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Contents

Foreword

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

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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.

In the present document, modal verbs have the following meanings:

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

should indicates a recommendation to do something

should not indicates a recommendation not to do something

may indicates permission to do something

need not indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

can indicates that something is possible

cannot indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

Introduction

This clause is optional. If it exists, it is always the second unnumbered clause.

1 Scope

The present document specifies the stage 3 protocol and data model for the ADRF Service Based Interface. It provides stage 3 protocol definitions and message flows, and specifies the API for each service offered by the ADRF.

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3]. The stage 2 definition and procedures of store and retrieve the collected data and analytics are contained in 3GPP TS 23.288 [14] and 3GPP TS 23.502 [3].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [4] and 3GPP TS 29.501 [5].

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] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[4] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[5] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[6] OpenAPI: "OpenAPI 3.0.0 Specification", https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md.

[7] 3GPP TR 21.900: "Technical Specification Group working methods".

[8] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[9] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

[10] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

[11] IETF RFC 9113: "HTTP/2".

[12] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[13] IETF RFC 9457: "Problem Details for HTTP APIs"

[14] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[15] 3GPP TS 29.520: "5G System; Network Data Analytics Services; Stage 3".

[16] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[17] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".

[18] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[19] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[20] 3GPP TS 29.517: "5G System; Application Function Event Exposure Services; Stage 3".

[21] 3GPP TS 29.591: "5G System; Network Exposure Function Southbound Services; Stage 3".

[22] 3GPP TS 29.122: "T8 reference point for Northbound APIs".

[23] 3GPP TS 29.574: "5G System; Data Collection Coordination Services; Stage 3".

[24] 3GPP TS 29.576: "5G System; Messaging Framework Adaptor Services; Stage 3".

[25] 3GPP TS 29.536: "5G System; Network Slice Admission Control Services; Stage 3".

[26] 3GPP TS 29.564: "5G System; User Plane Function Services; Stage 3".

[27] 3GPP TS 29.515: "5G System; Gateway Mobile Location Services; Stage 3".

[28] 3GPP TS 29.552: "5G System; Network Data Analytics signalling flows; Stage 3".

3 Definitions, symbols 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].

None.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

None.

3.3 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].

ADRF	Analytics Data Repository Function
AF	Application Function
AMF	Access and Mobility Management Function
DCCF	Data Collection Coordination Function
GMLC	Gateway Mobile Location Centre
MFAF	Messaging Framework Adaptor Function
NEF	Network Exposure Function
NF	Network Function
NRF	Network Repository Function
NWDAF	Network Data Analytics Function
NSACF	Network Slice Admission Control Function
SMF	Session Management Function
UDM	Unified Data Management
UPF	User Plane Function

4 Services offered by the ADRF

4.1 Introduction

The Analytics Data Repository Service is used for the Analytics Data Repository Function (ADRF) to storage and retrieval of data and ML model(s) by e.g. NF service consumers (e.g. NWDAF) which access the data or ML model(s) using Nadrf service. The ADRF offers to NF service consumers the following services:

Table 4.1-1: Service provided by ADRF

Service Name	Description	Service Operations	Operation Semantics	Example Consumer(s)
Nadrf_DataManagement (NOTE 1)	This service enables the NF service consumers to store, retrieve and remove the data or analytics in an ADRF.	StorageRequest	Request / Response	DCCF, NWDAF, MFAF
		StorageSubscriptionRequest	Request / Response	DCCF, NWDAF
		StorageSubscriptionRemoval	Request / Response	DCCF, NWDAF
		RetrievalRequest	Request / Response	DCCF, NWDAF
		RetrievalSubscribe	Subscribe / Notify	DCCF, NWDAF
		RetrievalUnsubscribe	Subscribe / Notify	DCCF, NWDAF
		RetrievalNotify	Subscribe / Notify	DCCF, NWDAF
		Delete	Request / Response	DCCF, NWDAF
Nadrf_MLModelManagement (NOTE 2)	This service enables the NF service consumers to store, retrieve and delete ML model(s) in an ADRF.	StorageRequest	Request / Response	NWDAF
		RetrievalRequest	Request / Response	NWDAF
		Delete	Request / Response	NWDAF
NOTE 1: The services correspond to the Nadrf_DataManagement service as defined in 3GPP TS 23.288 [14]. NOTE 2: The services correspond to the Nadrf_MLModelManagement service as defined in 3GPP TS 23.288 [14].				

