

# ETSI TS 129 503 V15.6.0 (2020-01)



**5G;  
5G System;  
Unified Data Management Services;  
Stage 3  
(3GPP TS 29.503 version 15.6.0 Release 15)**



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**Reference**

RTS/TSGC-0429503vf60

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**Keywords**

5G

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# Foreword

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

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

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  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

---

# 1 Scope

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

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2] 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] 3GPP TS 33.501: "Security Architecture and Procedures for 5G System".
- [7] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces Stage 3".
- [8] 3GPP TS 23.003: "Numbering, addressing and identification".
- [9] 3GPP TS 29.504: "5G System; Unified Data Repository Services; Stage 3".
- [10] 3GPP TS 29.505: "5G System; Usage of the Unified Data Repository Services for Subscription Data; Stage 3".
- [11] 3GPP TS 32.255: "Charging management; 5G data connectivity domain charging".
- [12] 3GPP TS 32.298: "Charging management; Charging Data Record (CDR) parameter description".
- [13] IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".
- [14] OpenAPI Initiative, "OpenAPI 3.0.0 Specification", <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md>
- [15] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".
- [16] IETF RFC 7807: "Problem Details for HTTP APIs".
- [17] IETF RFC 7396: "JSON Merge Patch".
- [18] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".
- [19] 3GPP TS 29.510: "Network Function Repository Services; Stage 3".

- [20] 3GPP TS 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station in idle mode".
- [21] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".
- [22] 3GPP TS 29.338: "Diameter based protocols to support Short Message Service (SMS) capable Mobile Management Entities (MMEs)"
- [23] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".
- [24] 3GPP TS 29.509: "Authentication Server Services; Stage 3".
- [25] IETF RFC 7232: "Hypertext Transfer Protocol (HTTP/1.1): Conditional Requests".
- [26] IETF RFC 7234: "Hypertext Transfer Protocol (HTTP/1.1): Caching".
- [27] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".
- [28] ETSI TS 102 225: "Smart Cards; Secured packet structure for UICC based applications".
- [29] IETF RFC 7542: "The Network Access Identifier".
- [30] 3GPP TR 21.900: "Technical Specification Group working methods".
- [31] IETF RFC 3986: "Uniform Resource Identifier (URI): Generic Syntax".
- [32] IETF RFC 6902: "JavaScript Object Notation (JSON) Patch".

---

## 3 Definitions and abbreviations

### 3.1 Definitions

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

### 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

|       |  |
|-------|--|
| 5GC   | 5G Core Network                                |
| AMF   | Access and Mobility Management Function        |
| AUSF  | Authentication Server Function                 |
| DNN   | Data Network Name                              |
| FQDN  | Fully Qualified Domain Name                    |
| GPSI  | Generic Public Subscription Identifier         |
| GUAMI | Globally Unique AMF Identifier                 |
| JSON  | Javascript Object Notation                     |
| MICO  | Mobile Initiated Connection Only               |
| NAI   | Network Access Identifier                      |
| NAS   | Non-Access Stratum                             |
| NEF   | Network Exposure Function                      |
| NRF   | Network Repository Function                    |
| NSSAI | Network Slice Selection Assistance Information |
| PEI   | Permanent Equipment Identifier                 |
| QFI   | QoS Flow Identifier                            |
| SBI   | Service Based Interface                        |
| SMF   | Session Management Function                    |
| SMSF  | Short Message Service Function                 |
| SUCI  | Subscription Concealed Identifier              |

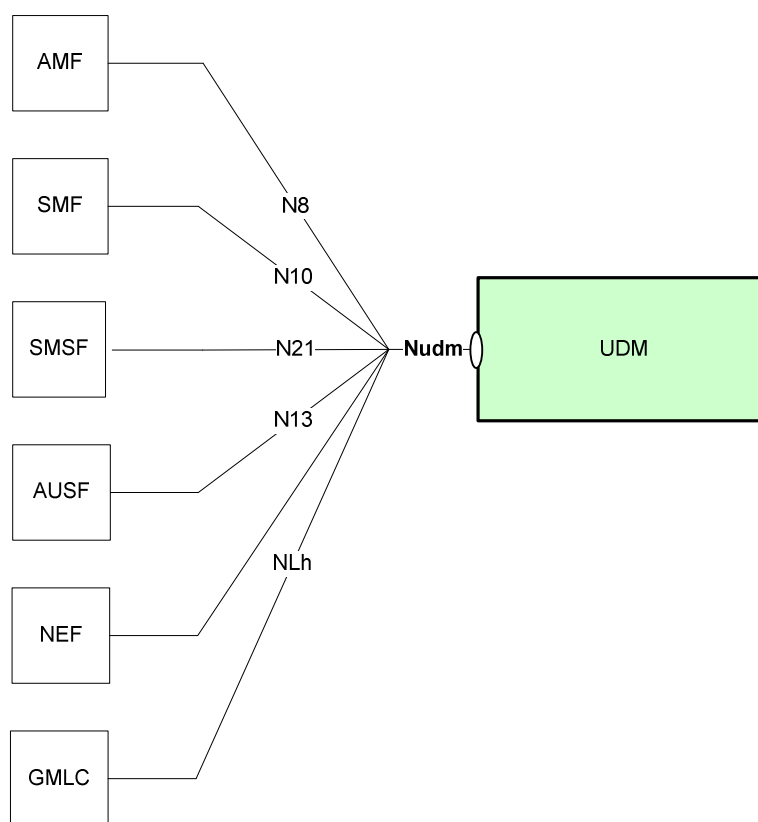
|      |                                   |
|------|-----------------------------------|
| SUPI | Subscription Permanent Identifier |
| UDM  | Unified Data Management           |
| UDR  | Unified Data Repository           |

## 4 Overview

### 4.1 Introduction

Within the 5GC, the UDM offers services to the AMF, SMF, SMSF, NEF, GMLC and AUSF via the Nudm service based interface (see 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3]).

Figure 4.1-1 provides the reference model (in service based interface representation and in reference point representation), with focus on the UDM.



**Figure 4.1-1: Reference model – UDM**

The functionalities supported by the UDM are listed in clause 6.2.7 of 3GPP TS 23.501 [2].

## 5 Services offered by the UDM

### 5.1 Introduction

The UDM offers the following services via the Nudm interface:

- Nudm\_SubscriberDataManagement Service
- Nudm\_UEContextManagement Service
- Nudm\_UEAuthentication Service



- Nudm\_EventExposure Service
- Nudm\_ParameterProvision Service

All scenarios shown in the following clauses assume that the UDM is stateful and stores information in local memory. However, the UDM may be stateless and stores information externally in the UDR. If so, the stateless UDM makes use of Nudr services as specified in 3GPP TS 29.504 [9] and 3GPP TS 29.505 [10] to retrieve required data from the UDR and store them locally before processing an incoming request. Processing the incoming request may then include updating data in the UDR or subscribing to data change notifications at the UDR by consuming the appropriate Nudr services. After processing the incoming request, the UDM may delete the locally stored data. When data stored in UDR is then shared among the different UDM instances of the same group, as identified by UDM Group ID (see 3GPP TS 23.501 [2], clause 6.2.6), bulk subscriptions, as described in clause 4.15.3.2.4 of 3GPP TS 23.502 [3], are not applicable, i.e. an NF consumer (e.g. NEF) only subscribes towards one of the UDM instances within the group. See Annex B.

## 5.2 Nudm\_SubscriberDataManagement Service

### 5.2.1 Service Description

See 3GPP TS 23.501 [2] table 7.2.5-1.

### 5.2.2 Service Operations

#### 5.2.2.1 Introduction

For the Nudm\_SubscriberDataManagement service the following service operations are defined:

- Get
- Subscribe
- ModifySubscription
- Unsubscribe
- Notification
- Info

The Nudm\_SubscriberDataManagement Service is used by Consumer NFs (AMF, SMF, SMSF) to retrieve the UE's individual subscription data relevant to the consumer NF from the UDM by means of the Get service operation. If the consumer NF supports the feature "sharedData" (see clause 6.1.8), the retrieved individual subscription data for the UE may contain shared data identifier identifying additional parts of subscription data shared by several UEs. If so, the Nudm\_SubscriberDataManagement Service is also used by Consumer NFs to retrieve shared subscription data from the UDM by means of the Get service operation.

It is also used by Consumer NFs to subscribe to notifications of data change by means of the Subscribe service operation. If the consumer NF supports the feature "sharedData" (see clause 6.1.8), the consumer NF may also subscribe to notifications of shared data change by means of the Subscribe service operation.

It is also used to modify an existing subscription by means of the ModifySubscription service operation. If the consumer NF supports the feature "sharedData" (see clause 6.1.8), the consumer NF may also modify an existing subscription to notifications of shared data change by means of the ModifySubscription service operation.

It is also used to unsubscribe from notifications of data changes by means of the Unsubscribe service operation. If the feature "sharedData" (see clause 6.1.8) is supported, it may also be used to unsubscribe from notifications of shared data changes by means of the Unsubscribe service operation.

It is also used by the Consumer NFs (AMF, SMF, SMSF) that have previously subscribed, to get notified by means of the Notification service operation when UDM decides to modify the subscribed data. If the feature "sharedData" (see clause 6.1.8) is supported by the consumer NF and the consumer NF has previously subscribed to notifications of

shared data change, it is also used by the consumer NF to get notified by means of the Notification service operation when the UDM decides to modify the subscribed shared data.

It is also used by Consumer NFs to provide the information about the status of the subscription data management procedures.

## 5.2.2.2 Get

### 5.2.2.2.1 General

The following procedures using the Get service operation are supported:

- Slice Selection Subscription Data Retrieval
- Access and Mobility Subscription Data Retrieval
- SMF Selection Subscription Data Retrieval
- Session Management Subscription Data Retrieval
- SMS Subscription Data Retrieval
- SMS Management Subscription Data Retrieval
- UE Context in SMF Data Retrieval
- UE Context in SMSF Data Retrieval
- Retrieval Of Multiple Data Sets
- Identifier Translation
- Shared Subscription Data Retrieval
- Trace Data Retrieval

When the feature SharedData (see clause 6.1.8) is supported and the retrieved UE-individual data (i.e. data other than Shared Subscription Data) contain SharedDataIds, the NF service consumer shall also retrieve the shared data identified by the received shared data Ids unless the identified shared data are already available at the NF service consumer. The order of sequence of sharedDataIds within UE-individual data is significant: Individual data take precedence over shared data; shared data "SharedDataX" identified by a sharedDataId X takes precedence over shared data "SharedDataY" identified by a sharedDataId Y if X appears before Y within the list of SharedDataIds in the UE-individual data.

#### 5.2.2.2.2 Slice Selection Subscription Data Retrieval

Figure 5.2.2.2.2-1 shows a scenario where the NF service consumer (e.g. AMF) sends a request to the UDM to receive the UE's NSSAI (see also 3GPP TS 23.502 [3] figure 4.2.2.2.3-1 step 3). The request contains the UE's identity ( $\{supi\}$ ), the type of the requested information ( $\{nssai\}$ ) and query parameters (supported-features, plmn-id).

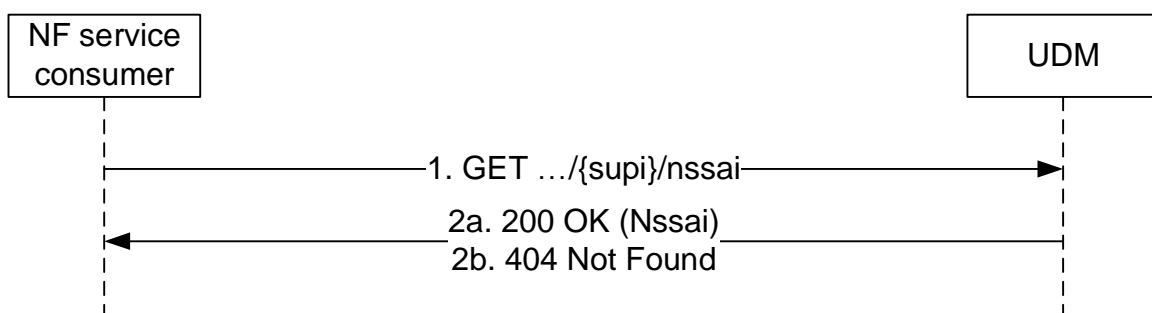


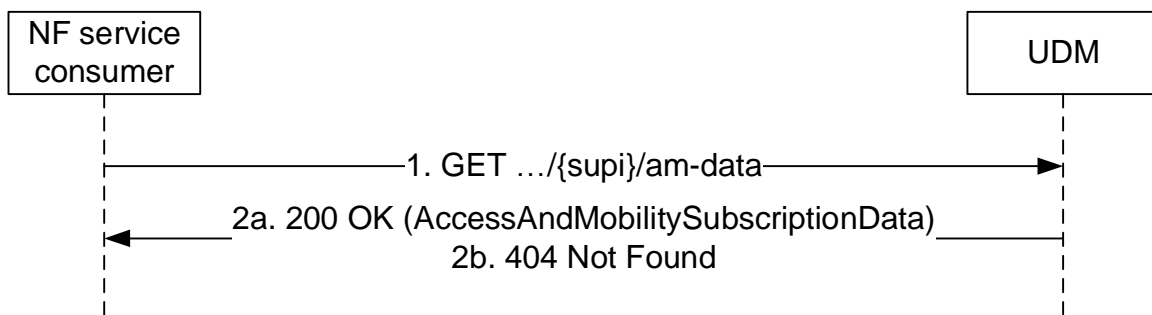
Figure 5.2.2.2.2-1: Requesting a UE's NSSAI

1. The NF service consumer (e.g. AMF) sends a GET request to the resource representing the UE's subscribed NSSAI, with query parameters indicating the supported-features and/or plmn-id.
- 2a. On success, the UDM responds with "200 OK" with the message body containing the UE's NSSAI as relevant for the requesting NF service consumer.
- 2b. If there is no valid subscription data for the UE, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

#### 5.2.2.2.3 Access and Mobility Subscription Data Retrieval

Figure 5.2.2.2.3-1 shows a scenario where the NF service consumer (e.g. AMF) sends a request to the UDM to receive the UE's Access and Mobility Subscription data (see also 3GPP TS 23.502 [3] figure 4.2.2.2.2-1 step 14). The request contains the UE's identity ( $\{/supi\}$ ), the type of the requested information ( $\{/am-data\}$ ) and query parameters (supported-features, plmn-id).



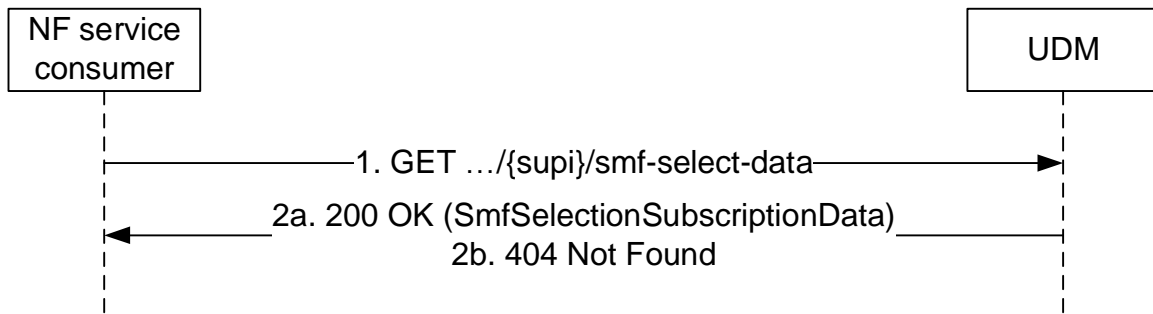
**Figure 5.2.2.2.3-1: Requesting a UE's Access and Mobility Subscription Data**

1. The NF service consumer (e.g. AMF) sends a GET request to the resource representing the UE's Access and Mobility Subscription Data, with query parameters indicating the supported-features and/or plmn-id.
- 2a. On Success, the UDM responds with "200 OK" with the message body containing the UE's Access and Mobility Subscription Data as relevant for the requesting NF service consumer.
- 2b. If there is no valid subscription data for the UE, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

#### 5.2.2.2.4 SMF Selection Subscription Data Retrieval

Figure 5.2.2.2.4-1 shows a scenario where the NF service consumer (e.g. AMF) sends a request to the UDM to receive the UE's SMF Selection Subscription data (see also 3GPP TS 23.502 [3] figure 4.2.2.2.2-1 step 14). The request contains the UE's identity ( $\{/supi\}$ ), the type of the requested information ( $\{/smf-select-data\}$ ) and query parameters (supported-features, plmn-id).



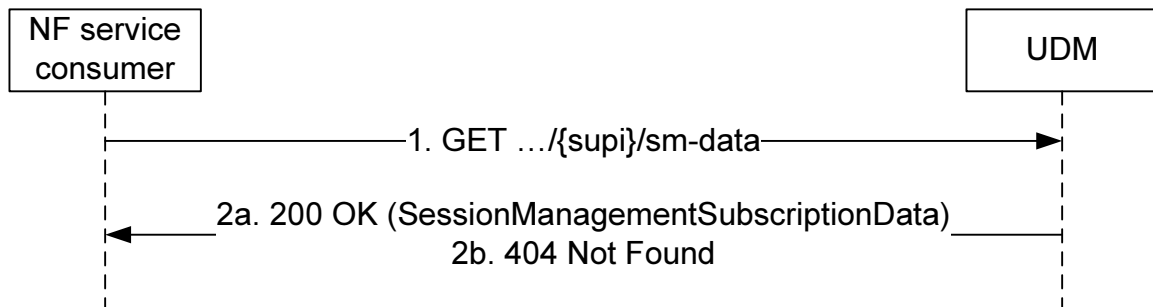
**Figure 5.2.2.2.4-1: Requesting a UE's SMF Selection Subscription Data**

1. The NF service consumer (e.g. AMF) sends a GET request to the resource representing the UE's SMF Selection Subscription Data, with query parameters indicating the supported-features and/or plmn-id.
- 2a. On success, the UDM responds with "200 OK" with the message body containing the UE's SMF Selection Subscription Data as relevant for the requesting NF service consumer.
- 2b. If there is no valid subscription data for the UE, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

#### 5.2.2.2.5 Session Management Subscription Data Retrieval

Figure 5.2.2.2.5-1 shows a scenario where the NF service consumer (e.g. SMF) sends a request to the UDM to receive the UE's session management subscription data (see also 3GPP TS 23.502 [3] figure 4.3.2.2.1-1 step 4a-4b). The request contains the UE's identity ( $\{/supi\}$ ), the type of the requested information ( $\{/sm-data\}$ ), and query parameters (single-nssai, dnn, supported-features, plmn-id).



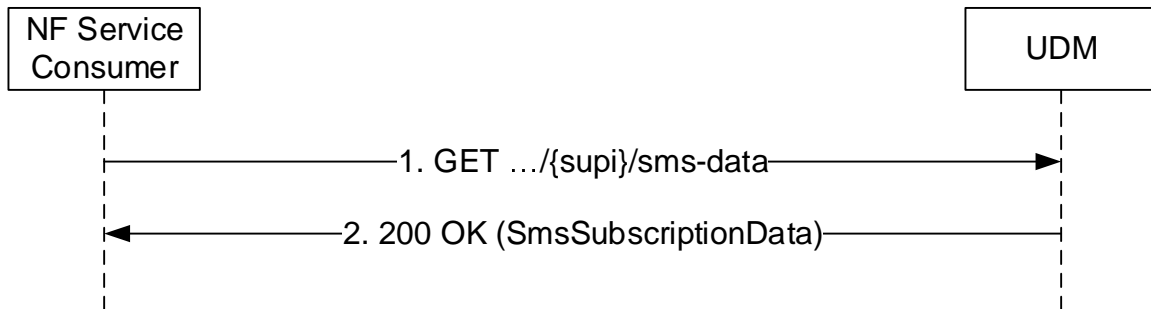
**Figure 5.2.2.2.5-1: Requesting a UE's Session Management Subscription Data**

1. The NF service consumer (e.g. SMF) sends a GET request to the resource representing the UE's session management subscription data, with query parameters indicating the selected network slice and/or the DNN and/or supported-features and/or plmn-id.
- 2a. On success, the UDM responds with "200 OK", the message body containing the UE's session management subscription data as relevant for the requesting NF service consumer.
- 2b. If there is no valid subscription data for the UE, or if the UE subscription data exists, but the requested session management subscription is not available (e.g. query parameter contains network slice and/or DNN that does not belong to the UE subscription), HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

### 5.2.2.2.6 SMS Subscription Data Retrieval

Figure 5.2.2.2.6-1 shows a scenario where the NF service consumer (e.g. AMF) sends a request to the UDM to receive the UE's SMS Subscription Data (see also 3GPP TS 23.502 [3], clause 4.13.3.1). The request contains the UE's identity (`/supi`) and the type of the requested information (`/sms-data`).



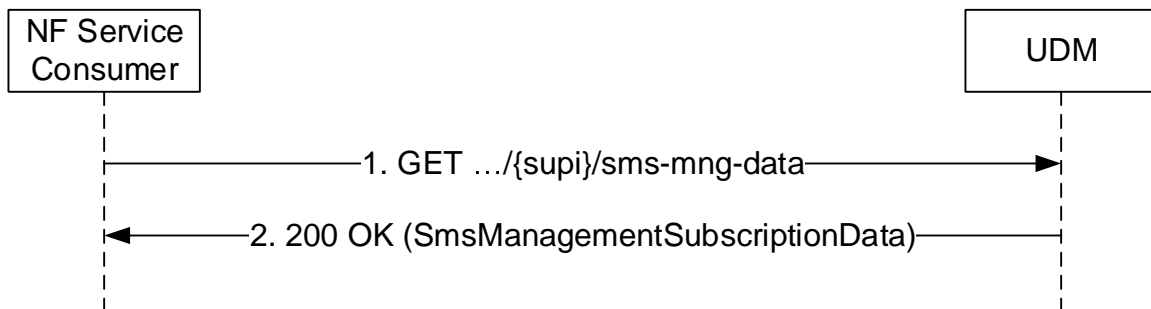
**Figure 5.2.2.2.6-1: Requesting UE's SMS Subscription Data**

1. The NF Service Consumer (e.g. AMF) sends a GET request to the resource representing the UE's SMS Subscription Data.
2. The UDM responds with "200 OK" with the message body containing the UE's SMS Subscription Data.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

### 5.2.2.2.7 SMS Management Subscription Data Retrieval

Figure 5.2.2.2.7-1 shows a scenario where the NF service consumer (e.g. SMSF) sends a request to the UDM to receive the UE's SMS Management Subscription Data (see also 3GPP TS 23.502 [3], clause 4.13.3.1). The request contains the UE's identity (`/supi`) and the type of the requested information (`/sms-mng-data`).



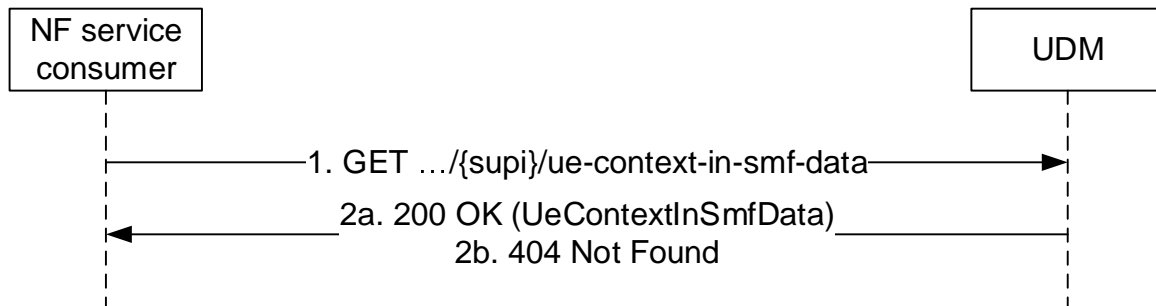
**Figure 5.2.2.2.7-1: Requesting UE's SMS Management Subscription Data**

1. The NF Service Consumer (e.g. SMSF) sends a GET request to the resource representing the UE's SMS Management Subscription Data.
2. The UDM responds with "200 OK" with the message body containing the UE's SMS Management Subscription Data.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

### 5.2.2.2.8 UE Context In SMF Data Retrieval

Figure 5.2.2.2.8-1 shows a scenario where the NF service consumer (e.g. AMF) sends a request to the UDM to receive the UE's Context In SMF data (see also 3GPP TS 23.502 [3] figure 4.2.2.2.2-1 step 14). The request contains the UE's identity ( $\{/supi\}$ ), the type of the requested information ( $\{/ue-context-in-smf-data\}$ ) and query parameters (supported-features).



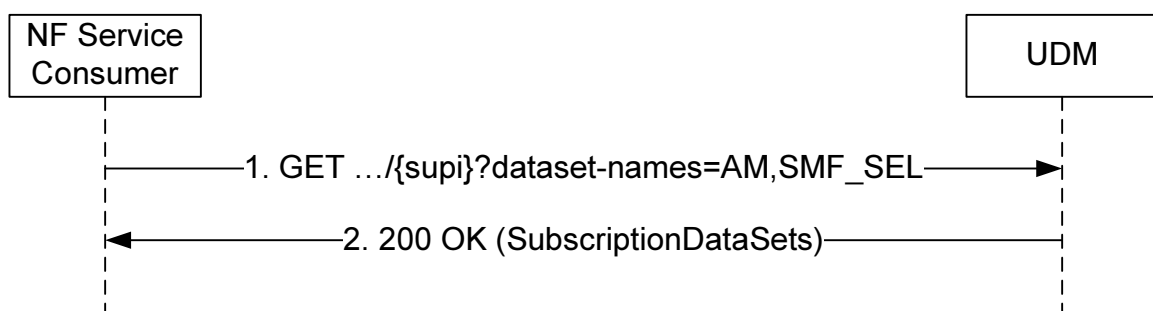
**Figure 5.2.2.2.8-1: Requesting a UE's Context in SMF Data**

1. The NF service consumer (e.g. AMF) shall send a GET request to the resource representing the UE's Context In SMF Data, with query parameters indicating the supported-features.
- 2a. On Success, the UDM shall respond with "200 OK" with the message body containing the UE's Context In SMF Data as relevant for the requesting NF service consumer.
- 2b. If there is no valid subscription data for the UE, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

### 5.2.2.2.9 Retrieval Of Multiple Data Sets

Figure 5.2.2.2.9-1 shows a scenario where the NF service consumer (e.g. AMF) sends a request to the UDM to receive multiple data sets. In this example scenario the UE's Access and Mobility Subscription data and the the UE's SMF Selection Subscription data are retrieved with a single request; see clause 6.1.3.11.3.1 for other data sets that can be retrieved with a single request. The request contains the UE's identity ( $\{/supi\}$ ) and query parameters identifying the requested data sets (in this example:  $\?dataset-names=AM,SMF\_SEL\}$ ).



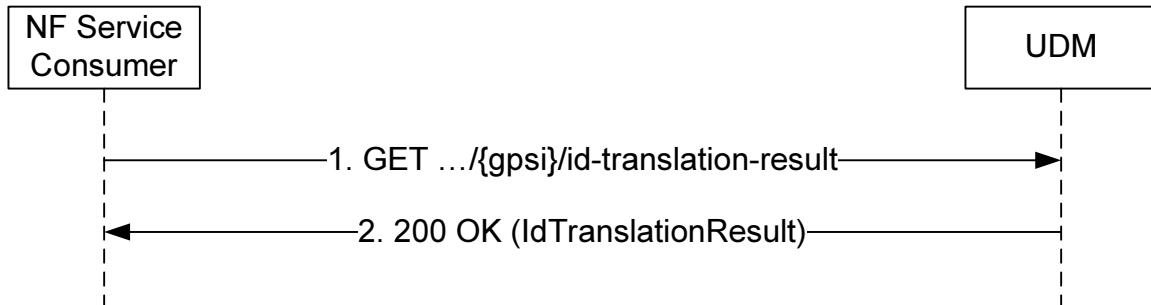
**Figure 5.2.2.2.9-1: Retrieval of Multiple Data Sets**

1. The NF Service Consumer (e.g. AMF) sends a GET request to the resource representing the  $\supi$ . Query parameters indicate the requested data sets.
2. The UDM responds with "200 OK" with the message body containing the requested data sets.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

### 5.2.2.2.10 Identifier Translation

Figure 5.2.2.2.10-1 shows a scenario where the NF service consumer (e.g. NEF) sends a request to the UDM to receive the SUPI that corresponds to the provided GPSI (see also 3GPP TS 23.502 [3], clause 4.13.2.2). The request contains the UE's identity (`/gpsi`) and the type of the requested information (`/id-translation-result`).



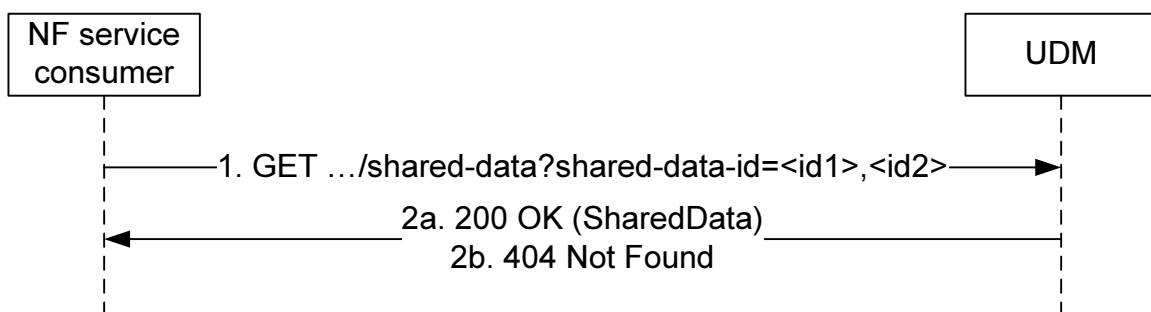
**Figure 5.2.2.2.10-1: Identifier Translation**

1. The NF Service Consumer (e.g. NEF) shall send a GET request to the resource representing the `IdTranslationResult`.
2. The UDM shall respond with "200 OK" with the message body containing the UE's SUPI.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

### 5.2.2.2.11 Shared Subscription Data Retrieval

Figure 5.2.2.2.11-1 shows a scenario where the NF service consumer (e.g. AMF) sends a request to the UDM to receive the shared subscription data. The request contains the type of the requested information (`/shared-data`) and query parameters (`supportedFeatures`, `shared-data-id`).



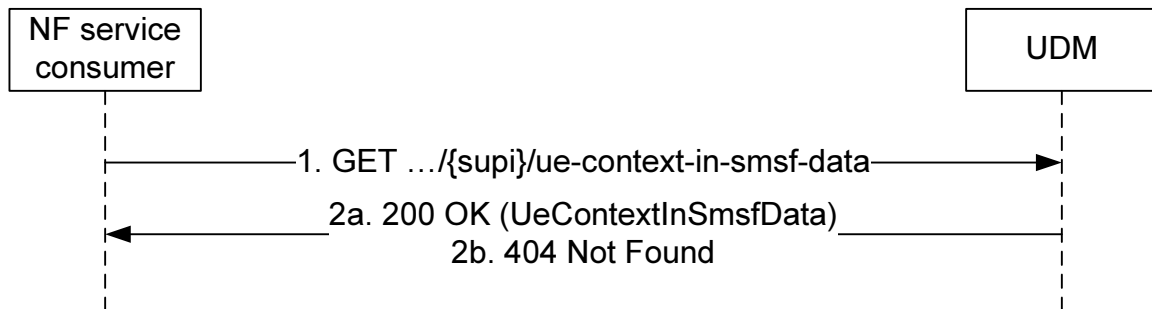
**Figure 5.2.2.2.11-1: Requesting shared data**

1. The NF service consumer (e.g. AMF) sends a GET request to the resource representing the `SharedData`, with query parameters indicating the `supportedFeatures` and `shared-data-id`.
- 2a. On success, the UDM responds with "200 OK" with the message body containing the `SharedData`.
- 2b. If there is no valid shared data for one or more of the `shared-data-ids`, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

### 5.2.2.2.12 UE Context In SMSF Data Retrieval

Figure 5.2.2.2.12-1 shows a scenario where the NF service consumer (e.g. AMF) sends a request to the UDM to receive the UE's Context In SMSF data. The request contains the UE's identity ( $\{/supi\}$ ), the type of the requested information ( $\{/ue-context-in-smsf-data\}$ ) and query parameters (supported-features).



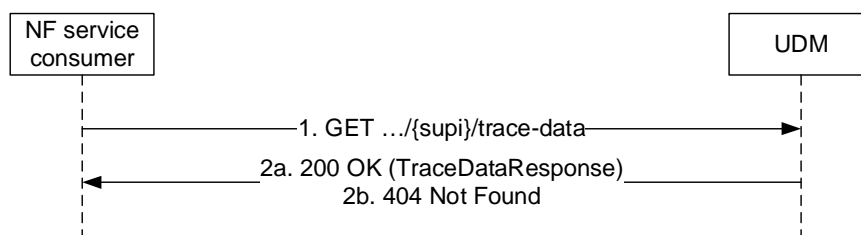
**Figure 5.2.2.2.12-1: Requesting a UE's Context in SMSF Data**

1. The NF service consumer (e.g. AMF) shall send a GET request to the resource representing the UE's Context In SMSF Data, with query parameters indicating the supported-features.
- 2a. On Success, the UDM shall respond with "200 OK" with the message body containing the UE's Context In SMSF Data as relevant for the requesting NF service consumer.
- 2b. If there is no valid subscription data for the UE, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

### 5.2.2.2.13 Trace data Retrieval

Figure 5.2.2.2.13-1 shows a scenario where the NF service consumer (e.g. AMF, SMF) sends a request to the UDM to receive the UE's trace data. The request contains the UE's identity ( $\{/supi\}$ ), the type of the requested information ( $\{/trace-data\}$ ) and query parameters.



**Figure 5.2.2.2.13-1: Requesting a UE's trace Data**

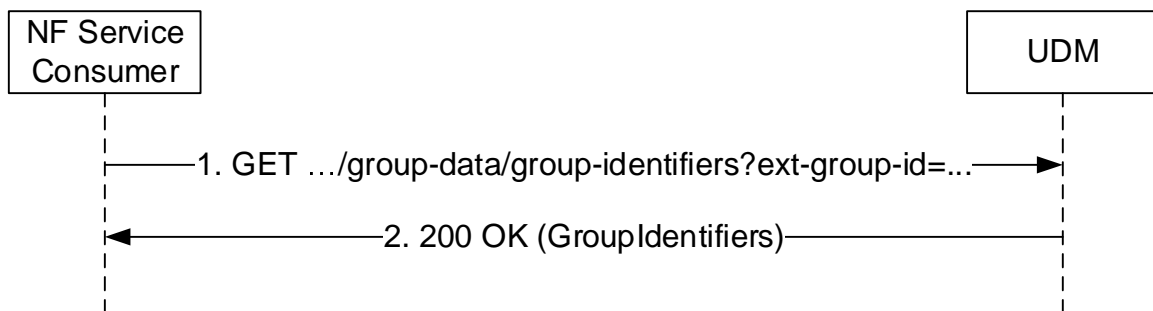
1. The NF service consumer (e.g. AMF, SMF) shall send a GET request to the resource representing the UE's trace Data, with query parameters.
- 2a. On Success, the UDM shall respond with "200 OK" with the message body containing the UE's trace data response as relevant for the requesting NF service consumer.
- 2b. If there is no valid subscription data for the UE, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.



5.2.2.2.14 Group Identifier Translation

Figure 5.2.2.2.14-1 shows a scenario where the NF service consumer sends a request to the UDM to receive the Internal Group Identifier that corresponds to the provided External Group Identifier.



