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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

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- should** indicates a recommendation to do something
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- may** indicates permission to do something
- need not** indicates permission not to do something

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- 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

1 Scope

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

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 Messaging Framework Adaptation 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 29.574: "5G System; Data Collection Coordination Services; Stage 3".
- [16] Void.
- [17] Void.
- [18] Void.

- [19] Void.
- [20] 3GPP TS 29.520: "5G System; Network Data Analytics Services; Stage 3".
- [21] Void.
- [22] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".
- [23] 3GPP TS 29.575: "5G System; 5G System; Analytics Data Repository Services; 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].

3.2 Symbols

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

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].

| | |
|-------|---|
| AF | Application Function |
| AMF | Access and Mobility Management Function |
| DCCF | Data Collection Coordination Function |
| MFAF | Messaging Framework Adaptor Function |
| NEF | Network Exposure Function |
| NF | Network Function |
| NRF | Network Repository Function |
| NSSF | Network Slice Selection Function |
| NWDAF | Network Data Analytics Function |
| PCF | Policy Control Function |
| SMF | Session Management Function |
| UDM | Unified Data Management |

4 Services offered by the MFAF

4.1 Introduction

The Messaging Framework Adaptor Services are used for the Messaging Framework Adaptor Function (MFAF) to enable the 5GS to interact with the messaging framework using Nmfaf services. The MFAF offers to other NFs the following services:

- Nmfaf_3daDataManagement; and
- Nmfaf_3caDataManagement.

Table 4.1-1: Service provided by MFAF

| Service Name | Description | Service Operations | Operation Semantics | Example Consumer(s) |
|-------------------------|---|--------------------|---------------------|-------------------------------------|
| Nmfaf_3daDataManagement | The 3GPP DCCF Adaptor (3DA) Data Management Service enables the DCCF to convey to the messaging framework, information about the data the messaging framework will receive from a Data Source, formatting and processing instructions and the Data Consumer and notification endpoints. | Configure | Request / Response | DCCF, NWDAF |
| | | Deconfigure | Request / Response | DCCF, NWDAF |
| Nmfaf_3caDataManagement | The 3GPP Consumer Adaptor (3CA) Data Management Service delivers data to each Data Consumer or notification endpoint after formatting and processing of data received by the messaging framework. | Notify | Subscribe / Notify | NWDAF, PCF, NSSF, AMF, SMF, NEF, AF |
| | | Fetch | Request / Response | NWDAF, PCF, NSSF, AMF, SMF, NEF, AF |

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 |
|-------------------------|--------|---------------------------------|------------------------------|-------------------------|---------------------------------------|
| Nmfaf_3daDataManagement | 4.2 | API for Nmfaf_3daDataManagement | Nmfaf_3daDataManagement.yaml | nmfaf-3dadatamanagement | Annex A.2 Nmfaf_3daDataManagement API |
| Nmfaf_3caDataManagement | 4.3 | API for Nmfaf_3caDataManagement | Nmfaf_3caDataManagement.yaml | nmfaf-3cadatamanagement | Annex A.3 Nmfaf_3caDataManagement API |

4.2 Nmfaf_3daDataManagement Service

4.2.1 Service Description

4.2.1.1 Overview

The Nmfaf_3daDataManagement service as defined in 3GPP TS 23.288 [14], is provided by the Messaging Framework Adaptor Function (MFAF).

This service:

- allows NF consumers to configure or reconfigure the MFAF to map data or analytics received by the MFAF to out-bound notification endpoints; and
- allows NF consumers to reconfigure the MFAF to stop mapping data or analytics received by the MFAF to out-bound notification endpoints.

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 Nmfaf_3daDataManagement service is part of the Nmfaf service-based interface exhibited by the Messaging Framework Adaptor Function (MFAF).

Known consumer of the Nmfaf_3daDataManagement service is:

- Data Collection Coordination Function (DCCF)

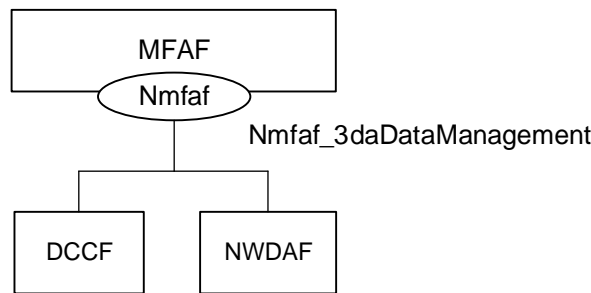


Figure 4.2.1.2-1: Reference Architecture for the Nmfaf_3daDataManagement Service; SBI representation

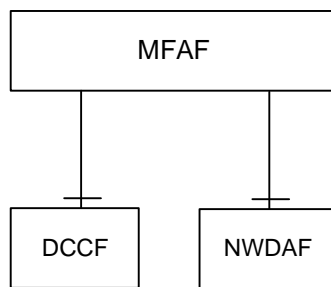


Figure 4.2.1.2-2: Reference Architecture for the Nmfaf_3daDataManagement Service; reference point representation

4.2.1.3 Network Functions

4.2.1.3.1 Messaging Framework Adaptor Function (MFAF)

The Messaging Framework Adaptor Function (MFAF) provides the functionality to allow NF consumers to configure or reconfigure the behaviour of mapping data or analytics received by the MFAF to out-bound notification endpoints.

4.2.1.3.2 NF Service Consumers

The Data Collection Coordination Function (DCCF) and the NWDAF support:

- configuring the MFAF to map data or analytics received by the MFAF to out-bound notification endpoints and to format and process the out-bound data or analytics; and
- reconfiguring the MFAF to stop the sending of data to consumers.

4.2.2 Service Operations

4.2.2.1 Introduction

Table 4.2.2.1-1: Operations of the Nmfaf_3daDataManagement Service

| Service operation name | Description | Initiated by |
|-------------------------------------|---|-----------------------------------|
| Nmfaf_3daDataManagement_Configure | This service operation is used by an NF to configure or reconfigure the MFAF to map data or analytics received by the MFAF to out-bound notification endpoints and to format and process the outbound data or analytics | NF service consumer (DCCF, NWDAF) |
| Nmfaf_3daDataManagement_Deconfigure | This service operation is used by an NF to stop mapping data or analytics received by the MFAF to one or more outbound notification endpoints. | NF service consumer (DCCF, NWDAF) |

4.2.2.2 Nmfaf_3daDataManagement_Configure service operation

4.2.2.2.1 General

The Nmfaf_3daDataManagement_Configure service operation is used by an NF service consumer to configure or update the configuration of the MFAF for mapping data or analytics received by the MFAF to out-bound notification endpoints, and formatting and processing the out-bound data or analytics.

4.2.2.2.2 Initial configuration for mapping data or analytics

Figure 4.2.2.2.2-1 shows a scenario where the NF service consumer (e.g. DCCF) sends a request to the MFAF to request the configuration of mapping data or analytics (as shown in 3GPP TS 23.288 [14]).

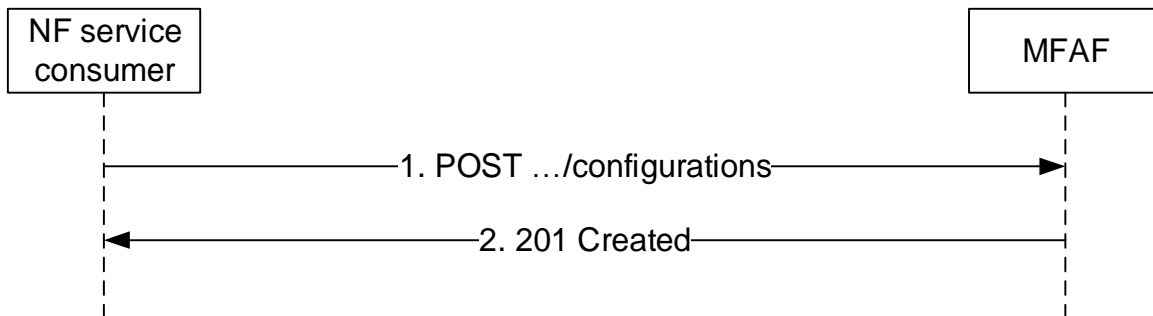


Figure 4.2.2.2-1: NF service consumer create the configuration

The NF service consumer shall invoke the Nmfaf_3daDataManagement_Configure service operation to create the configuration(s). The NF service consumer shall send an HTTP POST request with "{apiRoot}/nmfaf-3dadatamanagement/<apiVersion>/configurations" as Resource URI representing the "MFAF Configurations", as shown in figure 4.2.2.2.2-1, step 1, to create a configuration for an "Individual MFAF Configuration" according to the information in message body. The MfafConfiguration data structure provided in the request body

shall include:

- a description of the configurations as "messageConfigurations" attribute that, for each configuration, the MessageConfiguration data type shall include
 - 1) a notification URI of Data Consumer or Analytics Consumer or other endpoint where to receive the requested mapping data or analytics as "notificationURI" attribute; and
 - 2)- if the configuration is used for mapping analytics or data collection, a Notification Correlation ID for the Data or Analytics Consumer (or other endpoint) as "correId" attribute;

and may include:

- 1) the formatting instructions as "formatInstruct" attribute;
- 2) the processing instructions as "procInstruct" attribute or "multiProcInstructs" attribute if the "MultiProcessingInstruction" feature is supported;
- 3) the MFAF notification information to identify the Event Notifications received from the NWDAF or Data Source NF (e.g. AMF, SMF), which can be sent to the consumer or other notification endpoints, as "mfafNotiInfo" attribute;
- 4) NF instance identifier of the ADRF as "adrId" attribute; and
- 5) the notification endpoints within the "notifEndpoints" attribute, if the "DataAnaCollect" feature is supported.

