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Contents

Foreword

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

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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
GFBR	Guaranteed Flow Bit Rate
HTTP	Hypertext Transfer Protocol
JSON	JavaScript Object Notation
NEF	Network Exposure Function
NF	Network Function
NRF	Network Repository Function
NSSF	Network Slice Selection Function
NWDAF	Network Data Analytics Function
OAM	Operation, Administration, and Maintenance
PCF	Policy Control Function
SUPI	Subscription Permanent Identifier
S-NSSAI	Single Network Slice Selection Assistance Information
SMF	Session Management Function
UDM	Unified Data Management
UPF	User Plane Function
URI	Uniform Resource Identifier
UTC	Universal Time Coordinated

4 Services offered by the NWDAF

4.1 Introduction

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

Analytics information is either statistical information of 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 (NOTE)	This service enables the NF service consumers to subscribe to/unsubscribe from notifications for different analytics information from the NWDAF.	Subscribe Unsubscribe Notify	Subscribe / Notify	PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF
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_EventsSubscription.yaml	nnwdaf-eventssubscription	A.2
Nnwdaf_AnalyticsInfo	5.2	Nnwdaf Analytics Information Service	TS29520_Nnwdaf_AnalyticsInfo.yaml	nnwdaf-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.

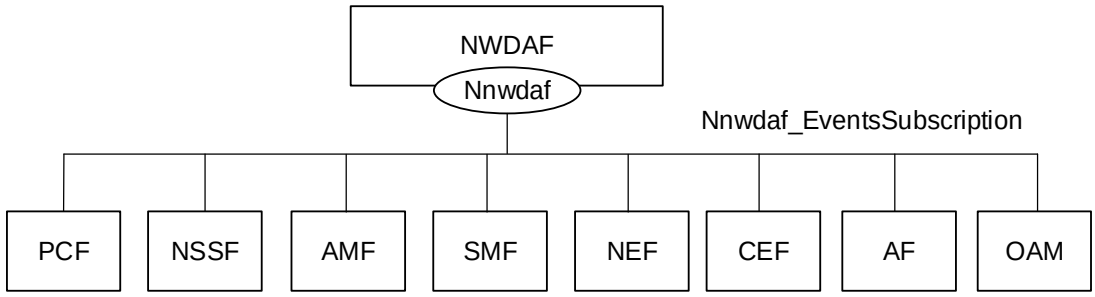

Figure 4.2.1.2-1: Reference Architecture for the Nnwdaf_EventsSubscription Service; SBI representation

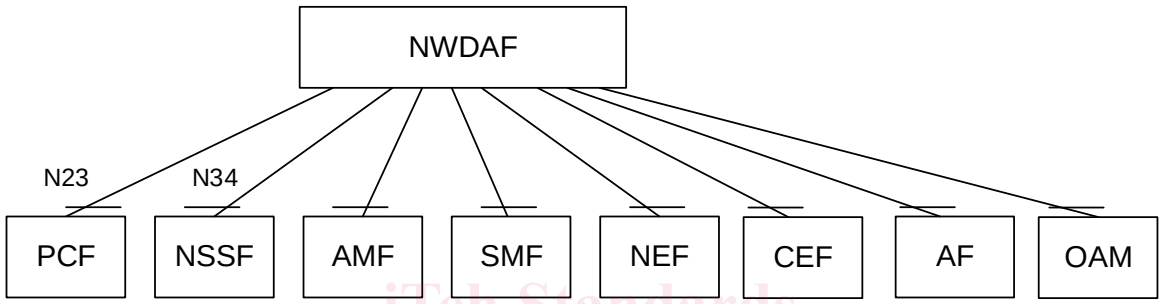

Figure 4.2.1.2-2: Reference Architecture for the Nnwdaf_EventsSubscription Service: reference point representation

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 communicationrelated 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 4.2.2.2.2-1 shows a scenario where the NF service consumer sends a request to the NWDAF to subscribe for event notification(s) (as shown in 3GPP TS 23.288 [17]).

Figure 4.2.2.2.2-1: NF service consumer subscribes to notifications