP-200224 | 0132 | 1 | B | Nnwdaf_AnalyticsInfo API, Support of abnormal behaviour                     | 16.3.0 |
| 2020-03 | CT#87e | CP-200228 | 0136 | 2 | B | Support of NF Load analytics                                                | 16.3.0 |
| 2020-03 | CT#87e | CP-200216 | 0140 |   | F | Update of OpenAPI version and TS version in externalDocs field              | 16.3.0 |
| 2020-06 | CT#88e | CP-201234 | 0142 | 1 | F | Condition description for threshold related attributes                      | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0143 | 1 | F | Some corrections to Nnwdaf_AnalyticsInfo Service                            | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0144 | 1 | F | Clarification on applicability for network slice information                | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0145 | 1 | F | Analytics result per DNN                                                    | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0146 | 3 | F | Maximum number of SUPIs                                                     | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0147 | 1 | F | Correction on FlowDescription                                               | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0149 | 3 | F | Support of Abnormal Behaviour                                               | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0150 | 2 | F | Confidence for User Data Congestion Information.                            | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0151 | 1 | F | Data types used for NWDAF services                                          | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0153 | 2 | F | Adding maxObjectNbr attribute in related feature of NWDAF analytics service | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0154 | 1 | F | Adding UDM as consumer of services provided by NWDAF                        | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0155 |   | F | Corrections on descriptions of NF service consumers offered by NWDAF        | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0157 | 1 | D | Updates to Abbreviations                                                    | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0158 | 2 | B | Support NSI ID                                                              | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0163 | 3 | B | Support Service Experience Variance                                         | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0165 | 1 | F | Correction to Service Description                                           | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0166 | 1 | F | Correction to description of consumer functionalities                       | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0167 | 1 | F | Correction to variance of Start time in UE Communication                    | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0169 | 1 | B | Correct supported feature in AnalyticsData                                  | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0170 | 1 | F | Clarify service experience data                                             | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0171 |   | F | Correct threshold                                                           | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0172 | 1 | F | Resource type in QoS requirement                                            | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0173 | 1 | F | Storage of YAML files in ETSI Forge                                         | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0176 | 2 | F | Analytics result per S-NSSAI                                                | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0177 | 1 | F | Corrections on confidence for other NWDAF events                            | 16.4.0 |
| 2020-06 | CT#88e | CP-201256 | 0179 | 1 | F | URI of the Nnwdaf services                                                  | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0180 | 1 | F | Default value for matching direction                                        | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0181 |   | F | Support of immediate reporting                                              | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0182 | 1 | F | Optionality of ProblemDetails                                               | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0183 | 1 | F | Correction to abnormal traffic volume                                       | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0186 | 2 | F | Corrections on ratio of UEs in NWDAF event reports                          | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0187 | 1 | F | Corrections to TargetUeInformation                                          | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0188 |   | F | Corrections on AbnormalBehaviour                                            | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0189 |   | F | Plural of NF load level information related attribute                       | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0190 | 1 | F | locInfo attribute within the UeMobility data                                | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0191 |   | F | Corrections on NfLoadLevelInformation                                       | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0192 | 1 | F | Supported headers, Resource Data type, Operation Name and yaml mapping      | 16.4.0 |