Upon the reception of an HTTP POST request with: "{apiRoot}/nmfaf-3dadatamanagement/<apiVersion>/configurations" as Resource URI and MfafConfiguration data structure as request body, the MFAF shall:

- create a new configuration;

- assign a transaction reference id;
- if no MFAF notification information has been provided in the request, determine the MFAF notification information and add it to the configuration that is created and will be returned to the NF service consumer;
- store the configuration.

If the MFAF created an "Individual MFAF Configuration" resource, the MFAF 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 an error occurs when processing the HTTP POST request, the MFAF shall send an HTTP error response as specified in clause 5.1.7.

4.2.2.2.3 Update the configuration of existing individual mapping data or analytics

Figure 4.2.2.2.3-1 shows a scenario where the NF service consumer sends a request to the MFAF to update the configuration of mapping data or analytics (as shown in 3GPP TS 23.288 [14])

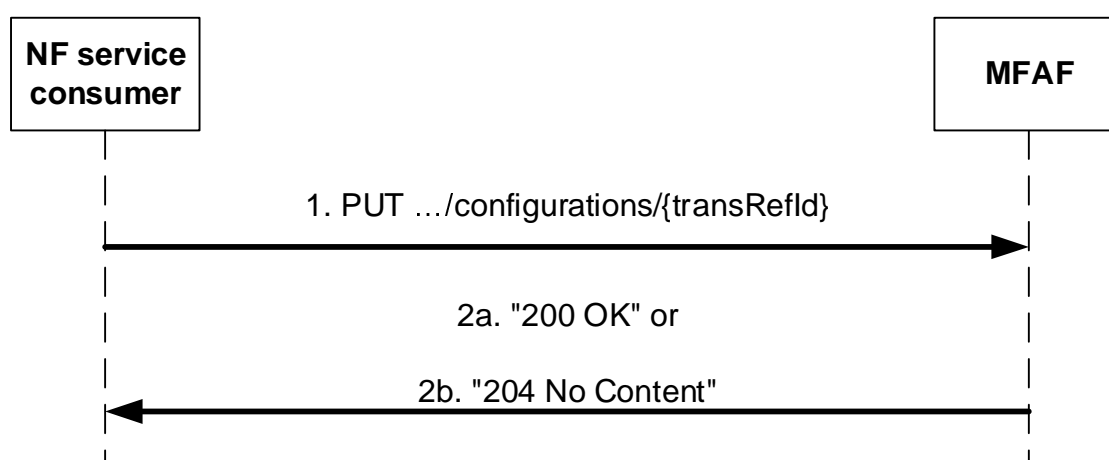


Figure 4.2.2.2.3-1: NF service consumer updates configuration

The NF service consumer shall invoke the `Nmfaf_3daDataManagement_Configure` service operation to update the configuration(s). The NF service consumer shall send an HTTP PUT request with "`{apiRoot}/nmfaf-3datamanagement/<apiVersion>/configurations/{transRefId}`" as Resource URI representing the "Individual MFAF Configuration", as shown in figure 4.2.2.2.3-1, step 1, to update the subscription for an "Individual MFAF Configuration" resource identified by the `{transRefId}`. The `MfafConfiguration` data structure provided in the request body shall include:

- a description of the configurations as "messageConfigurations" attribute that, for each configuration, the `MfafConfiguration` data structure provided in the request body shall include the same contents as described in 4.2.2.2.2.

Upon the reception of an HTTP PUT request with: "`{apiRoot}/nmfaf-3datamanagement/<apiVersion>/configurations/{transRefId}`" as Resource URI and `MfafConfiguration` data structure as request body, the MFAF shall:

- update the configuration of corresponding transaction reference Id; and
- store the configuration.

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

- HTTP "200 OK" status code with the message body containing a representation of the updated configuration, as shown in figure 4.2.2.2.3-1, step 2a. or
- HTTP "204 No Content" status code, as shown in figure 4.2.2.2.3-1, step 2b.

If an error occurs when processing the HTTP PUT request, the MFAF shall send an HTTP error response as specified in clause 5.1.7.

If the MFAF determines the received HTTP PUT request needs to be redirected, the MFAF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

4.2.2.3 Nmfaf_3daDataManagement_Deconfigure service operation

4.2.2.3.1 General

The Nmfaf_3daDataManagement_Deconfigure service operation is used by an NF service consumer to stop mapping data or analytics received by the MFAF to one or more out-bound notification endpoints.

4.2.2.3.2 Stop mapping data or analytics

Figure 4.2.2.3.2-1 shows a scenario where the NF service consumer sends a request to the MFAF to update the configuration to stop mapping data or analytics (as shown in 3GPP TS 23.288 [14])

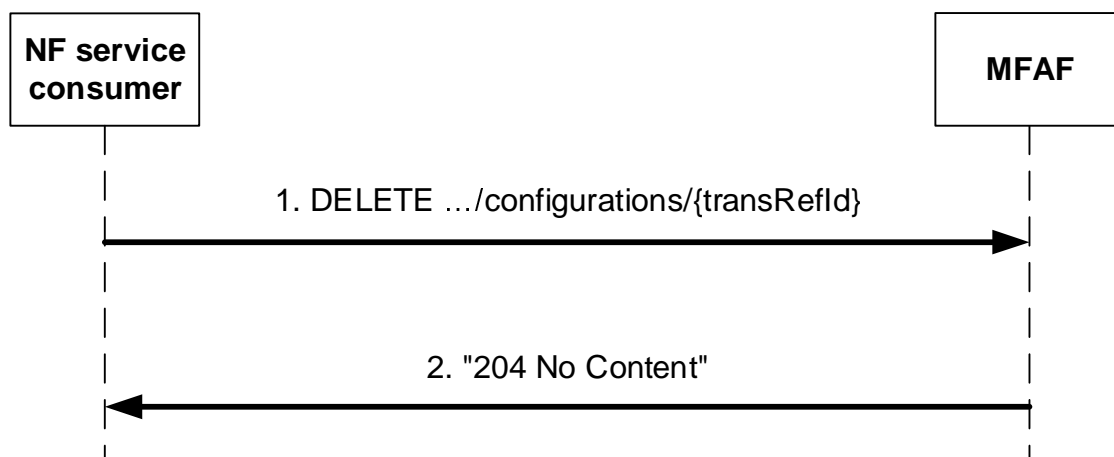


Figure 4.2.2.3.2-1: NF service consumer stops mapping data or analytics

The NF service consumer shall invoke the Nmfaf_3daDataManagement_Deconfigure service operation to stop the MFAF to map data or analytics. The NF service consumer shall send an HTTP DELETE request with "{apiRoot}/nmfap-3dadatamanagement/<apiVersion>/configurations/{transRefId}" as Resource URI, where {transRefId} represents the "Individual MFAF Configuration" to be deleted, as shown in figure 4.2.2.3.2-1, step 1.

Upon the reception of an HTTP DELETE request and if the MFAF successfully processed and accepted the received HTTP DELETE request from the NF service consumer, the MFAF shall acknowledge the request by sending a "204 No Content" response to the NF service consumer, as shown in figure 4.2.2.3.2-1, step 2. Further, the MFAF shall remove the individual resource linked to the delete request.

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

If the MFAF determines the received HTTP DELETE request needs to be redirected, the MFAF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

4.3 Nmfaf_3caDataManagement Service

4.3.1 Service Description

4.3.1.1 Overview

The Nmfaf_3caDataManagement service as defined in 3GPP TS 23.288 [14], is provided by the Messaging Framework Adaptor Function (MFAF).