**Figure 5.2.2.2.14-1: Group Identifier Translation**

1. The NF Service Consumer (e.g. NEF) shall send a GET request to the resource representing the group identifiers handled by UDM; the External Group Identifier is passed in a query parameter of the request URI.
2. The UDM shall respond with "200 OK" with the message body containing the Internal Group Identifier.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

5.2.2.3 Subscribe

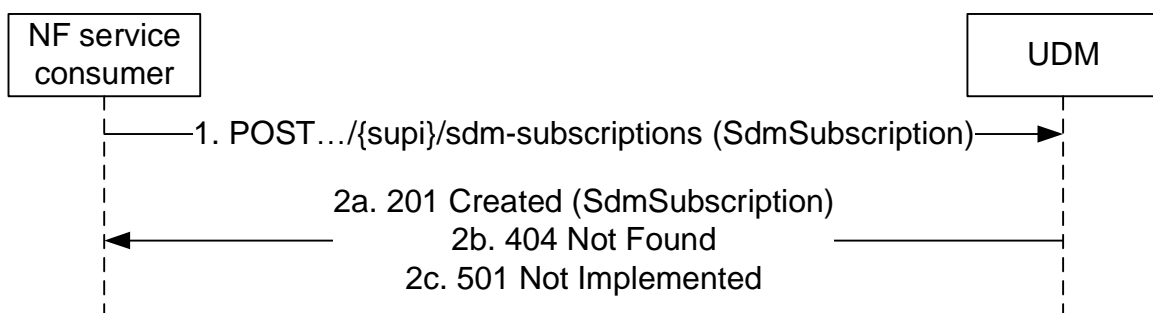
5.2.2.3.1 General

The following procedures using the Subscribe service operation are supported:

- Subscription to notification of data change (for UE individual data)
- Subscription to notification of shared data change

5.2.2.3.2 Subscription to notifications of data change

Figure 5.2.2.3.2-1 shows a scenario where the NF service consumer sends a request to the UDM to subscribe to notifications of data change (see also 3GPP TS 23.502 [3] figure 4.2.2.2.2-1 step 14). The request contains a callback URI and the URI of the monitored resource.



**Figure 5.2.2.3.2-1: NF service consumer subscribes to notifications**

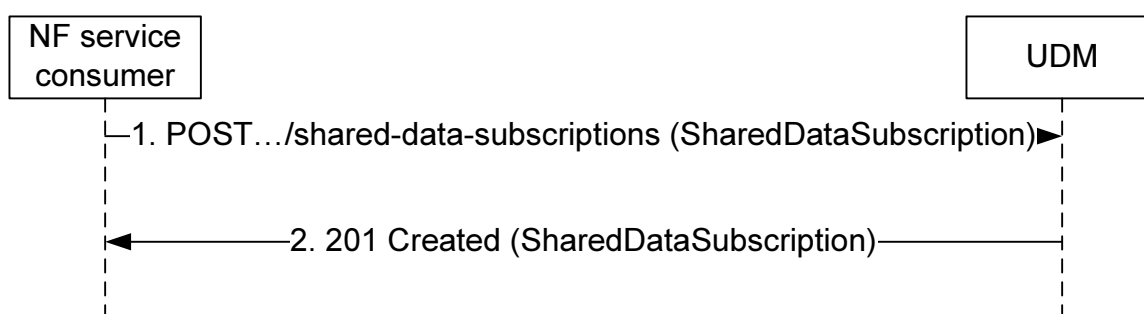
1. The NF service consumer sends a POST request to the parent resource (collection of subscriptions) (.../{supi}/sdm-subscriptions), to create a subscription as present in message body.
- 2a. On success, the UDM responds with "201 Created" with the message body containing a representation of the created subscription. The Location HTTP header shall contain the URI of the created subscription.

- 2b. If there is no valid subscription data for the UE, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).
- 2c. If the UE subscription data exist, but the requested subscription to data change notification cannot be created (e.g. due to an invalid/unsupported data reference to be monitored, contained in the SdmSubscription parameter), HTTP status code "501 Not Implemented" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

### 5.2.2.3.3 Subscription to notifications of shared data change

Figure 5.2.2.3.3-1 shows a scenario where the NF service consumer sends a request to the UDM to subscribe to notifications of shared data change. The request contains a callback URI and the URI of the monitored resource.



**Figure 5.2.2.3.3-1: NF service consumer subscribes to notifications of shared data change**

1. The NF service consumer sends a POST request to the parent resource (collection of subscriptions) (.../shared-data-subscriptions), to create a subscription as present in message body.
2. On success, the UDM responds with "201 Created" with the message body containing a representation of the created subscription. The Location HTTP header shall contain the URI of the created subscription.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

## 5.2.2.4 Unsubscribe

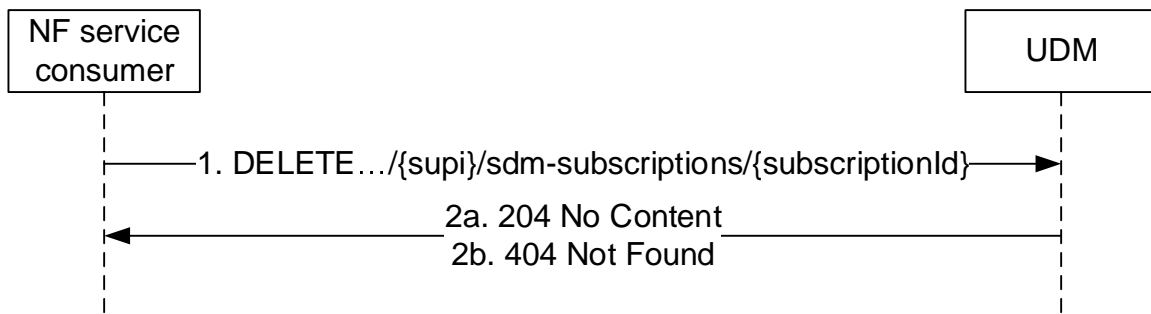
### 5.2.2.4.1 General

The following procedures using the Unsubscribe service operation are supported:

- Unsubscribe to notification of data change (for UE individual data)
- Unsubscribe to notifications of shared data change

### 5.2.2.4.2 Unsubscribe to notifications of data change

Figure 5.2.2.4.2-1 shows a scenario where the NF service consumer sends a request to the UDM to unsubscribe from notifications of data changes (see also 3GPP TS 23.502 [3] figure 4.2.2.2.2-1 step 14). The request contains the URI previously received in the Location HTTP header of the response to the subscription.



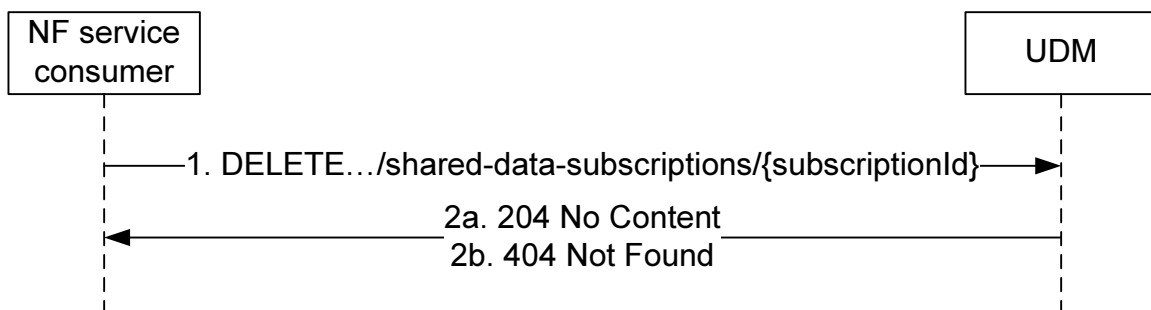
**Figure 5.2.2.4.2-1: NF service consumer unsubscribes to notifications**

1. The NF service consumer sends a DELETE request to the resource identified by the URI previously received during subscription creation.
- 2a. On success, the UDM responds with "204 No Content".
- 2b. If there is no valid subscription available (e.g. due to an unknown subscriptionId value), HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the DELETE response body.

#### 5.2.2.4.3 Unsubscribe to notifications of shared data change

Figure 5.2.2.4.3-1 shows a scenario where the NF service consumer sends a request to the UDM to unsubscribe from notifications of shared data changes. The request contains the URI previously received in the Location HTTP header of the response to the subscription.



**Figure 5.2.2.4.3-1: NF service consumer unsubscribes to notifications for shared data**

1. The NF service consumer sends a DELETE request to the resource identified by the URI previously received during subscription creation.
- 2a. On success, the UDM responds with "204 No Content".
- 2b. If there is no valid subscription available (e.g. due to an unknown subscriptionId value), HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the DELETE response body.

## 5.2.2.5 Notification

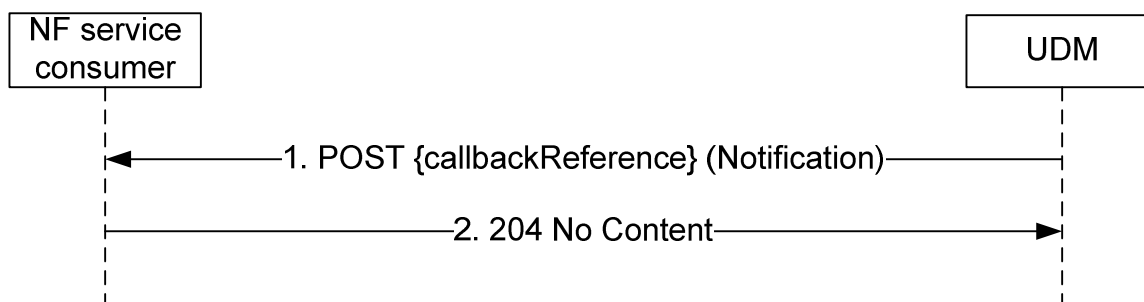
### 5.2.2.5.1 General

The following procedures using the Notification service operation are supported:

- Data change notification to NF, including the updates of UE's Subscriber Data indicated by the "subscription data Type" input and additional UE's UDM-related parameters.

#### 5.2.2.5.2 Data Change Notification To NF

Figure 5.2.2.5.2-1 shows a scenario where the UDM notifies the NF service consumer (that has subscribed to receive such notification) about subscription data change (see also 3GPP TS 23.502 [3] clause 4.5.1 or 3GPP TS 23.502 [3] clause 4.5.2) or shared data change. The request contains the callbackReference URI as previously received in the SdmSubscription (see clause 6.1.6.2.3).



**Figure 5.2.2.5.2-1: Subscription Data Change Notification**

1. The UDM sends a POST request to the callbackReference as provided by the NF service consumer during the subscription.
2. The NF service consumer responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

## 5.2.2.6 Info

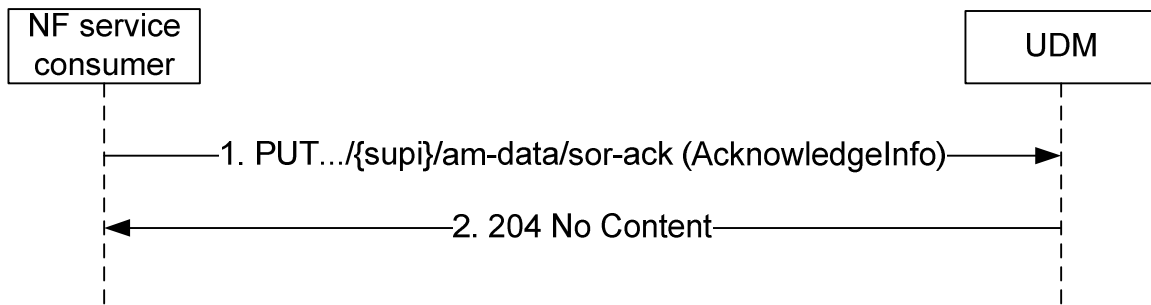
### 5.2.2.6.1 General

The following procedures using the Info service operation are supported:

- Providing acknowledgement from the UE to UDM about successful delivery of Steering of Roaming information via the AMF as defined in 3GPP TS 23.122 [20]
- Providing acknowledgement from the UE to UDM about successful delivery of updated Default Configured NSSAI or UICC data (Secured-Packet, containing e.g. Routing indicator) via the AMF as defined in 3GPP TS 23.502 [3].

#### 5.2.2.6.2 Providing acknowledgement of Steering of Roaming

Figure 5.2.2.6.2-1 shows a scenario where the NF service consumer (e.g. AMF) sends the UE acknowledgement to the UDM (see also 3GPP TS 23.122 [20] Annex C). The request contains the UE's identity ( $\{supi\}$ ), the type of the acknowledgement information ( $\{am-data/sor-ack\}$ ), and the SOR-MAC-Iue.



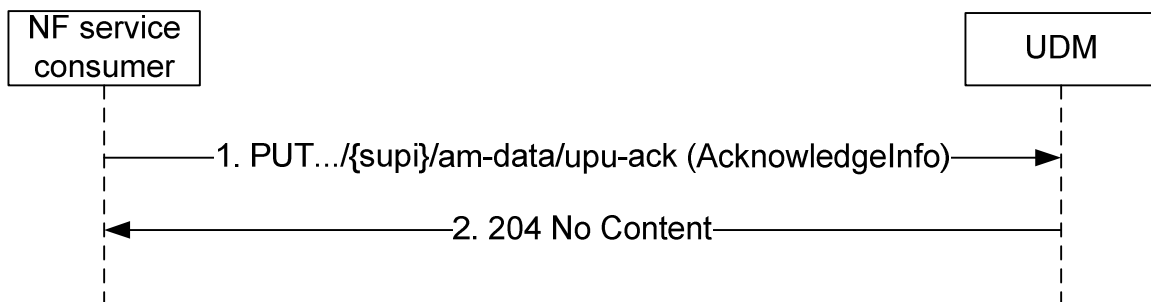
**Figure 5.2.2.6.2-1: Providing acknowledgement of Steering of Roaming**

1. The NF service consumer (e.g. AMF) sends a PUT request to the resource representing the UE's Access and Mobility Subscription Data, with the AcknowledgeInfo (SOR-MAC-Iue) received from the UE.
2. The UDM responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PUT response body.

### 5.2.2.6.3 Providing acknowledgement of UE parameters update

Figure 5.2.2.6.3-1 shows a scenario where the NF service consumer (e.g. AMF) sends the UE acknowledgement to the UDM (see also 3GPP TS 23.502 [3]). The request contains the UE's identity ( $\{/supi\}$ ), the type of the acknowledgement information ( $/am-data/upu-ack$ ), and the UPU-MAC-Iue.



**Figure 5.2.2.6.3-1: Providing acknowledgement of UE parameters update**

1. The NF service consumer (e.g. AMF) sends a PUT request to the resource representing the UE's Access and Mobility Subscription Data, with the AcknowledgeInfo(UPU-MAC-IUE) received from the UE.
2. The UDM responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PUT response body.

## 5.2.2.7 ModifySubscription

### 5.2.2.7.1 General

The following procedures using the ModifySubscription service operation are supported:

- Modification of a Subscription to notification of data change (for UE individual data)
- Modification of a Subscription to notification of shared data change

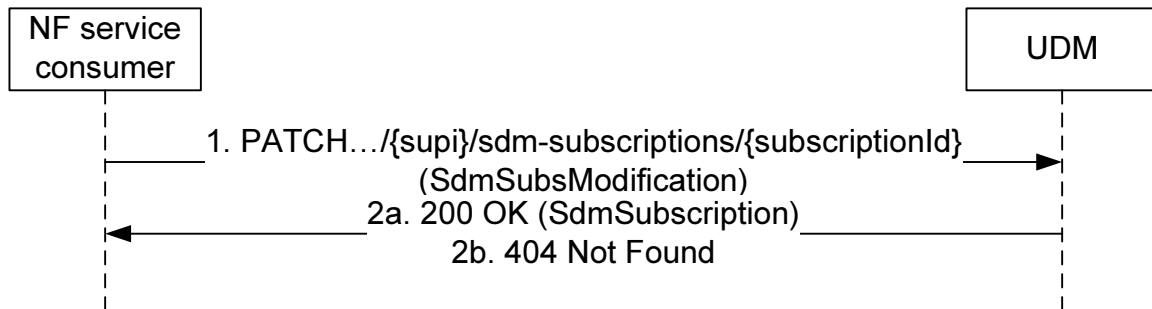
The ModifySubscription service operation can be used for the following purpose:

- Extend the expiry time of SdmSubscription;

- Modify the resource URIs to be monitored, e.g. add/remove resource URIs to/from the monitored resource URI list.

### 5.2.2.7.2 Modification of a subscription to notifications of data change

Figure 5.2.2.7.2-1 shows a scenario where the NF service consumer sends a request to the UDM to modify a subscription to notifications of data changes. The request contains the URI previously received in the Location HTTP header of the response to the subscription.



**Figure 5.2.2.7.2-1: NF service consumer modifies a subscription to notifications**

1. The NF service consumer sends a PATCH request to the resource identified by the URI previously received during subscription creation.

The NF service consumer may include "monitoredResourceUris" to replace the existing monitored resource URIs, e.g. to add/remove specific resource URIs from the monitored resource URI list.

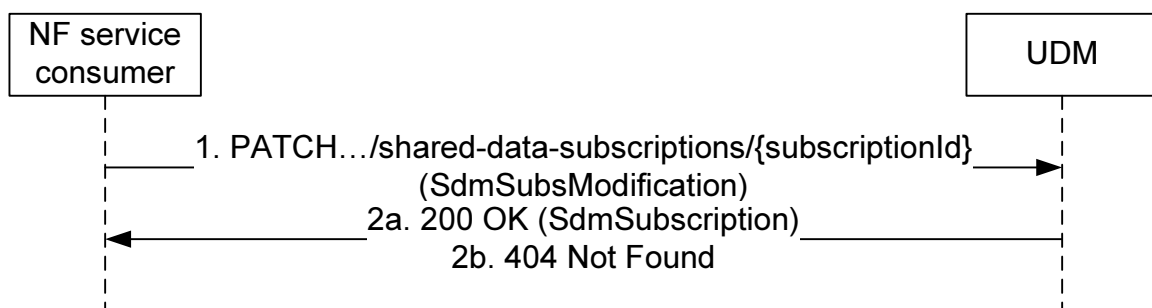
- 2a. On success, the UDM responds with "200 OK".

- 2b. If there is no valid subscription available (e.g. due to an unknown subscriptionId value), HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PATCH response body.

### 5.2.2.7.3 Modification of a subscription to notifications of shared data change

Figure 5.2.2.7.3-1 shows a scenario where the NF service consumer sends a request to the UDM to modify a subscription to notifications of shared data changes. The request contains the URI previously received in the Location HTTP header of the response to the subscription.



**Figure 5.2.2.7.3-1: NF service consumer modifies a subscription to notifications for shared data**

1. The NF service consumer sends a PATCH request to the resource identified by the URI previously received during subscription creation.

The NF service consumer may include "monitoredResourceUris" to replace the existing monitored resource URIs, e.g. for the purposes to add/remove specific resource URIs from the monitored resource URI list.

2a. On success, the UDM responds with "200 OK".

2b. If there is no valid subscription available (e.g. due to an unknown subscriptionId value), HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PATCH response body.

## 5.3 Nudm\_UEContextManagement Service

### 5.3.1 Service Description

See 3GPP TS 23.501 [2] table 7.2.5-1.

### 5.3.2 Service Operations

#### 5.3.2.1 Introduction

For the Nudm\_UEContextManagement service the following service operations are defined:

- Registration
- DeregistrationNotification
- Deregistration
- Get
- Update
- P-CSCF-RestorationNotification

The Nudm\_UEContextManagement Service is used by Consumer NFs (AMF, SMF, SMSF) to register at the UDM by means of the Registration service operation.

It is also used by the registered Consumer NFs (AMF) to get notified by means of the DeregistrationNotification service operation when UDM decides to deregister the registered consumer NF.

It is also used by the registered Consumer NFs (AMF, SMF, SMSF) to deregister from the UDM by means of the Deregistration service operation.

It is also used by consumer NFs (NEF) to retrieve registration information from the UDM by means of the Get service operation.

It is also used by the registered Consumer NFs (AMF, SMF) to update registration information stored at the UDM by means of the Update service operation.

It is also used by the registered Consumer NFs (AMF, SMF) to get notified by means of the P-CSCF-RestorationNotification service operation when UDM detects the need for P-CSCF restoration.

#### 5.3.2.2 Registration

##### 5.3.2.2.1 General

The Registration service operation is invoked by a NF that has been selected to provide service to the UE to store related UE Context Management information in UDM.

NF Consumers are AMF for access and mobility management service, SMF for session management services and SMSF providing SMS services.

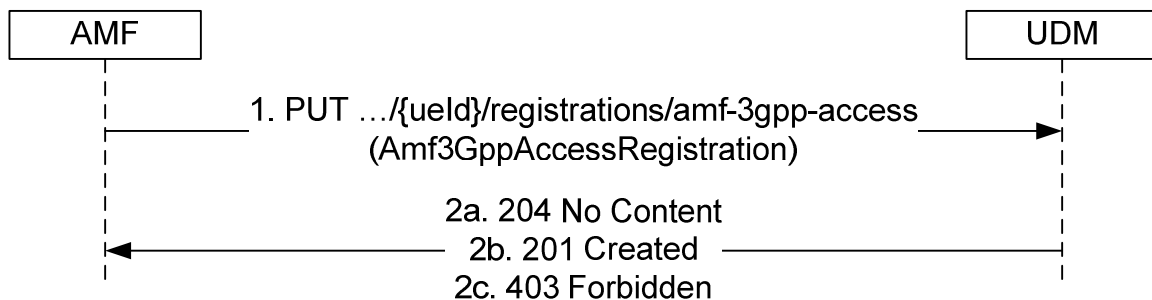
As part of this registration procedure, the UDM authorizes or rejects the subscriber to use the service provided by the registered NF, based on subscription data (e.g. roaming restrictions).

The following procedures using the Registration service operation are supported:

- AMF registration for 3GPP access
- AMF registration for non-3GPP access
- SMF registration
- SMSF registration for 3GPP access
- SMSF registration for non-3GPP access

### 5.3.2.2.2 AMF registration for 3GPP access

Figure 5.3.2.2.2-1 shows a scenario where the AMF sends a request to the UDM to update the AMF registration information for 3GPP access (see also 3GPP TS 23.502 [3] figure 4.2.2.2.2-1 step 14). The request contains the UE's identity ( $\{ueId\}$ ) which shall be a SUPI and the AMF Registration Information for 3GPP access.



**Figure 5.3.2.2.2-1: AMF registering for 3GPP access**

1. The AMF sends a PUT request to the resource representing the UE's AMF registration for 3GPP access to update or create AMF registration information.

If EPS interworking with N26 is supported, and the AMF has per DNN selected the PGW-C+SMF for EPS interworking, the AMF shall include the info of selected PGW-C+SMF to the UDM.

- 2a. On success, and if another AMF is registered for 3GPP access, the UDM updates the Amf3GppAccessRegistration resource by replacing it with the received resource information, and responds with "204 No Content".

UDM shall invoke the Deregistration Notification service operation towards the old AMF using the callback URI provided by the old AMF.

- 2b. If the resource does not exist (there is no previous AMF information stored in UDM for that user), UDM stores the received AMF registration data for 3GPP access and responds with HTTP Status Code "201 created". A response body may be included to convey additional information to the NF consumer (e.g., features supported by UDM).

- 2c. If the operation cannot be authorized due to e.g. UE does not have required subscription data, access barring or roaming restrictions, HTTP status code "403 Forbidden" should be returned including additional error information in the response body (in "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PUT response body.



### 5.3.2.2.3 AMF registration for non 3GPP access

Figure 5.3.2.2.3-1 shows a scenario where the AMF sends a request to the UDM to update the AMF registration information for non 3GPP access (see also 3GPP TS 23.502 [3] figure 4.2.2.2-1 step 14). The request contains the UE's identity ( $\{ueId\}$ ) which shall be a SUPI and the AMF Registration Information for non 3GPP access.



**Figure 5.3.2.2.3-1: AMF registering for non 3GPP access**

1. The AMF sends a PUT request to the resource representing the UE's AMF registration for non 3GPP access to update or create AMF registration information.
- 2a. On success, and if another AMF is registered for non-3GPP access, the UDM updates the `AmfNon3GppAccessRegistration` resource by replacing it with the received resource information, and responds with "204 No Content".

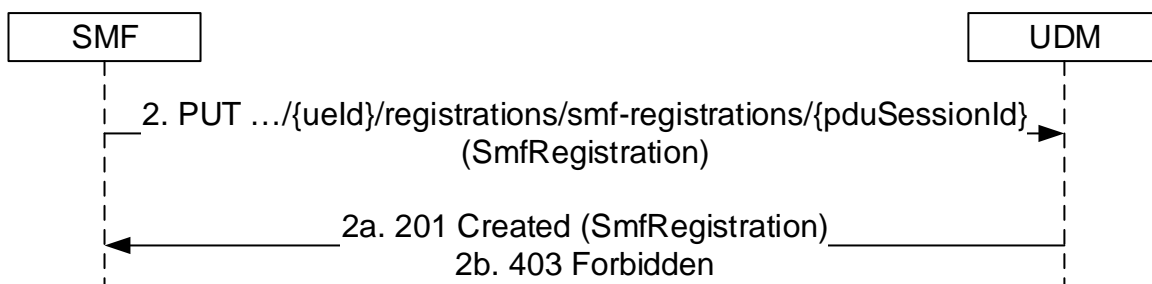
UDM shall invoke the Deregistration Notification service operation towards the old AMF using the callback URI provided by the old AMF.

- 2b. If the resource does not exist (there is no previous AMF information stored in UDM for that user), UDM stores the received AMF registration data for non-3GPP access and responds with HTTP Status Code "201 created". A response body may be included to convey additional information to the NF consumer (e.g., features supported by UDM).
- 2c. If the operation cannot be authorized due to e.g. UE does not have required subscription data, access barring or roaming restrictions, HTTP status code "403 Forbidden" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PUT response body.

### 5.3.2.2.4 SMF registration

Figure 5.3.2.2.4-1 shows a scenario where an SMF sends a request to the UDM to create a new registration (see also 3GPP TS 23.502 [3] figure 4.3.2.2.1-1 step 4). The request contains the UE's identity ( $\{ueId\}$ ) which shall be a SUPI and the SMF Registration Information.



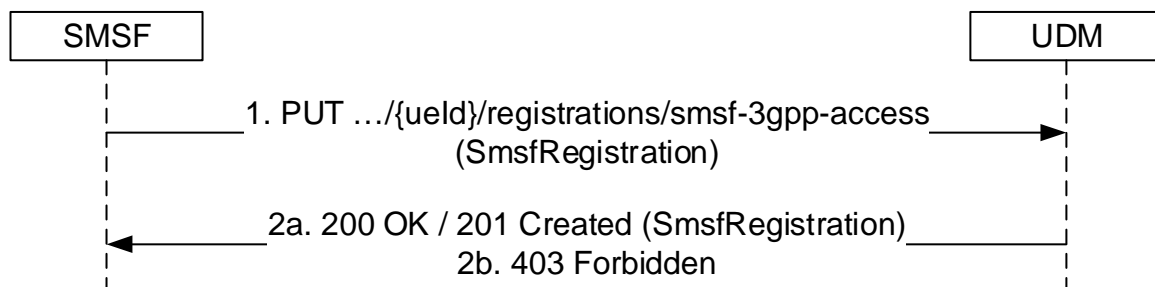
**Figure 5.3.2.2.4-1: SMF registration**

1. The SMF sends a PUT request to the resource `.../{ueId}/registrations/smf-registrations/{pduSessionId}`, to create an SMF Registration as present in the message body.
- 2a. The UDM responds with "201 Created" with the message body containing a representation of the created SMF registration.
- 2b. If the operation cannot be authorized due to e.g UE does not have required subscription data, access barring or roaming restrictions, HTTP status code "403 Forbidden" should be returned including additional error information in the response body (in "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PUT response body.

### 5.3.2.2.5 SMSF Registration for 3GPP Access

Figure 5.3.2.2.5-1 shows a scenario where the SMSF sends a request to the UDM to create or update the SMSF registration information for 3GPP access (see also 3GPP TS 23.502 [3], clause 4.13.3.1). The request contains the UE's identity (`{ueId}`) which shall be a SUPI and the SMSF Registration Information for SMS service.



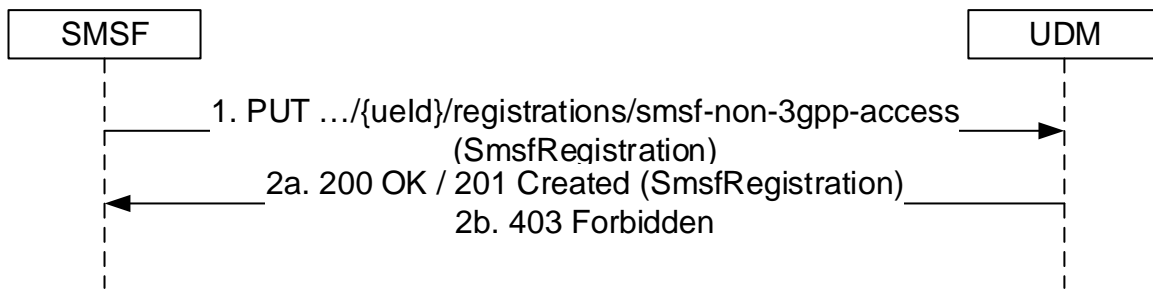
**Figure 5.3.2.2.5-1: SMSF registering for 3GPP Access**

1. The SMSF sends a PUT request to the resource representing the UE's SMSF registration for 3GPP Access to update or create SMSF registration information.
- 2a. If successful, the UDM responds with "200 OK", or "201 Created" with the message body containing the representation of the `SmsfRegistration`.
- 2b. If the operation cannot be authorized due to e.g UE does not have required subscription data, access barring or roaming restrictions, HTTP status code "403 Forbidden" should be returned including additional error information in the response body (in "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PUT response body.

### 5.3.2.2.6 SMSF Registration for Non 3GPP Access

Figure 5.3.2.2.6-1 shows a scenario where the SMSF sends a request to the UDM to create or update the SMSF registration information for non 3GPP access (see also 3GPP TS 23.502 [3], clause 4.13.3.1). The request contains the UE's identity (`{ueId}`) which shall be a SUPI and the SMSF Registration Information for SMS service.



**Figure 5.3.2.2.6-1: SMSF registering for Non 3GPP Access**

1. The SMSF sends a PUT request to the resource representing the UE's SMSF registration for Non 3GPP Access to update or create SMSF registration information.
- 2a. If successful, the UDM responds with "200 OK", or "201 Created" with the message body containing the representation of the SmsfRegistration.
- 2b. If the operation cannot be authorized due to e.g UE does not have required subscription data, access barring or roaming restrictions, HTTP status code "403 Forbidden" should be returned including additional error information in the response body (in "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PUT response body.

### 5.3.2.3 DeregistrationNotification

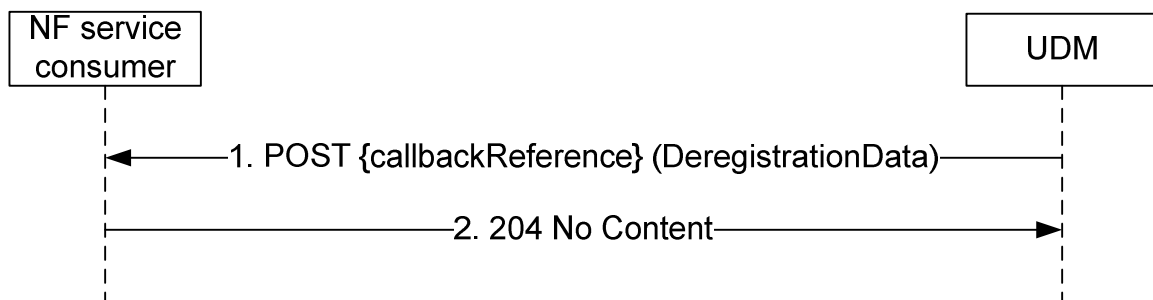
#### 5.3.2.3.1 General

The following procedure using the DeregistrationNotification service operation is supported:

- UDM initiated NF Deregistration

#### 5.3.2.3.2 UDM initiated NF Deregistration

Figure 5.3.2.3.2-1 shows a scenario where the UDM notifies the registered NF about its deregistration (see also 3GPP TS 23.502 [3] figure 4.2.2.2.2-1 step 14). The request contains the callback URI for deregistration notification as received by the UDM during registration, and Deregistration Data.



**Figure 5.3.2.3.2-1: UDM initiated NF Deregistration**

1. The UDM sends a POST request to the callbackReference as provided by the NF service consumer during the registration.
2. The NF service consumer responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

## 5.3.2.4 Deregistration

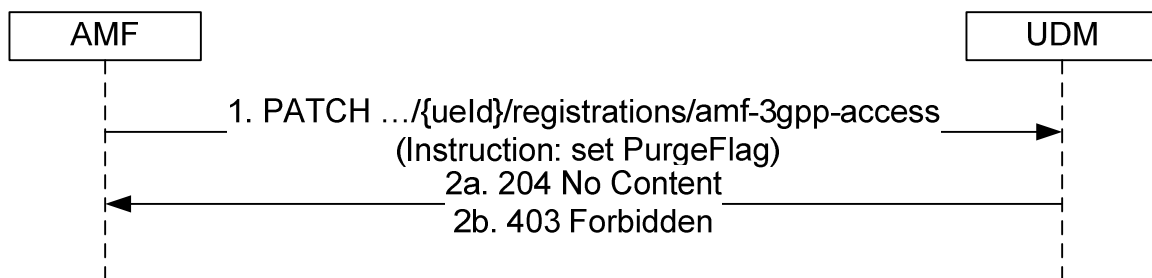
### 5.3.2.4.1 General

The following procedures using the Deregistration service operation are supported:

- AMF deregistration for 3GPP access
- AMF deregistration for non-3GPP access
- SMF deregistration
- SMSF deregistration for 3GPP access
- SMSF deregistration for non-3GPP access

#### 5.3.2.4.2 AMF deregistration for 3GPP access

Figure 5.3.2.4.2-1 shows a scenario where the AMF sends a request to the UDM to deregister (purge) from the UDM for 3GPP access (see also 3GPP TS 23.502 [3] figure 4.5.3.1-1 step 3). The request contains the UE's identity ( $\{\text{ueId}\}$ ) which shall be a SUPI and an instruction to set the `purgeFlag` within the `Amf3GppAccessRegistration` resource.



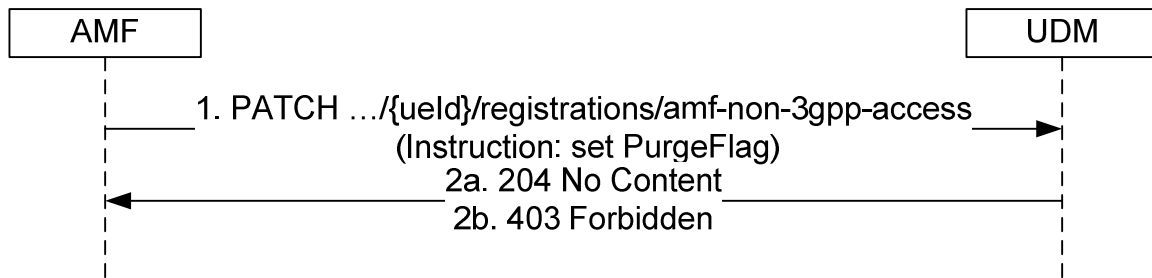
**Figure 5.3.2.4.2-1: AMF deregistering for 3GPP access**

1. The AMF sends a PATCH request to the resource representing the UE's AMF registration for 3GPP access.
- 2a. The UDM shall check whether the received GUAMI matches the stored GUAMI. If so, the UDM shall set the `PurgeFlag`. The UDM responds with "204 No Content".
- 2b. Otherwise the UDM responds with "403 Forbidden".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PATCH response body.

#### 5.3.2.4.3 AMF deregistration for non-3GPP access

Figure 5.3.2.4.3-1 shows a scenario where the AMF sends a request to the UDM to deregister (purge) from the UDM for non-3GPP access (see also 3GPP TS 23.502 [3] figure 4.5.3.1-1 step 3). The request contains the UE's identity ( $\{\text{ueId}\}$ ) which shall be a SUPI and an instruction to set the `purgeFlag` within the `AmfNon3GppAccessRegistration` resource.