| 2020-06 | CT#88e | CP-201255 | 0193 |   | F | Update of OpenAPI version and TS version in externalDocs field              | 16.4.0 |
| 2020-09 | CT#89e | CP-202066 | 0196 | 1 | F | Description for NWDAF services                                              | 16.5.0 |
| 2020-09 | CT#89e | CP-202066 | 0197 | 1 | F | Zero confidence                                                             | 16.5.0 |
| 2020-09 | CT#89e | CP-202066 | 0199 |   | F | Correct QoS sustainability requirement                                      | 16.5.0 |

|         |        |           |      |   |   |                                                                                |         |
|---------|--------|-----------|------|---|---|--------------------------------------------------------------------------------|---------|
| 2020-09 | CT#89e | CP-202066 | 0200 |   | F | Validity period for analytics information                                      | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0201 | 1 | F | Timestamp of analytics generation                                              | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0202 |   | F | Notification about subscribed event                                            | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0204 | 1 | F | Omitted event reporting information                                            | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0205 |   | F | Optional network slice identification                                          | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0206 |   | F | Slice load level information                                                   | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0207 | 1 | F | Matching direction                                                             | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0208 |   | F | Time when analytics information is needed                                      | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0209 | 1 | F | Confidence for UE mobility                                                     | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0210 |   | F | Supported feature in Nnwdaf_AnalyticsInfo API                                  | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0211 |   | F | Target UE identification                                                       | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0212 |   | F | Correction on NetworkPerfType                                                  | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0214 |   | F | Corrections on applds and dnns                                                 | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0215 | 1 | F | Corrections to networkArea with anyUE                                          | 16.5.0  |
| 2020-09 | CT#89e | CP-202066 | 0216 | 1 | F | Corrections to abnormal behaviour for any UE                                   | 16.5.0  |
| 2020-09 | CT#89e | CP-202054 | 0218 |   | A | ResourceURI correction during subscription update                              | 16.5.0  |
| 2020-09 | CT#89e | CP-202084 | 0221 | 1 | F | Update of OpenAPI version and TS version in externalDocs field                 | 16.5.0  |
| 2020-12 | CT#90e |           |      |   |   | Missing OpenAPI files added                                                    | 16.5.1  |
| 2020-12 | CT#90e | CP-203139 | 0222 | 1 | F | Essential corrections and alignments                                           | 16.6.0  |
| 2020-12 | CT#90e | CP-203117 | 0225 | 1 | A | Correction to notificationURI attribute                                        | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0227 |   | F | Mapping of expected analytics types and exception Ids                          | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0229 | 1 | F | Analytics report correction                                                    | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0231 | 1 | F | Error response for statistics request                                          | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0233 |   | F | S-NSSAI applicability                                                          | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0235 | 1 | F | Revomal of Service Experience feature for nsiLevelThrds attribute              | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0237 | 1 | F | Correction to supis of Service Experience Analytics                            | 16.6.0  |
| 2020-12 | CT#90e | CP-203155 | 0239 | 1 | F | Updates CEF as NWDAF consumer of Nnwdaf_EventsSubscription service             | 16.6.0  |
| 2020-12 | CT#90e | CP-203129 | 0243 | 1 | F | Corrections to Threshold                                                       | 16.6.0  |
| 2020-12 | CT#90e | CP-203152 | 0245 |   | F | Update of OpenAPI version and TS version in externalDocs field                 | 16.6.0  |
| 2021-03 | CT#91e | CP-210191 | 0247 | 1 | F | Support of stateless NFs                                                       | 16.7.0  |
| 2021-03 | CT#91e | CP-210217 | 0249 |   | F | Storage of YAML files in ETSI Forge                                            | 16.7.0  |