This service:

- allows NF consumers to collect the data or analytics from the MFAF.

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 [14].

The Nmfaf_3caDataManagement service is part of the Nmfaf service-based interface exhibited by the Messaging Framework Adaptor Function (MFAF).

Known consumers of the Nmfaf_3caDataManagement service are:

- Network Data Analytics Function (NWDAF)
- 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)

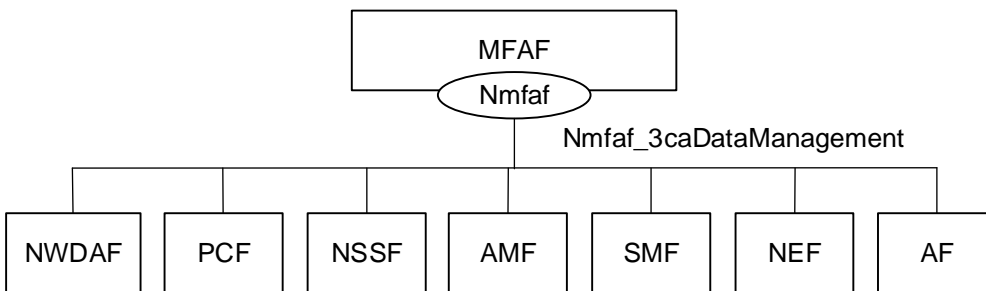


Figure 4.3.1.2-1: Reference Architecture for the Nmfaf_3caDataManagement Service; SBI representation

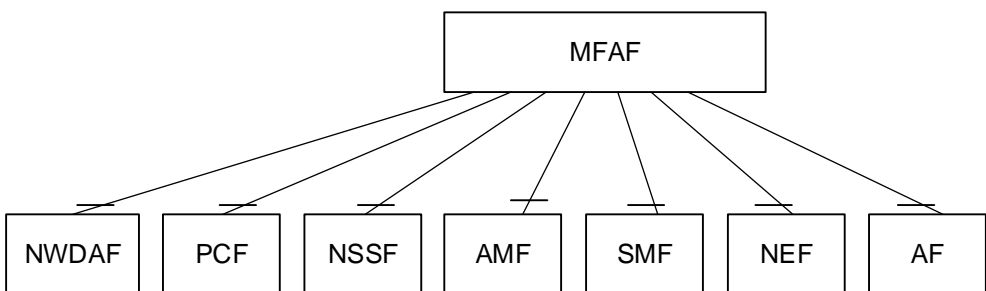


Figure 4.3.1.2-2: Reference Architecture for the Nmfaf_3caDataManagement Service; reference point representation

4.3.1.3 Network Functions

4.3.1.3.1 Messaging Framework Adaptor Function (MFAF)

The Messaging Framework Adaptor Function (MFAF) provides the functionality to supply data or analytics, or an indication of availability of data or analytics to notification endpoints configured in Nmfaf_3caDataManagement service as described in clause 4.2.1.

4.3.1.3.2 NF Service Consumers

The NWDAF, PCF, NSSF, AMF, SMF, NEF, and AF:

- supports retrieving data or analytics from the MFAF.

The MFAF:

- supports providing data or analytics or notification of availability of data or analytics to notification endpoints.

4.3.2 Service Operations

4.3.2.1 Introduction

Table 4.3.2.1-1: Operations of the Nmfa3caDataManagement Service

| Service operation name | Description | Initiated by |
|---------------------------------|---|--|
| Nmfa3caDataManagement_Fetch | This service operation is used by an NF to retrieve stored data or analytics from the MFAF. | NF service consumer (NWDAF, PCF, NSSF, AMF, SMF, NEF and AF) |
| Nmfa3caDataManagement_Subscribe | This is a pseudo operation, the actual subscription is created via Nmfa3daDataManagement Service. (NOTE) | |
| Nmfa3caDataManagement_Notify | This service operation is used by an NF with either data or analytics to provide data or analytics or notification of availability of data or analytics to notification endpoints. | MFAF |
| NOTE: | In the current release OpenAPI 3.0.0 is adopted, with OpenAPI 3.0.0 it is not possible to document a stand-alone callback operation, thus the Notify operation has to be defined in combination with a Subscribe operation. | |

NOTE: Nmfa3caDataManagement_Subscribe service operation is not used by any NF service consumers in this release.

4.3.2.2 Nmfa3caDataManagement_Fetch service operation

4.3.2.2.1 General

The Nmfa3caDataManagement_Fetch service operation allows consumer to retrieve data or analytics from the MFAF as indicated by Nmfa3caDataManagement_Notify Fetch Instruction.

4.3.2.2.2 Retrieve data or analytics from the MFAF

Figure 4.3.2.2.2-1 shows a scenario where the NF service consumer (e.g. NWDAF) sends a request to the MFAF to retrieve the data or analytics as indicated by Nmfa3caDataManagement_Notify Fetch Instruction.

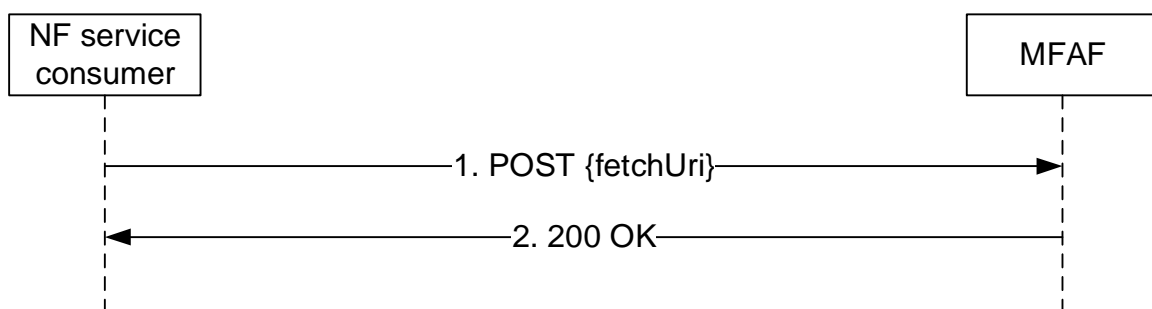


Figure 4.3.2.2.2-1: NF service consumer retrieve data or analytics from the MFAF

The NF service consumer shall invoke the `Nmfaf_3caDataManagement_Fetch` service operation to retrieve stored data or analytics. The NF service consumer shall send an HTTP POST request to the URI "`{fetchUri}`" which was previously provided by the MFAF within a `FetchInstruction` data structure in an MFAF notification, as shown in figure 4.3.2.2.2-1, step 1, to fetch data or analytics from the MFAF.

The request body shall include fetch correlation identifiers, which were also previously provided by the MFAF in the "`fetchCorrIds`" attribute within a `FetchInstruction` data structure in an MFAF notification.

Upon the reception of the HTTP POST request, the MFAF shall:

- find the data or analytics according to the requested parameters.

If the requested data is found, the MFAF shall respond with "200 OK" status code with the message body containing the `NmfafDataAnaNotification` data structure. The `NmfafDataAnaNotification` data structure in the response body shall include one of the following:

- information about network data analytics function events that occurred in the "`anaNotifications`" attribute;
- data collected from data sources (e.g. SMF, NEF) in the "`dataNotif`" attribute.

If errors occur when processing the HTTP POST request, the NF service consumer shall send an HTTP error response as specified in clause 5.2.7.

If the MFAF determines the received HTTP POST request needs to be redirected, the MFAF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

4.3.2.2A `Nmfaf_3caDataManagement_Subscribe` service operation

This is a pseudo operation, the MFAF does not actually provide `Subscribe` service operation through `Nmfaf_3caDataManagement` service. The actual subscription is created via `Nmfaf_3daDataManagement Service`.

4.3.2.3 `Nmfaf_3caDataManagement_Notify` service operation

4.3.2.3.1 General

The `Nmfaf_3caDataManagement_Notify` service operation provides data or analytics or notification of availability of data or analytics to notification endpoints.

4.3.2.3.2 Notification about the subscribed data or analytics

Figure 4.3.2.3.2-1 shows a scenario where the MFAF sends a request to the NF service consumer to notify it about data or analytics or fetch instructions.

The subscription corresponding to the notification is created by the service consumer via `Nmfaf_3daDataManagement Service Operation`.