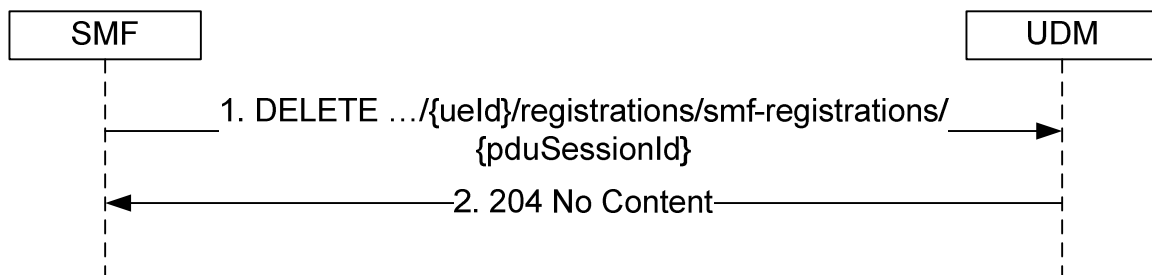
**Figure 5.3.2.4.3-1: AMF deregistering for non-3GPP access**

1. The AMF sends a PATCH request to the resource representing the UE's AMF registration for non-3GPP access.
- 2a. The UDM shall check whether the received GUAMI matches the stored GUAMI. If so, the UDM shall set the PurgeFlag. The UDM responds with "204 No Content".
- 2b. Otherwise the UDM responds with "403 Forbidden".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PATCH response body.

#### 5.3.2.4.4 SMF deregistration

Figure 5.3.2.4.4-1 shows a scenario where the SMF sends a request to the UDM to deregister an individual SMF registration (see also 3GPP TS 23.502 [3] figure 4.3.2.2-1 step 20). The request contains the UE's identity ( $\{/ueId\}$ ) which shall be a SUPI and the PDU Session ID ( $\{/pduSessionId\}$ ).



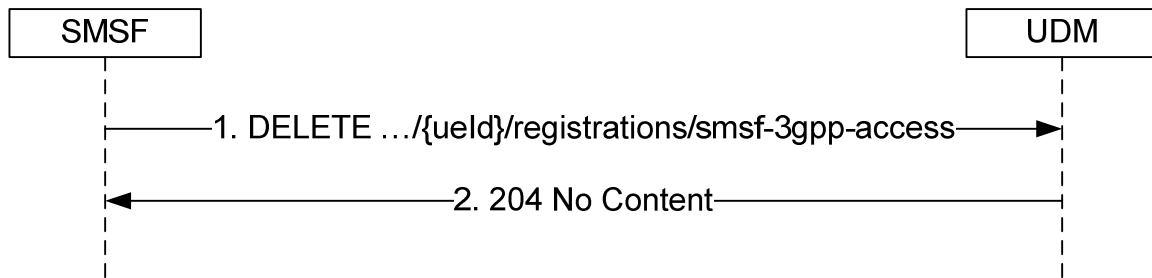
**Figure 5.3.2.4.4-1: SMF deregistration**

1. The SMF sends a DELETE request to the resource representing the individual SMF registration that is to be deregistered.
2. The UDM responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the DELETE response body.

#### 5.3.2.4.5 SMSF Deregistration for 3GPP Access

Figure 5.3.2.4.5-1 shows a scenario where the SMSF sends a request to the UDM to delete the SMSF registration information for 3GPP access (see also 3GPP TS 23.502 [3], clause 4.13.3.2). The request contains the UE's identity ( $\{/ueId\}$ ) which shall be a SUPI.



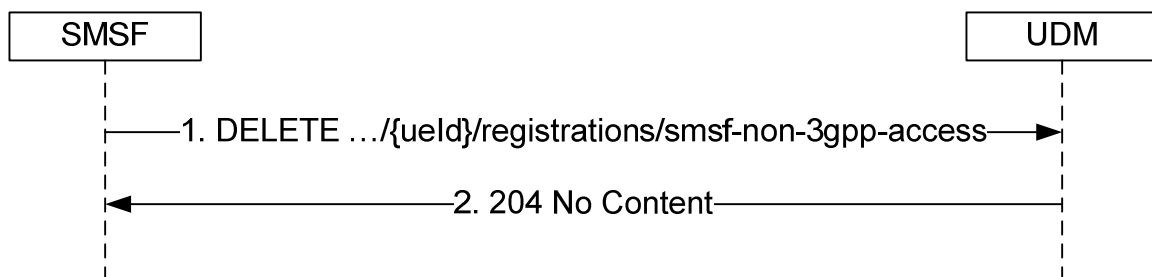
**Figure 5.3.2.4.5-1: SMSF Deregistering for 3GPP Access**

1. The SMSF sends a DELETE request to the resource representing the UE's SMSF registration for 3GPP access.
2. If successful, the UDM responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the DELETE response body.

#### 5.3.2.4.6 SMSF Deregistration for Non 3GPP Access

Figure 5.3.2.4.6-1 shows a scenario where the SMSF sends a request to the UDM to delete the SMSF registration information for non 3GPP access (see also 3GPP TS 23.502 [3], clause 4.13.3.2). The request contains the UE's identity ( $\{/ueId\}$ ) which shall be a SUPI.



**Figure 5.3.2.4.6-1: SMSF Deregistering for Non 3GPP Access**

1. The SMSF sends a DELETE request to the resource representing the UE's SMSF registration for non 3GPP access.
2. If successful, the UDM responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the DELETE response body.

### 5.3.2.5 Get

#### 5.3.2.5.1 General

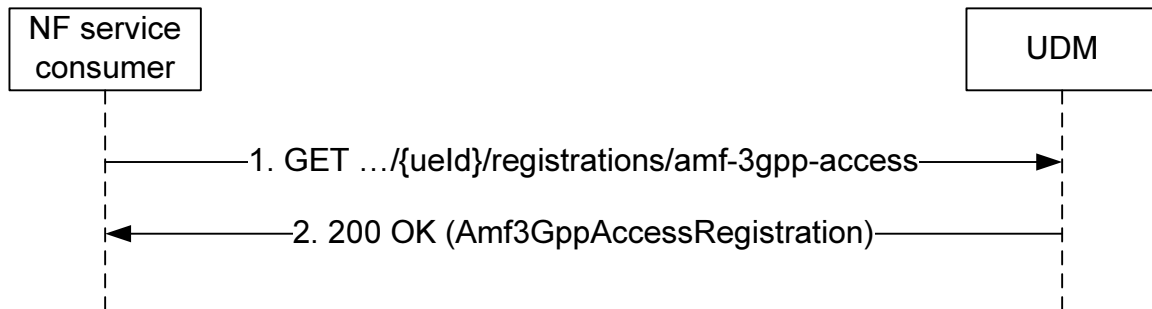
The following procedures using the Get service operation are supported:

- Amf3GppAccessRegistration Information Retrieval
- AmfNon3GppAccessRegistration Information Retrieval
- SmfRegistrations Information Retrieval
- SmfRegistration Information Retrieval for 3GPP Access

- SmsfRegistration Information Retrieval for Non-3GPP Access

### 5.3.2.5.2 Amf3GppAccessRegistration Information Retrieval

Figure 5.3.2.5.2-1 shows a scenario where the NF service consumer (e.g. NEF) sends a request to the UDM to retrieve the UE's Amf3GppAccessRegistration Information. The request contains the UE's identity ( $\{ueId\}$ ) which shall be a GPSI or SUPI, the type of the requested information ( $/registration/amf-3gpp-access$ ) and query parameters (supported-features).



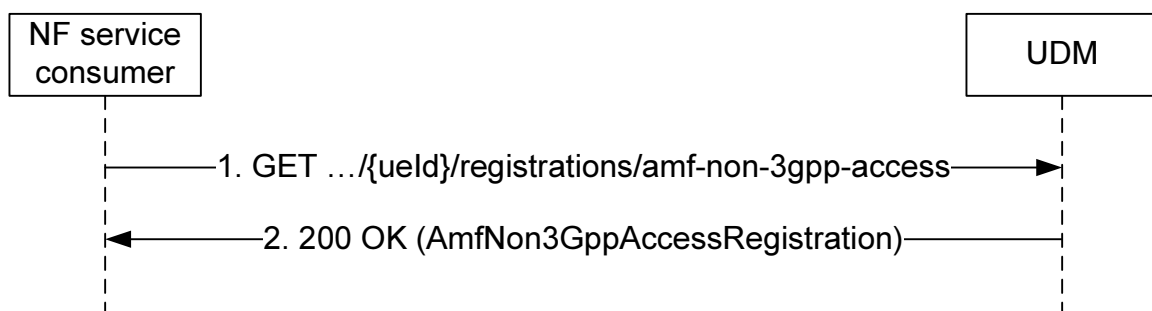
**Figure 5.3.2.5.2-1: Requesting a UE's AMF Registration Information for 3GPP Access**

1. The NF service consumer (e.g. NEF) sends a GET request to the resource representing the UE's AMF registration information for 3GPP access, with query parameters indicating the supported-features.
2. The UDM responds with "200 OK" with the message body containing the UE's Amf3GppAccessRegistration.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

### 5.3.2.5.3 AmfNon3GppAccessRegistration Information Retrieval

Figure 5.3.2.5.3-1 shows a scenario where the NF service consumer (e.g. NEF) sends a request to the UDM to retrieve the UE's AmfNon3GppAccessRegistration Information. The request contains the UE's identity ( $\{ueId\}$ ) which shall be a GPSI or SUPI, the type of the requested information ( $/registration/amf-non-3gpp-access$ ) and query parameters (supported-features).



**Figure 5.3.2.5.3-1: Requesting a UE's AMF Registration Information for non-3GPP Access**

1. The NF service consumer (e.g. NEF) sends a GET request to the resource representing the UE's AMF registration information for non-3GPP access, with query parameters indicating the supported-features.
2. The UDM responds with "200 OK" with the message body containing the UE's AmfNon3GppAccessRegistration.

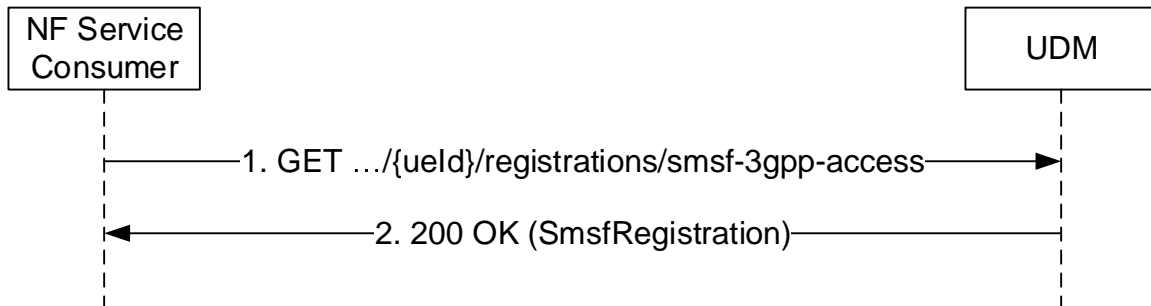
On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

#### 5.3.2.5.4 SmfRegistrations Information Retrieval

tbd

#### 5.3.2.5.5 SmsfRegistration Information Retrieval for 3GPP Access

Figure 5.3.2.5.5-1 shows a scenario where the NF service consumer (e.g. NEF) sends a request to the UDM to retrieve the UE's SmsfRegistration Information. The request contains the UE's identity ( $\{ueId\}$ ) which shall be a GPSI, the type of the requested information ( $/registrations/smsf-3gpp-access$ ) and query parameters (supported-features).



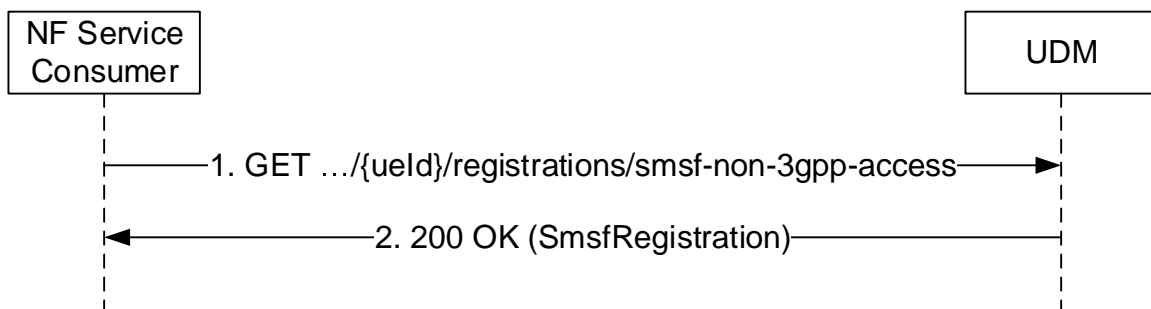
**Figure 5.3.2.5.5-1: Requesting a UE's SMSF Registration Information for 3GPP Access**

1. The NF service consumer (e.g. NEF) sends a GET request to the resource representing the UE's SMSF registration information for 3GPP access, with query parameters indicating the supported-features.
2. The UDM responds with "200 OK" with the message body containing the UE's SmsfRegistration for 3GPP access.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

#### 5.3.2.5.6 SmsfRegistration Information Retrieval for Non-3GPP Access

Figure 5.3.2.5.6-1 shows a scenario where the NF service consumer (e.g. NEF) sends a request to the UDM to retrieve the UE's SmsfRegistration Information for non-3GPP access. The request contains the UE's identity ( $\{ueId\}$ ) which shall be a GPSI, the type of the requested information ( $/registrations/smsf-non-3gpp-access$ ) and query parameters (supported-features).



**Figure 5.3.2.5.6-1: Requesting a UE's SMSF Registration Information for Non-3GPP Access**

1. The NF service consumer (e.g. NEF) sends a GET request to the resource representing the UE's SMSF registration information for non-3GPP access, with query parameters indicating the supported-features.
2. The UDM responds with "200 OK" with the message body containing the UE's SmsfRegistration for non-3GPP access.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.



## 5.3.2.6 Update

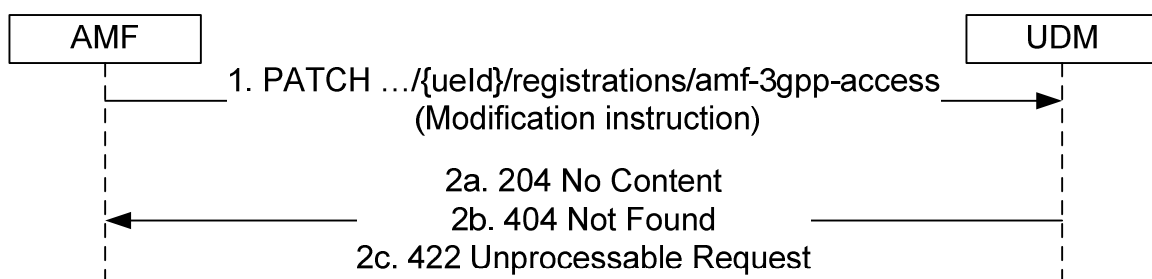
### 5.3.2.6.1 General

The following procedures using the Update service operation are supported:

- Update a parameter (e.g. PEI, EPS Interworking Info, etc) in the AMF registration for 3GPP access
- Update a parameter (e.g. PEI) in the AMF registration for non-3GPP access

#### 5.3.2.6.2 Update A Parameter (e.g. PEI) in the AMF Registration For 3GPP Access

Figure 5.3.2.6.2-1 shows a scenario where the AMF sends a request to the UDM to update a parameter within the Amf3GppAccessRegistration resource. The request contains the UE's identity ( $\{ueId\}$ ) which shall be a SUPI and an instruction to modify a parameter (e.g. PEI).



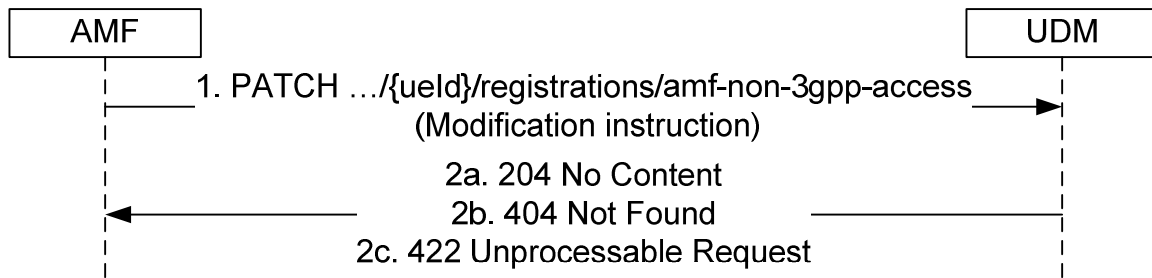
**Figure 5.3.2.6.2-1: AMF registration parameter update for 3GPP access**

1. The AMF sends a PATCH request to the resource representing the UE's AMF registration for 3GPP access.
- 2a. On success, the UDM responds with "204 No Content".
- 2b. If the resource does not exist e.g. the UE is not registered yet, HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).
- 2c. If the resource exists, but the requesting AMF is not the one currently registered for the UE, HTTP status code "422 Unprocessable Request" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PATCH response body.

#### 5.3.2.6.3 Update A Parameter (e.g. PEI) in the AMF Registration For Non 3GPP Access

Figure 5.3.2.6.3-1 shows a scenario where the AMF sends a request to the UDM to update a parameter within the AmfNon3GppAccessRegistration resource. The request contains the UE's identity ( $\{ueId\}$ ) which shall be a SUPI and an instruction to modify a parameter (e.g. PEI).



**Figure 5.3.2.6.3-1: AMF registration parameter update for non-3GPP access**

1. The AMF sends a PATCH request to the resource representing the UE's AMF registration for non-3GPP access.
- 2a. On success, the UDM responds with "204 No Content".
- 2b. If the resource does not exist e.g. the UE is not registered yet, HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).
- 2c. If the resource exists, but the requesting AMF is not the one currently registered for the UE, HTTP status code "422 Unprocessable Request" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PATCH response body.

## 5.3.2.7 P-CSCF-RestorationNotification

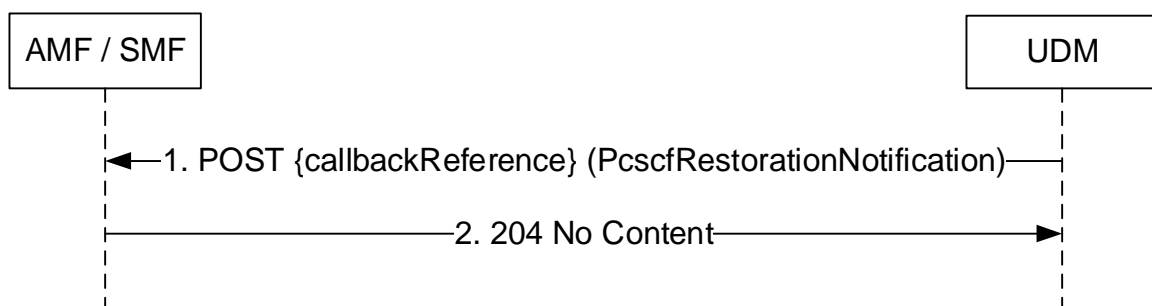
### 5.3.2.7.1 General

The following procedure using the P-CSCF-RestorationNotification service operation is supported:

- UDM initiated P-CSCF-Restoration

### 5.3.2.7.2 UDM initiated P-CSCF-Restoration

Figure 5.3.2.7.2-1 shows a scenario where the UDM notifies the registered AMF or SMF about the need for P-CSCF restoration. The request contains the callback URI for P-CSCF restoration as received by the UDM during registration, and P-CSCF Restoration Indication.



**Figure 5.3.2.7.2-1: UDM initiated P-CSCF Restoration**

1. The UDM sends a POST request to the callbackReference as provided by the NF service consumer during the registration.
2. The AMF or SMF responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

## 5.4 Nudm\_UEAuthentication Service

### 5.4.1 Service Description

See 3GPP TS 23.501 [2] table 7.2.5-1.

### 5.4.2 Service Operations

#### 5.4.2.1 Introduction

For the Nudm\_UEAuthentication service the following service operation is defined:

- Get
- ResultConfirmation

The Nudm\_UEAuthentication service is used by the AUSF to request the UDM to select an authentication method, calculate a fresh authentication vector (AV) if required for the selected method, and provide it to the AUSF by means of the Get service operation. See 3GPP TS 33.501 [6] clause 14.2.2.

The Nudm\_UEAuthentication service is also used by the AUSF to inform the UDM about the occurrence of a successful or unsuccessful authentication by means of the ResultConfirmation service operation. See 3GPP TS 33.501 [6] clause 14.2.3.

#### 5.4.2.2 Get

##### 5.4.2.2.1 General

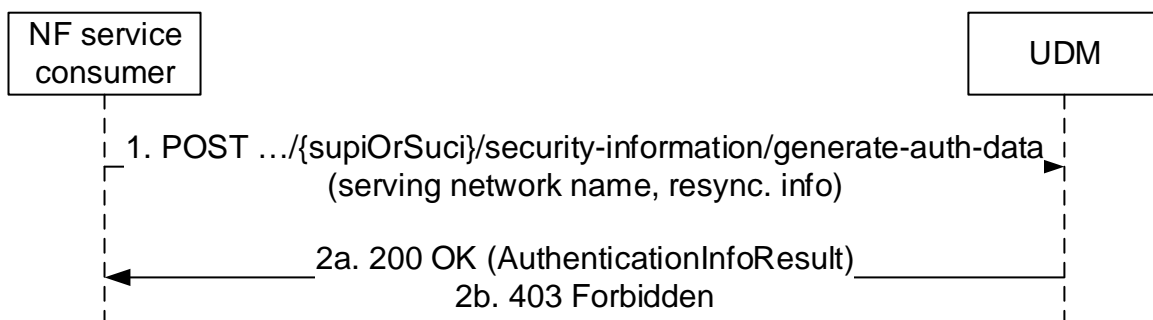
The following procedure using the Get service operation is supported:

- Authentication Information Retrieval

As part of this Authentication Information Retrieval operation, the UDM authorizes or rejects the subscriber to use the service provided by the registered NF, based on subscription data (e.g. roaming restrictions).

##### 5.4.2.2.2 Authentication Information Retrieval

Figure 5.4.2.2.2-1 shows a scenario where the NF service consumer (AUSF) retrieves authentication information for the UE from the UDM (see also 3GPP TS 33.501 [6] clause 6.1.2). The request contains the UE's identity (supi or suci), the serving network name, and may contain resynchronization info.



**Figure 5.4.2.2.2-1: NF service consumer requesting authentication information**

1. The NF service consumer sends a POST request (custom method: generate-auth-data) to the resource representing the UE's security information.

2a. The UDM responds with "200 OK" with the message body containing the authentication data information.

2b. If the operation cannot be authorized due to e.g UE does not have required subscription data, access barring or roaming restrictions, HTTP status code "403 Forbidden" should be returned including additional error information in the response body (in "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

### 5.4.2.3 ResultConfirmationInform

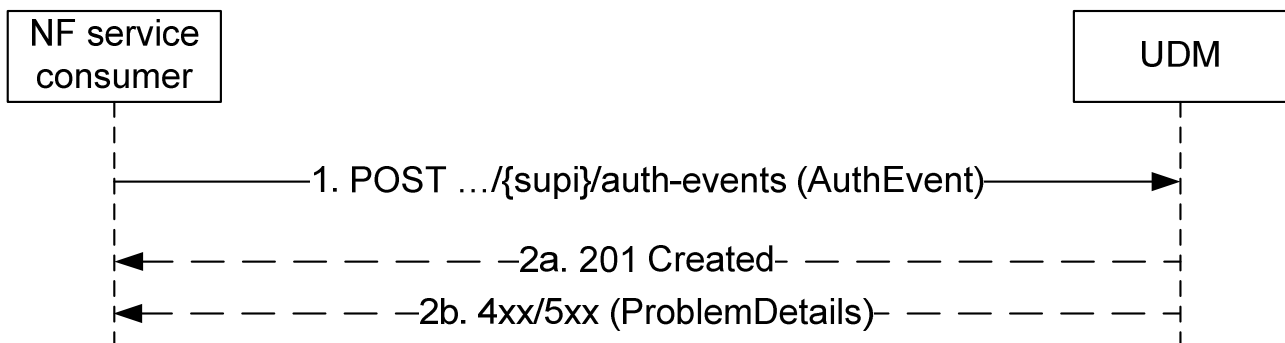
#### 5.4.2.3.1 General

The following procedure using the ResultConfirmation service operation is supported:

- Authentication Confirmation

#### 5.4.2.3.2 Authentication Confirmation

Figure 5.4.2.3.2-1 shows a scenario where the NF service consumer (AUSF) confirms the occurrence of a successful or unsuccessful authentication to the UDM (see also 3GPP TS 33.501 [6] clause 6.1.4.1a). The request contains the UE's identity (supi), and information about the authentication occurrence (AuthEvent).



**Figure 5.4.2.3.2-1: NF service consumer confirms UE authentication**

1. The NF service consumer sends a POST request to the resource representing the UE's authentication events.

2a. On success, the UDM responds with "201 Created".

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned.

## 5.5 Nudm\_EventExposure Service

### 5.5.1 Service Description

See 3GPP TS 23.501 [2] table 7.2.5-1.

### 5.5.2 Service Operations

#### 5.5.2.1 Introduction

For the Nudm\_EventExposure service the following service operations are defined:

- Subscribe
- Unsubscribe
- Notify
- ModifySubscription

The Nudm\_EventExposure service is used by consumer NFs (e.g. NEF) to subscribe to notifications of event occurrence by means of the Subscribe service operation. For events that can be detected by the AMF, the UDM makes use of the appropriate AMF service operation to subscribe on behalf of the consumer NF (e.g. NEF).

The Nudm\_EventExposure service is also used by the consumer NFs (e.g. NEF) that have previously subscribed to notifications, to unsubscribe by means of the Unsubscribe service operation. For events that can be detected by the AMF, the UDM makes use of the appropriate AMF service operation to unsubscribe on behalf of the consumer NF (e.g. NEF).

The Nudm\_EventExposure service is also used by the subscribed consumer NFs (e.g. NEF) to get notified by the UDM when a subscribed event occurs at the UDM by means of the Notify service operation. For subscribed events that can occur at the AMF, the consumer NF (e.g. NEF) makes use of the corresponding AMF service operation to get notified by the AMF directly without UDM involvement.

The Nudm\_EventExposure service is also used by the subscribed consumer NFs (e.g. NEF) to modify an existing subscription by means of the ModifySubscription service operation.

For details see 3GPP TS 23.502 [3] clause 4.15.

## 5.5.2.2 Subscribe

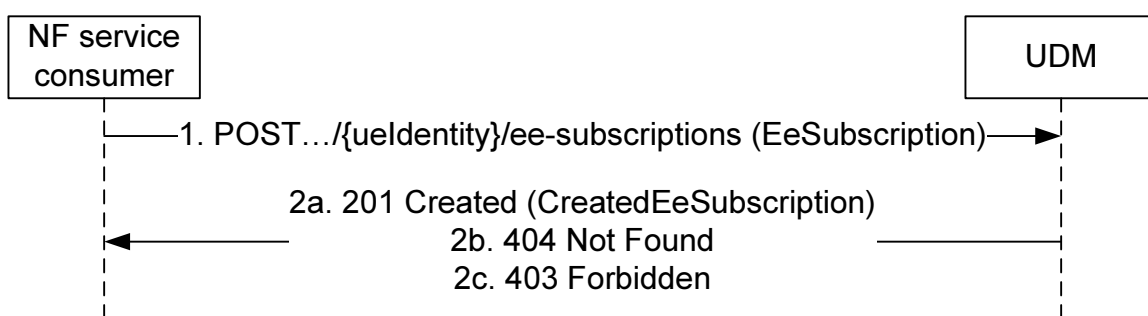
### 5.5.2.2.1 General

The following procedures using the Subscribe service operation are supported:

- Subscribe to Notification of event occurrence

#### 5.5.2.2.2 Subscription to Notification of event occurrence

Figure 5.5.2.2.2-1 shows a scenario where the NF service consumer sends a request to the UDM to subscribe to notifications of event occurrence (see also 3GPP TS 23.502 [3] figure 4.15.3.2.2-1 step 1). The request contains a callback URI, the type of event that is monitored and additional information e.g. event filters and reporting options.



**Figure 5.5.2.2.2-1: NF service consumer subscribes to notifications**

1. The NF service consumer sends a POST request to the parent resource (collection of subscriptions) (.../{ueIdentity}/ee-subscriptions), to create a subscription as present in message body. The values ueIdentity shall take are specified in Table 6.4.3.2.2-1. The request may contain an expiry time, suggested by the NF Service Consumer, representing the time upto which the subscription is desired to be kept active and the time after which the subscribed event(s) shall stop generating notifications.
- 2a. On success, the UDM responds with "201 Created" with the message body containing a representation of the created subscription. The Location HTTP header shall contain the URI of the created subscription. If the event subscription was for a group of UEs:

- The "maxNumOfReports" in the "reportingOptions" IE shall be applicable to each UE in the group;
- The UDM shall return the number of UEs in that group in the "numberOfUes" IE.

The NF service consumer shall keep track of the maximum number of reports reported for each UE in the event report and when "maxNumOfReports\*numberOfUes" limit is reached, the NF service consumer shall initiate the unsubscription of the notification towards the UDM (see clause 5.5.2.3.2).

The response, based on operator policy, may contain the expiry time, as determined by the UDM, after which the subscription becomes invalid. Once the subscription expires, if the NF Service Consumer wants to keep receiving notifications, it shall create a new subscription in the UDM. The NF Service Producer shall not provide the same expiry time for many subscriptions in order to avoid all of them expiring and recreating the subscription at the same time. If the expiry time is not included in the response, the NF Service Consumer shall not associate an expiry time for the subscription.

- 2b. If the user does not exist, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).
- 2c. If there is no valid subscription data for the UE, i.e. based on the UE's subscription information monitoring of the requested EventType is not allowed, or the requested EventType is not supported, HTTP status code "403 Forbidden" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

#### 5.5.2.2.3 Void

### 5.5.2.3 Unsubscribe

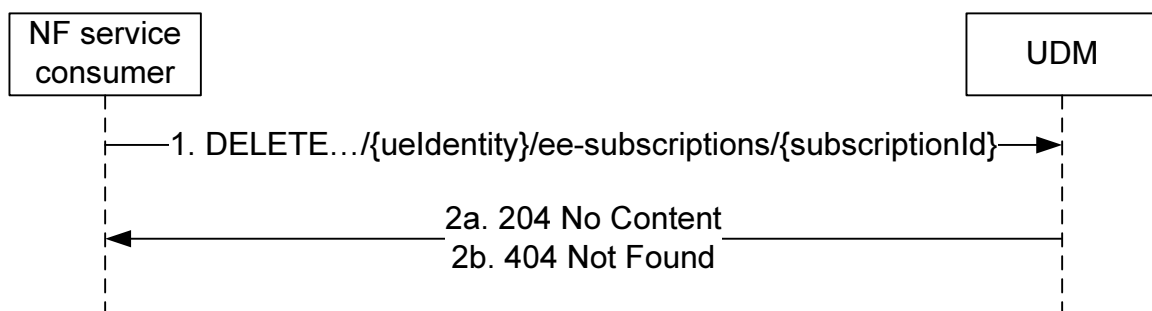
#### 5.5.2.3.1 General

The following procedures using the Unsubscribe service operation are supported:

- Unsubscribe to Notifications of event occurrence

#### 5.5.2.3.2 Unsubscribe to notifications of event occurrence

Figure 5.5.2.3.2-1 shows a scenario where the NF service consumer sends a request to the UDM to unsubscribe from notifications of event occurrence. The request contains the URI previously received in the Location HTTP header of the response to the subscription.



**Figure 5.5.2.3.2-1: NF service consumer unsubscribes to notifications**

1. The NF service consumer sends a DELETE request to the resource identified by the URI previously received during subscription creation.
- 2a. On success, the UDM responds with "204 No Content".

- 2b. If there is no valid subscription available (e.g. due to an unknown SubscriptionId value), HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the DELETE response body.

## 5.5.2.4 Notify

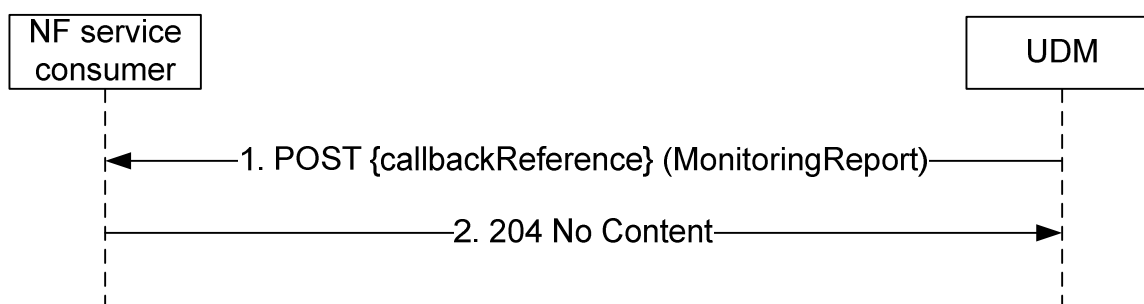
### 5.5.2.4.1 General

The following procedures using the Notify service operation are supported:

- Event Occurrence Notification

#### 5.5.2.4.2 Event Occurrence Notification

Figure 5.5.2.4.2-1 shows a scenario where the UDM notifies the NF service consumer (that has subscribed to receive such notification) about occurrence of an event (see also 3GPP TS 23.502 [3] figure 4.15.3.2.2-1 step 4a). The request contains the callbackReference URI as previously received in the EeSubscription (see clause 6.4.6.2.2).



**Figure 5.5.2.4.2-1: Event Occurrence Notification**

1. The UDM sends a POST request to the callbackReference as provided by the NF service consumer during the subscription.
2. The NF Service Consumer responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

## 5.5.2.5 ModifySubscription

### 5.5.2.5.1 General

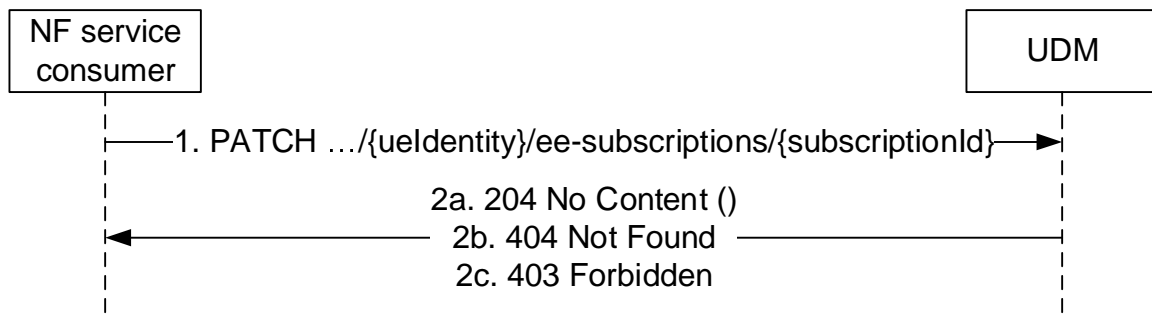
The following procedures using the ModifySubscription service operation are supported:

- Modification of an EE-Subscription to notification of events

#### 5.5.2.5.2 Modification of a subscription

The service operation is invoked by a NF Service Consumer, e.g. NEF, towards the UDM, when it needs to modify an existing subscription previously created by itself at the UDM.

The NF Service Consumer shall modify the subscription by using HTTP method PATCH with the URI of the individual subscription resource (see clause 6.4.3.3) to be modified.



**Figure 5.5.2.5.2-1: NF service consumer updates subscription**

1. The NF service consumer (e.g. NEF) shall send a PATCH request to the resource representing a subscription. The modification may be for the events subscribed or for updating the event report options.
- 2a. On success, the request is accepted, the UDM shall respond with "204 No Content".
- 2b. If the resource does not exist e.g. the subscriptionId cannot be found, HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).
- 2c. If the modification can't be accepted, HTTP status code "403 Forbidden" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PATCH response body.

## 5.6 Nudm\_ParameterProvision Service

### 5.6.1 Service Description

See 3GPP TS 23.501 [2] table 7.2.5-1.

### 5.6.2 Service Operations

#### 5.6.2.1 Introduction

For the Nudm\_ParameterProvision service the following service operations are defined:

- Update

The Nudm\_ParameterProvision service is used by consumer NFs (e.g. NEF) to update a UE's subscription data by means of the Update service operation.