| 2021-03 | CT#91e | CP-210206 | 0252 | 1 | F | Correction to S-NSSAI applicability                                            | 16.7.0  |
| 2021-03 | CT#91e | CP-210206 | 0254 | 1 | F | Adding network slice instance load level information                           | 16.7.0  |
| 2021-03 | CT#91e | CP-210206 | 0260 |   | F | Any Slice applicability                                                        | 16.7.0  |
| 2021-03 | CT#91e | CP-210206 | 0262 | 1 | F | Partial failure during event subscription                                      | 16.7.0  |
| 2021-03 | CT#91e | CP-210206 | 0264 |   | F | Supported feature                                                              | 16.7.0  |
| 2021-03 | CT#91e | CP-210239 | 0266 |   | F | Update of OpenAPI version and TS version in externalDocs field                 | 16.7.0  |
| 2021-06 | CT#92e | CP-211220 | 0268 | 3 | F | Adding missing description for partial failure operation                       | 16.8.0  |
| 2021-06 | CT#92e | CP-211206 | 0277 | 1 | A | Correction on 404 Not Found                                                    | 16.8.0  |
| 2021-06 | CT#92e | CP-211220 | 0279 |   | F | Missing attributes in subscription procedure                                   | 16.8.0  |
| 2021-06 | CT#92e | CP-211220 | 0281 | 1 | F | Correction on the value of confidence                                          | 16.8.0  |
| 2021-06 | CT#92e | CP-211206 | 0284 | 1 | A | Correction to Load Level Information                                           | 16.8.0  |
| 2021-06 | CT#92e | CP-211220 | 0286 | 1 | F | Correction to NSI Load Level Information                                       | 16.8.0  |
| 2021-06 | CT#92e | CP-211200 | 0296 | 1 | F | Redirect responses with "application/json" media type                          | 16.8.0  |
| 2021-06 | CT#92e | CP-211264 | 0304 |   | F | Update of OpenAPI version and TS version in externalDocs field                 | 16.8.0  |
| 2021-09 | CT#93e | CP-212202 | 0316 |   | F | Removal of NSI ID from PCF as consumer of NWDAF                                | 16.9.0  |
| 2021-09 | CT#93e | CP-212222 | 0319 |   | F | Update of OpenAPI version and TS version in externalDocs field                 | 16.9.0  |
| 2021-12 | CT#94e | CP-213226 | 0343 |   | F | Remove QoS sustainability as analytics for PCF                                 | 16.10.0 |
| 2022-03 | CT#95e | CP-220173 | 0408 | 1 | F | Correction of the description of end time                                      | 16.11.0 |
| 2022-03 | CT#95e | CP-220176 | 0416 | 1 | F | Alignment of "Application Errors" clauses with SBI TS template                 | 16.11.0 |
| 2022-03 | CT#95e | CP-220177 | 0425 |   | F | Update of info and externalDocs fields                                         | 16.11.0 |
| 2022-06 | CT#96  | CP-221128 | 0475 |   | F | Removing UDM from the list of service consumers for Analytics Subscriptions    | 16.12.0 |
| 2022-06 | CT#96  | CP-221128 | 0477 |   | F | Removing UDM from the list of service consumers for Analytics Information      | 16.12.0 |
| 2022-06 | CT#96  | CP-221128 | 0508 |   | F | Presence condition on data types of UE related analytics                       | 16.12.0 |
| 2022-06 | CT#96  | CP-221128 | 0511 |   | F | Presence condition on Network Performance and Flow Description data types      | 16.12.0 |
| 2022-06 | CT#96  | CP-221128 | 0513 | 1 | F | Presence condition on NF load data types                                       | 16.12.0 |
| 2022-06 | CT#96  | CP-221128 | 0515 |   | F | Presence condition on QoS Sustainability data types                            | 16.12.0 |
| 2022-06 | CT#96  | CP-221128 | 0527 | 1 | F | Correction to Threshold value in QoSSustainabilityInfo                         | 16.12.0 |
| 2022-06 | CT#96  | CP-221128 | 0529 |   | F | Correction to time period in CongestionInfo                                    | 16.12.0 |
| 2022-06 | CT#96  | CP-221119 | 0535 | 1 | A | Correction to the re-used data types for the re-using Nnwdaf_AnalyticsInfo API | 16.12.0 |
| 2022-06 | CT#96  | CP-221150 | 0539 |   | F | Update of the info and externalDocs field                                      | 16.12.0 |
| 2023-03 | CT#99  | CP-230129 | 0653 |   | A | Invalid JSON value                                                             | 16.13.0 |
| 2023-03 | CT#99  | CP-230159 | 0685 |   | F | Update of the info and externalDocs field                                      | 16.13.0 |
| 2025-03 | CT#107 | CP-250105 | 1035 |   | F | Corrections to UE COMMUNICATION event                                          | 16.14.0 |
| 2026-03 | CT#111 | CP-260051 | 1140 | 1 | F | Corrections to NfLoadLevelInformation and ExceptionTrend                       | 16.15.0 |
| 2026-03 | CT#111 | CP-260078 | 1161 |   | F | Update of the info and externalDocs field                                      | 16.15.0 |

History

| Version  | Date           | Status      |
|----------|----------------|-------------|
| V16.4.0  | August 2020    | Publication |
| V16.5.1  | November 2020  | Publication |
| V16.6.0  | January 2021   | Publication |
| V16.7.0  | April 2021     | Publication |
| V16.8.0  | August 2021    | Publication |
| V16.9.0  | September 2021 | Publication |
| V16.10.1 | March 2022     | Publication |
| V16.11.0 | March 2022     | Publication |
| V16.12.0 | June 2022      | Publication |
| V16.13.0 | April 2023     | Publication |
| V16.14.0 | March 2025     | Publication |
| V16.15.0 | March 2026     | Publication |