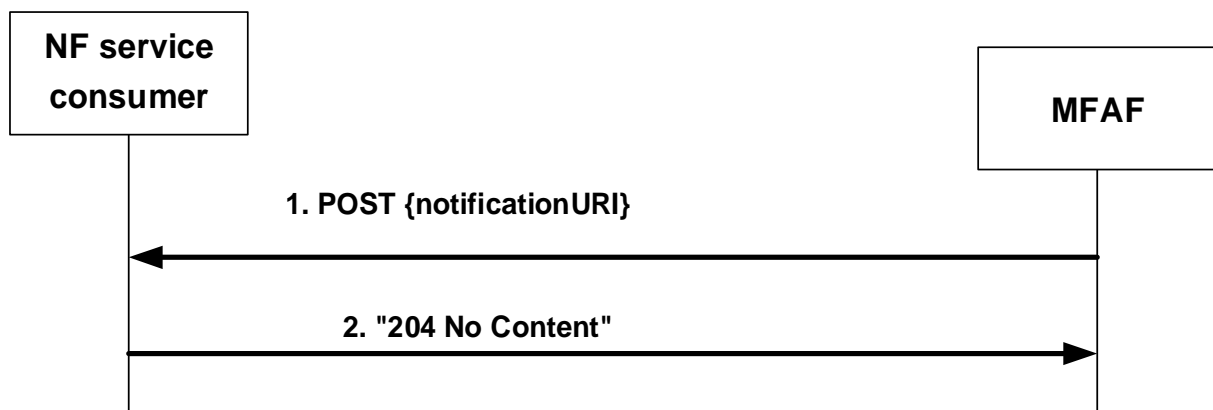


Figure 4.3.2.3.2-1: MFAF notifies the NF service consumer about subscribed data or analytics or fetch instructions

The MFAF shall invoke the `Nmfaf_3caDataManagement_Notify` service operation to notify about subscribed data or analytics, or notification about the availability of data or analytics. The MFAF shall send an HTTP POST request to the "`{notificationURI}`" received in the subscription (see clause 5.2.5 for the definition of this `notificationURI`), as shown in figure 4.3.2.3.2-1, step 1. The `NmfafDataRetrievalNotification` data structure provided in the request body shall include:

- notification correlation Id within the "correlId" attribute;

and shall include one of the following:

- fetch instructions indicate whether the data or analytics are to be fetched by the Consumer in the "fetchInstruction" attribute;
- information about the MFAF data or analytics in the "dataAnaNotif" attribute, which contains one of the following:
 - information about network data analytics function events that occurred in the "anaNotifications" attribute;
 - data collected from data sources (e.g. SMF, NEF) in the "dataNotif" attribute.

Upon the reception of an HTTP POST request with "`{notificationURI}`" as Resource URI and `NmfafDataRetrievalNotification` 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 clause 5.2.7.

If 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 clause 6.10.9 of 3GPP TS 29.500 [4].

After the successful processing of the HTTP POST request, if the MFAF requests the NF service consumer to retrieve the data or analytics with the "fetchInstruct" attribute, the NF service consumer may invoke the `Nmfaf_3caDataManagement_Fetch` service operation to retrieve the notified data or analytics as defined in clause 4.3.2.2.

5 API Definitions

5.1 Nmfaf_3daDataManagement Service API

5.1.1 Introduction

The `Nmfaf_3daDataManagement` Service shall use the `Nmfaf_3daDataManagement` API.

The API URI of the `Nmfaf_3daDataManagement` API shall be:

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

The request URIs used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

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

with the following components:

- The `{apiRoot}` shall be set as described in 3GPP TS 29.501 [5].
- The `<apiName>` shall be "nmfaf-3dadatamanagement".
- The `<apiVersion>` shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 5.1.3.

5.1.2 Usage of HTTP

5.1.2.1 General

HTTP/2, IETF RFC 9113 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

The OpenAPI [6] specification of HTTP messages and content bodies for the Nmfaf_3daDataManagement API is contained in Annex A.

5.1.2.2 HTTP standard headers

5.1.2.2.1 General

See clause 5.1.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

5.1.2.2.2 Content type

JSON, IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. 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 9457 [13].

5.1.2.3 HTTP custom headers

The mandatory HTTP custom header fields specified in clause 5.1.3.2 of 3GPP TS 29.500 [4] shall be applicable.

5.1.3 Resources

5.1.3.1 Overview

This clause describes the structure for the Resource URIs, the resources and methods used for the service.

Figure 5.1.3.1-1 depicts the resource URIs structure for the Nmfaf_3daDataManagement API.

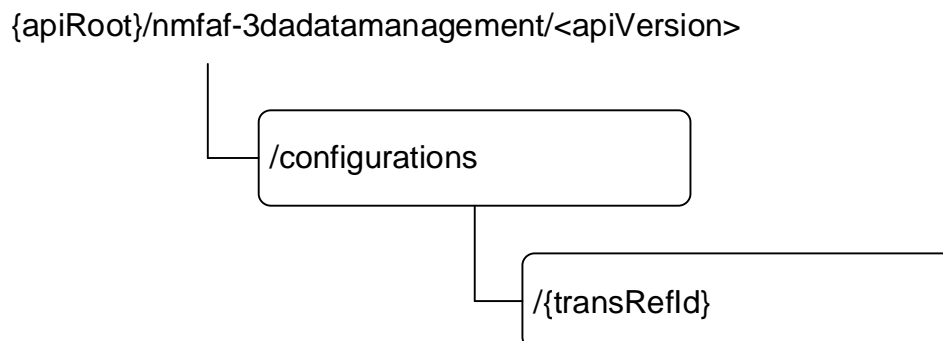


Figure 5.1.3.1-1: Resource URI structure of the Nmfaf_3daDataManagement API

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 |
|-------------------------------|------------------------------|---------------------------------|--|
| MFAF Configurations | /configurations | POST | Creates a new individual MFAF Configuration resource. |
| Individual MFAF Configuration | /configurations/{transRefId} | PUT | Modifies an existing Individual MFAF Configuration subresource. |
| | | DELETE | Deletes an Individual MFAF Configuration identified by subresource {transRefId}. |

5.1.3.2 Resource: MFAF Configurations

5.1.3.2.1 Description

The MFAF Configurations resource represents all configuration to the Nmfaf_3daDataManagement Service at a given MFAF. The resource allows an NF service consumer to create a new Individual MFAF Configuration resource.

5.1.3.2.2 Resource Definition

Resource URI: {apiRoot}/nmfaf-3dadatamanagement/<apiVersion>/configurations

The <apiVersion> shall be set as described in clause 5.1.1.

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 clause 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 | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| 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 |
|-------------------|---|-------------|--|
| MfafConfiguration | M | 1 | Create a new Individual MFAF Configuration 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 |
|--|---|-------------|----------------|---|
| MfafConfiguration | M | 1 | 201 Created | The creation of an Individual MFAF Configuration resource is confirmed and a representation of that resource is returned. |
| NOTE: The mandatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] 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}/nmfaf-3datamanagement/<apiVersion>/configurations/{transRefId} |

5.1.3.2.4 Resource Custom Operations

None in this release of the specification.

5.1.3.3 Resource: Individual MFAF Configuration

5.1.3.2.1 Description

The Individual MFAF Configurations resource represents an individual configuration created in the MFAF and associated with transaction reference Id.

5.1.3.3.2 Resource Definition

Resource URI: {apiRoot}/nmfaf-3datamanagement/<apiVersion>/configurations/{transRefId}

The <apiVersion> shall be set as described in clause 5.1.1.

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 clause 5.1.1 |
| transRefId | string | Unique identifier of the individual MFAF Configurations resource. |

5.1.3.3.3 Resource Standard Methods

5.1.3.3.3.1 PUT

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 PUT method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| 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 PUT Request Body on this resource

| Data type | P | Cardinality | Description |
|-------------------|---|-------------|---------------------------------|
| MfafConfiguration | M | 1 | The updated MFAF Configuration. |

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

| Data type | P | Cardinality | Response codes | Description |
|-------------------|---|-------------|------------------------|---|
| MfafConfiguration | M | 1 | 200 OK | The update of an Individual MFAF Configuration resource is confirmed and a representation of that resource is returned. |
| n/a | | | 204 No Content | Successful case: The Individual MFAF Configuration resource was modified. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during resource modification. (NOTE 2) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during resource modification. (NOTE 2) |

NOTE 1: The mandatory HTTP error status code for the PUT method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.

NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).