For details see 3GPP TS 23.502 [3] clause 4.15.6.2.

#### 5.6.2.2 Update

##### 5.6.2.2.1 General

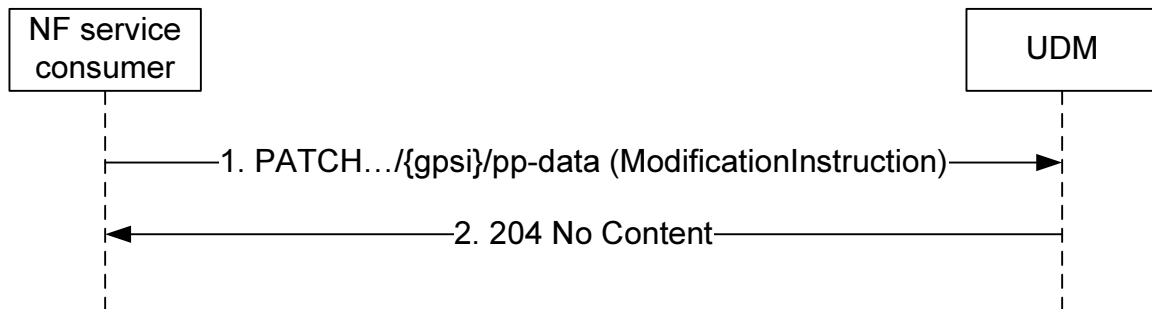
The following procedures using the Update service operation are supported:

- Subscription data update



### 5.6.2.2.2 Subscription data update

Figure 5.6.2.2.2-1 shows a scenario where the NF service consumer sends a request to the UDM to update a UE's subscription data (see also 3GPP TS 23.502 [3] figure 4.15.6.2-1 step 2). The request contains the identifier of the UE's parameter provision data ( .../{gpsi}/pp-data) and the modification instructions.



**Figure 5.6.2.2.2-1: NF service consumer updates subscription data**

1. The NF service consumer sends a PATCH request to the resource that represents a UE's modifiable subscription data.
2. The UDM responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PATCH response body.

## 6 API Definitions

### 6.1 Nudm\_SubscriberDataManagement Service API

#### 6.1.1 API URI

The Nudm\_SDM service shall use the Nudm\_SDM API.

The request URI used in HTTP request from the NF service consumer towards the NF service producer shall have the 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 "nudm-sdm".
- The {apiVersion} shall be "v2".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.1.3.

#### 6.1.2 Usage of HTTP

##### 6.1.2.1 General

HTTP/2, as defined in IETF RFC 7540 [13], 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].

HTTP messages and bodies for the Nudm\_SDM service shall comply with the OpenAPI [14] specification contained in Annex A2.

## 6.1.2.2 HTTP standard headers

### 6.1.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

### 6.1.2.2.2 Content type

The following content types shall be supported:

JSON, as defined in IETF RFC 8259 [15], signalled by the content type "application/json".

The Problem Details JSON Object (IETF RFC 7807 [16]) signalled by the content type "application/problem+json"

JSON Merge Patch, as defined in IETF RFC 7396 [17], signalled by the content type "application/merge-patch+json"

### 6.1.2.2.3 Cache-Control

As described in IETF RFC 7234 [26] clause 5.2, a "Cache-Control" header should be included in HTTP responses except for non-cacheable resources (e.g. UeContextInSmsfData). If it is included, it shall contain a "max-age" value, indicating the amount of time in seconds after which the received response is considered stale.

The "max-age" value shall be configurable by operator policy.

### 6.1.2.2.4 ETag

As described in IETF RFC 7232 [25] clause 2.32, an "ETag" (entity-tag) header should be included in HTTP responses except for non-cacheable resources (e.g. UeContextInSmfData) to allow an NF Service Consumer performing a conditional request with "If-None-Match" header. If it is included, it shall contain a server-generated strong validator, that allows further matching of this value (included in subsequent client requests) with a given resource representation stored in the server or in a cache.

### 6.1.2.2.5 If-None-Match

As described in IETF RFC 7232 [25] clause 3.2, an NF Service Consumer may issue conditional GET request towards UDM by including an "If-None-Match" header in HTTP requests containing one or several entity tags received in previous responses for the same resource.

### 6.1.2.2.6 Last-Modified

As described in IETF RFC 7232 [25] clause 2.2, a "Last-Modified" header should be included in HTTP responses except for non-cacheable resources (e.g. SorAck) to allow an NF Service Consumer performing a conditional request with "If-Modified-Since" header.

### 6.1.2.2.7 If-Modified-Since

As described in IETF RFC 7232 [25] clause 3.3, an NF Service Consumer may issue conditional GET request towards UDM, by including an "If-Modified-Since" header in HTTP requests.

### 6.1.2.2.8 When to Use Entity-Tags and Last-Modified Dates

Both "ETag" and "Last-Modified" headers should be sent in the same HTTP response as stated in IETF RFC 7232 [25] clause 2.4.

NOTE: "ETag" is a stronger validator than "Last-Modified" and is preferred.

If the NF Service Producer included an "ETag" header with the resource then a conditional request for this resource shall be performed with the "If-None-Match" header.

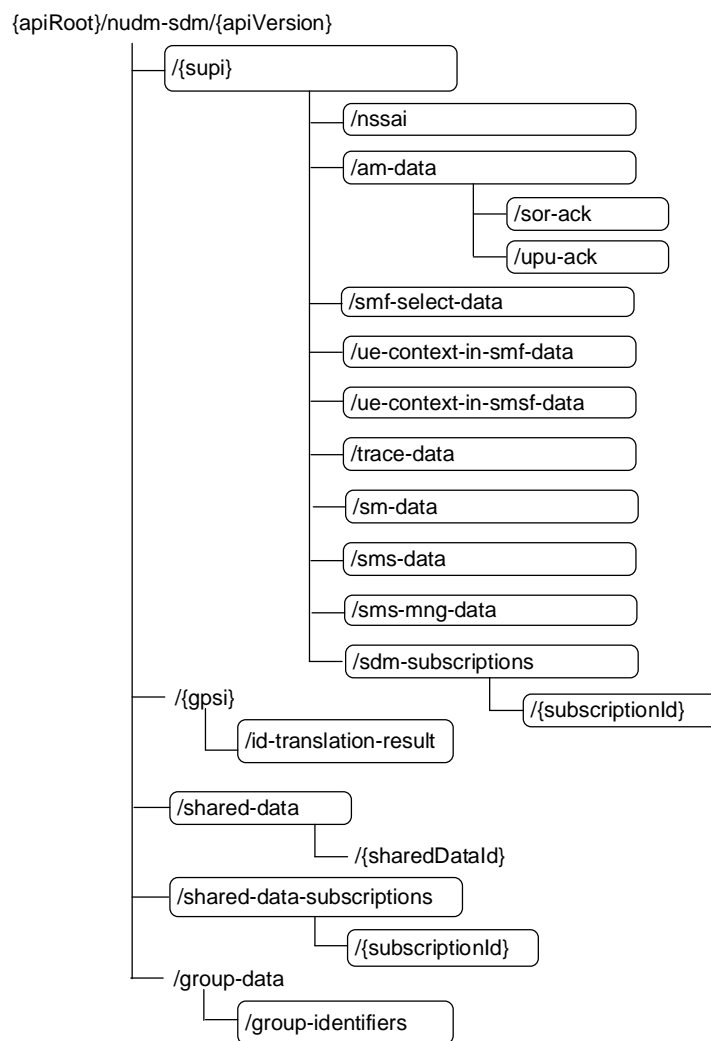
### 6.1.2.3 HTTP custom headers

#### 6.1.2.3.1 General

The usage of HTTP custom headers shall be supported as specified in clause 5.2.3 of 3GPP TS 29.500 [4].

## 6.1.3 Resources

### 6.1.3.1 Overview



**Figure 6.1.3.1-1: Resource URI structure of the nudm-sdm API**

Table 6.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.1.3.1-1: Resources and methods overview

| Resource name (Archetype)                    | Resource URI                                   | HTTP method or custom operation | Description   |
|--|--|---------------------------------|---|
| Supi (Document)                              | /{{supi}}                                      | GET                             | Retrieve UE's subscription data   |
| Nssai (Document)                             | /{{supi}}/nssai                                | GET                             | Retrieve the UE's subscribed Network Slice Selection Assistance Information |
| AccessAndMobilitySubscriptionData (Document) | /{{supi}}/am-data                              | GET                             | Retrieve the UE's subscribed Access and Mobility Data                       |
| SorAck (Document)                            | /{{supi}}/am-data/sor-ack                      | PUT                             | Providing acknowledgement of Steering of Roaming                            |
| UpuAck (Document)                            | /{{supi}}/am-data/upu-ack                      | PUT                             | Providing acknowledgement of UE parameters update                           |
| SmfSelectionSubscriptionData (Document)      | /{{supi}}/smf-select-data                      | GET                             | Retrieve the UE's subscribed SMF Selection Data                             |
| UeContextInSmfData (Document)                | /{{supi}}/ue-context-in-smf-data               | GET                             | Retrieve the UE's Context in SMF Data                                       |
| SessionManagementSubscriptionData (Document) | /{{supi}}/sm-data                              | GET                             | Retrieve the UE's session management subscription data                      |
| SMSSubscriptionData (Document)               | /{{supi}}/sms-data                             | GET                             | Retrieve the UE's SMS subscription data                                     |
| SMSManagementSubscriptionData (Document)     | /{{supi}}/sms-mng-data                         | GET                             | Retrieve the UE's SMS management subscription data                          |
| SdmSubscriptions (Collection)                | /{{supi}}/sdm-subscriptions                    | POST                            | Create a subscription   |
| Individual subscription (Document)           | /{{supi}}/sdm-subscriptions/{{subscriptionId}} | DELETE                          | Delete the subscription identified by {{subscriptionId}}, i.e. unsubscribe  |
|  |  | PATCH                           | Modify the sdm-subscription identified by {{subscriptionId}}                |
| IdTranslationResult (Document)               | /{{gpsi}}/id-translation-result                | GET                             | Retrieve a UE's SUPI  |
| UeContextInSmsfData (Document)               | /{{supi}}/ue-context-in-smsf-data              | GET                             | Retrieve the UE's Context in SMSF Data                                      |
| TraceData (Document)                         | /{{supi}}/trace-data                           | GET                             | Retrieve Trace Configuration Data   |
| SharedData (Collection)                      | /shared-data                                   | GET                             | Retrieve shared data  |
| SharedDataSubscriptions (Collection)         | /shared-data-subscriptions                     | POST                            | Create a subscription   |
| SharedDataIndividual subscription (Document) | /shared-data-subscriptions/{{subscriptionId}}  | DELETE                          | Delete the subscription identified by {{subscriptionId}}, i.e. unsubscribe  |
|  |  | PATCH                           | Modify the shared data subscription identified by {{subscriptionId}}        |
| GroupIdentifiers (Document)                  | /group-data/group-identifiers                  | GET                             | Retrieve group identifiers  |

## 6.1.3.2 Resource: Nssai

### 6.1.3.2.1 Description

This resource represents the subscribed Nssai for a SUPI. It is queried by the AMF before registering, and is used to assist network slice selection. See 5.2.2.2.2 and 3GPP TS 23.501 [2] clause 5.15.3.

### 6.1.3.2.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{{supi}}/nssai

This resource shall support the resource URI variables defined in table 6.1.3.2.2-1.

**Table 6.1.3.2.2-1: Resource URI variables for this resource**

| Name       | Definition   |
|------------|--|
| apiRoot    | See clause 6.1.1   |
| apiVersion | See clause 6.1.1   |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15} nai-.+ .+)") |

### 6.1.3.2.3 Resource Standard Methods

#### 6.1.3.2.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.2.3.1-1.

**Table 6.1.3.2.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                              |
|--------------------|-------------------|---|-------------|--|
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6        |
| plmn-id            | Plmnlid           | O | 0..1        | PLMN identity of the PLMN serving the UE |

If "plmn-id" is included, UDM shall return the Subscribed S-NSSAIs which the UE is subscribed to use in the PLMN identified by "plmn-id".

If "plmn-id" is not included, UDM shall return the Subscribed S-NSSAIs for HPLMN.

This method shall support the request data structures specified in table 6.1.3.2.3.1-2 and the response data structures and response codes specified in table 6.1.3.2.3.1-3.

**Table 6.1.3.2.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.2.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type      | P | Cardinality | Response codes | Description  |
|----------------|---|-------------|----------------|--|
| Nssai          | M | 1           | 200 OK         | Upon success, a response body containing the NSSAI shall be returned.  |
| ProblemDetails | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- DATA_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

### 6.1.3.3 Resource: SdmSubscriptions

#### 6.1.3.3.1 Description

This resource is used to represent subscriptions to notifications.

#### 6.1.3.3.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/sdm-subscriptions

This resource shall support the resource URI variables defined in table 6.1.3.3.2-1.

**Table 6.1.3.3.2-1: Resource URI variables for this resource**

| Name       | Definition   |
|------------|--|
| apiRoot    | See clause 6.1.1   |
| apiVersion | See clause 6.1.1   |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15} nai-.+ .+)") |

### 6.1.3.3.3 Resource Standard Methods

#### 6.1.3.3.3.1 POST

This method shall support the URI query parameters specified in table 6.1.3.3.3.1-1.

**Table 6.1.3.3.3.1-1: URI query parameters supported by the POST method on this resource**

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

This method shall support the request data structures specified in table 6.1.3.3.3.1-2 and the response data structures and response codes specified in table 6.1.3.3.3.1-3.

**Table 6.1.3.3.3.1-2: Data structures supported by the POST Request Body on this resource**

| Data type       | P | Cardinality | Description                             |
|-----------------|---|-------------|---|
| SdmSubscription | M | 1           | The subscription that is to be created. |

**Table 6.1.3.3.3.1-3: Data structures supported by the POST Response Body on this resource**

| Data type       | P | Cardinality | Response codes      | Description   |
|-----------------|---|-------------|---------------------|---|
| SdmSubscription | M | 1           | 201 Created         | Upon success, a response body containing a representation of the created Individual subscription resource shall be returned.<br><br>The HTTP response shall include a "Location" HTTP header that contains the resource URI of the created resource. When stateless UDM is deployed, the stateless UDM may use an FQDN identifying the UDM group to which the UDM belongs as the host part of the resource URI. |
| ProblemDetails  | M | 1           | 404 Not Found       | The "cause" attribute shall be set to the following application error:<br>- USER_NOT_FOUND  |
| ProblemDetails  | M | 1           | 501 Not Implemented | The "cause" attribute shall be set to the following application error:<br>- UNSUPPORTED_RESOURCE_URI  |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

NOTE: In the scenario of stateless UDM deployment, it is assumed that stateless UDMs are organized into several UDM groups, and for each UDM group an FQDN can be allocated.

### 6.1.3.4 Resource: Individual subscription

#### 6.1.3.4.1 Description

This resource is used to represent an individual subscription to notifications.

#### 6.1.3.4.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/sdm-subscriptions/{subscriptionId}

This resource shall support the resource URI variables defined in table 6.1.3.4.2-1.

**Table 6.1.3.4.2-1: Resource URI variables for this resource**

| Name           | Definition   |
|----------------|--|
| apiRoot        | See clause 6.1.1   |
| apiVersion     | See clause 6.1.1   |
| supi           | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15}[nai-.+].+)"                          |
| subscriptionId | The subscriptionId identifies an individual subscription to notifications. The value is allocated by the UDM during creation of the Subscription resource. |

### 6.1.3.4.3 Resource Standard Methods

#### 6.1.3.4.3.1 DELETE

This method shall support the URI query parameters specified in table 6.1.3.4.3.1-1.

**Table 6.1.3.4.3.1-1: URI query parameters supported by the DELETE method on this resource**

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

This method shall support the request data structures specified in table 6.1.3.4.3.1-2 and the response data structures and response codes specified in table 6.1.3.4.3.1-3.

**Table 6.1.3.4.3.1-2: Data structures supported by the Delete Request Body on this resource**

| Data type | P | Cardinality | Description                      |
|-----------|---|-------------|----------------------------------|
| n/a       |   |             | The request body shall be empty. |

**Table 6.1.3.4.3.1-3: Data structures supported by the DELETE Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| n/a  |   |             | 204 No Content | Upon success, an empty response body shall be returned.   |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- CONTEXT_NOT_FOUND |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                |   |

#### 6.1.3.4.3.2 PATCH

This method shall support the URI query parameters specified in table 6.1.3.4.3.2-1.

**Table 6.1.3.4.3.2-1: URI query parameters supported by the PATCH method on this resource**

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

This method shall support the request data structures specified in table 6.1.3.4.3.2-2 and the response data structures and response codes specified in table 6.1.3.4.3.2-3.

**Table 6.1.3.4.3.2-2: Data structures supported by the PATCH Request Body on this resource**

| Data type          | P | Cardinality | Description                  |
|--------------------|---|-------------|------------------------------|
| SdmSubModification | M | 1           | The modification Instruction |

**Table 6.1.3.4.3.2-3: Data structures supported by the PATCH Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| SdmSubscription  | M | 1           | 200 OK         | Upon success, the modified sdmSubscription shall be returned. |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                |   |

### 6.1.3.5 Resource: AccessAndMobilitySubscriptionData

#### 6.1.3.5.1 Description

This resource represents the subscribed Access and Mobility Data for a SUPI. It is queried by the AMF after registering.

#### 6.1.3.5.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/am-data

This resource shall support the resource URI variables defined in table 6.1.3.5.2-1.

**Table 6.1.3.5.2-1: Resource URI variables for this resource**

| Name       | Definition  |
|------------|---|
| apiRoot    | See clause 6.1.1  |
| apiVersion | See clause 6.1.1  |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15} nai-.+ .+)" |

#### 6.1.3.5.3 Resource Standard Methods

##### 6.1.3.5.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.5.3.1-1.

**Table 6.1.3.5.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                              |
|--------------------|-------------------|---|-------------|--|
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6        |
| plmn-id            | PlmnId            | O | 0..1        | PLMN identity of the PLMN serving the UE |

If "plmn-id" is included, UDM shall return the Access and Mobility Data for the SUPI associated to the PLMN identified by "plmn-id".

If "plmn-id" is not included, UDM shall return the Access and Mobility Data for the SUPI associated to the HPLMN.

This method shall support the request data structures specified in table 6.1.3.5.3.1-2 and the response data structures and response codes specified in table 6.1.3.5.3.1-3.

**Table 6.1.3.5.3.1-2: Data structures supported by the GET Request Body on this resource**

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



**Table 6.1.3.5.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type                         | P | Cardinality | Response codes | Description  |
|-----------------------------------|---|-------------|----------------|--|
| AccessAndMobilitySubscriptionData | M | 1           | 200 OK         | Upon success, a response body containing the Access and Mobility Subscription Data shall be returned.                  |
| ProblemDetails                    | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- DATA_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

### 6.1.3.6 Resource: SmfSelectionSubscriptionData

#### 6.1.3.6.1 Description

This resource represents the subscribed SMF Selection Data for a SUPI. It is queried by the AMF after registering.

#### 6.1.3.6.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/smf-select-data

This resource shall support the resource URI variables defined in table 6.1.3.6.2-1.

**Table 6.1.3.6.2-1: Resource URI variables for this resource**

| Name       | Definition  |
|------------|---|
| apiRoot    | See clause 6.1.1  |
| apiVersion | See clause 6.1.1  |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15} nai-.+ .+)" |

#### 6.1.3.6.3 Resource Standard Methods

##### 6.1.3.6.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.6.3.1-1.

**Table 6.1.3.6.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                              |
|--------------------|-------------------|---|-------------|--|
| supported-features | SupportedFeatureS | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6        |
| plmn-id            | PlmnId            | O | 0..1        | PLMN identity of the PLMN serving the UE |

If "plmn-id" is included, UDM shall return the SMF Selection Subscription Data for the SUPI associated to the PLMN identified by "plmn-id".

If "plmn-id" is not included, UDM shall return the SMF Selection Subscription Data for the SUPI associated to the HPLMN.

This method shall support the request data structures specified in table 6.1.3.6.3.1-2 and the response data structures and response codes specified in table 6.1.3.6.3.1-3.

**Table 6.1.3.6.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.6.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type                    | P | Cardinality | Response codes | Description  |
|------------------------------|---|-------------|----------------|--|
| SmfSelectionSubscriptionData | M | 1           | 200 OK         | Upon success, a response body containing the SMF Selection Subscription Data shall be returned.                        |
| ProblemDetails               | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- DATA_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

### 6.1.3.7 Resource: UeContextInSmfData

#### 6.1.3.7.1 Description

This resource represents the allocated SMFs for a SUPI. It is queried by the AMF after registering.

#### 6.1.3.7.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/ue-context-in-smf-data

This resource shall support the resource URI variables defined in table 6.1.3.7.2-1.

**Table 6.1.3.7.2-1: Resource URI variables for this resource**

| Name       | Definition  |
|------------|---|
| apiRoot    | See clause 6.1.1  |
| apiVersion | See clause 6.1.1  |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15} nai-.+ .+)" |

#### 6.1.3.7.3 Resource Standard Methods

##### 6.1.3.7.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.7.3.1-1.

**Table 6.1.3.7.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                       |
|--------------------|-------------------|---|-------------|-----------------------------------|
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6 |

This method shall support the request data structures specified in table 6.1.3.7.3.1-2 and the response data structures and response codes specified in table 6.1.3.7.3.1-3.

**Table 6.1.3.7.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.7.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type          | P | Cardinality | Response codes | Description  |
|--------------------|---|-------------|----------------|--|
| UeContextInSmfData | M | 1           | 200 OK         | Upon success, a response body containing the UeContextInSmfData shall be returned.                                     |
| ProblemDetails     | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- DATA_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

### 6.1.3.8 Resource: SessionManagementSubscriptionData

#### 6.1.3.8.1 Description

This resource represents the Session Management subscription data for a SUPI. It is queried by the SMF during session setup, using query parameters representing the selected network slice and the DNN. The SMF is responsible for enforcing the user session management subscription data.

#### 6.1.3.8.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/sm-data

This resource shall support the resource URI variables defined in table 6.1.3.8.2-1.

**Table 6.1.3.8.2-1: Resource URI variables for this resource**

| Name       | Definition   |
|------------|--|
| apiRoot    | See clause 6.1.1   |
| apiVersion | See clause 6.1.1   |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15} nai-.+ .+)") |

#### 6.1.3.8.3 Resource Standard Methods

##### 6.1.3.8.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.8.3.1-1.

**Table 6.1.3.8.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                              |
|--------------------|-------------------|---|-------------|--|
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6        |
| single-nssai       | Snssai            | O | 0..1        |  |
| dnn                | Dnn               | O | 0..1        |  |
| plmn-id            | PlmnId            | O | 0..1        | PLMN identity of the PLMN serving the UE |

JSON objects (such as Snssai, PlmnId...) shall be included directly as part of the URI query parameters by specifying in the OpenAPI file that the "Content-Type" of such parameters is "application/json".

If "singleNssai" is not included, and "dnn" is not included, UDM shall return all DNN configurations for all network slice(s).

If "singleNssai" is included, and "dnn" is not included, UDM shall return all DNN configurations for the requested network slice identified by "singleNssai".

If "singleNssai" is not included, and "dnn" is included, UDM shall return all DNN configurations identified by "dnn" for all network slices where such DNN is available.

If "singleNssai" is included, and "dnn" is included, UDM shall return the DNN configuration identified by "dnn", if such DNN is available in the network slice identified by "singleNssai".

For all the combinations about the inclusion of "dnn" and "singleNssai" as URI query parameters, if "plmn-id" is included, UDM shall return the configurations for the DNN and network slices associated to the PLMN identified by "plmn-id". Otherwise (i.e. if "plmn-id" is not included), UDM shall return the configurations for the DNN and network slices associated to the HPLMN.

This method shall support the request data structures specified in table 6.1.3.8.3.1-2 and the response data structures and response codes specified in table 6.1.3.8.3.1-3.

**Table 6.1.3.8.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.8.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description  |
|--|---|-------------|----------------|--|
| array(SessionManagementSubscriptionData)   | M | 1..N        | 200 OK         | Upon success, a response body containing the Session Management Subscription data shall be returned.                   |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- DATA_NOT_FOUND |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                |  |

### 6.1.3.9 Resource: SMSSubscriptionData

#### 6.1.3.9.1 Description

This resource represents the subscribed SMS Subscription Data for a SUPI. It is queried by the AMF after registering.

#### 6.1.3.9.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/sms-data

This resource shall support the resource URI variables defined in table 6.1.3.9.2-1.

**Table 6.1.3.9.2-1: Resource URI variables for this resource**

| Name       | Definition   |
|------------|--|
| apiRoot    | See clause 6.1.1   |
| apiVersion | See clause 6.1.1   |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15} nai-.+ .+)") |

#### 6.1.3.9.3 Resource Standard Methods

##### 6.1.3.9.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.9.3.1-1.

**Table 6.1.3.9.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                             |
|--------------------|-------------------|---|-------------|---|
| plmn-id            | PlmnlId           | C | 0..1        | if absent, H-PLMN ID is used as default |
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6       |

This method shall support the request data structures specified in table 6.1.3.9.3.1-2 and the response data structures and response codes specified in table 6.1.3.9.3.1-3.

**Table 6.1.3.9.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.9.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description  |
|--|---|-------------|----------------|--|
| SmsSubscriptionData  | M | 1           | 200 OK         | Upon success, a response body containing the SMS Subscription Data shall be returned.                                  |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- DATA_NOT_FOUND |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                |  |

### 6.1.3.10 Resource: SMSManagementSubscriptionData

#### 6.1.3.10.1 Description

This resource represents the subscribed SMS Management Data for a SUPI. It is queried by the SMSF after registering.

#### 6.1.3.10.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/sms-mng-data

This resource shall support the resource URI variables defined in table 6.1.3.10.2-1.

**Table 6.1.3.10.2-1: Resource URI variables for this resource**

| Name       | Definition   |
|------------|--|
| apiRoot    | See clause 6.1.1   |
| apiVersion | See clause 6.1.1   |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15} nai-.+ .+)") |

#### 6.1.3.10.3 Resource Standard Methods

##### 6.1.3.10.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.10.3.1-1.

**Table 6.1.3.10.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                             |
|--------------------|-------------------|---|-------------|---|
| plmn-id            | PlmnlId           | C | 0..1        | if absent, H-PLMN ID is used as default |
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6       |

This method shall support the request data structures specified in table 6.1.3.10.3.1-2 and the response data structures and response codes specified in table 6.1.3.10.3.1-3.

**Table 6.1.3.10.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.10.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description  |
|--|---|-------------|----------------|--|
| SmsManagementSubscriptionData  | M | 1           | 200 OK         | Upon success, a response body containing the SMS Management Subscription Data shall be returned.                       |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- DATA_NOT_FOUND |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                |  |

### 6.1.3.11 Resource: Supi

#### 6.1.3.11.1 Description

This resource represents the subscription profile of the subscriber identified by a given SUPI.

#### 6.1.3.11.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}

This resource shall support the resource URI variables defined in table 6.1.3.11.2-1.

**Table 6.1.3.11.2-1: Resource URI variables for this resource**

| Name       | Definition   |
|------------|--|
| apiRoot    | See clause 6.1.1   |
| apiVersion | See clause 6.1.1   |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15} nai-.+)" |

#### 6.1.3.11.3 Resource Standard Methods

##### 6.1.3.11.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.11.3.1-1.

NOTE: The retrieval of these data sets can also be achieved by sending individual GET requests to the corresponding sub-resources under the {supi} resource. When multiple data sets need to be retrieved by the NF Service consumer, it is recommended to use a single GET request with query parameters rather than issuing multiple GET requests.

**Table 6.1.3.11.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type          | P | Cardinality | Description                             |
|--------------------|--------------------|---|-------------|---|
| dataset-names      | array(DataSetName) | M | 2..N        |   |
| plmn-id            | PlmnId             | C | 0..1        | if absent, H-PLMN ID is used as default |
| supported-features | SupportedFeatures  | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6       |

This method shall support the request data structures specified in table 6.1.3.11.3.1-2 and the response data structures and response codes specified in table 6.1.3.11.3.1-3.

**Table 6.1.3.11.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.11.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type            | P | Cardinality | Response codes | Description  |
|----------------------|---|-------------|----------------|--|
| SubscriptionDataSets | M | 1           | 200 OK         | Upon success, a response body containing the requested data sets shall be returned.                                    |
| ProblemDetails       | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- DATA_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

## 6.1.3.12 Resource: IdTranslationResult

### 6.1.3.12.1 Description

This resource represents the SUPI. It is queried by the NEF for GPSI to SUPI translation. See 3GPP TS 23.502 [3] clause 4.13.2.2.

### 6.1.3.12.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{gpsi}/id-translation-result

This resource shall support the resource URI variables defined in table 6.1.3.12.2-1.

**Table 6.1.3.12.2-1: Resource URI variables for this resource**

| Name       | Definition   |
|------------|--|
| apiRoot    | See clause 6.1.1   |
| apiVersion | See clause 6.1.1   |
| gpsi       | Represents the Generic Public Subscription Identifier (see 3GPP TS 23.501 [2] clause 5.9.8)<br>pattern: "(msisdn-[0-9]{5,15} extid-[^@]+@[^@]+.+)" |

### 6.1.3.12.3 Resource Standard Methods

#### 6.1.3.12.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.12.3.1-1.

**Table 6.1.3.12.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                       |
|--------------------|-------------------|---|-------------|-----------------------------------|
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6 |

This method shall support the request data structures specified in table 6.1.3.12.3.1-2 and the response data structures and response codes specified in table 6.1.3.12.3.1-3.

**Table 6.1.3.12.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.12.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description  |
|--|---|-------------|----------------|--|
| IdTranslationResult  | M | 1           | 200 OK         | Upon success, a response body containing the SUPI and optionally the MSISDN shall be returned.                         |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- DATA_NOT_FOUND |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                |  |

### 6.1.3.13 Resource: SorAck

#### 6.1.3.13.1 Description

This resource represents the acknowledgement of the SoR for a SUPI.

#### 6.1.3.13.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/am-data/sor-ack

This resource shall support the resource URI variables defined in table 6.1.3.13.2-1.

**Table 6.1.3.13.2-1: Resource URI variables for this resource**

| Name       | Definition   |
|------------|--|
| apiRoot    | See clause 6.1.1   |
| apiVersion | See clause 6.1.1   |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15} nai-.+ .+)") |

### 6.1.3.13.3 Resource Standard Methods

#### 6.1.3.13.3.1 PUT

This method shall support the URI query parameters specified in table 6.1.3.13.3.1-1.

**Table 6.1.3.13.3.1-1: URI query parameters supported by the PUT method on this resource**

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



This method shall support the request data structures specified in table 6.1.3.13.3.1-2 and the response data structures and response codes specified in table 6.1.3.13.3.1-3.

**Table 6.1.3.13.3.1-2: Data structures supported by the PUT Request Body on this resource**

| Data type       | P | Cardinality | Description                                    |
|-----------------|---|-------------|--|
| AcknowledgeInfo | M | 1           | Contains the SOR-MAC-lue received from the UE. |

**Table 6.1.3.13.3.1-3: Data structures supported by the PUT Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description  |
|--|---|-------------|----------------|--|
| n/a  |   |             | 204 No Content | Successful receiving the SorXmaclue in the Request.  |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- USER_NOT_FOUND |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                |  |

### 6.1.3.14 Resource: TraceData

#### 6.1.3.14.1 Description

This resource represents the trace configuration data for a SUPI. It is queried by the AMF and SMF after registering.

#### 6.1.3.14.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/trace-data

This resource shall support the resource URI variables defined in table 6.1.3.14.2-1.

**Table 6.1.3.14.2-1: Resource URI variables for this resource**

| Name       | Definition   |
|------------|--|
| apiRoot    | See clause 6.1.1   |
| apiVersion | See clause 6.1.1   |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15} nai-.+ .+)") |

#### 6.1.3.14.3 Resource Standard Methods

##### 6.1.3.14.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.14.3.1-1.

**Table 6.1.3.14.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                              |
|--------------------|-------------------|---|-------------|--|
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6        |
| plmn-id            | PlmnId            | O | 0..1        | PLMN identity of the PLMN serving the UE |

If "plmn-id" is included, UDM shall return the Trace Data for the SUPI associated to the PLMN identified by "plmn-id".

If "plmn-id" is not included, UDM shall return the Trace Data for the SUPI associated to the HPLMN.

This method shall support the request data structures specified in table 6.1.3.14.3.1-2 and the response data structures and response codes specified in table 6.1.3.14.3.1-3.

**Table 6.1.3.14.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.14.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description  |
|--|---|-------------|----------------|--|
| TraceDataResponse  | M | 1           | 200 OK         | Upon success, a response body containing the Trace Data shall be returned.   |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- DATA_NOT_FOUND |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                |  |

### 6.1.3.15 Resource: SharedData

#### 6.1.3.15.1 Description

This resource represents the collection of data that can be shared by multiple UEs.

#### 6.1.3.15.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/shared-data

This resource shall support the resource URI variables defined in table 6.1.3.15.2-1.

**Table 6.1.3.15.2-1: Resource URI variables for this resource**

| Name       | Definition       |
|------------|------------------|
| apiRoot    | See clause 6.1.1 |
| apiVersion | See clause 6.1.1 |

#### 6.1.3.15.3 Resource Standard Methods

##### 6.1.3.15.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.15.3.1-1.

**Table 6.1.3.15.3.1-1: URI query parameters supported by the GET method on this resource**

| Name            | Data type           | P | Cardinality | Description |
|-----------------|---------------------|---|-------------|-------------|
| shared-data-ids | array(SharedDataId) | M | 1..N        |             |

This method shall support the request data structures specified in table 6.1.3.15.3.1-2 and the response data structures and response codes specified in table 6.1.3.15.3.1-3.

**Table 6.1.3.15.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.15.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type         | P | Cardinality | Response codes | Description  |
|-------------------|---|-------------|----------------|--|
| array(SharedData) | M | 1..N        | 200 OK         | Upon success, a response body containing a list of SharedData shall be returned.           |
| ProblemDetails    | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- DATA_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

### 6.1.3.16 Resource: SharedDataSubscriptions

#### 6.1.3.16.1 Description

This resource is used to represent subscriptions to notifications for shared data.

#### 6.1.3.16.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/shared-data-subscriptions

This resource shall support the resource URI variables defined in table 6.1.3.16.2-1.

**Table 6.1.3.16.2-1: Resource URI variables for this resource**

| Name       | Definition       |
|------------|------------------|
| apiRoot    | See clause 6.1.1 |
| apiVersion | See clause 6.1.1 |

### 6.1.3.16.3 Resource Standard Methods

#### 6.1.3.16.3.1 POST

This method shall support the URI query parameters specified in table 6.1.3.16.3.1-1.

**Table 6.1.3.16.3.1-1: URI query parameters supported by the POST method on this resource**

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

This method shall support the request data structures specified in table 6.1.3.16.3.1-2 and the response data structures and response codes specified in table 6.1.3.16.3.1-3.

**Table 6.1.3.16.3.1-2: Data structures supported by the POST Request Body on this resource**

| Data type       | P | Cardinality | Description                             |
|-----------------|---|-------------|---|
| SdmSubscription | M | 1           | The subscription that is to be created. |

**Table 6.1.3.16.3.1-3: Data structures supported by the POST Response Body on this resource**

| Data type  | P | Cardinality | Response codes      | Description  |
|--|---|-------------|---------------------|--|
| SdmSubscription  | M | 1           | 201 Created         | Upon success, a response body containing a representation of the created Individual subscription resource shall be returned.<br><br>The HTTP response shall include a "Location" HTTP header that contains the resource URI of the created resource. When stateless UDM is deployed, the stateless UDM shall use the FQDN identifying the UDM set to which the UDM belongs as the host part of the resource URI. |
| ProblemDetails   | M | 1           | 501 Not Implemented | The "cause" attribute shall be set to the following application error:<br>- UNSUPPORTED_RESOURCE_URI   |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.   |   |             |                     |  |
| NOTE: In the scenario of stateless UDM deployment, it is assumed that stateless UDMs are organized into several UDM sets, and each UDM set is allocated an FQDN. |   |             |                     |  |

### 6.1.3.17 Resource: Individual subscription

#### 6.1.3.17.1 Description

This resource is used to represent an individual subscription to notifications for shared data.