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

Table 4.1-2: API Descriptions

Service Name	Clause	Description	OpenAPI Specification File	apiName	Annex
Nadrf_DataManagement	4.2	API for Nadrf_DataManagement		nadrf_datamanagement	Annex A.2 Nadrf_DataManagement API
Nadrf_MLModelManagement	4.3	API for Nadrf_MLModelManagement		nadrf_mlmodelmanagement	Annex A.3 Nadrf_MLModelManagement API

4.2 Nadrf_DataManagement Service

4.2.1 Service Description

4.2.1.1 Overview

The Nadrf_DataManagement service as defined in 3GPP TS 23.288 [14], is provided by the Analytics Data Repository Function (ADRF).

This service:

- allows NF service consumers to store data or analytics in the ADRF, and request/receive notifications about data or analytics that are about to be deleted;
- allows NF service consumers to retrieve data or analytics from an ADRF; and
- allows NF service consumers to delete data or analytics from an ADRF.

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 [14].

The Nadrf_DataManagement service is part of the Nadrf service-based interface exhibited by the Analytics Data Repository Function (ADRF).

Known consumers of the Nadrf_DataManagement service are:

- Data Collection Coordination Function (DCCF)
- Network Data Analytics Function (NWDAF)
- Messaging Framework Adaptor Function (MFAF)

The Nadrf_DataManagement service is provided by the ADRF and consumed by the NF service consumers as shown in figure 4.2.1.2-1 for the SBI representation model and in figure 4.2.1.2-2 for the reference point representation model.

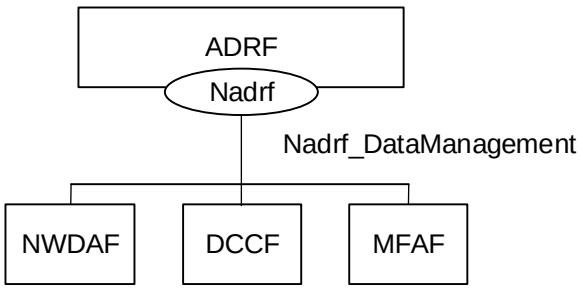

Figure 4.2.1.2-1: Reference Architecture for the Nadrf_DataManagement Service; SBI representation

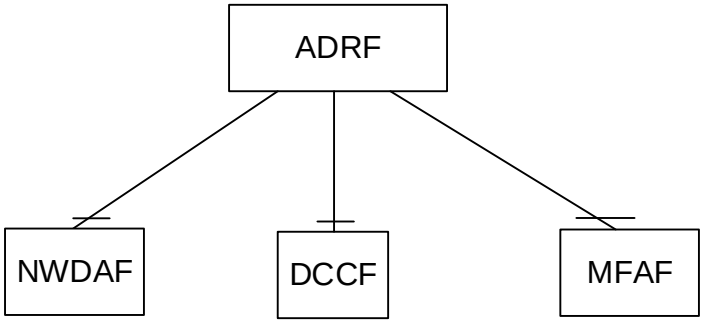

Figure 4.2.1.2-2: Nadrf_DataManagement service architecture, reference point representation

4.2.1.3 Network Functions

4.2.1.3.1 Analytics Data Repository Function (ADRF)

The Analytics Data Repository Function (ADRF) provides the functionality to allow NF service consumers to store, retrieve, and remove data or analytics from the ADRF, and request/receive notifications about data or analytics that are about to be deleted.

4.2.1.3.2 NF Service Consumers

The NWDAF and DCCF:

- supports storing data or analytics in the ADRF, and requesting/receiving notifications about data or analytics that are about to be deleted;
- supports retrieving data or analytics from an ADRF; and
- supports deletion data or analytics from an ADRF.

The MFAF:

- supports storing data or analytics in the ADRF.