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 | Contains an alternative URI of the resource located in an alternative NF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target MFAF (service) instance towards which the request is redirected. |

Table 5.1.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|--|
| Location | string | M | 1 | Contains an alternative URI of the resource located in an alternative NF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target MFAF (service) instance towards which the request is redirected. |

5.1.3.3.3.2 DELETE

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

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

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

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

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

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

Table 5.1.3.3.3.2-3: 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 MFAF Configuration resource matching the transRefId was deleted. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during resource deletion (NOTE 2) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during resource deletion (NOTE 2) |
| NOTE 1: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |
| NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]). | | | | |

Table 5.1.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|--|
| Location | string | M | 1 | Contains an alternative URI of the resource located in an alternative NF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target MFAF (service) instance towards which the request is redirected. |

Table 5.1.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|--|
| Location | string | M | 1 | Contains an alternative URI of the resource located in an alternative NF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target MFAF (service) instance towards which the request is redirected. |

5.1.4 Custom Operations without associated resources

None in this release of the specification.

5.1.5 Notifications

None in this release of the specification.

5.1.6 Data Model

5.1.6.1 General

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

Table 5.1.6.1-1 specifies the data types defined for the Nmfaf_3daDataManagement service based interface protocol.

Table 5.1.6.1-1: Nmfaf_3daDataManagement specific Data Types

| Data type | Clause defined | Description | Applicability |
|----------------------|----------------|--|---------------|
| MfafConfiguration | 5.1.6.2.2 | The description of MFAF configuration | |
| MessageConfiguration | 5.1.6.2.3 | The description of the configurations. | |
| MfafNotifInfo | 5.1.6.2.4 | The MFAF notification information. | |

Table 5.1.6.1-2 specifies data types re-used by the Nmfaf_3daDataManagement 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 Nmfaf_3daDataManagement service based interface.

Table 5.1.6.1-2: Nmfaf_3daDataManagement re-used Data Types

| Data type | Reference | Comments | Applicability |
|-----------------------|---------------------|--|----------------|
| FormattingInstruction | 3GPP TS 29.574 [15] | Contains data or analytics formatting Instructions. | |
| NotifyEndpoint | 3GPP TS 29.574 [15] | The information of notification endpoint. | DataAnaCollect |
| ProcessingInstruction | 3GPP TS 29.574 [15] | Contains instructions related to the processing | |
| SupportedFeatures | 3GPP TS 29.571 [22] | Used to negotiate the applicability of the optional features defined in table 5.1.8-1. | |
| Uri | 3GPP TS 29.571 [22] | URI. | |

5.1.6.2 Structured data types

5.1.6.2.1 Introduction

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

5.1.6.2.2 Type: MfafConfiguration

Table 5.1.6.2.2-1: Definition of type MfafConfiguration

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|-----------------------|------------------------------|---|-------------|--|---------------|
| messageConfigurations | array(Message Configuration) | M | 1..N | The configuration of the MFAF for mapping data or analytics. | |

5.1.6.2.3 Type: MessageConfiguration

Table 5.1.6.2.3-1: Definition of type MessageConfiguration

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|--|------------------------------|---|-------------|--|----------------------------|
| correld | string | M | 1 | If the configuration is used for mapping analytics or data collection, representing the Analytics Consumer Notification Correlation ID or Data Consumer Notification Correlation ID. | |
| formatInstruct | FormattingInstruction | O | 0..1 | Formatting instructions to be used for sending event notifications. | |
| mfafNotifInfo | MfafNotifInfo | C | 0..1 | The MFAF notification information. It shall be provided in a response message if it had not been provided in the respective request message. | |
| notificationURI | Uri | M | 1 | The notification URI of Data Consumer or Analytics Consumer or other endpoint where to receive the requested mapping data or analytics | |
| notifEndpoints | array(NotifyEndpoint) | O | 1..N | The additional information of notification target address and correlation identifier. | DataAnaCollect |
| proclnstruct | ProcessingInstruction | O | 0..1 | Processing instructions to be used for sending event notifications. (NOTE 1) | |
| multiProclnstructs | array(ProcessingInstruction) | O | 1..N | Processing instructions to be used for sending event notifications. (NOTE 1) | MultiProcessingInstruction |
| adrfld | NfInstanceId | O | 0..1 | NF instance identifier of the ADRF in which data and analytics can be stored. | |
| suppFeat | SupportedFeatures | C | 0..1 | This IE represents a list of Supported features as described in clause 5.1.8. (NOTE 2) | |
| NOTE 1: The "multiProclnstructs" attribute shall be used instead of the "proclnstruct" attribute when the "MultiProcessingInstruction" feature is supported. | | | | | |
| NOTE 2: It shall be present in the POST request if at least one feature defined in clause 5.1.8 is supported, and it shall be present in the POST response if the NF service consumer includes the "suppFeat" attribute in the POST request. | | | | | |

5.1.6.2.4 Type: MfafNotifInfo

Table 5.1.6.2.4-1: Definition of type MfafNotifInfo

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|-----------|---|-------------|---|---------------|
| mfafNotifUri | Uri | M | 1 | The notification URI of MFAF Notification Target Address. | |
| mfafCorreld | string | M | 1 | The MFAF Notification Correlation ID | |

5.1.6.3 Simple data types and enumerations

5.1.6.3.1 Introduction

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

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 |
|-----------|-----------------|-------------|---------------|
| | | | |

5.1.6.4 Data types describing alternative data types or combinations of data types

None in current specification.

5.1.6.5 Binary data

None in current specification.

5.1.7 Error Handling

5.1.7.1 General

For the Nmfaf_3daDataManagement API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.1.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.1.7.1-1 of 3GPP TS 29.500 [4].

In addition, the requirements in the following clauses are applicable for the Nmfaf_3daDataManagement API.

5.1.7.2 Protocol Errors

No specific procedures for the Nmfaf_3daDataManagement service are specified.

5.1.7.3 Application Errors

The application errors defined for the Nmfaf_3daDataManagement service are listed in Table 5.1.7.3-1.

Table 5.1.7.3-1: Application errors

| Application Error | HTTP status code | Description |
|-------------------|------------------|-------------|
| | | |

5.1.8 Feature negotiation

The optional features in table 5.1.8-1 are defined for the Nmfaf_3daDataManagement API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 5.1.8-1: Supported Features

| Feature number | Feature Name | Description |
|----------------|----------------------------|---|
| 1 | MultiProcessingInstruction | Indicates the support of multiple processing instructions. |
| 2 | DataAnaCollect | This feature indicates support for the enhancement of data and analytics process. |

5.1.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Nmfaf_3daDataManagement API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nmfaf_3daDataManagement API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 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 Nmfaf_3daDataManagement service.

The Nmfaf_3daDataManagement API defines a single scope "nmfaf-3dadatamanagement" for the entire service, and it does not define any additional scopes at resource or operation level.

5.2 Nmfaf_3caDataManagement Service API

5.2.1 Introduction

The Nmfaf_3caDataManagement Service shall use the Nmfaf_3caDataManagement API.

The API URI of the Nmfaf_3caDataManagement API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "nmfaf-3cadatamanagement".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 5.2.3.

5.2.2 Usage of HTTP

5.2.2.1 General

HTTP/2, IETF RFC 9113 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

The OpenAPI [6] specification of HTTP messages and content bodies for the Nmfaf_3caDataManagement API is contained in Annex A.

5.2.2.2 HTTP standard headers

5.2.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

5.2.2.2.2 Content type

JSON, IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. 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 9457 [13].

5.2.2.3 HTTP custom headers

The mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] shall be applicable.

5.2.3 Resources

There are no resources defined for this API in this release of the specification.

5.2.4 Custom Operations without associated resources

There are no custom operations without associated resources defined for this API in this release of the specification.

5.2.5 Notifications

5.2.5.1 General

Notifications shall comply to clause 6.2 of 3GPP TS 29.500 [4] and clause 4.6.2.3 of 3GPP TS 29.501 [5].

Table 5.2.5.1-1: Notifications overview

| Notification | Callback URI | HTTP method or custom operation | Description (service operation) |
|--|-----------------------------|---------------------------------|---|
| MFAF Notification | {notificationURI} (NOTE) | POST | Report one or several observed data or analytics. |
| Fetch Notification | {fetchUri} | POST | Fetch one or several notified data or analytics. |
| NOTE: The notificationURI is not provided by NF service consumer via Nmfaf_3caDataManagement API, it is provided via Nmfaf_3daDataManagement API during the configuration for mapping data or analytics. | | | |

5.2.5.2 MFAF Notification

5.2.5.2.1 Description

The MFAF Notification is used by the MFAF to provide data or analytics or notification of availability of data or analytics to notification endpoints.

5.2.5.2.2 Target URI

The Callback URI "{notificationURI}" shall be used with the callback URI variables defined in table 5.2.5.2.2-1.