#### 6.1.3.17.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/shared-data-subscriptions/{subscriptionId}

This resource shall support the resource URI variables defined in table 6.1.3.17.2-1.

**Table 6.1.3.17.2-1: Resource URI variables for this resource**

| Name           | Definition   |
|----------------|--|
| apiRoot        | See clause 6.1.1   |
| apiVersion     | See clause 6.1.1   |
| subscriptionId | The subscriptionId identifies an individual subscription to notifications. The value is allocated by the UDM during creation of the Subscription resource. |

#### 6.1.3.17.3 Resource Standard Methods

##### 6.1.3.17.3.1 DELETE

This method shall support the URI query parameters specified in table 6.1.3.17.3.1-1.

**Table 6.1.3.17.3.1-1: URI query parameters supported by the DELETE method on this resource**

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

This method shall support the request data structures specified in table 6.1.3.17.3.1-2 and the response data structures and response codes specified in table 6.1.3.17.3.1-3.

**Table 6.1.3.17.3.1-2: Data structures supported by the Delete Request Body on this resource**

| Data type | P | Cardinality | Description                      |
|-----------|---|-------------|----------------------------------|
| n/a       |   |             | The request body shall be empty. |

**Table 6.1.3.17.3.1-3: Data structures supported by the DELETE Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| n/a  |   |             | 204 No Content | Upon success, an empty response body shall be returned. |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                |   |

### 6.1.3.17.3.2 PATCH

This method shall support the URI query parameters specified in table 6.1.3.17.3.2-1.

**Table 6.1.3.17.3.2-1: URI query parameters supported by the PATCH method on this resource**

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

This method shall support the request data structures specified in table 6.1.3.17.3.2-2 and the response data structures and response codes specified in table 6.1.3.17.3.2-3.

**Table 6.1.3.17.3.2-2: Data structures supported by the PATCH Request Body on this resource**

| Data type          | P | Cardinality | Description                  |
|--------------------|---|-------------|------------------------------|
| SdmSubModification | M | 1           | The modification Instruction |

**Table 6.1.3.17.3.2-3: Data structures supported by the PATCH Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| SdmSubscription  | M | 1           | 200 OK         | Upon success, the modified sdmSubscription shall be returned. |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                |   |

## 6.1.3.18 Resource: UeContextInSmsfData

### 6.1.3.18.1 Description

This resource represents the allocated SMSFs for a SUPI.

### 6.1.3.18.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/ue-context-in-smsf-data

This resource shall support the resource URI variables defined in table 6.1.3.18.2-1.

**Table 6.1.3.18.2-1: Resource URI variables for this resource**

| Name       | Definition  |
|------------|---|
| apiRoot    | See clause 6.1.1  |
| apiVersion | See clause 6.1.1  |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)<br>pattern: "(imsi-[0-9]{5,15})nai-.[.+]") |

## 6.1.3.18.3 Resource Standard Methods

## 6.1.3.18.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.18.3.1-1.

**Table 6.1.3.18.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                       |
|--------------------|-------------------|---|-------------|-----------------------------------|
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6 |

This method shall support the request data structures specified in table 6.1.3.18.3.1-2 and the response data structures and response codes specified in table 6.1.3.18.3.1-3.

**Table 6.1.3.18.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.18.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description  |
|--|---|-------------|----------------|--|
| UeContextInSmsf Data   | M | 1           | 200 OK         | Upon success, a response body containing the UeContextInSmsfData shall be returned.                                    |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- USER_NOT_FOUND<br>- DATA_NOT_FOUND |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                |  |

## 6.1.3.19 Resource: UpuAck

## 6.1.3.19.1 Description

This resource represents the acknowledgement of UE parameters update for a SUPI.

## 6.1.3.19.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/{supi}/am-data/upu-ack

This resource shall support the resource URI variables defined in table 6.1.3.19.2-1.

**Table 6.1.3.19.2-1: Resource URI variables for this resource**

| Name       | Definition  |
|------------|---|
| apiRoot    | See clause 6.1.1  |
| apiVersion | See clause 6.1.1  |
| supi       | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2) pattern: "(imsi-[0-9]{5,15} nai-.+ .+)") |

## 6.1.3.19.3 Resource Standard Methods

## 6.1.3.19.3.1 PUT

This method shall support the URI query parameters specified in table 6.1.3.19.3.1-1.

**Table 6.1.3.19.3.1-1: URI query parameters supported by the PUT method on this resource**

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

This method shall support the request data structures specified in table 6.1.3.19.3.1-2 and the response data structures and response codes specified in table 6.1.3.19.3.1-3.

**Table 6.1.3.19.3.1-2: Data structures supported by the PUT Request Body on this resource**

| Data type       | P | Cardinality | Description                                    |
|-----------------|---|-------------|--|
| AcknowledgeInfo | M | 1           | Contains the UPU-MAC-lue received from the UE. |

**Table 6.1.3.19.3.1-3: Data structures supported by the PUT Response Body on this resource**

| Data type      | P | Cardinality | Response codes | Description  |
|----------------|---|-------------|----------------|--|
| n/a            |   |             | 204 No Content | Successful receiving the UpuXmaclue in the Request.  |
| ProblemDetails | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- USER_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

## 6.1.3.20 Resource: GroupIdentifiers

### 6.1.3.20.1 Description

This resource represents the Group Identifiers handled by UDM/UDR. It is queried by the NEF for translation between External and Internal Group Identifiers.

### 6.1.3.20.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/{apiVersion}/group-data/group-identifiers

This resource shall support the resource URI variables defined in table 6.1.3.20.2-1.

**Table 6.1.3.20.2-1: Resource URI variables for this resource**

| Name       | Definition       |
|------------|------------------|
| apiRoot    | See clause 6.1.1 |
| apiVersion | See clause 6.1.1 |

### 6.1.3.20.3 Resource Standard Methods

#### 6.1.3.20.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.20.3.1-1.

**Table 6.1.3.20.3.1-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                       |
|--------------------|-------------------|---|-------------|-----------------------------------|
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6 |
| ext-group-id       | ExtGroupId        | C | 0..1        | External Group ID                 |
| int-group-id       | GroupId           | C | 0..1        | Internal Group ID                 |

NOTE: Either ext-group-id or int-group-id shall be present in the request.

Either the ext-group-id or the int-group-id shall be present in the request.

This method shall support the request data structures specified in table 6.1.3.20.3.1-2 and the response data structures and response codes specified in table 6.1.3.20.3.1-3.

**Table 6.1.3.20.3.1-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.1.3.20.3.1-3: Data structures supported by the GET Response Body on this resource**

| Data type   | P | Cardinality | Response codes | Description  |
|---|---|-------------|----------------|--|
| GroupIdentifiers  | M | 1           | 200 OK         | Upon success, a response body containing the group identifier(s) shall be returned.                            |
| ProblemDetails  | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- GROUP_IDENTIFIER_NOT_FOUND |
| NOTE: In addition, common data structures as listed in table 6.1.7-1 are supported. |   |             |                |  |

## 6.1.4 Custom Operations without associated resources

In this release of this specification, no custom operations without associated resources are defined for the Nudm\_SubscriberDataManagement Service.

## 6.1.5 Notifications

### 6.1.5.1 General

This clause will specify the use of notifications and corresponding protocol details if required for the specific service. When notifications are supported by the API, it will include a reference to the general description of notifications support over the 5G SBIs specified in TS 29.500 / TS 29.501.

### 6.1.5.2 Data Change Notification

The POST method shall be used for Data Change Notifications and the URI shall be as provided during the subscription procedure.

Resource URI: {callbackReference}

Support of URI query parameters is specified in table 6.1.5.2-1.

**Table 6.1.5.2-1: URI query parameters supported by the POST method**

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

Support of request data structures is specified in table 6.1.5.2-2 and of response data structures and response codes is specified in table 6.1.5.2-3.

**Table 6.1.5.2-2: Data structures supported by the POST Request Body**

| Data type                | P | Cardinality | Description |
|--------------------------|---|-------------|-------------|
| ModificationNotification | M | 1           |             |



**Table 6.1.5.2-3: Data structures supported by the POST Response Body**

| Data type  | P | Cardinality | Response codes         | Description  |
|--|---|-------------|------------------------|--|
| n/a  |   |             | 204 No Content         | Upon success, an empty response body shall be returned.  |
| ProblemDetails   | M | 1           | 307 Temporary Redirect | <p>This represents the case when the related UE context is not fully available at the target NF Service Consumer (e.g. AMF) during a planned maintenance case (e.g. AMF planned maintenance without UDSF case). The "cause" attribute shall be set to the following application error:</p> <ul style="list-style-type: none"> <li>- NF_CONSUMER_REDIRECT_ONE_TXN</li> </ul> <p>See table 6.1.7.3-1 for the description of this error.</p> <p>The Location header of the response shall be set to the new Callback URI of the target NF Service Consumer (e.g. AMF) to which the request is redirected.</p> |
| ProblemDetails   | M | 1           | 308 Permanent Redirect | <p>This represents the case when the related UE is not found in the NF Service Consumer (e.g. AMF) and the NF Service Consumer knows which NF Service Consumer is serving the UE. The "cause" attribute shall be set to the following application error:</p> <ul style="list-style-type: none"> <li>- CONTEXT_NOT_FOUND</li> </ul> <p>See table 6.1.7.3-1 for the description of this error.</p> <p>The Location header of the response shall be set to the new Callback URI of the target NF Service Consumer (e.g. AMF) to which the request is redirected.</p>  |
| ProblemDetails   | M | 1           | 404 Not Found          | <p>The "cause" attribute shall be set to the following application error:</p> <ul style="list-style-type: none"> <li>- CONTEXT_NOT_FOUND</li> </ul> <p>See table 6.1.7.3-1 for the description of this error.</p>  |
| NOTE: In addition common data structures as listed in table 6.1.7-1 are supported. |   |             |                        |  |

## 6.1.6 Data Model

### 6.1.6.1 General

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

Table 6.1.6.1-1 specifies the structured data types defined for the Nudm\_SDM service API. For simple data types defined for the Nudm\_SDM service API see table 6.1.6.3.2-1.

Table 6.1.6.1-1: Nudm\_SDM specific Data Types

| Data type                         | Clause defined | Description   |
|-----------------------------------|----------------|---|
| Nssai                             | 6.1.6.2.2      | Network Slice Selection Assistance Information  |
| SdmSubscription                   | 6.1.6.2.3      | A subscription to notifications   |
| AccessAndMobilitySubscriptionData | 6.1.6.2.4      | Access and Mobility Subscription Data   |
| SmfSelectionSubscriptionData      | 6.1.6.2.5      | SMF Selection Subscription Data   |
| UeContextInSmfData                | 6.1.6.2.16     | UE Context In SMF Data  |
| PduSession                        | 6.1.6.2.17     |   |
| DnnInfo                           | 6.1.6.2.6      | Data Network Name and associated information (LBO roaming allowed flag)                   |
| SnssaiInfo                        | 6.1.6.2.7      | S-NSSAI and associated information (DNN Info)   |
| SessionManagementSubscriptionData | 6.1.6.2.8      | User subscribed session management data   |
| DnnConfiguration                  | 6.1.6.2.9      | User subscribed data network configuration  |
| PduSessionTypes                   | 6.1.6.2.11     | Default/allowed session types for a data network  |
| SscModes                          | 6.1.6.2.12     | Default/allowed SSC modes for a data network  |
| SmsManagementSubscriptionData     | 6.1.6.2.14     | SMS Management Subscription Data  |
| IdTranslationResult               | 6.1.6.2.18     | SUPI that corresponds to a given GPSI   |
| IpAddress                         | 6.1.6.2.22     | IP address (IPv4, or IPv6, or IPv6 prefix)  |
| 3GppChargingCharacteristics       | 6.1.6.3.2      | 3GPP Charging Characteristics   |
| lwkEpsInd                         | 6.1.6.3.2      | Interworking with EPS Indication  |
| ModificationNotification          | 6.1.6.2.21     |   |
| UeContextInSmsfData               | 6.1.6.2.23     |   |
| SmsfInfo                          | 6.1.6.2.24     |   |
| AcknowledgeInfo                   | 6.1.6.2.25     |   |
| SorInfo                           | 6.1.6.2.26     | Steering Of Roaming Information   |
| UpuInfo                           | 6.1.6.2.33     | UE Parameters Update Information  |
| SharedData                        | 6.1.6.2.27     | Subscription Data shared by multiple UEs  |
| PgwInfo                           | 6.1.6.2.28     | Information about the DNNs/APNs and PGW-C+SMF FQDNs used in interworking with EPS         |
| TraceDataResponse                 | 6.1.6.2.29     | Contains Trace Data or a shared data Id identifying shared Trace Data                     |
| SdmSubsModification               | 6.1.6.2.31     | Modification instruction for a subscription to notifications                              |
| EmergencyInfo                     | 6.1.6.2.32     | Information about emergency session   |
| EpslwkPgw                         | 6.1.6.2.11     | Information of the PGW-C+SMF selected by the AMF for EPS interworking with N26 interface. |
| GroupIdentifiers                  | 6.1.6.2.34     |   |
| ExtGroupId                        | 6.1.6.3.2      |   |

Table 6.1.6.1-2 specifies data types re-used by the Nudm\_SDM service API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nudm\_SDM service API.

Table 6.1.6.1-2: Nudm\_SDM re-used Data Types

| Data type              | Reference           | Comments  |
|------------------------|---------------------|---|
| Dnn                    | 3GPP TS 29.571 [7]  | Data Network Name; this type is used as key in a map of:<br>- DnnConfigurations; see clause 6.1.6.2.8;<br>- EpslwkPgws; see clause 6.2.6.2.2; |
| DurationSec            | 3GPP TS 29.571 [7]  | Time value in seconds   |
| ProblemDetails         | 3GPP TS 29.571 [7]  | Common data type used in response bodies  |
| Snssai                 | 3GPP TS 29.571 [7]  | Single NSSAI  |
| Uri                    | 3GPP TS 29.571 [7]  | Uniform Resource Identifier   |
| Gpsi                   | 3GPP TS 29.571 [7]  | Generic Public Subscription Identifier  |
| RatType                | 3GPP TS 29.571 [7]  | Radio Access Technology Type  |
| Area                   | 3GPP TS 29.571 [7]  |   |
| ServiceAreaRestriction | 3GPP TS 29.571 [7]  |   |
| CoreNetworkType        | 3GPP TS 29.571 [7]  |   |
| SupportedFeatures      | 3GPP TS 29.571 [7]  | see 3GPP TS 29.500 [4] clause 6.6   |
| PlmnId                 | 3GPP TS 29.571 [7]  | PLMN Identity   |
| PduSessionType         | 3GPP TS 29.571 [7]  |   |
| SubscribedDefaultQos   | 3GPP TS 29.571 [7]  | Subscribed Default QoS  |
| Ambr                   | 3GPP TS 29.571 [7]  |   |
| PduSessionId           | 3GPP TS 29.571 [7]  | PduSessionId is used as key in a map of PduSessions; see clause 6.1.6.2.16.   |
| NfInstanceId           | 3GPP TS 29.571 [7]  |   |
| Supi                   | 3GPP TS 29.571 [7]  |   |
| RfspIndex              | 3GPP TS 29.571 [7]  |   |
| SscMode                | 3GPP TS 29.571 [7]  |   |
| Ipv4Address            | 3GPP TS 29.571 [7]  |   |
| Ipv6Address            | 3GPP TS 29.571 [7]  |   |
| Ipv6Prefix             | 3GPP TS 29.571 [7]  |   |
| SorMac                 | 3GPP TS 29.509 [24] |   |
| SteeringInfo           | 3GPP TS 29.509 [24] |   |
| AckInd                 | 3GPP TS 29.509 [24] |   |
| CounterSor             | 3GPP TS 29.509 [24] |   |
| UpuMac                 | 3GPP TS 29.509 [24] |   |
| UpuData                | 3GPP TS 29.509 [24] |   |
| UpuAckInd              | 3GPP TS 29.509 [24] |   |
| CounterUpu             | 3GPP TS 29.509 [24] |   |
| TraceData              | 3GPP TS 29.571 [7]  | Trace control and configuration parameters  |
| NotifyItem             | 3GPP TS 29.571 [7]  |   |
| UpSecurity             | 3GPP TS 29.571 [7]  |   |
| ServiceName            | 3GPP TS 29.510 [19] |   |
| OdbPacketServices      | 3GPP TS 29.571 [7]  |   |
| GroupId                | 3GPP TS 29.571 [7]  |   |

## 6.1.6.2 Structured data types

### 6.1.6.2.1 Introduction

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

#### 6.1.6.2.2 Type: Nssai

Table 6.1.6.2.2-1: Definition of type Nssai

| Attribute name      | Data type         | P | Cardinality | Description                             |
|---------------------|-------------------|---|-------------|---|
| supportedFeatures   | SupportedFeatures | O | 0..1        | See clause 6.1.8                        |
| defaultSingleNssais | array(Snssai)     | M | 1..N        | A list of Single Nssais used as default |
| singleNssais        | array(Snssai)     | O | 1..N        | List of non default Single Nssais.      |

## 6.1.6.2.3 Type: SdmSubscription

Table 6.1.6.2.3-1: SdmSubscription

| Attribute name  | Data type     | P | Cardinality | Description   |
|---|---------------|---|-------------|---|
| nfnInstanceid   | NfnInstanceid | M | 1           | Identity of the NF Instance creating the subscription.  |
| implicitUnsubscribe   | boolean       | O | 0..1        | If present with value true indicates that the subscription expires when the subscribing NF (AMF, SMF, SMSF) identified by the nfnInstanceid ceases to be registered at the UDM.   |
| expires   | DateTime      | C | 0..1        | If present, indicates the point in time at which the subscription expires. Shall be present if implicitUnsubscribe is absent or false. Within a POST request the proposed expiry time is conveyed whereas in a POST response or PATCH response the confirmed expiry time is returned. |
| callbackReference   | Uri           | M | 1           | URI provided by the NF service consumer to receive notifications  |
| amfServiceName  | ServiceName   | O | 0..1        | When present, this IE shall contain the name of the AMF service to which Data Change Notifications are to be sent (see clause 6.5.2.2 of 3GPP TS 29.500 [4]). This IE may be included if the NF service consumer is an AMF.   |
| monitoredResourceUris   | array(Uri)    | M | 1..N        | A set of URIs that identify the resources for which a change triggers a notification. The URI shall take the form of either an absolute URI or an absolute-path reference as defined in IETF RFC 3986 [31].   |
| singleNssai   | Snssai        | O | 0..1        | This IE may be present if the consumer is SMF. See NOTE.  |
| dnn   | Dnn           | O | 0..1        | This IE may be present if the consumer is SMF. See NOTE.  |
| subscriptionId  | string        | C | 0..1        | This attribute shall be present if the SdmSubscription is sent in a GET response message on Nudr. It identifies the individual sdmSubscription stored in the UDR and may be used by the UDM to delete an expired or implicitly unsubscribed sdmSubscription.                          |
| plmnId  | PlmnId        | C | 0..1        | If present, it indicates the PLMN of the NF Instance creating the subscription (i.e., the PLMN serving the UE).<br><br>It shall be present if the NF Instance is located in a different PLMN than the UDM.<br><br>If absent, the Home PLMN ID is used as default.                     |
| <p>NOTE: If "singleNssai" is not included, and "dnn" is not included, the UDM shall notify the data change of all DNN configurations and network slice(s).<br/> If "singleNssai" is included, and "dnn" is not included, the UDM shall notify the data change of network slice identified by "singleNssai" and all DNN configurations for the requested network slice identified by "singleNssai".<br/> If "singleNssai" is not included, and "dnn" is included, the UDM shall notify the data change of all network slices where such DNN is available and all DNN configurations identified by "dnn".<br/> If "singleNssai" is included, and "dnn" is included, the UDM shall notify the data change of network slice identified by "singleNssai" where such DNN is available and the DNN configuration identified by "dnn", if such DNN is available in the network slice identified by "singleNssai".</p> |               |   |             |   |

## 6.1.6.2.4 Type: AccessAndMobilitySubscriptionData

Table 6.1.6.2.4-1: Definition of type AccessAndMobilitySubscriptionData

| Attribute name              | Data type   | P | Cardinality | Description  |
|-----------------------------|---|---|-------------|--|
| supportedFeatures           | SupportedFeatures   | O | 0..1        | See clause 6.1.8   |
| gpsis                       | array(Gpsi)   | O | 0..N        | List of Generic Public Subscription Identifier; see 3GPP TS 29.571 [7]   |
| internalGroupIds            | array(GroupId)  | O | 1..N        | List of internal group identifier; see 3GPP TS 23.501 [2] clause 5.9.7   |
| subscribedUeAmbr            | AmbrRm  | O | 0..1        |  |
| nssai                       | Nssai   | O | 0..1        | Network Slice Selection Assistance Information   |
| ratRestrictions             | array(RatType)  | O | 0..N        | List of RAT Types that are restricted; see 3GPP TS 29.571 [7]  |
| forbiddenAreas              | array(Area)   | O | 0..N        | List of forbidden areas  |
| serviceAreaRestriction      | ServiceAreaRestriction  | O | 0..1        | Subscribed Service Area Restriction  |
| coreNetworkTypeRestrictions | array(CoreNetworkType)  | O | 0..N        | List of Core Network Types that are restricted   |
| rfspIndex                   | RfspIndexRm   | O | 0..1        | Index to RAT/Frequency Selection Priority;   |
| subsRegTimer                | DurationSecRm   | O | 0..1        | Subscribed periodic registration timer; see 3GPP TS 29.571 [7]   |
| ueUsageType                 | UeUsageType   | O | 0..1        |  |
| mpsPriority                 | MpsPriorityIndicator  | O | 0..1        |  |
| mcsPriority                 | McsPriorityIndicator  | O | 0..1        |  |
| activeTime                  | DurationSecRm   | O | 0..1        | subscribed active time for PSM UEs   |
| dlPacketCount               | DlPacketCount   | O | 0..1        | DL Buffering Suggested Packet Count indicates whether extended buffering of downlink packets for High Latency Communication is requested.  |
| sorInfo                     | SorInfo   | O | 0..1        | On Nudm, this IE shall be present if the UDM shall send the information for Steering of Roaming during registration or the subscription data update to the UE. The UDM may detect the need to send sorInfo by retrieving context information from the UDR.                         |
| upulInfo                    | UpulInfo  | O | 0..1        | This IE shall be present if the UDM shall send the information for UE Parameters Update after the UE has been successfully authenticated and registered to the 5G system.  |
| micoAllowed                 | MicoAllowed   | O | 0..1        | Indicates whether the UE subscription allows MICO mode.  |
| sharedAmDataIds             | array(SharedDataId)   | O | 0..N        | Identifier of shared Access And Mobility Subscription data   |
| odbPacketServices           | OdbPacketServices   | O | 0..1        | Operator Determined Barring for Packet Oriented Services   |
| subscribedDnnList           | array(Dnn)  | O | 0..N        | List of the subscribed DNNs for the UE (including optionally the Wildcard DNN). Used to determine the list of LADN available to the UE as defined in clause 5.6.5 of TS 23.501 [2].  |
| nssaiInclusionAllowed       | boolean   | O | 0..1        | Indicates that the UE is allowed to include NSSAI in the RRC connection establishment in clear text for 3GPP access.<br><br>true: indicates that NSSAI can be included in RRC connection establishment by the UE.<br><br>false or absent: indicates that NSSAI cannot be included. |
| NOTE:                       | AccessAndMobilitySubscriptionData can be UE-individual data or shared data. UE-individual data take precedence over shared data.<br>E.g.: When an attribute of type array is present but empty within UE-Individual data and present (with any cardinality) in shared data, the empty array takes precedence. Similarly, when a nullable attribute is present with value null within the individual data and present (with any value) in shared data, the null value takes precedence (i.e. for the concerned UE the attribute is considered absent). |   |             |  |

## 6.1.6.2.5 Type: SmfSelectionSubscriptionData

**Table 6.1.6.2.5-1: Definition of type SmfSelectionSubscriptionData**

| Attribute name   | Data type         | P | Cardinality | Description  |
|--|-------------------|---|-------------|--|
| supportedFeatures  | SupportedFeatures | O | 0..1        | See clause 6.1.8   |
| subscribedSnssailInfos   | map(SnssailInfo)  | O | 0..N        | List of S-NSSAIs and associated information (DNN Info); see 3GPP TS 23.501 [2] clause 6.3.2.<br>A map (list of key-value pairs where singleNssai converted to string serves as key; see 3GPP TS 29.571 [7]) of arrays of DnnInfo |
| sharedSnssailInfosId   | SharedDataId      | O | 0..1        | Identifier of shared SnssailInfos.   |
| NOTE: A single UE-individual subscribedSnssailInfo (within subscribedSnssailInfos) may clash with a sharedSnssailInfo (i.e. both have the same singleNssai value as key). In this case the UE-individual subscribedSnssailInfo takes precedence. |                   |   |             |  |

## 6.1.6.2.6 Type: DnnInfo

**Table 6.1.6.2.6-1: Definition of type DnnInfo**

| Attribute name   | Data type           | P | Cardinality | Description  |
|--|---------------------|---|-------------|--|
| dnn  | Dnn                 | M | 1           | Data Network Name, or Wildcard DNN (NOTE)  |
| defaultDnnIndicator  | DefaultDnnIndicator | O | 0..1        | Indicates whether this DNN is the default DNN:<br>true: The DNN is the default DNN (NOTE);<br>false: The DNN is not the default DNN;<br>If this attribute is absent it means the DNN is not the default DNN.   |
| lboRoamingAllowed  | LboRoamingAllowed   | O | 0..1        | Indicates whether local breakout for the DNN is allowed when roaming:<br>true: Allowed;<br>false: Not allowed;<br>If this attribute is absent it means not allowed.  |
| iwkEpsInd  | IwkEpsInd           | O | 0..1        | Indicates whether interworking with EPS is subscribed:<br>true: Subscribed;<br>false: Not subscribed;<br>If this attribute is absent it means not subscribed.  |
| dnnBarred  | boolean             | C | 0..1        | Indicates whether the DNN is barred. Absence and false indicates "not barred".<br>This attribute is only used on the Nudr interface. The UDM shall handle barred DNNs received from the UDR as not subscribed. |
| NOTE: If the dnn attribute contains the value of the Wildcard DNN ("*"), the defaultDnnIndicator shall not be set to true. |                     |   |             |  |

## 6.1.6.2.7 Type: SnssailInfo

**Table 6.1.6.2.7-1: Definition of type SnssailInfo**

| Attribute name | Data type      | P | Cardinality | Description  |
|----------------|----------------|---|-------------|--|
| dnnInfos       | array(DnnInfo) | M | 1..N        | list of Data Network Names for an S-NSSAI and associated information |

## 6.1.6.2.8 Type: SessionManagementSubscriptionData

**Table 6.1.6.2.8-1: SessionManagementSubscriptionData**

| Attribute name  | Data type             | P | Cardinality | Description  |
|---|-----------------------|---|-------------|--|
| singleNssai   | Snssai                | M | 1           | A single Network Slice Selection Assistance Information  |
| dnnConfigurations   | map(DnnConfiguration) | O | 0..N        | Additional DNN configurations for the network slice;<br>A map (list of key-value pairs where DNN, or optionally the Wildcard DNN, serves as key; see clause 6.1.6.1) of DnnConfigurations. |
| internalGroupIds  | array(GroupId)        | O | 1..N        | List of internal group identifier; see 3GPP TS 23.501 [2] clause 5.9.7   |
| sharedDnnConfigurationSld   | SharedDataId          | O | 0..1        | Identifier of shared data.   |
| odbPacketServices   | OdbPacketServices     | O | 0..1        | Operator Determined Barring for Packet Oriented Services   |
| NOTE: A single UE-individual dnnConfiguration (within dnnConfigurations) may clash with a shared dnnConfiguration (i.e. both have the same dnn value as key). In this case the UE-individual dnnConfiguration takes precedence. |                       |   |             |  |

## 6.1.6.2.9 Type: DnnConfiguration

**Table 6.1.6.2.9-1: DnnConfiguration**

| Attribute name              | Data type                   | P | Cardinality | Description   |
|-----------------------------|-----------------------------|---|-------------|---|
| pduSessionTypes             | PduSessionTypes             | M | 1           | Default/Allowed session types   |
| sscModes                    | SscModes                    | M | 1           | Default/Allowed SSC modes   |
| iwkEpsInd                   | IwkEpsInd                   | O | 0..1        | Indicates whether interworking with EPS is subscribed:<br>true: Subscribed;<br>false: Not subscribed;<br>If this attribute is absent it means not subscribed. |
| 5gQosProfile                | SubscribedDefaultQos        | O | 0..1        | 5G QoS parameters associated to the session for a data network  |
| sessionAmbr                 | Ambr                        | O | 0..1        | The maximum aggregated uplink and downlink bit rates to be shared across all Non-GBR QoS Flows in each PDU Session  |
| 3gppChargingCharacteristics | 3GppChargingCharacteristics | O | 0..1        | Subscribed charging characteristics data associated to the session for a data network   |
| staticIpAddress             | array(IpAddress)            | O | 1..2        | Subscribed static IP address(es) of the IPv4 and/or IPv6 type   |
| upSecurity                  | UpSecurity                  | O | 0..1        | When present, this IE shall indicate the security policy for integrity protection and encryption for the user plane.  |

## 6.1.6.2.10 Void

## 6.1.6.2.11 Type: PduSessionTypes

**Table 6.1.6.2.11-1: PduSessionTypes**

| Attribute name      | Data type             | P | Cardinality | Description   |
|---------------------|-----------------------|---|-------------|---|
| defaultSessionType  | PduSessionType        | M | 1           | Default session type                                  |
| allowedSessionTypes | array(PduSessionType) | O | 1..N        | Additional session types allowed for the data network |

## 6.1.6.2.12 Type: SscModes

Table 6.1.6.2.12-1: SscModes

| Attribute name  | Data type      | P | Cardinality | Description                                       |
|-----------------|----------------|---|-------------|---|
| defaultSscMode  | SscMode        | M | 1           | Default SSC mode                                  |
| allowedSscModes | array(SscMode) | O | 1..2        | Additional SSC modes allowed for the data network |

## 6.1.6.2.13 Type: SmsSubscriptionData

Table 6.1.6.2.13-1: Definition of type SmsSubscriptionData

| Attribute name      | Data type     | P | Cardinality | Description   |
|---------------------|---------------|---|-------------|---|
| smsSubscribed       | SmsSubscribed | C | 0..1        | Indicates whether the UE subscription allows SMS delivery over NAS. Shall not be absent unless the feature SharedData is supported and smsSubscribed is present within shared data. |
| sharedSmsSubsDataId | SharedDataId  | C | 0..1        | Identifier of shared data. Shall be present if smsSubscribed is absent.   |

## 6.1.6.2.14 Type: SmsManagementSubscriptionData

Table 6.1.6.2.14-1: Definition of type SmsManagementSubscriptionData

| Attribute name      | Data type           | P | Cardinality | Description  |
|---------------------|---------------------|---|-------------|--|
| supportedFeatures   | SupportedFeatures   | O | 0..1        | See clause 6.1.8   |
| mtSmsSubscribed     | boolean             | C | 1           | Indicates the SMS teleservice subscription for MT-SMS. Shall not be absent unless the feature SharedData is supported and mtSmsSubscribed is present within shared data. |
| mtSmsBarringAll     | boolean             | C | 0..1        | Barring of all MT-SMS  |
| mtSmsBarringRoaming | boolean             | C | 0..1        | Barring of MT-SMS when roaming outside the Home Public Land Mobile Network (PLMN) country  |
| moSmsSubscribed     | boolean             | C | 1           | Indicates the SMS teleservice subscription for MO-SMS. Shall not be absent unless the feature SharedData is supported and mtSmsSubscribed is present within shared data. |
| moSmsBarringAll     | boolean             | C | 0..1        | Barring of all MO-SMS  |
| moSmsBarringRoaming | boolean             | C | 0..1        | Barring of MO-SMS when roaming outside the Home Public Land Mobile Network (PLMN) country  |
| sharedSmsMngDataIds | array(SharedDataId) | C | 1..N        | Identifier of shared data. Shall be present if mtSmsSubscribed and/or moSmsSubscribed are absent.  |



## 6.1.6.2.15 Type: SubscriptionDataSets

**Table 6.1.6.2.15-1: SubscriptionDataSets**

| Attribute name | Data type                                | P | Cardinality | Description  |
|----------------|--|---|-------------|--|
| amData         | AccessAndMobilitySubscriptionData        | O | 0..1        | Access and Mobility Subscription Data                          |
| smfSelData     | SmfSelectionSubscriptionData             | O | 0..1        | SMF Selection Subscription Data                                |
| uecSmfData     | UeContextInSmfData                       | O | 0..1        | UE Context In SMF Data   |
| uecSmsfData    | UeContextInSmsfData                      | O | 0..1        | UE Context In SMSF Data  |
| smsSubsData    | SmsSubscriptionData                      | O | 0..1        | SMS Subscription Data  |
| smData         | array(SessionmanagementsubscriptionData) | O | 1..N        | Session Management Subscription Data                           |
| traceData      | TraceData                                | O | 0..1        | Trace Data. The Null value indicates that trace is not active. |
| smsMngData     | SmsManagementSubscriptionData            | O | 0..1        | SMS Management Subscription Data                               |

## 6.1.6.2.16 Type: UeContextInSmfData

**Table 6.1.6.2.16-1: Definition of type UeContextInSmfData**

| Attribute name | Data type       | P | Cardinality | Description   |
|----------------|-----------------|---|-------------|---|
| pduSessions    | map(PduSession) | O | 0..N        | A map (list of key-value pairs where pduSessionId converted from integer to string serves as key; see clause 6.1.6.1) of PduSessions. |
| pgwInfo        | array(PgwInfo)  | O | 1..N        | Information about the DNNs/APNs and PGW-C+SMF FQDNs used in interworking with EPS   |
| emergencyInfo  | EmergencyInfo   | O | 0..1        | Information about emergency session   |

## 6.1.6.2.17 Type: PduSession

**Table 6.1.6.2.17-1: Definition of type PduSession**

| Attribute name | Data type     | P | Cardinality | Description               |
|----------------|---------------|---|-------------|---------------------------|
| dnn            | Dnn           | M | 1           | Data Network Name         |
| smfInstancelid | NfInstancelid | M | 1           | NF Instance Id of the SMF |
| plmnid         | Plmnid        | M | 1           | PLMN Id of the SMF        |

## 6.1.6.2.18 Type: IdTranslationResult

**Table 6.1.6.2.18-1: Definition of type IdTranslationResult**

| Attribute name    | Data type         | P | Cardinality | Description        |
|-------------------|-------------------|---|-------------|--------------------|
| supportedFeatures | SupportedFeatures | O | 0..1        | See clause 6.1.8   |
| supi              | Supi              | M | 1           | SUPI               |
| gpsi              | Gpsi              | O | 0..1        | shall be an MSISDN |

6.1.6.2.19 Void

6.1.6.2.20 Void

6.1.6.2.21 Type: ModificationNotification

**Table 6.1.6.2.21-1: ModificationNotification**

| Attribute name | Data type         | P | Cardinality | Description |
|----------------|-------------------|---|-------------|-------------|
| notifyItems    | array(NotifyItem) | M | 1..N        |             |

6.1.6.2.22 Type: IpAddress

**Table 6.1.6.2.22-1: IpAddress**

| Attribute name | Data type  | P | Cardinality | Description |
|----------------|------------|---|-------------|-------------|
| ipv4Addr       | Ipv4Addr   | C | 0..1        |             |
| ipv6Addr       | Ipv6Addr   | C | 0..1        |             |
| ipv6Prefix     | Ipv6Prefix | C | 0..1        |             |

NOTE: Either ipv4Addr, or ipv6Addr, or ipv6Prefix shall be present.