4.2.2 Service Operations

4.2.2.1 Introduction

Table 4.2.2.1-1: Operations of the Nadrf_DataManagement Service

Service operation name	Description	Initiated by
Nadrf_DataManagement_StorageRequest	This service operation is used by an NF to request the ADRF to store data or analytics. Data or analytics are provided to the ADRF in the request message.	NF service consumer (DCCF, NWDAF, MFAF)
Nadrf_DataManagement_StorageSubscriptionRequest	This service operation is used by an NF to request the ADRF to initiate a subscription for data or analytics. Data or analytics provided in notifications as a result of the subsequent subscription by the ADRF are stored in the ADRF.	NF service consumer (DCCF, NWDAF)
Nadrf_DataManagement_StorageSubscriptionRemoval	This service operation is used by an NF to request that the ADRF no longer subscribes to data or analytics it is collecting and storing.	NF service consumer (DCCF, NWDAF)
Nadrf_DataManagement_RetrievalRequest	This service operation is used by an NF to retrieve stored data or analytics from the ADRF.	NF service consumer (DCCF, NWDAF)
Nadrf_DataManagement_RetrievalSubscribe	This service operation is used by an NF to retrieve stored data or analytics from the ADRF and to receive future notifications containing the corresponding data or analytics received by ADRF.	NF service consumer (DCCF, NWDAF)
Nadrf_DataManagement_RetrievalUnsubscribe	This service operation is used by an NF to request that the ADRF no longer sends data or analytics to a notification endpoint.	NF service consumer (DCCF, NWDAF)
Nadrf_DataManagement_RetrievalNotify	This service operation is used by the ADRF to notify an NF with either data or analytics, or instructions to fetch the data or analytics from the ADRF. It is also used by the ADRF to notify NF service consumers about data or analytics that are about to be deleted.	ADRF
Nadrf_DataManagement_Delete	This service operation is used by an NF to delete stored data in ADRF.	NF service consumer (DCCF, NWDAF)

4.2.2.2 Nadrf_DataManagement_StorageRequest service operation

4.2.2.2.1 General

The Nadrf_DataManagement_StorageRequest service operation is used by an NF service consumer to store data or analytics.

4.2.2.2.2 Request Storage of data or analytics

Figure 4.2.2.2.2-1 shows a scenario where the NF service consumer sends a request to the ADRF to store data or analytics.

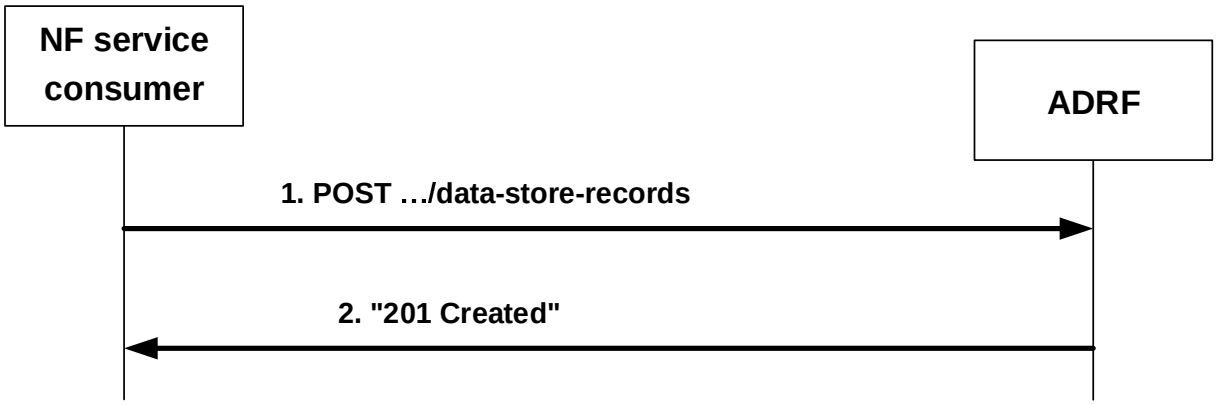

Figure 4.2.2.2.2-1: NF service consumer requesting to store data or analytics

The NF service consumer shall invoke the Nadrf_DataManagement_StorageRequest service operation to store data or analytics. The NF service consumer shall send an HTTP POST request with "{apiRoot}/nadrf-datamanagement/<apiVersion>/data-store-records" as Resource URI representing the "ADRF Data Store Records" resource, as shown in figure 4.2.2.2.2-1, step 1, to create an "Individual ADRF Data Store Record" according to the information in the message body. The NadrfDataStoreRecord data structure provided in the request body shall include:

- one of the following:
  - analytics subscription notification(s) within the "anaNotifications" attribute together with the corresponding subscription information within the "anaSub" attribute;
  - data subscription notification within the "dataNotif" attribute together with the corresponding subscription information within the " dataSub" attribute.

and may include:

- storage handling information within the "storeHandl" attribute, if the "EnhDataMgmt" feature is supported.
- a data set tag within the "dataSetTag" attribute, if the "EnhDataMgmt" feature is supported;
- data synthesis and compression information within the "dsc" attribute, if the "EnhDataMgmt" feature is supported.

NOTE: The data synthesis and compression information can include an indication that the data have been generated using a data synthesis tool, an indication that the data have been generated using a data compression tool, and information about the data synthesis and/or compression technique.

Upon the reception of an HTTP POST request with "{apiRoot}/nadrf-datamanagement/<apiVersion>/data-store-records" as Resource URI and NadrfDataStoreRecord data structure as request body, the ADRF shall:

- create a new data store record;
- assign a storeTransId;
- store the data or analytics.