Table 5.2.5.2.2-1: Callback URI variables

| Name | Definition |
|-----------------|--|
| notificationURI | The notification URI of Data Consumer or Analytics Consumer or other endpoint where to receive the requested data or analytics. The notificationURI is not provided by NF service consumer via Nmfaf_3caDataManagement API, it is provided via Nmfaf_3daDataManagement API during the configuration for mapping data or analytics. |

5.2.5.2.3 Standard Methods

5.2.5.2.3.1 POST

This method shall support the request data structures specified in table 5.2.5.2.3.1-1 and the response data structures and response codes specified in table 5.2.5.2.3.1-2.

Table 5.2.5.2.3.1-1: Data structures supported by the POST Request Body

| Data type | P | Cardinality | Description |
|--------------------------------|---|-------------|---|
| NmfafDataRetrievalNotification | M | 1 | The data or analytics or notification of availability of data or analytics to notification endpoints. |

Table 5.2.5.2.3.1-2: Data structures supported by the POST Response Body

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|---|
| n/a | | | 204 No Content | The MFAF notification is treated successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during the retrieval notification. (NOTE 2) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during the retrieval notification. (NOTE 2) |
| NOTE 1: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |
| NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]). | | | | |

Table 5.2.5.2.3.1-3: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|--|
| Location | string | M | 1 | Contains an alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification is redirected. For the case where the notification is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF service consumer (service) instance towards which the notification request is redirected. |

Table 5.2.5.2.3.1-4: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|--|
| Location | string | M | 1 | Contains an alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification is redirected. For the case where the notification is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF service consumer (service) instance towards which the notification request is redirected. |

5.2.5.3 Fetch Notification

5.2.5.3.1 Description

The Fetch Notification is used by the NF service consumer to retrieve data or analytics from the MFAF.

5.2.5.3.2 Target URI

The Callback URI "{fetchUri}" shall be used with the callback URI variables defined in table 5.2.5.3.2-1.

Table 5.2.5.3.2-1: Callback URI variables

| Name | Data type | Definition |
|----------|-----------|--|
| fetchUri | Uri | Fetch Uri as assigned during the procedure of notification about the subscribed data or analytics within the FetchInstruction data type (see table 5.2.6.2.3-1). |

5.2.5.3.3 Standard Methods

5.2.5.3.3.1 POST

This method shall support the URI query parameters specified in table 5.2.5.3.3.1-1.

Table 5.2.5.3.3.1-1: URI query parameters supported by the POST method on this resource

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

This method shall support the request data structures specified in table 5.2.5.3.3.1-2 and the response data structures and response codes specified in table 5.2.5.3.3.1-3.

Table 5.2.5.3.3.1-2: Data structures supported by the POST Request Body on this resource

| Data type | P | Cardinality | Description |
|---------------|---|-------------|---|
| array(string) | M | 1..N | Indicate the fetch correlation identifier(s). |

Table 5.2.5.3.3.1-3: Data structures supported by the POST Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|--|
| NmfafDataAnaNotification | M | 1 | 200 OK | The stored data or analytics related to the fetch correlation identifier(s). |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during the retrieval notification. (NOTE 2) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during the retrieval notification. (NOTE 2) |
| NOTE 1: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |
| NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]). | | | | |

Table 5.2.5.3.3.1-4: Headers supported by the by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | Contains an alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. For the case where the notification is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF service consumer (service) instance towards which the notification request is redirected. |

Table 5.2.5.3.3.1-5: Headers supported by the 308 response code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | Contains an alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. For the case where the notification is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF service consumer (service) instance towards which the notification request is redirected. |

5.2.6 Data Model

5.2.6.1 General

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

Table 5.2.6.1-1 specifies the data types defined for the Nmfaf_3caDataManagement service based interface protocol.

Table 5.2.6.1-1: Nmfaf_3caDataManagement specific Data Types

| Data type | Clause defined | Description | Applicability |
|--------------------------------|----------------|---|---------------|
| FetchInstruction | 5.2.6.2.3 | The fetch instruction indicates whether the data or analytics are to be fetched by the Consumer. | |
| NmfafDataAnaNotification | 5.2.6.2.4 | MFAF data or analytics. | |
| NmfafDataRetrievalNotification | 5.2.6.2.2 | The data or analytics or notification of availability of data or analytics to notification endpoints. | |

Table 5.2.6.1-2 specifies data types re-used by the Nmfaf_3caDataManagement 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 Nmfaf_3caDataManagement service based interface.

Table 5.2.6.1-2: Nmfaf_3caDataManagement re-used Data Types

| Data type | Reference | Comments | Applicability |
|--------------------------------------|---------------------|---|---------------|
| DataNotification | 3GPP TS 29.575 [23] | Represents a data subscription notification of one of various possible data sources | |
| DateTime | 3GPP TS 29.571 [22] | Identifies a specific time. | |
| NnwdafEventsSubscriptionNotification | 3GPP TS 29.520 [20] | Represents an NWDAF analytics subscription notification. | |
| Uri | 3GPP TS 29.571 [22] | URI. | |

5.2.6.2 Structured data types

5.2.6.2.1 Introduction

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

5.2.6.2.2 Type: NmfafDataRetrievalNotification

Table 5.2.6.2.2-1: Definition of type NmfafDataRetrievalNotification

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|--------------------------|---|-------------|--|---------------|
| correlId | string | M | 1 | Represents the Analytics Consumer Notification Correlation ID or Data Consumer Notification Correlation ID. It shall be set to the same value as the "correlId" attribute of MessageConfiguration data type. | |
| dataAnaNotif | NmfafDataAnaNotification | C | 0..1 | Represents notifications of analytics and data. (NOTE) | |
| fetchInstruction | FetchInstruction | C | 0..1 | The fetch instruction indicate whether the data or analytics are to be fetched by the Consumer. (NOTE) | |
| NOTE: Exactly one of the "dataAnaNotif" and "fetchInstruction" shall be included. | | | | | |

5.2.6.2.3 Type: FetchInstruction

Table 5.2.6.2.3-1: Definition of type FetchInstruction

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|---------------|---|-------------|---|---------------|
| fetchUri | Uri | M | 1 | The target address used by a data or analytics consumer to fetch the data or analytics. | |
| fetchCorrIds | array(string) | M | 1..N | The fetch correlation identifier(s) of the MFAF Data or Analytics | |
| expiry | DateTime | O | 0..1 | Indicates an expiration time, i.e. a deadline to fetch the data. | |

5.2.6.2.4 Type: NmfafDataAnaNotification

Table 5.2.6.2.4-1: Definition of type NmfafDataAnaNotification

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|---|---|-------------|--|---------------|
| anaNotifications | array(NnwdafEventsSubscriptionNotification) | C | 1..N | List of analytics subscription notifications. (NOTE 1, NOTE 2) | |
| dataNotif | DataNotification | C | 0..1 | Data subscription notification. (NOTE 1, NOTE 2) | |
| NOTE 1: Exactly one of these attributes shall be provided. | | | | | |
| NOTE 2: If the MFAF has received the notifications from another source without a time stamp, then the MFAF adds itself a time stamp based on the time it received the notification in "timeStampGen" attribute contained in the EventNotification data type in the NnwdafEventsSubscriptionNotification data type, or in "timeStamp" attribute contained in DataNotification data type. | | | | | |

5.2.6.3 Simple data types and enumerations

5.2.6.3.1 Introduction

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

5.2.6.3.2 Simple data types

None in this release of the specification.

5.2.6.4 Data types describing alternative data types or combinations of data types

None in this release of the specification.

5.2.6.5 Binary data

None in this release of the specification.

5.2.7 Error Handling

5.2.7.1 General

For the Nmfa_3caDataManagement API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] 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 [4].

In addition, the requirements in the following clauses are applicable for the Nmfaf_3caDataManagement API.

5.2.7.2 Protocol Errors

No specific procedures for the Nmfaf_3caDataManagement service are specified.

5.2.7.3 Application Errors

The application errors defined for the Nmfaf_3caDataManagement service are listed in Table 5.2.7.3-1.

Table 5.2.7.3-1: Application errors

| Application Error | HTTP status code | Description |
|-------------------|------------------|-------------|
| | | |

5.2.8 Feature negotiation

The optional features in table 5.2.8-1 are defined for the Nmfaf_3caDataManagement API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 5.2.8-1: Supported Features

| Feature number | Feature Name | Description |
|----------------|--------------|-------------|
| | | |

5.2.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Nmfaf_3caDataManagement API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nmfaf_3caDataManagement API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 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 Nmfaf_3caDataManagement service.