6.1.6.2.23 Type: UeContextInSmsfData

**Table 6.1.6.2.23-1: Definition of type UeContextInSmsfData**

| Attribute name        | Data type | P | Cardinality | Description                   |
|-----------------------|-----------|---|-------------|-------------------------------|
| smsfInfo3GppAccess    | SmsfInfo  | O | 0..1        | SMSF Info for 3GPP Access     |
| smsfInfoNon3GppAccess | SmsfInfo  | O | 0..1        | SMSF Info for Non 3GPP Access |

6.1.6.2.24 Type: SmsfInfo

**Table 6.1.6.2.24-1: Definition of type SmsfInfo**

| Attribute name | Data type    | P | Cardinality | Description                |
|----------------|--------------|---|-------------|----------------------------|
| smsfInstanceld | NfInstanceld | M | 1           | NF Instance Id of the SMSF |
| plmnld         | Plmnld       | M | 1           | PLMN Id of the SMSF        |

6.1.6.2.25 Type: AcknowledgeInfo

**Table 6.1.6.2.25: Definition of type AcknowledgeInfo**

| Attribute name   | Data type | P | Cardinality | Description  |
|------------------|-----------|---|-------------|--|
| sorMaclue        | SorMac    | C | 0..1        | Shall be present when the Acknowledgement is sent to acknowledge receipt of SorInfo.   |
| upuMaclue        | UpuMac    | C | 0..1        | Shall be present when the Acknowledgement is sent to acknowledge receipt of UpuInfo.   |
| provisioningTime | DateTime  | M | 1           | the provisioning time is used to correlate the acknowledgement with the modification request, to address glare cases when multiple modifications are ongoing simultaneously. |

## 6.1.6.2.26 Type: SorInfo

Table 6.1.6.2.26: Definition of type SorInfo

| Attribute name    | Data type         | P | Cardinality | Description   |
|-------------------|-------------------|---|-------------|---|
| ackInd            | AckInd            | M | 1           | Contains the indication whether the acknowledgement from UE is needed.  |
| sorMaclausf       | SorMac            | C | 0..1        | Contains the SoR-MAC-IAUSF. Shall be present when SorInfo is sent within AccessAndMobilitySubscriptionData on Nudm, and shall be absent when sent on Nudr.  |
| countersor        | CounterSor        | C | 0..1        | Contains the CounterSoR. Shall be present when SorInfo is sent within AccessAndMobilitySubscription on Nudm, and shall be absent when sent on Nudr.   |
| steeringContainer | SteeringContainer | C | 0..1        | When present, this information contains the information needed to update the "Operator Controlled PLMN Selector with Access Technology" list stored in the USIM either as an array of preferred PLMN/AccessTechnologies combinations in priority order. The first entry in the array indicates the highest priority and the last entry indicates the lowest. Or it may contain a secured packet. If no change of the "Operator Controlled PLMN Selector with Access Technology" list stored in the USIM is needed, then this attribute shall be absent. |
| provisioningTime  | DateTime          | M | 1           | Point in time of SorInfo provisioning at the UDR.   |

## 6.1.6.2.27 Type: SharedData

Table 6.1.6.2.27-1: SharedData

| Attribute name          | Data type  | P | Cardinality | Description                                  |
|-------------------------|--|---|-------------|--|
| sharedDataId            | SharedDataId   | M | 1           | Identifier of the shared data                |
| sharedAmData            | AccessAndMobilitySubscriptionData  | O | 0..1        | Shared Access and Mobility Subscription Data |
| sharedSmsSubsData       | SmsSubscriptionData  | O | 0..1        | Shared SMS Subscription Data                 |
| sharedSmsMngSubsData    | SmsManagementSubscriptionData  | O | 0..1        | Shared SMS Management Subscription Data      |
| sharedDnnConfigurations | map(DnnConfigurations)   | O | 1..N        | Shared DNN configurations                    |
| sharedTraceData         | TraceData  | O | 0..1        | Shared Trace Data                            |
| sharedSnssaiInfos       | map(SnssaiInfo)  | O | 1..N        | Shared Snssai Infos                          |
| Note 1:                 | Exactly one of sharedAmData, sharedSmsSubsData, sharedSmsMngSubsData, sharedDnnConfigurations, sharedTraceData and sharedSnssaiInfos shall be present. |   |             |  |
| Note 2:                 | The attributes sharedAmData, sharedSmsSubsData and SharedSmsMngSubsData shall not contain sharedDataId   |   |             |  |
| Note 3:                 | When shared data clash with individual data, individual data shall take precedence.  |   |             |  |

## 6.1.6.2.28 Type: PgwInfo

Table 6.1.6.2.28-1: PgwInfo

| Attribute name | Data type | P | Cardinality | Description                         |
|----------------|-----------|---|-------------|-------------------------------------|
| dnn            | Dnn       | M | 1           | DNN/APN                             |
| pgwFqdn        | string    | M | 1           | FQDN of the PGW-C+SMF               |
| plmnId         | PlmnId    | O | 0..1        | PLMN where the PGW-C+SMF is located |

## 6.1.6.2.29 Type: TraceDataResponse

**Table 6.1.6.2.29-1: TraceDataResponse**

| Attribute name    | Data type    | P | Cardinality | Description   |
|-------------------|--------------|---|-------------|---|
| traceData         | TraceData    | C | 0..1        | UE-individual trace data. Shall not be absent unless the feature SharedData is supported and traceData is present within shared data. |
| sharedTraceDataId | SharedDataId | C | 0..1        | Shared data identifier. Shall be present if traceData is absent.  |

## 6.1.6.2.30 Type: SteeringContainer

**Table 6.1.6.2.30-1: Definition of type SteeringContainer as a list of alternatives**

| Data type           | Cardinality | Description   |
|---------------------|-------------|---|
| array(SteeringInfo) | 1..N        | List of PLMN/AccessTechnologies combinations.   |
| SecuredPacket       | 1           | A Secured packet containing one or more APDUs commands dedicated to Remote File Management or command responses (see ETSI TS 102.225 [28]). |

## 6.1.6.2.31 Type: SdmSubsModification

**Table 6.1.6.2.31-1: SdmSubsModification**

| Attribute name        | Data type  | P | Cardinality | Description  |
|-----------------------|------------|---|-------------|--|
| expires               | DateTime   | O | 0..1        | If present, indicates the point in time at which the subscription expires. Within a PATCH request the proposed new expiry time is conveyed.  |
| monitoredResourceUris | array(Uri) | C | 1..N        | If present, indicates the updated resources URIs to be monitored.<br>The URI shall take the form of either an absolute URI or an absolute-path reference as defined in IETF RFC 3986 [31]. |

## 6.1.6.2.32 Type: EmergencyInfo

**Table 6.1.6.2.32-1: EmergencyInfo**

| Attribute name | Data type    | P | Cardinality | Description  |
|----------------|--------------|---|-------------|--|
| pgwFqdn        | string       | C | 0..1        | FQDN of the PGW-C+SMF for emergency session; either pgwFqdn or ipAddress shall be present. |
| pgwIpAddress   | IpAddress    | C | 0..1        | IP address of the PGW-C+SMF for emergency session  |
| smfInstanceid  | NfInstanceid | O | 0..1        | NF Instance Id of the SMF for emergency session  |

## 6.1.6.2.33 Type: UpuInfo

Table 6.1.6.2.33-1: Definition of type UpuInfo

| Attribute name   | Data type      | P | Cardinality | Description  |
|------------------|----------------|---|-------------|--|
| upuDataList      | array(UpuData) | M | 1..N        | This information defines the UE Parameters Update (UPU). A secured packed with the Routing indicator update data is included and/or the Default configured NSSAI update data are included. |
| upuRegInd        | UpuRegInd      | M | 1           | Contains the indication of whether the re-registration is requested.   |
| upuAckInd        | UpuAckInd      | M | 1           | Contains the indication of whether the acknowledgement from UE is needed.  |
| upuMaclausf      | UpuMac         | C | 0..1        | Contains the UPU-MAC-IAUSF. Shall be present when UpuInfo is sent within AccessAndMobilitySubscriptionData on Nudm, and shall be absent when sent on Nudr.                                 |
| counterUpu       | CounterUpu     | C | 0..1        | Contains the Counter <sub>UPU</sub> . Shall be present when UpuInfo is sent within AccessAndMobilitySubscriptionData on Nudm, and shall be absent when sent on Nudr.                       |
| provisioningTime | DateTime       | M | 1           | Point in time of provisioning of UPU by the UDR.   |

## 6.1.6.2.34 Type: GroupIdentifiers

Table 6.1.6.2.34-1: Definition of type GroupIdentifiers

| Attribute name | Data type  | P | Cardinality | Description  |
|----------------|------------|---|-------------|--|
| extGroupld     | ExtGroupld | C | 0..1        | This IE shall contain the External Group ID associated to the provided Internal Group ID.  |
| intGroupld     | Groupld    | C | 0..1        | This IE shall contain the Internal Group ID associated to the provided External Group ID.. |

## 6.1.6.3 Simple data types and enumerations

## 6.1.6.3.1 Introduction

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

## 6.1.6.3.2 Simple data types

The simple data types defined in table 6.1.6.3.2-1 shall be supported.

Table 6.1.6.3.2-1: Simple data types

| Type Name                   | Type Definition | Description  |
|-----------------------------|-----------------|--|
| DefaultDnnIndicator         | boolean         | Indicates whether a DNN is the default DNN   |
| LboRoamingAllowed           | boolean         | This flag indicates whether local breakout is allowed when roaming.  |
| UeUsageType                 | integer         | Indicates the usage characteristics of the UE, enables the selection of a specific Dedicated Core Network for EPS interworking   |
| MpsPriorityIndicator        | boolean         | Indicates whether UE is subscribed to multimedia priority service  |
| McsPriorityIndicator        | boolean         | Indicates whether UE is subscribed to mission critical service   |
| 3GppChargingCharacteristics | string          | 16-bit string identifying charging characteristics as specified in 3GPP TS 32.255 [11] Annex A and 3GPP TS 32.298 [12] clause 5.1.2.2.7, in hexadecimal representation. Each character in the string shall take a value of "0" to "9" or "A" to "F" and shall represent 4 bits. The most significant character representing the 4 most significant bits of the charging characteristics shall appear first in the string, and the character representing the 4 least significant bits of the charging characteristics shall appear last in the string.<br><br>Example:<br>The charging characteristic 0x123A shall be encoded as "123A". |
| DIPacketCount               | integer         | The following values are defined:<br><br>0: "Extended DL Data Buffering NOT REQUESTED"<br><br>-1: "Extended DL Data Buffering REQUESTED, without a suggested number of packets"<br><br>n>0: "Extended DL Data Buffering REQUESTED, with a suggested number of n packets"   |
| MicoAllowed                 | boolean         | Indicates whether MICO mode is allowed for the UE.   |
| SmsSubscribed               | boolean         | Indicates whether the UE subscription allows SMS delivery over NAS.  |
| SharedDataId                | string          | Identifies globally and uniquely a piece of subscription data shared by multiple UEs. The value shall start with the HPLMN id (MCC/MNC) followed by a hyphen followed by a local id as allocated by the home network operator.<br>pattern: "[0-9]{5,6}-.+"   |
| IwkEpsInd                   | boolean         | Indicates whether Interworking with EPS is supported   |
| SecuredPacket               | string          | Indicates the secured packet as specified in 3GPP TS 24.501 [27]. It is encoded using base64 and represented as a String.  |
| UpuRegInd                   | boolean         | true indicates that re-registration is requested after the successful UE parameters update.  |
| ExtGroupId                  | string          | String containing a External Group ID.<br>Pattern: "^extgroupid-[^@]+@[^@]+\$"   |

## 6.1.6.3.3 Enumeration: DataSetName

Table 6.1.6.3.3-1: Enumeration DataSetName

| Enumeration value | Description                           |
|-------------------|---------------------------------------|
| "AM"              | Access and Mobility Subscription Data |
| "SMF_SEL"         | SMF Selection Subscription Data       |
| "UEC_SMF"         | UE Context in SMF Data                |
| "UEC_SMSF"        | UE Context in SMSF Data               |
| "SMS_SUB"         | SMS Subscription Data                 |
| "SM"              | Session Management Subscription Data  |
| "TRACE"           | Trace Data                            |
| "SMS_MNG"         | SMS Management Subscription Data      |

Note: The current naming conventions for Enumerations (uppercase with underscore), when their intended usage is for query parameters is not consistent with the naming conventions for URI components (lowercase with hyphen).

6.1.6.3.4 Void

6.1.6.3.5 Void

6.1.6.3.6 Void

## 6.1.7 Error Handling

### 6.1.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

### 6.1.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

### 6.1.7.3 Application Errors

The common application errors defined in the Table 5.2.7.2-1 in 3GPP TS 29.500 [4] may also be used for the Nudm\_SubscriberDataManagement service. The following application errors listed in Table 6.1.7.3-1 are specific for the Nudm\_SubscriberDataManagement service.

**Table 6.1.7.3-1: Application errors**

| Application Error            | HTTP status code       | Description   |
|------------------------------|------------------------|---|
| NF_CONSUMER_REDIRECT_ONE_TXN | 307 Temporary Redirect | The request has been asked to be redirected to a specified target for one transaction.                                      |
| CONTEXT_NOT_FOUND            | 308 Permanent Redirect | The request has been asked to be redirected to a specified target.  |
| DATA_NOT_FOUND               | 404 Not Found          | The requested UE subscription data is not found/does not exist.<br>This error is applicable to all Nudm_SDM GET operations. |
| USER_NOT_FOUND               | 404 Not Found          | The user does not exist<br>This error is applicable to all Nudm_SDM GET operations.   |
| CONTEXT_NOT_FOUND            | 404 Not Found          | It is used during the modification of an existing subscription when no corresponding context exists.                        |
| GROUP_IDENTIFIER_NOT_FOUND   | 404 Not Found          | The requested Group Identifier does not exist.  |
| UNSUPPORTED_RESOURCE_URI     | 501 Not Implemented    | The SDM Subscription contains unsupported resource URI to be monitored.   |

## 6.1.8 Feature Negotiation

The optional features in table 6.1.8-1 are defined for the Nudm\_SDM API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

**Table 6.1.8-1: Supported Features**

| Feature number | Feature Name | Description  |
|----------------|--------------|--|
| 1              | SharedData   | When receiving a Nudm_SDM_Get service operation request to retrieve a UE's individual subscription data, and the request does not contain a supported-features query parameter indicating support of this feature, the UDM shall not include Shared Data Ids in the response. Instead the UDM may – based on operator policy – take no further action (i.e. allow the UE to get services based on only the UE's individual subscription data), or send the shared data as individual data (this may result in notifications of individual subscription data change – if so subscribed – when shared data, which are sent as individual data, are modified, and/or when the UE's Shared Data IDs are modified). |

## 6.1.9 Security

As indicated in 3GPP TS 33.501 [6] and 3GPP TS 29.500 [4], the access to the Nudm\_SDM API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [18]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [19]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nudm\_SDM API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [19], 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 Nudm\_SDM service.

The Nudm\_SDM API defines a single scope "nudm-sdm" for OAuth2 authorization (as specified in 3GPP TS 33.501 [6]) for the entire API, and it does not define any additional scopes at resource or operation level.

## 6.2 Nudm\_UEContextManagement Service API

### 6.2.1 API URI

URIs of this API shall have the following root:

```
{apiRoot}/{apiName}/{apiVersion}/
```

where "apiRoot" is defined in clause 4.4.1 of 3GPP TS 29.501 [5], the "apiName" shall be set to "nudm-uecm" and the "apiVersion" shall be set to "v1" for the current version of this specification.

### 6.2.2 Usage of HTTP

#### 6.2.2.1 General

HTTP/2, as defined in IETF RFC 7540 [13], 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].

HTTP messages and bodies for the Nudm\_UECM service shall comply with the OpenAPI [14] specification contained in Annex A3.

#### 6.2.2.2 HTTP standard headers

##### 6.2.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].



### 6.2.2.2.2 Content type

The following content types shall be supported:

JSON, as defined in IETF RFC 8259 [15], signalled by the content type "application/json".

The Problem Details JSON Object (IETF RFC 7807 [16] signalled by the content type "application/problem+json"

JSON Merge Patch, as defined in IETF RFC 7396 [17], signalled by the content type "application/merge-patch+json"

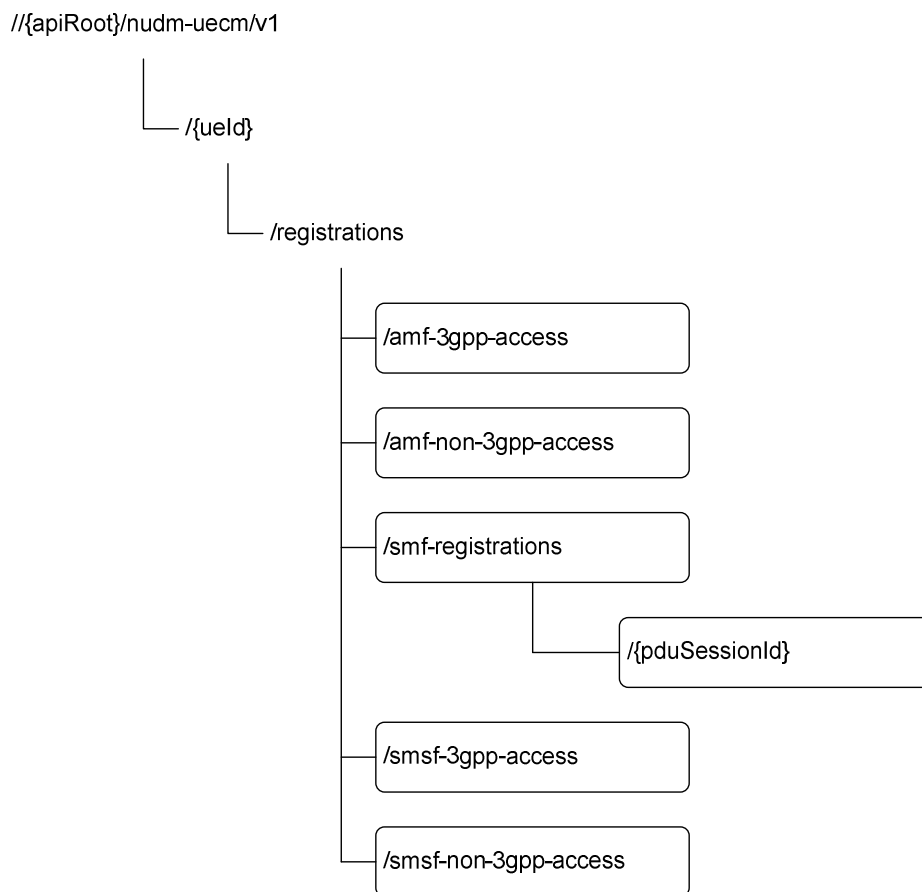
### 6.2.2.3 HTTP custom headers

#### 6.2.2.3.1 General

The usage of HTTP custom headers shall be supported as specified in clause 5.2.3 of 3GPP TS 29.500 [4].

## 6.2.3 Resources

### 6.2.3.1 Overview



**Figure 6.2.3.1-1: Resource URI structure of the Nudm\_UECM API**

Table 6.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.2.3.1-1: Resources and methods overview

| Resource name (Archetype)                | Resource URI   | HTTP method or custom operation | Description  |
|--|--|---------------------------------|--|
| Amf3GppAccessRegistration (Document)     | /{ueId}/registrations/amf-3gpp-access                  | PUT                             | Update the AMF registration for 3GPP access                    |
|  |  | PATCH                           | Modify the AMF registration for 3GPP access                    |
|  |  | GET                             | Retrieve the AMF registration information for 3GPP access      |
| AmfNon3GppAccessRegistration (Document)  | /{ueId}/registrations/amf-non-3gpp-access              | PUT                             | Update the AMF registration for non 3GPP access                |
|  |  | PATCH                           | Modify the AMF registration for non 3GPP access                |
|  |  | GET                             | Retrieve the AMF registration information for non 3GPP access  |
| SmfRegistrations (Store)                 | /{ueId}/registrations/smf-registrations                |                                 |  |
| IndividualSmfRegistration (Document)     | /{ueId}/registrations/smf-registrations/{pduSessionId} | PUT                             | Create an SMF registration identified by PDU Session Id        |
|  |  | DELETE                          | Delete an individual SMF registration                          |
|  |  | PATCH                           | Modify an individual SMF Registration                          |
| Smsf3GppAccessRegistration (Document)    | /{ueId}/registrations/smsf-3gpp-access                 | PUT                             | Create or Update the SMSF registration                         |
|  |  | DELETE                          | Delete the SMSF registration for 3GPP access                   |
|  |  | PATCH                           | Modify the SMSF registration                                   |
| SmsfNon3GppAccessRegistration (Document) | /{ueId}/registrations/smsf-non-3gpp-access             | GET                             | Retrieve the SMSF registration information                     |
|  |  | PUT                             | Create or Update the SMSF registration for non 3GPP access     |
|  |  | DELETE                          | Delete the SMSF registration for non 3GPP access               |
|  |  | PATCH                           | Modify the SMSF registration for non 3GPP access               |
|  |  | GET                             | Retrieve the SMSF registration information for non 3GPP access |

## 6.2.3.2 Resource: Amf3GppAccessRegistration

### 6.2.3.2.1 Description

This resource represents the registered AMF for 3GPP access.

### 6.2.3.2.2 Resource Definition

Resource URI: {apiRoot}/nudm-uecm/v1/{ueId}/registrations/amf-3gpp-access

This resource shall support the resource URI variables defined in table 6.2.3.2.2-1.

**Table 6.2.3.2.2-1: Resource URI variables for this resource**

| Name    | Definition  |
|---------|---|
| apiRoot | See clause 6.2.1  |
| ueld    | Represents the Subscription Identifier SUPI or GPSI (see 3GPP TS 23.501 [2] clause 5.9.2) SUPI (i.e. imsi or nai) is used with the PUT and PATCH methods; SUPI (i.e. imsi or nai) or GPSI (i.e. msisdn or extid) is used with the GET method.<br>pattern: "(imsi-[0-9]{5,15} nai-.+ msisdn-[0-9]{5,15} extid-[^\@]+\@[^\@]+\.)" |

### 6.2.3.2.3 Resource Standard Methods

#### 6.2.3.2.3.1 PUT

This method shall support the URI query parameters specified in table 6.2.3.2.3.1-1.

**Table 6.2.3.2.3.1-1: URI query parameters supported by the PUT method on this resource**

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

This method shall support the request data structures specified in table 6.2.3.2.3.1-2 and the response data structures and response codes specified in table 6.2.3.2.3.1-3.

**Table 6.2.3.2.3.1-2: Data structures supported by the PUT Request Body on this resource**

| Data type                 | P | Cardinality | Description   |
|---------------------------|---|-------------|---|
| Amf3GppAccessRegistration | M | 1           | The AMF registration for 3GPP access is replaced with the received information. |

**Table 6.2.3.2.3.1-3: Data structures supported by the PUT Response Body on this resource**

| Data type                 | P | Cardinality | Response codes | Description   |
|---------------------------|---|-------------|----------------|---|
| Amf3GppAccessRegistration | M | 1           | 201 Created    | Upon success, a response body containing a representation of the created Individual Amf3GppAccessRegistration resource shall be returned.   |
| Amf3GppAccessRegistration | M | 1           | 200 OK         | Upon success, a response body containing a representation of the updated Individual Amf3GppAccessRegistration resource shall be returned.   |
| n/a                       |   |             | 204 No Content | Upon success, an empty response body shall be returned  |
| ProblemDetails            | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- USER_NOT_FOUND  |
| ProblemDetails            | M | 1           | 403 Forbidden  | The "cause" attribute shall be set to one of the following application errors:<br>- UNKNOWN_5GS_SUBSCRIPTION<br>- NO_PS_SUBSCRIPTION<br>- ROAMING_NOT_ALLOWED<br>- ACCESS_NOT_ALLOWED<br>- RAT_NOT_ALLOWED<br>- REAUTHENTICATION_REQUIRED |

NOTE: In addition common data structures as listed in table 6.2.7-1 are supported.

#### 6.2.3.2.3.2 PATCH

This method shall support the URI query parameters specified in table 6.2.3.2.3.2-1.

**Table 6.2.3.2.3.2-1: URI query parameters supported by the PATCH method on this resource**

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

This method shall support the request data structures specified in table 6.2.3.2.3.2-2 and the response data structures and response codes specified in table 6.2.3.2.3.2-3.

**Table 6.2.3.2.3.2-2: Data structures supported by the PATCH Request Body on this resource**

| Data type                             | P | Cardinality | Description   |
|---------------------------------------|---|-------------|---|
| Amf3GppAccessRegistrationModification | M | 1           | The AMF registration for 3GPP access is modified with the received information. |

**Table 6.2.3.2.3.2-3: Data structures supported by the PATCH Response Body on this resource**

| Data type      | P | Cardinality | Response codes           | Description   |
|----------------|---|-------------|--------------------------|---|
| n/a            |   |             | 204 No Content           | Upon success, an empty response body shall be returned  |
| ProblemDetails | M | 1           | 404 Not Found            | The "cause" attribute shall be set to one of the following application errors:<br>- CONTEXT_NOT_FOUND<br>- USER_NOT_FOUND |
| ProblemDetails | M | 1           | 422 Unprocessable Entity | The "cause" attribute shall be set to the following application error:<br>- UNPROCESSABLE_REQUEST                         |

NOTE: In addition common data structures as listed in table 6.2.7-1 are supported.

### 6.2.3.2.3.3 GET

This method shall support the URI query parameters specified in table 6.2.3.2.3.3-1.

**Table 6.2.3.2.3.3-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                       |
|--------------------|-------------------|---|-------------|-----------------------------------|
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6 |

This method shall support the request data structures specified in table 6.2.3.2.3.3-2 and the response data structures and response codes specified in table 6.2.3.2.3.3-3.

**Table 6.2.3.2.3.3-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.2.3.2.3.3-3: Data structures supported by the GET Response Body on this resource**

| Data type                 | P | Cardinality | Response codes | Description   |
|---------------------------|---|-------------|----------------|---|
| Amf3GppAccessRegistration | M | 1           | 200 OK         | Upon success, a response body containing the Amf3GppAccessRegistration shall be returned.                                 |
| ProblemDetails            | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- CONTEXT_NOT_FOUND<br>- USER_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.2.7-1 are supported.

### 6.2.3.3 Resource: AmfNon3GppAccessRegistration

#### 6.2.3.3.1 Description

This resource represents the registered AMF for non 3GPP access.

#### 6.2.3.3.2 Resource Definition

Resource URI: {apiRoot}/nudm-uecm/v1/{ueId}/registrations/amf-non-3gpp-access/

This resource shall support the resource URI variables defined in table 6.2.3.3.2-1.

**Table 6.2.3.3.2-1: Resource URI variables for this resource**

| Name    | Definition   |
|---------|--|
| apiRoot | See clause 6.2.1   |
| ueId    | Represents the Subscription Identifier SUPI or GPSI (see 3GPP TS 23.501 [2] clause 5.9.2) SUPI (i.e. imsi or nai) is used with the PUT and PATCH methods; SUPI (i.e. imsi or nai) or GPSI (i.e. msisdn or extid) is used with the GET method.<br>pattern: "(imsi-[0-9]{5,15} nai-.+ msisdn-[0-9]{5,15} extid-[^@]+@[^@]+.+)" |

#### 6.2.3.3.3 Resource Standard Methods

##### 6.2.3.3.3.1 PUT

This method shall support the URI query parameters specified in table 6.2.3.3.3.1-1.

**Table 6.2.3.3.3.1-1: URI query parameters supported by the PUT method on this resource**

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

This method shall support the request data structures specified in table 6.2.3.3.3.1-2 and the response data structures and response codes specified in table 6.2.3.3.3.1-3.

**Table 6.2.3.3.3.1-2: Data structures supported by the PUT Request Body on this resource**

| Data type                    | P | Cardinality | Description   |
|------------------------------|---|-------------|---|
| AmfNon3GppAccessRegistration | M | 1           | The AMF registration for non 3GPP access is replaced with the received information. |

**Table 6.2.3.3.3.1-3: Data structures supported by the PUT Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| AmfNon3GppAccessRegistration   | M | 1           | 201 Created    | Upon success, a response body containing a representation of the created Individual AmfNon3GppAccessRegistration resource shall be returned.  |
| AmfNon3GppAccessRegistration   | M | 1           | 200 OK         | Upon success, a response body containing a representation of the updated Individual AmfNon3GppAccessRegistration resource shall be returned.  |
| n/a  |   |             | 204 No Content | Upon success, an empty response body shall be returned  |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- USER_NOT_FOUND  |
| ProblemDetails   | M | 1           | 403 Forbidden  | The "cause" attribute shall be set to one of the following application errors:<br>- UNKNOWN_5GS_SUBSCRIPTION<br>- NO_PS_SUBSCRIPTION<br>- ROAMING_NOT_ALLOWED<br>- ACCESS_NOT_ALLOWED<br>- RAT_NOT_ALLOWED<br>- REAUTHENTICATION_REQUIRED |
| NOTE: In addition common data structures as listed in table 6.2.7-1 are supported. |   |             |                |   |

#### 6.2.3.3.3.2 PATCH

This method shall support the URI query parameters specified in table 6.2.3.3.3.2-1.

**Table 6.2.3.3.3.2-1: URI query parameters supported by the PATCH method on this resource**

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

This method shall support the request data structures specified in table 6.2.3.3.3.2-2 and the response data structures and response codes specified in table 6.2.3.3.3.2-3.

**Table 6.2.3.3.3.2-2: Data structures supported by the PATCH Request Body on this resource**

| Data type                                | P | Cardinality | Description   |
|--|---|-------------|---|
| AmfNon3GppAccessRegistrationModification | M | 1           | The AMF registration for non 3GPP access is modified with the received information. |

**Table 6.2.3.3.3.2-3: Data structures supported by the PATCH Response Body on this resource**

| Data type  | P | Cardinality | Response codes           | Description   |
|--|---|-------------|--------------------------|---|
| n/a  |   |             | 204 No Content           | Upon success, an empty response body shall be returned  |
| ProblemDetails   | M | 1           | 404 Not Found            | The "cause" attribute shall be set to one of the following application errors:<br>- CONTEXT_NOT_FOUND<br>- USER_NOT_FOUND |
| ProblemDetails   | M | 1           | 422 Unprocessable Entity | The "cause" attribute shall be set to the following application error:<br>- UNPROCESSABLE_REQUEST                         |
| NOTE: In addition common data structures as listed in table 6.2.7-1 are supported. |   |             |                          |   |

## 6.2.3.3.3.3 GET

This method shall support the URI query parameters specified in table 6.2.3.3.3.3-1.

**Table 6.2.3.3.3.3-1: URI query parameters supported by the GET method on this resource**

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

This method shall support the request data structures specified in table 6.2.3.3.3.3-2 and the response data structures and response codes specified in table 6.2.3.3.3.3-3.

**Table 6.2.3.3.3.3-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.2.3.3.3.3-3: Data structures supported by the GET Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| AmfNon3GppAccessRegistration   | M | 1           | 200 OK         | Upon success, a response body containing the AmfNon3GppAccessRegistration shall be returned.                              |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- CONTEXT_NOT_FOUND<br>- USER_NOT_FOUND |
| NOTE: In addition common data structures as listed in table 6.2.7-1 are supported. |   |             |                |   |

## 6.2.3.4 Resource: SmfRegistrations

## 6.2.3.4.1 Description

This resource is used to represent SMF registrations.

## 6.2.3.4.2 Resource Definition

Resource URI: {apiRoot}/nudm-uecm/v1/{ueId}/registrations/smf-registrations

This resource shall support the resource URI variables defined in table 6.2.3.4.2-1.

**Table 6.2.3.4.2-1: Resource URI variables for this resource**

| Name    | Definition   |
|---------|--|
| apiRoot | See clause 6.4.1   |
| ueId    | Represents the Subscription Identifier SUPI or GPSI (see 3GPP TS 23.501 [2] clause 5.9.2) pattern: "(imsi-[0-9]{5,15} nai-.+ msisdn-[0-9]{5,15} extid-[^\@]+\@[^\@]+.+)" |

## 6.2.3.4.3 Resource Standard Methods

none

## 6.2.3.5 Resource: IndividualSmfRegistration

## 6.2.3.5.1 Resource Definition

Resource URI: {apiRoot}/nudm-uecm/v1/{ueId}/registrations/smf-registrations/{pduSessionId}

This resource shall support the resource URI variables defined in table 6.2.3.5.1-1.

**Table 6.2.3.5.1-1: Resource URI variables for this resource**

| Name         | Definition   |
|--------------|--|
| apiRoot      | See clause 6.1.1   |
| ueld         | Represents the Subscription Identifier (see 3GPP TS 23.501 [2] clause 5.9.2) SUPI (i.e. imsi or nai) is used with the PUT, DELETE and PATCH methods;<br>pattern: "(imsi-[0-9]{5,15} nai-.+ msisdn-[0-9]{5,15} extid-[^\@]+\@[^\@]+\.)" |
| pduSessionId | The pduSessionId identifies an individual SMF registration.  |

## 6.2.3.5.2 Resource Standard Methods

### 6.2.3.5.2.1 PUT

This method shall support the URI query parameters specified in table 6.2.3.5.2.1-1.

**Table 6.2.3.5.2.1-1: URI query parameters supported by the PUT method on this resource**

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

This method shall support the request data structures specified in table 6.2.3.5.2.1-2 and the response data structures and response codes specified in table 6.2.3.5.2.1-3.

**Table 6.2.3.5.2.1-2: Data structures supported by the PUT Request Body on this resource**

| Data type       | P | Cardinality | Description                            |
|-----------------|---|-------------|--|
| SmfRegistration | M | 1           | The registration that is to be created |

**Table 6.2.3.5.2.1-3: Data structures supported by the PUT Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| SmfRegistration  | M | 1           | 201 Created    | Upon success, a response body containing a representation of the created Individual SmfRegistration resource shall be returned. |
| SmfRegistration  | M | 1           | 200 OK         | Upon success, a response body containing a representation of the updated Individual SmfRegistration resource shall be returned. |
| n/a  |   |             | 204 No Content | Upon success, an empty response body shall be returned  |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- USER_NOT_FOUND                                      |
| ProblemDetails   | M | 1           | 403 Forbidden  | The "cause" attribute shall be set to one of the following application errors:<br>- ROAMING_NOT_ALLOWED<br>- DNN_NOT_ALLOWED    |
| NOTE: In addition common data structures as listed in table 6.4.7-1 are supported. |   |             |                |   |

### 6.2.3.5.2.2 DELETE

This method shall support the URI query parameters specified in table 6.2.3.5.2.2-1.

**Table 6.2.3.5.2.2-1: URI query parameters supported by the DELETE method on this resource**

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



This method shall support the request data structures specified in table 6.2.3.5.2.2-2 and the response data structures and response codes specified in table 6.2.3.5.2.2-3.

**Table 6.2.3.5.2.2-2: Data structures supported by the DELETE Request Body on this resource**

| Data type | P | Cardinality | Description                      |
|-----------|---|-------------|----------------------------------|
| n/a       |   |             | The request body shall be empty. |

**Table 6.2.3.5.2.2-3: Data structures supported by the DELETE Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| n/a  |   |             | 204 No Content | Upon success, an empty response body shall be returned. |
| NOTE: In addition common data structures as listed in table 6.4.7-1 are supported. |   |             |                |   |

## 6.2.3.6 Resource: Smsf3GppAccessRegistration

### 6.2.3.6.1 Description

This resource represents the registered SMSF for 3GPP access.

### 6.2.3.6.2 Resource Definition

Resource URI: {apiRoot}/nudm-uecm/v1/{ueId}/registrations/smsf-3gpp-access

This resource shall support the resource URI variables defined in table 6.2.3.6.2-1.

**Table 6.2.3.6.2-1: Resource URI variables for this resource**

| Name    | Definition  |
|---------|---|
| apiRoot | See clause 6.2.1  |
| ueId    | Represents the Subscription Identifier SUPI or GPSI (see 3GPP TS 23.501 [2] clause 5.9.2) SUPI (i.e. imsi or nai) is used with the PUT, DELETE and PATCH methods; GPSI (i.e. msisdn or extid) is used with the GET method.<br>pattern: "(imsi-[0-9]{5,15} nai-.+ msisdn-[0-9]{5,15} extid-[^\@]+\@[^\@]+ .+)" |

### 6.2.3.6.3 Resource Standard Methods

#### 6.2.3.6.3.1 PUT

This method shall support the URI query parameters specified in table 6.2.3.6.3.1-1.