The Nmfaf_3caDataManagement API defines a single scope "nmfaf-3cadatamanagement" 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

This Annex specifies the formal definition of the API(s) defined in the present specification. It consists of OpenAPI 3.0.0 specifications in YAML format.

This Annex takes 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 1: 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 that uses the GitLab software version control system (see 3GPP TS 29.501 [5] clause 5.3.1 and 3GPP TR 21.900 [7] clause 5B).

A.2 Nmfaf_3daDataManagement API

openapi: 3.0.0

info:

```
version: 1.1.0
title: Nmfaf_3daDataManagement
description: |
  MFAF 3GPP DCCF Adaptor (3DA) Data Management Service.
  © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.
```

externalDocs:

```
description: 3GPP TS 29.576 V18.4.0; 5G System; Messaging Framework Adaptor Services; Stage 3.
url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.576/'
```

servers:

```
- url: '{apiRoot}/nmfaf-3dadatamanagement/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501.
```

security:

```
- oAuth2ClientCredentials:
  - nmfaf-3dadatamanagement
- {}
```

paths:

```
/configurations:
  post:
    summary: Creates a new Individual MFAF Configuration resource.
    operationId: CreateMFAFConfiguration
    tags:
      - MFAF Configuration(Collection)
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/MfafConfiguration'
          required: true
      description: >
        Contains the information for the creation of a new Individual MFAF
        Configuration resource.
    responses:
      '201':
        description: Successful creation of new Individual MFAF Configuration resource.
```

```

headers:
  Location:
    description: >
      Contains the URI of the newly created resource, according to the structure
      {apiRoot}/nmfaf-3datadatamanagement/<apiVersion>/configurations/{transRefId}
    required: true
    schema:
      type: string
  content:
    application/json:
      schema:
        $ref: '#/components/schemas/MfafConfiguration'
'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'
'502':
  $ref: 'TS29571_CommonData.yaml#/components/responses/502'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29571_CommonData.yaml#/components/responses/default'

/configurations/{transRefId}:
  put:
    summary: Updates an existing Individual MFAF Configuration resource.
    operationId: UpdateMFAFConfiguration
    tags:
      - Individual MFAF Configuration (Document)
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/MfafConfiguration'
    parameters:
      - name: transRefId
        in: path
        description: Unique identifier of the Individual MFAF Configuration resource.
        required: true
        schema:
          type: string
    responses:
      '200':
        description: The updated Individual MFAF Configuration resource is returned.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/MfafConfiguration'
      '204':
        description: The Individual MFAF Configuration 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':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '411':

```

```

    $ref: 'TS29571_CommonData.yaml#/components/responses/411'
  '413':
    $ref: 'TS29571_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29571_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29571_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '501':
    $ref: 'TS29571_CommonData.yaml#/components/responses/501'
  '502':
    $ref: 'TS29571_CommonData.yaml#/components/responses/502'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'
delete:
  summary: Deletes an existing Individual MFAF Configuration resource.
  operationId: DeleteMFAFConfiguration
  tags:
    - Individual MFAF Configuration (Document)
  parameters:
    - name: transRefId
      in: path
      description: Unique identifier of the Individual MFAF Configuration resource.
      required: true
      schema:
        type: string
  responses:
    '204':
      description: >
        No Content. The Individual MFAF Configuration resource matching
        the transRefId 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':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '429':
      $ref: 'TS29571_CommonData.yaml#/components/responses/429'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '502':
      $ref: 'TS29571_CommonData.yaml#/components/responses/502'
    '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:
            nmfaf-3dadatamanagement: Access to the nmfaf-3dadatamanagement API
schemas:
  MfafConfiguration:
    description: Represents an Individual MFAF Configuration.
    type: object
    required:
      - messageConfigurations
    properties:
      messageConfigurations:
        type: array
        items:
          $ref: '#/components/schemas/MessageConfiguration'

```

```

    minItems: 1
    description: The configuration of the MFAF for mapping data or analytics.

MessageConfiguration:
  description: Represents the message configuration.
  type: object
  required:
    - notificationURI
    - correId
  properties:
    correId:
      type: string
      description: >
        If the configuration is used for mapping analytics or data collection,
        representing the Analytics Consumer Notification Correlation ID or
        Data Consumer Notification Correlation ID.
    formatInstruct:
      $ref: 'TS29574_Ndccf_DataManagement.yaml#/components/schemas/FormattingInstruction'
    mfafNotiInfo:
      $ref: '#/components/schemas/MfafNotiInfo'
    notificationURI:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    notifEndpoints:
      type: array
      items:
        $ref: 'TS29574_Ndccf_DataManagement.yaml#/components/schemas/NotifyEndpoint'
      minItems: 1
      description: The information of notification endpoints.
    procInstruct:
      $ref: 'TS29574_Ndccf_DataManagement.yaml#/components/schemas/ProcessingInstruction'
    multiProcInstructs:
      type: array
      items:
        $ref: 'TS29574_Ndccf_DataManagement.yaml#/components/schemas/ProcessingInstruction'
      minItems: 1
      description: Processing instructions to be used for sending event notifications.
    adrfId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    suppFeat:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'

MfafNotiInfo:
  description: >
    The MFAF notification information. It shall be provided in a response message
    if it had not been provided in the respective request message.
  type: object
  required:
    - mfafNotifUri
    - mfafCorreId
  properties:
    mfafNotifUri:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    mfafCorreId:
      type: string

```

A.3 Nmfaf_3caDataManagement API

openapi: 3.0.0

info:

```

version: 1.1.0
title: Nmfaf_3caDataManagement
description: |
  MFAF 3GPP Consumer Adaptor (3CA) Data Management Service.
  © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.

```

externalDocs:

```

description: 3GPP TS 29.576 V18.4.0; 5G System; Messaging Framework Adaptor Services; Stage 3.
url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.576/'

```

servers:

```

- url: '{apiRoot}/nmfaf-3cadatamanagement/v1'
  variables:
    apiRoot:
      default: https://example.com

```

```

description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501.

security:
- oAuth2ClientCredentials:
- nmfaf-3cadatamanagement
- {}

paths:
/mfaf-data-analytics:
  post:
    # This is a pseudo operation, clients shall NOT invoke this method!
    requestBody:
      required: true
      content:
        application/json:
          # Unspecified schema for the JSON body, since this is used by neither the NF service
consumer nor the MFAF.
          schema: {}
    responses:
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    callbacks:
      Notification:
        '{notificationURI}':
          # The URI in {notificationURI} is obtained out of band by the MFAF, i.e. it is provided
via the Nmfaf_3daDataManagement API during the configuration for mapping data or analytics.
        post:
          requestBody:
            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/NmfafDataRetrievalNotification'
          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'
            '502':
              $ref: 'TS29571_CommonData.yaml#/components/responses/502'
            '503':
              $ref: 'TS29571_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29571_CommonData.yaml#/components/responses/default'
          callbacks:
            Fetch:
              '{request.body#/fetchInstruction/fetchUri}':
                post:
                  requestBody:
                    required: true
                    content:
                      application/json:
                        schema:
                          type: array
                          items:
                            type: string
                          minItems: 1
                        description: Indicate the fetch correlation identifier.

```



```

responses:
  '200':
    description: Expected response to a valid request.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/NmfafDataAnaNotification'
  '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'
  '502':
    $ref: 'TS29571_CommonData.yaml#/components/responses/502'
  '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:
            nmfaf-3cadatamanagement: Access to the nmfaf-3cadatamanagement API

```

```

schemas:
  NmfafDataRetrievalNotification:
    description: >
      Represents the data or analytics or notification of availability of data or analytics
      to notification endpoints.
    type: object
    required:
      - correId
    oneOf:
      - required: [dataAnaNotif]
      - required: [fetchInstruction]
    properties:
      correId:
        type: string
        description: >
          Represents the Analytics Consumer Notification Correlation ID
          or Data Consumer Notification Correlation ID. It shall be set to the same
          value as the "correId" attribute of MessageConfiguration data type.
      dataAnaNotif:
        $ref: '#/components/schemas/NmfafDataAnaNotification'
      fetchInstruction:
        $ref: '#/components/schemas/FetchInstruction'

```

```

FetchInstruction:
  description: >
    The fetch instructions indicate whether the data or analytics are to be fetched by the
    consumer.
  type: object
  required:
    - fetchUri
    - fetchCorrIds

```

```
properties:
  fetchUri:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
  fetchCorrIds:
    type: array
    items:
      type: string
    minItems: 1
    description: The fetch correlation identifier(s) of the MFAF Data or Analytics.
  expiry:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'

NmfafDataAnaNotification:
  description: MFAF data or analytics.
  type: object
  oneOf:
    - required: [anaNotifications]
    - required: [dataNotif]
  properties:
    anaNotifications:
      type: array
      items:
        $ref:
'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/NnwdafEventsSubscriptionNotification'
      minItems: 1
      description: List of analytics subscription notifications.
    dataNotif:
      $ref: 'TS29575_Nadrf_DataManagement.yaml#/components/schemas/DataNotification'
```

Annex B (informative): Change history

| Change history | | | | | | | |
|----------------|--------------|-----------|------|-----|-----|--|-------------|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-06 | CT3#116e | | | | | TS skeleton of Messaging Framework Adaptor Services specification | 0.0.0 |
| 2021-06 | CT3#116e | C3-213502 | | | | Inclusion of documents agreed in CT3#116e C3-213377. | 0.1.0 |
| 2021-08 | CT3#117e | C3-214580 | | | | Inclusion of documents agreed in CT3#117e C3-214479, C3-214358, C3-214359, C3-214360, C3-214361, C3-214362, C3-214363 and C3-214480. | 0.2.0 |
| 2021-11 | CT3#119e | C3-216522 | | | | Inclusion of documents agreed in CT3#119e C3-216422, C3-216423, C3-216441, C3-216465, C3-216467. | 0.3.0 |
| 2022-01 | CT3#119bis-e | C3-220455 | | | | Inclusion of documents agreed in CT3#119bis-e C3-220294, C3-220464, C3-220319, C3-220504, C3-220321, C3-220505. | 0.4.0 |
| 2022-02 | CT3#120e | C3-221516 | | | | Inclusion of documents agreed in CT3#120e C3-221289, C3-221299, C3-221424, C3-221602, C3-221603, C3-221604, C3-221605. | 0.5.0 |
| 2022-03 | CT#95e | CP-220161 | | | | Presentation to TSG CT for approval | 1.0.0 |
| 2022-03 | CT#95e | CP-220161 | | | | Approved by TSG CT | 17.0.0 |
| 2022-06 | CT#96 | CP-221132 | 0001 | 1 | F | Adding 3XX and error response handling support for MFAF services | 17.1.0 |
| 2022-06 | CT#96 | CP-221132 | 0002 | 1 | F | Corrections in the MFAF 3caDataManagement API | 17.1.0 |
| 2022-06 | CT#96 | CP-221129 | 0003 | | F | Correct the Cardinality and Presence of some attributes | 17.1.0 |
| 2022-06 | CT#96 | CP-221132 | 0004 | 1 | B | Support carrying ADRF ID in Nmfaf_3daDataManagement_Configure service operation | 17.1.0 |
| 2022-06 | CT#96 | CP-221129 | 0005 | | F | Nmfaf_3daDataManagement API corrections | 17.1.0 |
| 2022-06 | CT#96 | CP-221131 | 0006 | 1 | F | Nmfaf_3caDataManagement API corrections | 17.1.0 |
| 2022-06 | CT#96 | CP-221130 | 0007 | | F | Handling of the redirection responses | 17.1.0 |
| 2022-06 | CT#96 | CP-221134 | 0009 | 2 | F | Correction on DataNotification type | 17.1.0 |
| 2022-06 | CT#96 | CP-221133 | 0011 | | F | Removing UDM from the list of MFAF service consumers | 17.1.0 |
| 2022-06 | CT#96 | CP-221135 | 0012 | 1 | F | Update inputs of Nmfaf_3caDataManagement_Notify service | 17.1.0 |
| 2022-06 | CT#96 | CP-221134 | 0014 | | F | Correction to MFAF notification information | 17.1.0 |
| 2022-06 | CT#96 | CP-221134 | 0015 | | F | add CEF and OAM as consumers of Ndcf_DataManagement Service | 17.1.0 |
| 2022-06 | CT#96 | CP-221134 | 0016 | | F | update of Abbreviations | 17.1.0 |
| 2022-06 | CT#96 | CP-221155 | 0018 | 1 | F | Update the apiVersion placeholder | 17.1.0 |
| 2022-06 | CT#96 | CP-221152 | 0019 | | F | Update of info and externalDocs fields | 17.1.0 |
| 2022-09 | CT#97e | CP-222104 | 0021 | 2 | F | Add expiry attribute to the fetch instructions | 17.2.0 |
| 2022-09 | CT#97e | CP-222104 | 0022 | 1 | F | Corrections related to callback functions in MFAF | 17.2.0 |
| 2022-09 | CT#97e | CP-222104 | 0023 | 1 | F | Add NWDAF hosting DCCF as consumer of the Nmfaf_3daDataManagement service | 17.2.0 |
| 2022-09 | CT#97e | CP-222101 | 0024 | | F | Clean up References | 17.2.0 |
| 2022-09 | CT#97e | CP-222101 | 0025 | | F | Corrections related to NmfafDataRetrievalNotification data type | 17.2.0 |
| 2022-09 | CT#97e | CP-222101 | 0026 | | F | Corrections to Fetch Notification | 17.2.0 |
| 2022-09 | CT#97e | CP-222102 | 0028 | 1 | F | Miscellaneous corrections | 17.2.0 |
| 2022-09 | CT#97e | CP-222101 | 0029 | | F | Corrections to NF service consumer | 17.2.0 |
| 2022-09 | CT#97e | CP-222121 | 0030 | | F | Update of info and externalDocs fields | 17.2.0 |
| 2022-12 | CT#98e | CP-223172 | 0034 | | F | Correcting procedure description for dataNotif attribute | 17.3.0 |
| 2022-12 | CT#98e | CP-223172 | 0036 | | F | Corrections to data type in POST header | 17.3.0 |
| 2022-12 | CT#98e | CP-223237 | 0037 | 1 | F | The time stamp of data and analytics notification | 17.3.0 |
| 2022-12 | CT#98e | CP-223188 | 0041 | | F | Update of info and externalDocs fields | 17.3.0 |
| 2022-12 | CT#98e | CP-223191 | 0031 | | F | Adding the mandatory error code 502 Bad Gateway | 18.0.0 |
| 2022-12 | CT#98e | CP-223176 | 0035 | 1 | F | Correction of data type of proclnstruct | 18.0.0 |
| 2022-12 | CT#98e | CP-223190 | 0040 | | F | Update of info and externalDocs fields | 18.0.0 |
| 2023-03 | CT#99 | CP-230149 | 0042 | 1 | F | Handling of fetch Instruction | 18.1.0 |
| 2023-03 | CT#99 | CP-230148 | 0044 | | B | Support of multiple notification endpoints | 18.1.0 |
| 2023-03 | CT#99 | CP-230162 | 0045 | | F | Update of info and externalDocs fields | 18.1.0 |
| 2023-06 | CT#100 | CP-231131 | 0046 | 1 | F | Corrections to the dummy POST based operation of the Nmfaf_3caDataManagement API | 18.2.0 |
| 2023-06 | CT#100 | CP-231132 | 0047 | 1 | F | Corrections to the redirection mechanism description | 18.2.0 |
| 2023-06 | CT#100 | CP-231142 | 0048 | | F | Update of info and externalDocs fields | 18.2.0 |
| 2023-12 | CT#102 | CP-233229 | 0049 | 1 | F | IETF RFC 7540, RFC 7807 obsoleted by RFC 9113 and RFC 9457 respectively | 18.3.0 |
| 2024-06 | CT#104 | CP-241101 | 0050 | | F | Callback correction | 18.4.0 |
| 2024-06 | CT#104 | CP-241105 | 0052 | | A | Corrections on the attribute names in the service description | 18.4.0 |
| 2024-06 | CT#104 | CP-241101 | 0053 | 1 | F | MFAF service consumers | 18.4.0 |
| 2024-06 | CT#104 | CP-241101 | 0054 | 1 | F | MFAF API names corrections | 18.4.0 |
| 2024-06 | CT#104 | CP-241101 | 0057 | | F | MFAF 3daDataManagement API corrections | 18.4.0 |

| | | | | | | | |
|---------|--------|-----------|------|---|---|--|--------|
| 2024-06 | CT#104 | CP-241101 | 0058 | | F | MFAF 3caDataManagement API corrections | 18.4.0 |
| 2024-06 | CT#104 | CP-241105 | 0060 | 1 | A | Corrections on attribute name | 18.4.0 |
| 2024-06 | CT#104 | CP-241086 | 0061 | | F | Update of info and externalDocs fields | 18.4.0 |

History

| Document history | | |
|-------------------------|-----------|-------------|
| V18.3.0 | May 2024 | Publication |
| V18.4.0 | July 2024 | Publication |
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