**Table 6.2.3.6.3.1-1: URI query parameters supported by the PUT method on this resource**

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

This method shall support the request data structures specified in table 6.2.3.6.3.1-2 and the response data structures and response codes specified in table 6.2.3.6.3.1-3.

**Table 6.2.3.6.3.1-2: Data structures supported by the PUT Request Body on this resource**

| Data type        | P | Cardinality | Description  |
|------------------|---|-------------|--|
| SmsfRegistration | M | 1           | The SMSF registration for 3GPP access is created or updated with the received information. |

**Table 6.2.3.6.3.1-3: Data structures supported by the PUT Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| SmsfRegistration   | M | 1           | 201 Created    | Upon success, a response body containing a representation of the created Individual SmsfRegistration resource shall be returned.                              |
| SmsfRegistration   | M | 1           | 200 OK         | Upon success, a response body containing a representation of the updated Individual SmsfRegistration resource shall be returned.                              |
| n/a  |   |             | 204 No Content | Upon success, an empty response body shall be returned  |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- USER_NOT_FOUND  |
| ProblemDetails   | M | 1           | 403 Forbidden  | The "cause" attribute shall be set to one of the following application errors:<br>- UNKNOWN_5GS_SUBSCRIPTION<br>- ACCESS_NOT_ALLOWED<br>- ROAMING_NOT_ALLOWED |
| NOTE: In addition common data structures as listed in table 6.2.7-1 are supported. |   |             |                |   |

### 6.2.3.6.3.2 DELETE

This method shall support the URI query parameters specified in table 6.2.3.6.3.2-1.

**Table 6.2.3.6.3.2-1: URI query parameters supported by the DELETE method on this resource**

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

This method shall support the request data structures specified in table 6.2.3.6.3.2-2 and the response data structures and response codes specified in table 6.2.3.6.3.2-3.

**Table 6.2.3.6.3.2-2: Data structures supported by the DELETE Request Body on this resource**

| Data type | P | Cardinality | Description                      |
|-----------|---|-------------|----------------------------------|
| n/a       |   |             | The request body shall be empty. |

**Table 6.2.3.6.3.2-3: Data structures supported by the DELETE Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| n/a  |   |             | 204 No Content | Upon success, an empty response body shall be returned. |
| NOTE: In addition common data structures as listed in table 6.4.7-1 are supported. |   |             |                |   |

### 6.2.3.6.3.3 GET

This method shall support the URI query parameters specified in table 6.2.3.6.3.3-1.

**Table 6.2.3.6.3.3-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                       |
|--------------------|-------------------|---|-------------|-----------------------------------|
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6 |

This method shall support the request data structures specified in table 6.2.3.6.3.3-2 and the response data structures and response codes specified in table 6.2.3.6.3.3-3.

**Table 6.2.3.6.3.3-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.2.3.6.3.3-3: Data structures supported by the GET Response Body on this resource**

| Data type        | P | Cardinality | Response codes | Description   |
|------------------|---|-------------|----------------|---|
| SmsfRegistration | M | 1           | 200 OK         | Upon success, a response body containing the SmsfRegistration shall be returned.  |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- CONTEXT_NOT_FOUND<br>- USER_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.2.7-1 are supported.

## 6.2.3.7 Resource: SmsfNon3GppAccessRegistration

### 6.2.3.7.1 Description

This resource represents the registered SMSF for non 3GPP access.

### 6.2.3.7.2 Resource Definition

Resource URI: {apiRoot}/nudm-uecm/v1/{ueId}/registrations/smsf-non-3gpp-access

This resource shall support the resource URI variables defined in table 6.2.3.7.2-1.

**Table 6.2.3.7.2-1: Resource URI variables for this resource**

| Name    | Definition  |
|---------|---|
| apiRoot | See clause 6.2.1  |
| ueId    | Represents the Subscription Identifier SUPI or GPSI (see 3GPP TS 23.501 [2] clause 5.9.2) SUPI (i.e. imsi or nai) is used with the PUT, DELETE and PATCH methods; GPSI (i.e. msisdn or extid) is used with the GET method.<br>pattern: "(imsi-[0-9]{5,15} nai-.+ msisdn-[0-9]{5,15} extid-[^@]+@[^@]+.+)" |

### 6.2.3.7.3 Resource Standard Methods

#### 6.2.3.7.3.1 PUT

This method shall support the URI query parameters specified in table 6.2.3.7.3.1-1.

**Table 6.2.3.7.3.1-1: URI query parameters supported by the PUT method on this resource**

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

This method shall support the request data structures specified in table 6.2.3.7.3.1-2 and the response data structures and response codes specified in table 6.2.3.7.3.1-3.

**Table 6.2.3.7.3.1-2: Data structures supported by the PUT Request Body on this resource**

| Data type        | P | Cardinality | Description  |
|------------------|---|-------------|--|
| SmsfRegistration | M | 1           | The SMSF registration for non 3GPP access is created or updated with the received information. |

**Table 6.2.3.7.3.1-3: Data structures supported by the PUT Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| SmsfRegistration   | M | 1           | 201 Created    | Upon success, a response body containing a representation of the created Individual SmsfRegistration for non 3GPP access resource shall be returned.          |
| SmsfRegistration   | M | 1           | 200 OK         | Upon success, a response body containing a representation of the updated Individual SmsfRegistration for non 3GPP access resource shall be returned.          |
| n/a  |   |             | 204 No Content | Upon success, an empty response body shall be returned  |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- USER_NOT_FOUND  |
| ProblemDetails   | M | 1           | 403 Forbidden  | The "cause" attribute shall be set to one of the following application errors:<br>- UNKNOWN_5GS_SUBSCRIPTION<br>- ACCESS_NOT_ALLOWED<br>- ROAMING_NOT_ALLOWED |
| NOTE: In addition common data structures as listed in table 6.2.7-1 are supported. |   |             |                |   |

### 6.2.3.7.3.2 DELETE

This method shall support the URI query parameters specified in table 6.2.3.7.2.2-1.

**Table 6.2.3.7.2.2-1: URI query parameters supported by the DELETE method on this resource**

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

This method shall support the request data structures specified in table 6.2.3.7.2.2-2 and the response data structures and response codes specified in table 6.2.3.5.2.2-3.

**Table 6.2.3.7.2.2-2: Data structures supported by the DELETE Request Body on this resource**

| Data type | P | Cardinality | Description                      |
|-----------|---|-------------|----------------------------------|
| n/a       |   |             | The request body shall be empty. |

**Table 6.2.3.7.2.2-3: Data structures supported by the DELETE Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| n/a  |   |             | 204 No Content | Upon success, an empty response body shall be returned. |
| NOTE: In addition common data structures as listed in table 6.4.7-1 are supported. |   |             |                |   |

### 6.2.3.7.3.3 GET

This method shall support the URI query parameters specified in table 6.2.3.7.3.3-1.

**Table 6.2.3.7.3.3-1: URI query parameters supported by the GET method on this resource**

| Name               | Data type         | P | Cardinality | Description                       |
|--------------------|-------------------|---|-------------|-----------------------------------|
| supported-features | SupportedFeatures | O | 0..1        | see 3GPP TS 29.500 [4] clause 6.6 |

This method shall support the request data structures specified in table 6.2.3.7.3.3-2 and the response data structures and response codes specified in table 6.2.3.7.3.3-3.

**Table 6.2.3.7.3.3-2: Data structures supported by the GET Request Body on this resource**

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

**Table 6.2.3.7.3.3-3: Data structures supported by the GET Response Body on this resource**

| Data type        | P | Cardinality | Response codes | Description   |
|------------------|---|-------------|----------------|---|
| SmsfRegistration | M | 1           | 200 OK         | Upon success, a response body containing the SmsfRegistration shall be returned.  |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to one of the following application errors:<br>- CONTEXT_NOT_FOUND<br>- USER_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.2.7-1 are supported.

## 6.2.4 Custom Operations without associated resources

In this release of this specification, no custom operations without associated resources are defined for the Nudm\_UEContextManagement Service.

## 6.2.5 Notifications

### 6.2.5.1 General

This clause will specify the use of notifications and corresponding protocol details if required for the specific service. When notifications are supported by the API, it will include a reference to the general description of notifications support over the 5G SBIs specified in TS 29.500 / TS 29.501.

### 6.2.5.2 Deregistration Notification

The POST method shall be used for Deregistration Notifications and the URI shall be as provided during the registration procedure.

Resource URI: {callbackReference}

Support of URI query parameters is specified in table 6.2.5.2-1.

**Table 6.2.5.2-1: URI query parameters supported by the POST method**

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

Support of request data structures is specified in table 6.2.5.2-2 and of response data structures and response codes is specified in table 6.2.5.2-3.

**Table 6.2.5.2-2: Data structures supported by the POST Request Body**

| Data type          | P | Cardinality | Description                    |
|--------------------|---|-------------|--------------------------------|
| DeregistrationData | M | 1           | Includes Deregistration Reason |

**Table 6.2.5.2-3: Data structures supported by the POST Response Body**

| Data type      | P | Cardinality | Response codes | Description   |
|----------------|---|-------------|----------------|---|
| n/a            |   |             | 204 No Content | Upon success, an empty response body shall be returned.                                       |
| ProblemDetails | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- CONTEXT_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

### 6.2.5.3 P-CSCF Restoration Notification

The POST method shall be used for P-CSCF Restoration Notifications and the URI shall be as provided during the registration procedure.

Resource URI: {callbackReference}

Support of URI query parameters is specified in table 6.2.5.3-1.

**Table 6.2.5.3-1: URI query parameters supported by the POST method**

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

Support of request data structures is specified in table 6.2.5.3-2 and of response data structures and response codes is specified in table 6.2.5.3-3.

**Table 6.2.5.3-2: Data structures supported by the POST Request Body**

| Data type                     | P | Cardinality | Description       |
|-------------------------------|---|-------------|-------------------|
| PcscfRestoration Notification | M | 1           | contains the SUPI |

**Table 6.2.5.3-3: Data structures supported by the POST Response Body**

| Data type      | P | Cardinality | Response codes | Description   |
|----------------|---|-------------|----------------|---|
| n/a            |   |             | 204 No Content | Upon success, an empty response body shall be returned.                                       |
| ProblemDetails | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- CONTEXT_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

## 6.2.6 Data Model

### 6.2.6.1 General

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

Table 6.2.6.1-1 specifies the structured data types defined for the Nudm\_UECM service API. For simple data types defined for the Nudm\_UECM service API see table 6.2.6.3.2-1.

**Table 6.2.6.1-1: Nudm\_UECM specific Data Types**

| Data type                                | Clause defined | Description  |
|--|----------------|--|
| Amf3GppAccessRegistration                | 6.2.6.2.2      | The complete set of information relevant to the AMF where the UE has registered via 3GPP access.     |
| PurgeFlag                                | 6.2.6.3.2      | This flag indicates whether or not the NF has deregistered.  |
| AmfNon3GppAccessRegistration             | 6.2.6.2.3      | The complete set of information relevant to the AMF where the UE has registered via non 3GPP access. |
| DeregistrationData                       | 6.2.6.2.5      | Data sent with the Deregistration Notification   |
| SmfRegistration                          | 6.2.6.2.4      | The complete set of information relevant to an SMF serving the UE                                    |
| SmsfRegistration                         | 6.2.6.2.6      | The complete set of information relevant to the SMSF serving the UE.                                 |
| Amf3GppAccessRegistrationModification    | 6.2.6.2.7      | Contains attributes of Amf3GppAccessRegistration that can be modified using PATCH                    |
| AmfNon3GppAccessRegistrationModification | 6.2.6.2.8      | Contains attributes of AmfNon3GppAccessRegistration that can be modified using PATCH                 |
| PcscfRestorationNotification             | 6.2.6.2.9      | Information sent to the AMF or SMF when P-CSCF restoration is triggered.                             |
| DualRegistrationFlag                     | 6.2.6.3.2      | Dual Registration Flag   |

Table 6.2.6.1-2 specifies data types re-used by the Nudm\_uecm service API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nudm\_uecm service API.

**Table 6.2.6.1-2: Nudm\_UECM re-used Data Types**

| Data type         | Reference           | Comments                                 |
|-------------------|---------------------|--|
| Dnn               | 3GPP TS 29.571 [7]  | Data Network Name                        |
| NfInstanceId      | 3GPP TS 29.571 [7]  | Network Function Instance Identifier     |
| PduSessionId      | 3GPP TS 29.571 [7]  | PDU Session ID                           |
| Pei               | 3GPP TS 29.571 [7]  | Permanent Equipment Identifier           |
| ProblemDetails    | 3GPP TS 29.571 [7]  | Common data type used in response bodies |
| Uri               | 3GPP TS 29.571 [7]  | Uniform Resource Identifier              |
| SupportedFeatures | 3GPP TS 29.571 [7]  | see 3GPP TS 29.500 [4] clause 6.6        |
| Supi              | 3GPP TS 29.571 [7]  | see 3GPP TS 23.501 [2] clause 5.9.2      |
| Guami             | 3GPP TS 29.571 [7]  | Globally Unique AMF Identifier           |
| PlmnId            | 3GPP TS 29.571 [7]  | PLMN Identity                            |
| DiameterIdentity  | 3GPP TS 29.571 [7]  |  |
| AccessType        | 3GPP TS 29.571 [7]  | Access Type                              |
| BackupAmfInfo     | 3GPP TS 29.571 [7]  | Backup AMFs                              |
| ServiceName       | 3GPP TS 29.510 [19] |  |

## 6.2.6.2 Structured data types

### 6.2.6.2.1 Introduction

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

6.2.6.2.2 Type: Amf3GppAccessRegistration

**Table 6.2.6.2.2-1: Definition of type Amf3GppAccessRegistration**



| Attribute name              | Data type            | P | Cardinality | Description  |
|-----------------------------|----------------------|---|-------------|--|
| amfInstanceId               | NfInstanceId         | M | 1           | The identity the AMF uses to register in the NRF.  |
| deregCallbackUri            | Uri                  | M | 1           | A URI provided by the AMF to receive (implicitly subscribed) notifications on deregistration. The deregistration callback URI shall have unique information within AMF set to identify the UE to be deregistered.  |
| guami                       | Guami                | M | 1           | This IE shall contain the serving AMF's GUAMI.   |
| ratType                     | RatType              | M | 1           | This IE shall indicate the current RAT type of the UE.   |
| supportedFeatures           | SupportedFeatures    | O | 0..1        | See clause 6.2.8   |
| purgeFlag                   | PurgeFlag            | O | 0..1        | This flag indicates whether or not the AMF has deregistered. It shall not be included in the Registration service operation.   |
| pei                         | Pei                  | O | 0..1        | Permanent Equipment Identifier.  |
| imsVoPs                     | ImsVoPs              | O | 0..1        | Indicates per UE if "IMS Voice over PS Sessions" is homogeneously supported in all TAs in the serving AMF, or homogeneously not supported, or if support is non-homogeneous/unknown. Absence of this attribute shall be interpreted as "non homogenous or unknown" support.  |
| amfServiceNameDereg         | ServiceName          | O | 0..1        | When present, this IE shall contain the name of the AMF service to which the Deregistration Notification is to be sent (see clause 6.5.2.2 of 3GPP TS 29.500 [4]).   |
| pcscfRestorationCallbackUri | Uri                  | O | 0..1        | A URI provided by the AMF to receive (implicitly subscribed) notifications on the need for P-CSCF Restoration.   |
| amfServiceNamePcscfRest     | ServiceName          | O | 0..1        | When present, this IE shall contain the name of the AMF service to which P-CSCF Restoration Notifications are to be sent (see clause 6.5.2.2 of 3GPP TS 29.500 [4]). This IE may be included if pcscfRestorationCallbackUri is present.  |
| initialRegistrationInd      | boolean              | C | 0..1        | This IE shall be included by the AMF and set to true if the UE performs an Initial Registration. If the UE does not perform initial registration it shall be absent or set to false.   |
| backupAmfInfo               | array(BackupAmfInfo) | C | 1..N        | This IE shall be included if the NF service consumer is an AMF and the AMF supports the AMF management without UDSF for the first interaction with UDM. The UDM uses this attribute to do an NRF query in order to invoke later services in a backup AMF, e.g. Namf_EventExposure.   |
| drFlag                      | DualRegistrationFlag | O | 0..1        | Dual Registration flag. When present and true, this flag indicates that the UDM+HSS is requested not to send S6a-CLR to the registered MME (if any). Otherwise, the registered MME (if any) shall be cancelled.  |
| urrplIndicator              | boolean              | O | 0..1        | This IE indicates whether "UE_REACHABILITY_FOR_SMS" event for this user has been subscribed or not:<br>- true: the event has been subscribed<br>- false, or absence of this attribute: the event for this user is currently not subscribed   |
| amfEeSubscriptionId         | string               | C | 0..1        | Shall be present if urrpIndicator is true and the UDM has subscribed to UE-reachability notification at the AMF. It contains the subscription Id allocated by the AMF as received by the UDM as part of the HTTP "Location" header of the Namf_EventExposure_Subscribe response. The UDM shall make use of the Nudr_DataRepository Update service operation (see 3GPP TS 29.504 [9]) to store the amfEeSubscription Id in the UDR. |

|   |                |   |      |   |
|---|----------------|---|------|---|
| epsInterworkingInfo   | map(EpslwkPgw) | C | 1..N | A map (list of key-value pairs where dnn serves as key; see clause 6.1.6.1) of EpslwkPgws.<br>This IE shall be included if the AMF has determined per APN/DNN which PGW-C+SMF is selected for EPS interworking. For each APN/DNN, only one PGW-C+SMF shall be selected by the AMF for EPS interworking. |
| NOTE: The urrplndicator attribute shall only be exposed over the Nudr SBI, and it shall not be included by the AMF. |                |   |      |   |

6.2.6.2.3 Type: AmfNon3GppAccessRegistration

**Table 6.2.6.2.3-1: Definition of type AmfNon3GppAccessRegistration**

| Attribute name              | Data type            | P | Cardinality | Description  |
|-----------------------------|----------------------|---|-------------|--|
| amfInstanceid               | NfInstanceid         | M | 1           | The identity the AMF uses to register in the NRF.  |
| deregCallbackUri            | Uri                  | M | 1           | A URI provided by the AMF to receive (implicitly subscribed) notifications on deregistration.<br>The deregistration callback URI shall have unique information within AMF set to identify the UE to be deregistered.   |
| guami                       | Guami                | M | 1           | This IE shall contain the serving AMF's GUAMI.   |
| ratType                     | RatType              | M | 1           | This IE shall indicate the current RAT type of the UE.   |
| supportedFeatures           | SupportedFeatures    | O | 0..1        | See clause 6.2.8   |
| purgeFlag                   | PurgeFlag            | O | 0..1        | This flag indicates whether or not the AMF has deregistered. It shall not be included in the Registration service operation.   |
| pei                         | Pei                  | O | 0..1        | Permanent Equipment Identifier   |
| imsVoPs                     | ImsVoPs              | M | 1           | Indicates per UE if "IMS Voice over PS Sessions" is supported, or not supported.<br>The value NON_HOMOGENEOUS_OR_UNKNOWN is not applicable.  |
| amfServiceNameDereg         | ServiceName          | O | 0..1        | When present, this IE shall contain the name of the AMF service to which the Deregistration Notification is to be sent (see clause 6.5.2.2 of 3GPP TS 29.500 [4]).   |
| pcscfRestorationCallbackUri | Uri                  | O | 0..1        | A URI provided by the AMF to receive (implicitly subscribed) notifications on the need for P-CSCF Restoration.   |
| amfServiceNamePcscfRest     | ServiceName          | O | 0..1        | When present, this IE shall contain the name of the AMF service to which P-CSCF Restoration Notifications are to be sent (see clause 6.5.2.2 of 3GPP TS 29.500 [4]). This IE may be included if pcscfRestorationCallbackUri is present.  |
| backupAmfInfo               | array(BackupAmfInfo) | C | 1..N        | This IE shall be included if the NF service consumer is an AMF and the AMF supports the AMF management without UDSF for the first interaction with UDM.<br>The UDM uses this attribute to do an NRF query in order to invoke later services in a backup AMF, e.g. Namf_EventExposure.  |
| urrpIndicator               | boolean              | O | 0..1        | This IE indicates whether "UE_REACHABILITY_FOR_SMS" event for this user has been subscribed or not:<br>- true: the event has been subscribed<br>- false, or absence of this attribute: the event for this user is currently not subscribed   |
| amfEeSubscriptionId         | string               | C | 0..1        | Shall be present if urrpIndicator is true and the UDM has subscribed to UE-reachability notification at the AMF. It contains the subscription Id allocated by the AMF as received by the UDM as part of the HTTP "Location" header of the Namf_EventExposure_Subscribe response.<br>The UDM shall make use of the Nudr_DataRepository Update service operation (see 3GPP TS 29.504 [9]) to store the amfEeSubscriptionId in the UDR. |

NOTE: The urrpIndicator attribute shall only be exposed over the Nudr SBI, and it shall not be included by the AMF.

## 6.2.6.2.4 Type: SmfRegistration

Table 6.2.6.2.4-1: Definition of type SmfRegistration

| Attribute name              | Data type         | P | Cardinality | Description   |
|-----------------------------|-------------------|---|-------------|---|
| smfInstancelId              | NfInstancelId     | M | 1           | NF Instance Id of the SMF   |
| supportedFeatures           | SupportedFeatures | O | 0..1        | See clause 6.2.8  |
| pduSessionId                | PduSessionId      | M | 1           | PDU Session ID  |
| singleNssai                 | Snssai            | M | 1           | A single Network Slice Selection Assistance Information   |
| dnn                         | Dnn               | C | 0..1        | Data Network Name; shall be present if emergencyServices is false or absent                                   |
| emergencyServices           | boolean           | C | 0..1        | Indication of Emergency Services; absence indicates false.  |
| pcscfRestorationCallbackUri | Uri               | O | 0..1        | a URI provided by the SMF to receive (implicitly subscribed) notifications on the need for P-CSCF Restoration |
| plmnId                      | PlmnId            | M | 1           | Serving node PLMN identity.   |
| pgwFqdn                     | string            | C | 0..1        | FQDN of the PGW in the "PGW-C+SMF", to be included for interworking with EPS.                                 |

## 6.2.6.2.5 Type: DeregistrationData

Table 6.2.6.2.5-1: Definition of type DeregistrationData

| Attribute name | Data type            | P | Cardinality | Description                              |
|----------------|----------------------|---|-------------|--|
| deregReason    | DeregistrationReason | M | 1           | String; see clause 6.2.6.3.3             |
| accessType     | AccessType           | M | 1           | Access type where the UE is deregistered |

## 6.2.6.2.6 Type: SmsfRegistration

Table 6.2.6.2.6-1: Definition of type SmsfRegistration

| Attribute name      | Data type                  | P | Cardinality | Description   |
|---------------------|----------------------------|---|-------------|---|
| smsfInstancelId     | NfInstancelId              | M | 1           | NF Instance Id of the SMSF  |
| supportedFeatures   | SupportedFeatures          | O | 0..1        | See clause 6.2.8  |
| plmnId              | PlmnId                     | M | 1           | Serving node PLMN identity  |
| smsfMAPAddress      | E164Number                 | C | 0..1        | International E.164 number of the SMSF; shall be present if the SMSF supports MAP (see 3GPP TS 29.002 [21]) |
| smsfDiameterAddress | NetworkNodeDiameterAddress | C | 0..1        | shall be present if the SMSF supports Diameter (see 3GPP TS 29.338 [22])                                    |

## 6.2.6.2.7 Type: Amf3GppAccessRegistrationModification

This type is derived from the type Amf3GppAccessRegistration by deleting all attributes that are not subject to modification by means of the HTTP PATCH method.

**Table 6.2.6.2.7-1: Definition of type Amf3GppAccessRegistrationModification**

| Attribute name      | Data type   | P | Cardinality | Description   |
|---------------------|---|---|-------------|---|
| guami               | Guami   | M | 1           | Guami of the AMF requesting the modification. If the MCC, MNC, AMF Region ID and AMF Set ID within the guami do not match the stored value, the modification request shall be rejected.   |
| purgeFlag           | PurgeFlag   | O | 0..1        | This flag indicates whether or not the AMF has deregistered. It shall be included in the Deregistration service operation with a value of "TRUE".   |
| pei                 | Pei   | O | 0..1        | Permanent Equipment Identifier.   |
| imsVoPs             | ImsVoPs   | O | 0..1        | Indicates per UE if "IMS Voice over PS Sessions" is homogeneously supported in all TAs in the serving AMF, or homogeneously not supported, or if support is non-homogeneous/unknown   |
| backupAmfInfo       | array(BackupAmfInfo)  | C | 0..N        | This IE shall be included if the NF service consumer is an AMF and the AMF supports the AMF management without UDSF for the Modification of the BackupAmfInfo.<br>The UDM uses this attribute to do an NRF query in order to invoke later services in a backup AMF, e.g. Namf_EventExposure             |
| epsInterworkingInfo | map(EpslwkPgw)  | C | 0..N        | A map (list of key-value pairs where dnn serves as key; see clause 6.2.6.1) of EpslwkPgws.<br>This IE shall be included if the AMF has determined per APN/DNN which PGW-C+SMF is selected for EPS interworking. For each APN/DNN, only one PGW-C+SMF shall be selected by the AMF for EPS interworking. |
| Note:               | Absence of optional attributes indicates: no modification. Attributes of this type are not marked "nullable: true" in the OpenAPI file as deletion of these attributes is not applicable. |   |             |   |

#### 6.2.6.2.8 Type: AmfNon3GppAccessRegistrationModification

This type is derived from the type AmfNon3GppAccessRegistration by deleting all attributes that are not subject to modification by means of the HTTP PATCH method.

**Table 6.2.6.2.8-1: Definition of type AmfNon3GppAccessRegistrationModification**

| Attribute name | Data type   | P | Cardinality | Description   |
|----------------|---|---|-------------|---|
| guami          | Guami   | M | 1           | Guami of the AMF requesting the modification. If the MCC, MNC, AMF Region ID and AMF Set ID within the guami do not match the stored value, the modification request shall be rejected.   |
| purgeFlag      | PurgeFlag   | O | 0..1        | This flag indicates whether or not the AMF has deregistered. It shall be included in the Deregistration service operation with a value of "TRUE".   |
| pei            | Pei   | O | 0..1        | Permanent Equipment Identifier  |
| imsVoPs        | ImsVoPs   | O | 0..1        | If present indicates per UE that support of "IMS Voice over PS Sessions" has been modified to supported or not supported".<br>The value NON_HOMOGENEOUS_OR_UNKNOWN is not applicable.   |
| backupAmfInfo  | array(BackupAmfInfo)  | C | 0..N        | This IE shall be included if the NF service consumer is an AMF and the AMF supports the AMF management without UDSF for the Modification of the BackupAmfInfo.<br>The UDM uses this attribute to do an NRF query in order to invoke later services in a backup AMF, e.g. Namf_EventExposure |
| Note:          | Absence of optional attributes indicates: no modification. Attributes of this type are not marked "nullable: true" in the OpenAPI file as deletion of these attributes is not applicable. |   |             |   |

## 6.2.6.2.9 Type: PcscfRestorationNotification

**Table 6.2.6.2.9-1: Definition of type PcscfRestorationNotification**

| Attribute name | Data type | P | Cardinality | Description                                |
|----------------|-----------|---|-------------|--|
| supi           | Supi      | M | 1           | A SUPI that is served by the failed P-CSCF |

## 6.2.6.2.10 Type: NetworkNodeDiameterAddress

**Table 6.2.6.2.10-1: Definition of type NetworkNodeDiameterAddress**

| Attribute name | Data type        | P | Cardinality | Description |
|----------------|------------------|---|-------------|-------------|
| name           | DiameterIdentity | M | 1           |             |
| realm          | DiameterIdentity | M | 1           |             |

## 6.2.6.2.11 Type: EpslwkPgw

**Table 6.2.6.2.11-1: Definition of type EpslwkPgw**

| Attribute name | Data type    | P | Cardinality | Description                            |
|----------------|--------------|---|-------------|--|
| pgwFqdn        | string       | M | 1           | The PGW FQDN of the "PGW-C+SMF"        |
| smfInstanceId  | NfInstanceId | M | 1           | The SMF Instance Id of the "PGW-C+SMF" |

## 6.2.6.3 Simple data types and enumerations

## 6.2.6.3.1 Introduction

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

## 6.2.6.3.2 Simple data types

The simple data types defined in table 6.2.6.3.2-1 shall be supported.

**Table 6.2.6.3.2-1: Simple data types**

| Type Name            | Type Definition | Description   |
|----------------------|-----------------|---|
| PurgeFlag            | boolean         | This flag indicates whether or not the NF has deregistered. |
| E164Number           | string          | see ITU-T Recommendation E.164 [23]<br>pattern: [0-9]{1,15} |
| DualRegistrationFlag | boolean         | Dual Registration Flag                                      |

## 6.2.6.3.3 Enumeration: DeregistrationReason

The enumeration DeregistrationReason represents the reason for the Deregistration Notification. It shall comply with the provisions defined in table 6.2.6.3.3-1.

**Table 6.2.6.3.3-1: Enumeration DeregistrationReason**

| Enumeration value                             | Description            |
|---|------------------------|
| "UE_INITIAL_REGISTRATION"                     | see 3GPP TS 23.502 [3] |
| "UE_REGISTRATION_AREA_CHANGE"                 | see 3GPP TS 23.502 [3] |
| "SUBSCRIPTION_WITHDRAWN"                      | see 3GPP TS 23.502 [3] |
| "5GS_TO_EPS_MOBILITY"                         | see 3GPP TS 23.502 [3] |
| "5GS_TO_EPS_MOBILITY_UE_INITIAL_REGISTRATION" | see 3GPP TS 23.502 [3] |
| "REREGISTRATION_REQUIRED"                     | see 3GPP TS 23.502 [3] |

#### 6.2.6.3.4 Enumeration: ImsVoPs

The enumeration ImsVoPs represents information indicating homogeneity of IMS Voice over PS Sessions support for the UE. It shall comply with the provisions defined in table 6.2.6.3.4-1.

**Table 6.2.6.3.4-1: Enumeration ImsVoPs**

| Enumeration value            | Description   |
|------------------------------|---|
| "HOMOGENEOUS_SUPPORT"        | "IMS Voice over PS Sessions" is homogeneously supported in all TAs in the serving AMF.                                |
| "HOMOGENEOUS_NON_SUPPORT"    | "IMS Voice over PS Sessions" is homogeneously not supported in all TAs in the serving AMF.                            |
| "NON_HOMOGENEOUS_OR_UNKNOWN" | "IMS Voice over PS Sessions" is not homogeneously supported in all TAs in the serving AMF, or its support is unknown. |

## 6.2.7 Error Handling

### 6.2.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

### 6.2.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

### 6.2.7.3 Application Errors

The common application errors defined in the Table 5.2.7.2-1 in 3GPP TS 29.500 [4] may also be used for the Nudm\_UEContextManagement service. The following application errors listed in Table 6.2.7.3-1 are specific for the Nudm\_UEContextManagement service.



**Table 6.2.7.3-1: Application errors**

| Application Error         | HTTP status code         | Description   |
|---------------------------|--------------------------|---|
| UNKNOWN_5GS_SUBSCRIPTION  | 403 Forbidden            | No 5GS subscription is associated with the user.  |
| NO_PS_SUBSCRIPTION        | 403 Forbidden            | No PS (5GS, EPS, GPRS) subscription is associated with the user.  |
| ROAMING_NOT_ALLOWED       | 403 Forbidden            | The subscriber is not allowed to roam within that PLMN  |
| USER_NOT_FOUND            | 404 Not Found            | The user does not exist in the HPLMN  |
| CONTEXT_NOT_FOUND         | 404 Not Found            | It is used when no corresponding context exists.  |
| ACCESS_NOT_ALLOWED        | 403 Forbidden            | Access type not allowed for the user.   |
| RAT_NOT_ALLOWED           | 403 Forbidden            | RAT is not allowed for the user   |
| DNN_NOT_ALLOWED           | 403 Forbidden            | DNN not authorized for the user   |
| REAUTHENTICATION_REQUIRED | 403 Forbidden            | Due to operator policies the user needs to be re-authenticated, e.g. last valid authentication is considered obsolete |
| INVALID_GUAMI             | 403 Forbidden            | The AMF is not allowed to modify the registration information stored in the UDM, as it is not the registered AMF.     |
| UNPROCESSABLE_REQUEST     | 422 Unprocessable Entity | The request cannot be processed due to semantic errors when trying to process a patch method                          |

## 6.2.8 Feature Negotiation

The optional features in table 6.2.8-1 are defined for the Nudm\_UECM API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

**Table 6.2.8-1: Supported Features**

| Feature number | Feature Name | Description   |
|----------------|--------------|---|
| 1              | SharedData   | When receiving a Nudm_UECM_Registration service operation request for a UE that shares subscription data with other UEs, and the request does not indicate support of this feature by the service consumer, the UDM may – based on operator policy – decide to reject the registration. |

## 6.2.9 Security

As indicated in 3GPP TS 33.501 [6] and 3GPP TS 29.500 [4], the access to the Nudm\_UECM API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [18]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [19]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nudm\_UECM API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [19], 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 Nudm\_UECM service.

The Nudm\_UECM API defines a single scope "nudm-uecm" for OAuth2 authorization (as specified in 3GPP TS 33.501 [6]) for the entire API, and it does not define any additional scopes at resource or operation level.

## 6.3 Nudm\_UEAuthentication Service API

### 6.3.1 API URI

URIs of this API shall have the following root:

```
{apiRoot}/{apiName}/{apiVersion}/
```

where "apiRoot" is defined in clause 4.4.1 of 3GPP TS 29.501 [5], the "apiName" shall be set to "nudm-ueau" and the "apiVersion" shall be set to "v1" for the current version of this specification.

## 6.3.2 Usage of HTTP

### 6.3.2.1 General

HTTP/2, as defined in IETF RFC 7540 [13], 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].

HTTP messages and bodies for the Nudm\_UEAU service shall comply with the OpenAPI [14] specification contained in Annex A4.

### 6.3.2.2 HTTP standard headers

#### 6.3.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

#### 6.3.2.2.2 Content type

The following content types shall be supported:

JSON, as defined in IETF RFC 8259 [15], signalled by the content type "application/json".

The Problem Details JSON Object (IETF RFC 7807 [16]) signalled by the content type "application/problem+json".

### 6.3.2.3 HTTP custom headers

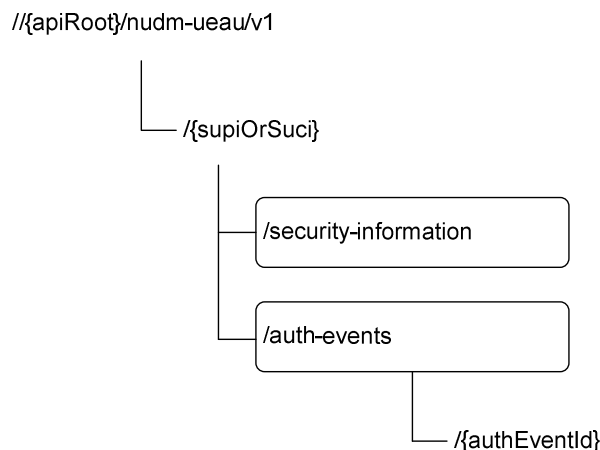
#### 6.3.2.3.1 General

The usage of HTTP custom headers shall be supported as specified in clause 5.2.3 of 3GPP TS 29.500 [4].

## 6.3.3 Resources

### 6.3.3.1 Overview

Figure 6.3.3.1-1 describes the resources supported by the Nudm\_UEAU API.



**Figure 6.3.3.1-1: Resource URI structure of the nudm\_ueau API**

Table 6.3.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 6.3.3.1-1: Resources and methods overview**

| Resource name (Archetype)              | Resource URI  | HTTP method or custom operation | Description   |
|--|---|---------------------------------|---|
| SecurityInformation (Custom operation) | /{supiOrSuci}/security-information/generate-auth-data | generate-auth-data (POST)       | If the variable {supiOrSuci} takes the value of a SUCI, the UDM calculates the corresponding SUPI. The UDM calculates a fresh authentication vector based on the received information and the stored security information for the SUPI if 5G-AKA or EAP-AKA' is selected. Otherwise, UDM provides corresponding authentication information. |
| AuthEvents (Collection)                | /{supi}/auth-events                                   | POST                            | Create an Authentication Event  |

### 6.3.3.2 Resource: SecurityInformation

#### 6.3.3.2.1 Description

This resource represents the information that is needed together with the serving network name and the access type to calculate a fresh authentication vector. See 3GPP TS 33.501 [6].

#### 6.3.3.2.2 Resource Definition

Resource URI: {apiRoot}/nudm-ueau/v1/{supiOrSuci}/security-information

This resource shall support the resource URI variables defined in table 6.3.3.2-1.

**Table 6.3.3.2-1: Resource URI variables for this resource**

| Name       | Definition  |
|------------|---|
| apiRoot    | See clause 6.3.1  |
| supiOrSuci | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2), or Subscription Concealed Identifier (see 3GPP TS 23.003 [8]).<br><br>Pattern: "^(imsi-[0-9]{5,15}){nai-.+}[suci-(0-[0-9]{3}-[0-9]{2,3}){1-7}-+][0-9]{1,4}-(0-0-+ [a-fA-F1-9]-{1-9}){1-9}[0-9]{1}[0-9]{2}2[0-4][0-9]{25[0-5]}-[a-fA-F0-9]+).+)\$"<br><br>(See NOTE 1, NOTE 2).                                  |
| NOTE 1:    | The format for SUCI, when the corresponding SUPI is NAI-based, contains a realm that may include a "minus" character ("-"), which is also used as field separator. Given that the NAI and its realm shall conform to IETF RFC 7542 [29], the regular expression defined here allows for non-ambiguous matching of the different fields of the SUCI, even when the realm contains the "minus" character. |
| NOTE 2:    | When the SUCI corresponds to a SUPI of type IMSI, and the Null protection scheme is used, the MSIN of the IMSI (which is formatted by the UE and sent over the NAS protocol as Binary Coded Decimal, BCD) shall be formatted in the SUCI as an UTF-8 string containing all decimal digits of the MSIN; see Annex C for SUCI encoding examples.  |

#### 6.3.3.2.3 Resource Standard Methods

No Standard Methods are supported for this resource.

## 6.3.3.2.4 Resource Custom Operations

## 6.3.3.2.4.1 Overview

**Table 6.3.3.2.4.1-1: Custom operations**

| Custom operation URI | Mapped HTTP method | Description   |
|----------------------|--------------------|---|
| /generate-auth-data  | POST               | Select the authentication method and calculate a fresh AV if 5G-AKA or EAP-AKA' is selected or provides corresponding authentication information. |

## 6.3.3.2.4.2 Operation: generate-auth-data

## 6.3.3.2.4.2.1 Description

This custom operation is used by the NF service consumer (AUSF) to request authentication information data for the SUPI/SUCI from the UDM. If SUCI is provided, the UDM calculates the SUPI from the SUCI (see 3GPP TS 33.501 [6]). The UDM calculates an authentication vector taking into account the information received from the NF service consumer (AUSF) and the current representation of this resource if 5G AKA or EAP-AKA' is selected. For details see 3GPP TS 33.501 [6].

## 6.3.3.2.4.2.2 Operation Definition

This operation shall support the request data structures specified in table 6.3.3.2.4.2.2-1 and the response data structure and response codes specified in table 6.3.3.2.4.2.2-2.

**Table 6.3.3.2.4.2.2-1: Data structures supported by the POST Request Body on this resource**

| Data type                 | P | Cardinality | Description   |
|---------------------------|---|-------------|---|
| AuthenticationInfoRequest | M | 1           | Contains the serving network name and Resynchronization Information |

**Table 6.3.3.2.4.2.2-2: Data structures supported by the POST Response Body on this resource**

| Data type                | P | Cardinality | Response codes      | Description  |
|--------------------------|---|-------------|---------------------|--|
| AuthenticationInfoResult | M | 1           | 200 OK              | Upon success, a response body containing the selected authentication method and an authentication vector if 5G AKA or EAP-AKA' has been selected shall be returned   |
| ProblemDetails           | M | 1           | 404 Not Found       | The "cause" attribute shall be set to the following application error:<br>- USER_NOT_FOUND   |
| ProblemDetails           | M | 1           | 403 Forbidden       | The "cause" attribute shall be set to one of the following application errors:<br>- AUTHENTICATION_REJECTED<br>- SERVING_NETWORK_NOT_AUTHORIZED<br>- INVALID_HN_PUBLIC_KEY_IDENTIFIER<br>- INVALID_SCHEME_OUTPUT |
| ProblemDetails           | M | 1           | 501 Not Implemented | The "cause" attribute shall be set to the following application error:<br>- UNSUPPORTED_PROTECTION_SCHEME  |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

## 6.3.3.3 Resource: AuthEvents

## 6.3.3.3.1 Description

This resource represents the collection of UE authentication events.

### 6.3.3.3.2 Resource Definition

Resource URI: {apiRoot}/nudm-ueau/v1/{supi}/auth-events

This resource shall support the resource URI variables defined in table 6.3.3.3.2-1.

**Table 6.3.3.3.2-1: Resource URI variables for this resource**

| Name    | Definition  |
|---------|---|
| apiRoot | See clause 6.3.1  |
| supi    | Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2) pattern: "(imsi-[0-9]{5,15} nai-.+ .+)") |

### 6.3.3.3.3 Resource Standard Methods

#### 6.3.3.3.3.1 POST

This method shall support the URI query parameters specified in table 6.3.3.3.3.1-1.

**Table 6.3.3.3.3.1-1: URI query parameters supported by the POST method on this resource**

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

This method shall support the request data structures specified in table 6.3.3.3.3.1-2 and the response data structures and response codes specified in table 6.3.3.3.3.1-3.

**Table 6.3.3.3.3.1-2: Data structures supported by the POST Request Body on this resource**

| Data type | P | Cardinality | Description                 |
|-----------|---|-------------|-----------------------------|
| AuthEvent | M | 1           | The UE Authentication Event |

**Table 6.3.3.3.3.1-3: Data structures supported by the POST Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description  |
|--|---|-------------|----------------|--|
| AuthEvent  | O | 0..1        | 201 Created    | Upon success, a response body containing a representation of the created Authentication Event may be returned.<br><br>The HTTP response shall include a "Location" HTTP header that contains the resource URI of the created resource. |
| ProblemDetails   | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- USER_NOT_FOUND   |
| NOTE: In addition common data structures as listed in table 6.3.7-1 are supported. |   |             |                |  |

## 6.3.4 Custom Operations without associated resources

In this release of this specification, no custom operations without associated resources are defined for the Nudm\_UEAuthentication Service.

## 6.3.5 Notifications

In this release of this specification, no notifications are defined for the Nudm\_UEAuthentication Service.

## 6.3.6 Data Model

### 6.3.6.1 General

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

Table 6.3.6.1-1 specifies the structured data types defined for the Nudm\_UEAU service API. For simple data types defined for the Nudm\_UEAU service API see table 6.3.6.3.2-1.

**Table 6.3.6.1-1: Nudm\_UEAU specific Data Types**

| Data type                 | Clause defined | Description   |
|---------------------------|----------------|---|
| AuthenticationInfoRequest | 6.3.6.2.2      | Contains Serving Network Name and Resynchronization Information |
| AuthenticationInfoResult  | 6.3.6.2.3      | Contains an Authentication Vector (AV)                          |
| AvEapAkaPrime             | 6.3.6.2.4      | Contains RAND, XRES, AUTN, CK', and IK'                         |
| Av5GHeAka                 | 6.3.6.2.5      | Contains RAND, XRES*, AUTN, KAUSF                               |
| AuthEvent                 | 6.3.6.2.7      | Authentication Event  |
| ResynchronizationInfo     | 6.3.6.2.6      | Contains RAND and AUTS  |
| AuthenticationVector      | 6.3.6.2.8      |   |

Table 6.3.6.1-2 specifies data types re-used by the Nudm\_UEAU service API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nudm\_UEAU service API.

**Table 6.3.6.1-2: Nudm\_UEAU re-used Data Types**

| Data type         | Reference          | Comments                                 |
|-------------------|--------------------|--|
| ProblemDetails    | 3GPP TS 29.571 [7] | Common data type used in response bodies |
| NfInstanceId      | 3GPP TS 29.571 [7] | Network Function Instance Identifier     |
| DateTime          | 3GPP TS 29.571 [7] |  |
| SupportedFeatures | 3GPP TS 29.571 [7] | see 3GPP TS 29.500 [4] clause 6.6        |
| Supi              | 3GPP TS 29.571 [7] |  |

### 6.3.6.2 Structured data types

#### 6.3.6.2.1 Introduction

This clause defines the structures to be used in POST request / response bodies.

#### 6.3.6.2.2 Type: AuthenticationInfoRequest

**Table 6.3.6.2.2-1: Definition of type AuthenticationInfoRequest**

| Attribute name        | Data type             | P | Cardinality | Description   |
|-----------------------|-----------------------|---|-------------|---|
| servingNetworkName    | ServingNetworkName    | M | 1           | See 3GPP TS 33.501 [6] clause 6.1.1.4                     |
| resynchronizationInfo | ResynchronizationInfo | O | 0..1        | Contains RAND and AUTS; see 3GPP TS 33.501 [6] clause 7.5 |
| supportedFeatures     | SupportedFeatures     | O | 0..1        | See clause 6.3.8  |
| ausfInstanceId        | NfInstanceId          | M | 1           | NF Instance Id of the AUSF                                |

## 6.3.6.2.3 Type: AuthenticationInfoResult

**Table 6.3.6.2.3-1: Definition of type AuthenticationInfoResult**

| Attribute name       | Data type            | P | Cardinality | Description  |
|----------------------|----------------------|---|-------------|--|
| authType             | AuthType             | M | 1           | Indicates the authentication method  |
| authenticationVector | AuthenticationVector | C | 0..1        | contains an authentication vector if 5G AKA or EAP-AKA's is selected           |
| supi                 | Supi                 | C | 0..1        | SUPI shall be present if the request contained the SUCI within the request URI |
| supportedFeatures    | SupportedFeatures    | O | 0..1        | See clause 6.3.8   |

## 6.3.6.2.4 Type: AvEapAkaPrime

**Table 6.3.6.2.4-1: Definition of type AvEapAkaPrime**

| Attribute name | Data type | P | Cardinality | Description                   |
|----------------|-----------|---|-------------|-------------------------------|
| avType         | AvType    | M | 1           | Type of authentication vector |
| rand           | Rand      | M | 1           |                               |
| xres           | Xres      | M | 1           |                               |
| autn           | Autn      | M | 1           |                               |
| ckPrime        | CkPrime   | M | 1           |                               |
| ikPrime        | IkPrime   | M | 1           |                               |

## 6.3.6.2.5 Type: Av5GHeAka

**Table 6.3.6.2.5-1: Definition of type Av5GAka**

| Attribute name | Data type | P | Cardinality | Description                   |
|----------------|-----------|---|-------------|-------------------------------|
| avType         | AvType    | M | 1           | Type of authentication vector |
| rand           | Rand      | M | 1           |                               |
| xresStar       | XresStar  | M | 1           |                               |
| autn           | Autn      | M | 1           |                               |
| kauf           | Kauf      | M | 1           |                               |

## 6.3.6.2.6 Type: ResynchronizationInfo

**Table 6.3.6.2.6-1: Definition of type ResynchronizationInfo**

| Attribute name | Data type | P | Cardinality | Description |
|----------------|-----------|---|-------------|-------------|
| rand           | Rand      | M | 1           |             |
| auts           | Auts      | M | 1           |             |

## 6.3.6.2.7 Type: AuthEvent

**Table 6.3.6.2.7-1: Definition of type AuthEvent**

| Attribute name     | Data type          | P | Cardinality | Description   |
|--------------------|--------------------|---|-------------|---|
| nfInstanceId       | NfInstanceId       | M | 1           | Identifier of the NF instance where the authentication occurred |
| success            | Success            | M | 1           | true indicates success; false indicates no success              |
| timeStamp          | DateTime           | M | 1           | time stamp of the authentication                                |
| authType           | AuthType           | M | 1           | string<br>Authentication Type ("EAP_AKA_PRIME" or "5G_AKA")     |
| servingNetworkName | ServingNetworkName | M | 1           | See 3GPP TS 33.501 [6] clause 6.1.1.4                           |

6.3.6.2.8 Type: AuthenticationVector

**Table 6.3.6.2.8-1: Definition of type AuthenticationVector as a list of alternatives**

| Data type     | Cardinality | Description |
|---------------|-------------|-------------|
| AvEapAkaPrime | 1           |             |
| Av5GHeAka     | 1           |             |

6.3.6.3 Simple data types and enumerations

6.3.6.3.1 Introduction

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

6.3.6.3.2 Simple data types

The simple data types defined in table 6.3.6.3.2-1 shall be supported.

**Table 6.3.6.3.2-1: Simple data types**

| Type Name          | Type Definition | Description  |
|--------------------|-----------------|--|
| Autn               | string          | pattern: "[A-Fa-f0-9]{32}"                         |
| Auts               | string          | pattern: "[A-Fa-f0-9]{28}"                         |
| CkPrime            | string          | pattern: "[A-Fa-f0-9]{32}"                         |
| IkPrime            | string          | pattern: "[A-Fa-f0-9]{32}"                         |
| Kausf              | string          | pattern: "[A-Fa-f0-9]{64}"                         |
| Rand               | string          | pattern: "[A-Fa-f0-9]{32}"                         |
| ServingNetworkName | string          | See 3GPP TS 33.501 [6] clause 6.1.1.4              |
| Success            | boolean         | true indicates success, false indicates no success |
| Xres               | string          | pattern: "[A-Fa-f0-9]{8,32}"                       |
| XresStar           | string          | pattern: "[A-Fa-f0-9]{32}"                         |

6.3.6.3.3 Enumeration: AuthType

**Table 6.3.6.3.3-1: Enumeration AuthType**

| Enumeration value | Description  |
|-------------------|--|
| "EAP_AKA_PRIME"   | EAP-AKA'   |
| "5G_AKA"          | 5G AKA   |
| "EAP_TLS"         | EAP-TLS. See NOTE  |
| NOTE:             | EAP-TLS is described in the Informative Annex B of 3GPP TS 33.501 [6] and is not mandatory to support. |

6.3.6.3.4 Enumeration: AvType

**Table 6.3.6.3.4-1: Enumeration AvType**

| Enumeration value | Description |
|-------------------|-------------|
| "5G_HE_AKA"       |             |
| "EAP_AKA_PRIME"   |             |



## 6.3.7 Error Handling

### 6.3.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

### 6.3.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

### 6.3.7.3 Application Errors

The common application errors defined in the Table 5.2.7.2-1 in 3GPP TS 29.500 [4] may also be used for the Nudm\_UEAuthentication service. The following application errors listed in Table 6.3.7.3-1 are specific for the Nudm\_UEAuthentication service.

**Table 6.3.7.3-1: Application errors**

| Application Error                | HTTP status code    | Description  |
|----------------------------------|---------------------|--|
| AUTHENTICATION_REJECTED          | 403 Forbidden       | The user is cannot be authenticated with this authentication method e.g. only SIM data available |
| SERVING_NETWORK_NOT_AUTHORIZED   | 403 Forbidden       | The requesting network is not authorized to request UE authentication information.               |
| USER_NOT_FOUND                   | 404 Not Found       | The user does not exist in the HPLMN   |
| UNSUPPORTED_PROTECTION_SCHEME    | 501 Not implemented | The received protection scheme is not supported by HPLMN   |
| INVALID_HN_PUBLIC_KEY_IDENTIFIER | 403 Forbidden       | Invalid HN public key identifier received  |
| INVALID_SCHEME_OUTPUT            | 403 Forbidden       | SUCI cannot be decrypted with received data  |

## 6.3.8 Feature Negotiation

The optional features in table 6.3.8-1 are defined for the Nudm\_UEAU API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

**Table 6.3.8-1: Supported Features**

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

## 6.3.9 Security

As indicated in 3GPP TS 33.501 [6] and 3GPP TS 29.500 [4], the access to the Nudm\_UEAU API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [18]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [19]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nudm\_UEAU API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [19], 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 Nudm\_UEAU service.

The Nudm\_UEAU API defines a single scope "nudm-ueau" for OAuth2 authorization (as specified in 3GPP TS 33.501 [6]) for the entire API, and it does not define any additional scopes at resource or operation level.

## 6.4 Nudm\_EventExposure Service API

### 6.4.1 API URI

URIs of this API shall have the following root:

```
{apiRoot}/{apiName}/{apiVersion}/
```

where "apiRoot" is defined in clause 4.4.1 of 3GPP TS 29.501 [5], the "apiName" shall be set to "nudm-ee" and the "apiVersion" shall be set to "v1" for the current version of this specification.

### 6.4.2 Usage of HTTP

#### 6.4.2.1 General

HTTP/2, as defined in IETF RFC 7540 [13], 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].

HTTP messages and bodies for the Nudm\_EE service shall comply with the OpenAPI [14] specification contained in Annex A5.

#### 6.4.2.2 HTTP standard headers

##### 6.4.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

##### 6.4.2.2.2 Content type

The following content types shall be supported:

JSON, as defined in IETF RFC 8259 [15], signalled by the content type "application/json".

The Problem Details JSON Object (IETF RFC 7807 [16]) signalled by the content type "application/problem+json"

JSON Patch (IETF RFC 6902 [32]). The use of the JSON Patch format in a HTTP request body shall be signalled by the content type "application/json-patch+json".

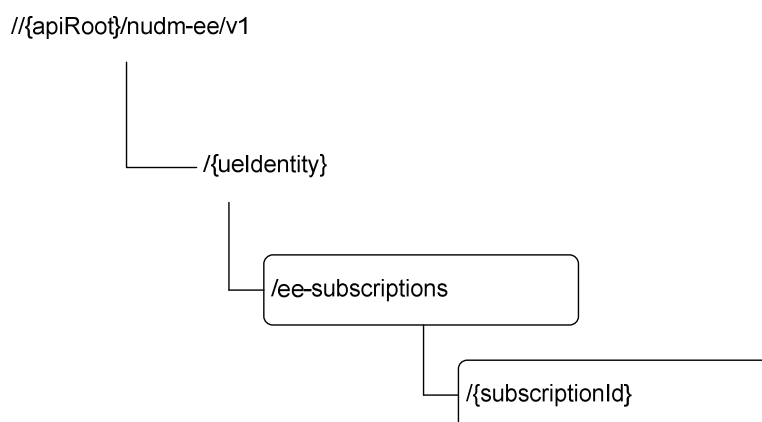
#### 6.4.2.3 HTTP custom headers

##### 6.4.2.3.1 General

The usage of HTTP custom headers shall be supported as specified in clause 5.2.3 of 3GPP TS 29.500 [4].

## 6.4.3 Resources

### 6.4.3.1 Overview



**Figure 6.4.3.1-1: Resource URI structure of the Nudm\_EE API**

Table 6.4.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 6.4.3.1-1: Resources and methods overview**

| Resource name<br>(Archetype)          | Resource URI   | HTTP<br>method<br>or<br>custom<br>operation | Description  |
|---------------------------------------|--|---|--|
| EeSubscriptions<br>(Collection)       | <code>/{ueIdentity}/ee-subscriptions</code>                  | POST  | Create a subscription  |
| Individual subscription<br>(Document) | <code>/{ueIdentity}/ee-subscriptions/{subscriptionId}</code> | PATCH                                       | Update the subscription identified by <code>{subscriptionId}</code>                    |
|                                       |  | DELETE                                      | Delete the subscription identified by <code>{subscriptionId}</code> , i.e. unsubscribe |

### 6.4.3.2 Resource: EeSubscriptions

#### 6.4.3.2.1 Description

This resource is used to represent subscriptions to notifications.

#### 6.4.3.2.2 Resource Definition

Resource URI: `{apiRoot}/nudm-ee/v1/{ueIdentity}/ee-subscriptions`

This resource shall support the resource URI variables defined in table 6.4.3.2.2-1.

**Table 6.4.3.2.2-1: Resource URI variables for this resource**

| Name        | Definition   |
|-------------|--|
| apiRoot     | See clause 6.4.1   |
| uelidentity | <p>Represents a single UE or a group of UEs or any UE.</p> <ul style="list-style-type: none"> <li>- If representing a single UE, this parameter shall contain the Generic Public Subscription Identifier (see 3GPP TS 23.501 [2] clause 5.9.8)<br/>pattern: "<code>^(msisdn-[0-9]{5,15} extid-[^@]+@[^@]+.+)\$</code>"</li> <li>- If representing a group of UEs, this parameter shall contain the External GroupId.<br/>pattern: "<code>^extgroupid-[^@]+@[^@]+\$</code>"</li> <li>- If representing any UE, this parameter shall contain "anyUE".<br/>pattern: "<code>^anyUES\$</code>"</li> </ul> |

### 6.4.3.2.3 Resource Standard Methods

#### 6.4.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.4.3.2.3.1-1.

**Table 6.4.3.2.3.1-1: URI query parameters supported by the POST method on this resource**

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

This method shall support the request data structures specified in table 6.4.3.2.3.1-2 and the response data structures and response codes specified in table 6.4.3.2.3.1-3.

**Table 6.4.3.2.3.1-2: Data structures supported by the POST Request Body on this resource**

| Data type      | P | Cardinality | Description                            |
|----------------|---|-------------|--|
| EeSubscription | M | 1           | The subscription that is to be created |

**Table 6.4.3.2.3.1-3: Data structures supported by the POST Response Body on this resource**

| Data type  | P | Cardinality | Response codes      | Description  |
|--|---|-------------|---------------------|--|
| CreatedEeSubscription  | M | 1           | 201 Created         | <p>Upon success, a response body containing a representation of the created Individual subscription resource shall be returned.</p> <p>The HTTP response shall include a "Location" HTTP header that contains the resource URI of the created resource. When stateless UDM is deployed, the stateless UDM may use an FQDN identifying the UDM group to which the UDM belongs as the host part of the resource URI.</p> |
| ProblemDetails   | M | 1           | 403 Forbidden       | <p>The "cause" attribute shall be set to the following application error:<br/>- MONITORING_NOT_ALLOWED</p>   |
| ProblemDetails   | M | 1           | 404 Not Found       | <p>The "cause" attribute shall be set to the following application error:<br/>- USER_NOT_FOUND</p>   |
| ProblemDetails   | M | 1           | 501 Not Implemented | <p>The "cause" attribute shall be set to one of the following application errors:<br/>- UNSUPPORTED_MONITORING_EVENT_TYPE<br/>- UNSUPPORTED_MONITORING_REPORT_OPTIONS</p>  |
| NOTE: In addition common data structures as listed in table 6.4.7-1 are supported. |   |             |                     |  |

NOTE: In the scenario of stateless UDM deployment, it is assumed that stateless UDMs are organized into several UDM groups, and for each UDM group an FQDN can be allocated.

### 6.4.3.3 Resource: Individual subscription

#### 6.4.3.3.1 Resource Definition

Resource URI: {apiRoot}/nudm-ee/v1/{ueIdentity}/ee-subscriptions/{subscriptionId}

This resource shall support the resource URI variables defined in table 6.4.3.3.1-1.

**Table 6.4.3.3.1-1: Resource URI variables for this resource**

| Name           | Definition   |
|----------------|--|
| apiRoot        | See clause 6.1.1   |
| ueIdentity     | Represents a single UE or a group of UEs or any UE.<br>- If representing a single UE, this parameter shall contain the Generic Public Subscription Identifier (see 3GPP TS 23.501 [2] clause 5.9.8)<br>pattern: "^(\msisdn-[0-9]{5,15} extid-[^\@]+\@[^\@]+\.\+)\$"<br>- If representing a group of UEs, this parameter shall contain the External GroupId.<br>pattern: "^extgroupid-[^\@]+\@[^\@]+\.\$"<br>- If representing any UE, this parameter shall contain "anyUE".<br>pattern: "^anyUE\$" |
| subscriptionId | The subscriptionId identifies an individual subscription to notifications. The value is allocated by the UDM during creation of the Subscription resource.   |

#### 6.4.3.3.2 Resource Standard Methods

##### 6.4.3.3.2.1 DELETE

This method shall support the URI query parameters specified in table 6.4.3.3.2.1-1.

**Table 6.4.3.3.1-1: URI query parameters supported by the DELETE method on this resource**

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

This method shall support the request data structures specified in table 6.4.3.3.2.1-2 and the response data structures and response codes specified in table 6.4.3.3.2.1-3.

**Table 6.4.3.3.2.1-2: Data structures supported by the Delete Request Body on this resource**

| Data type | P | Cardinality | Description                      |
|-----------|---|-------------|----------------------------------|
| n/a       |   |             | The request body shall be empty. |

**Table 6.4.3.3.2.1-3: Data structures supported by the DELETE Response Body on this resource**

| Data type  | P | Cardinality | Response codes | Description   |
|--|---|-------------|----------------|---|
| n/a  |   |             | 204 No Content | Upon success, an empty response body shall be returned. |
| NOTE: In addition common data structures as listed in table 6.4.7-1 are supported. |   |             |                |   |

##### 6.4.3.3.2.2 PATCH

This method shall support the URI query parameters specified in table 6.4.3.3.2.2-1.

**Table 6.4.3.3.2.2-1: URI query parameters supported by the PATCH method on this resource**

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

This method shall support the request data structures specified in table 6.4.3.3.2.2-2 and the response data structures and response codes specified in table 6.4.3.3.2.2-3.

**Table 6.4.3.3.2.2-2: Data structures supported by the PATCH Request Body on this resource**

| Data type        | P | Cardinality | Description  |
|------------------|---|-------------|--|
| array(PatchItem) | M | 1..N        | Items describe the modifications to the Event Subscription |

**Table 6.4.3.3.2.2-3: Data structures supported by the PATCH Response Body on this resource**

| Data type      | P | Cardinality | Response codes | Description  |
|----------------|---|-------------|----------------|--|
| n/a            |   |             | 204 No Content | Upon success, an empty response body shall be returned.  |
| ProblemDetails | M | 1           | 404 Not Found  | The resource corresponding to the SubscriptionId can't be found.<br><br>The "cause" attribute shall be set to:<br>- SUBSCRIPTION_NOT_FOUND |
|                | M | 1           | 403 Forbidden  | One or more attributes are not allowed to be modified.<br><br>The "cause" attribute shall be set to:<br>- MODIFY_NOT_ALLOWED               |

NOTE: In addition common data structures as listed in table 6.4.6.1-2 are supported.

## 6.4.4 Custom Operations without associated resources

In this release of this specification, no custom operations without associated resources are defined for the Nudm\_EventExposure Service.

## 6.4.5 Notifications

### 6.4.5.1 General

This clause will specify the use of notifications and corresponding protocol details if required for the specific service. When notifications are supported by the API, it will include a reference to the general description of notifications support over the 5G SBIs specified in TS 29.500 / TS 29.501.

### 6.4.5.2 Event Occurrence Notification

The POST method shall be used for Event Occurrence Notifications and the URI shall be as provided during the subscription procedure.

Resource URI: {callbackReference}

Support of URI query parameters is specified in table 6.4.5.2-1.

**Table 6.4.5.2-1: URI query parameters supported by the POST method**

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

Support of request data structures is specified in table 6.4.5.2-2 and of response data structures and response codes is specified in table 6.4.5.2-3.

**Table 6.4.5.2-2: Data structures supported by the POST Request Body**

| Data type               | P | Cardinality | Description   |
|-------------------------|---|-------------|---|
| array(MonitoringReport) | M | 1..N        | A list of MonitoringReports each of which contains information regarding the occurred event |

**Table 6.4.5.2-3: Data structures supported by the POST Response Body**

| Data type      | P | Cardinality | Response codes | Description   |
|----------------|---|-------------|----------------|---|
| n/a            |   |             | 204 No Content | Upon success, an empty response body shall be returned.                                       |
| ProblemDetails | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- CONTEXT_NOT_FOUND |

NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.

## 6.4.6 Data Model

### 6.4.6.1 General

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

Table 6.4.6.2-1 specifies the data types defined for the Nudm\_EE service API.

**Table 6.4.6.1-1: Nudm\_EE specific Data Types**

| Data type                        | Clause defined | Description                     |
|----------------------------------|----------------|---------------------------------|
| EeSubscription                   | 6.4.6.2.2      | A subscription to Notifications |
| MonitoringConfiguration          | 6.4.6.2.3      | Monitoring Configuration        |
| MonitoringReport                 | 6.4.6.2.4      | Monitoring Report               |
| Report                           | 6.4.6.2.5      |                                 |
| ReportingOptions                 | 6.4.6.2.6      |                                 |
| ChangeOfSupiPeiAssociationReport | 6.4.6.2.7      |                                 |
| RoamingStatusReport              | 6.4.6.2.8      |                                 |
| CreatedEeSubscription            | 6.4.6.2.9      |                                 |
| LocationReportingConfiguration   | 6.4.6.2.10     |                                 |

Table 6.4.6.1-2 specifies data types re-used by the Nudm\_EE service API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nudm\_EE service API.

**Table 6.4.6.1-2: Nudm\_EE re-used Data Types**

| Data type         | Reference          | Comments                          |
|-------------------|--------------------|-----------------------------------|
| Uri               | 3GPP TS 29.571 [7] | Uniform Resource Identifier       |
| SupportedFeatures | 3GPP TS 29.571 [7] | see 3GPP TS 29.500 [4] clause 6.6 |
| DateTime          | 3GPP TS 29.571 [7] |                                   |
| Pei               | 3GPP TS 29.571 [7] |                                   |
| PlmnId            | 3GPP TS 29.571 [7] |                                   |
| Gpsi              | 3GPP TS 29.571 [7] |                                   |

### 6.4.6.2 Structured data types

#### 6.4.6.2.1 Introduction

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

## 6.4.6.2.2 Type: EeSubscription

**Table 6.4.6.2.2-1: Definition of type EeSubscription**

| Attribute name           | Data type                     | P | Cardinality | Description  |
|--------------------------|-------------------------------|---|-------------|--|
| callbackReference        | Uri                           | M | 1           | URI provided by the NF service consumer to receive notifications   |
| monitoringConfigurations | map(Monitoring Configuration) | M | 1..N        | A map (list of key-value pairs where referenceld converted from integer to string serves as key; see clause 6.4.6.3.2) of MonitoringConfigurations; see clause 6.4.6.2.3   |
| reportingOptions         | ReportingOptions              | O | 0..1        | This IE may be included if the NF service consumer wants to describe how the reports of the event to be generated.   |
| supportedFeatures        | SupportedFeatures             | O | 0..1        | See clause 6.4.8   |
| subscriptionId           | string                        | C | 0..1        | This attribute shall be present if the EeSubscription is sent in a GET response message on Nudr. It identifies the individual EeSubscription stored in the UDR and may be used by the UDM to delete an EeSubscription. |

## 6.4.6.2.3 Type: MonitoringConfiguration

**Table 6.4.6.2.3-1: Definition of type MonitoringConfiguration**

| Attribute name                 | Data type                      | P | Cardinality | Description  |
|--------------------------------|--------------------------------|---|-------------|--|
| eventType                      | EventType                      | M | 1           | String; see clause 6.4.6.3.3   |
| immediateFlag                  | boolean                        | O | 0..1        | Indicates if an immediate event report in the subscription response indicating current value / status of the event is required or not. If the flag is not present then immediate reporting shall not be done.                                  |
| locationReportingConfiguration | LocationReportingConfiguration | C | 0..1        | shall be present if eventType is "LOCATION_REPORTING"  |
| associationType                | AssociationType                | O | 0..1        | If the eventType indicates CHANGE_OF_SUPI_PEI_ASSOCIATION, this parameter may be included to identify whether the IMSI-IMEI or IMSI-IMEISV association shall be detected.<br>If the flag is not present, then a value of IMEISV shall be used. |

## 6.4.6.2.4 Type: MonitoringReport

**Table 6.4.6.2.4-1: Definition of type MonitoringReport**

| Attribute name | Data type   | P | Cardinality | Description   |
|----------------|-------------|---|-------------|---|
| referenceld    | Referenceld | M | 1           |   |
| eventType      | EventType   | M | 1           | String; see clause 6.4.6.3.3<br>only the following values are allowed:<br>"UE_REACHABILITY_FOR_SMS"<br>"CHANGE_OF_SUPI_PEI_ASSOCIATION"<br>"ROAMING_STATUS" |
| report         | Report      | C | 0..1        | Shall be present if eventType is "CHANGE_OF_SUPI_PEI_ASSOCIATION" or "ROAMING_STATUS"   |
| gpsi           | Gpsi        | C | 0..1        | shall be present if the report is associated to exposure subscriptions for a group of UEs or any UE.  |
| timeStamp      | DateTime    | M | 1           | Point in time at which the event occurred   |



## 6.4.6.2.5 Type: Report

**Table 6.4.6.2.5-1: Definition of type Report as a list of alternatives**

| Data type                        | Cardinality | Description |
|----------------------------------|-------------|-------------|
| ChangeOfSupiPeiAssociationReport | 1           |             |
| RoamingStatusReport              | 1           |             |

## 6.4.6.2.6 Type: ReportingOptions

**Table 6.4.6.2.6-1: Definition of type ReportingOptions**

| Attribute name  | Data type       | P | Cardinality | Description  |
|-----------------|-----------------|---|-------------|--|
| maxNumOfReports | MaxNumOfReports | O | 0..1        | Maximum number of reports. If the event subscription is for a group of UEs, this parameter shall be applied to each individual member UE of the group.   |
| expiry          | DateTime        | C | 0..1        | This IE shall be included in an event subscription response, if, based on operator policy, the UDM needs to include an expiry time, and may be included in an event subscription request. When present, this IE shall represent the time at which monitoring shall cease and the subscription becomes invalid. If the maxNumOfReports included in an event subscription response is 1 and if an event report is included in the subscription response then the value of the expiry included in the response shall be an immediate timestamp. |

## 6.4.6.2.7 Type: ChangeOfSupiPeiAssociationReport

**Table 6.4.6.2.7-1: Definition of type ChangeOfSupiPeiAssociationReport**

| Attribute name | Data type | P | Cardinality | Description |
|----------------|-----------|---|-------------|-------------|
| newPei         | Pei       | M | 1           | the new PEI |

## 6.4.6.2.8 Type: RoamingStatusReport

**Table 6.4.6.2.8-1: Definition of type RoamingStatusReport**

| Attribute name | Data type | P | Cardinality | Description   |
|----------------|-----------|---|-------------|---|
| roaming        | boolean   | M | 1           | True: The new serving PLMN is different from the HPLMN;<br>False: The new serving PLMN is the HPLMN |
| newServingPlmn | PlmnId    | M | 1           | the new Serving PLMN  |

## 6.4.6.2.9 Type: CreatedEeSubscription

**Table 6.4.6.2.9-1: Definition of type CreatedEeSubscription**

| Attribute name | Data type                | P | Cardinality | Description   |
|----------------|--------------------------|---|-------------|---|
| eeSubscription | EeSubscription           | M | 1           | This IE shall contain the representation of the created event subscription.   |
| numberOfUes    | UInteger                 | C | 0..1        | This IE shall be included if the event subscription is for a group of UEs. When present, this IE shall represent the number of UEs in the group.                        |
| eventReports   | array(Monitoring Report) | O | 1..N        | This IE when present, shall contain the status of events that are requested for immediate reporting as well, if those events are available at the time of subscription. |

## 6.4.6.2.10 Type: LocationReportingConfiguration

**Table 6.4.6.2.10-1: Definition of type LocationReportingConfiguration**

| Attribute name  | Data type        | P | Cardinality | Description  |
|-----------------|------------------|---|-------------|--|
| currentLocation | boolean          | M | 1           | When true: Indicates that current location is requested.<br>When false: Indicates that last known location is requested.   |
| oneTime         | boolean          | C | 0..1        | When true: Indicates that a single report is requested.<br>When false or absent: Indicates that continuous reporting is requested.<br>Shall not be absent or set to false when currentLocation is false. |
| accuracy        | LocationAccuracy | C | 0..1        | Indicates whether Cell-level or TA-level accuracy is requested.<br>Shall be present if continuous reporting is requested   |

## 6.4.6.3 Simple data types and enumerations

## 6.4.6.3.1 Introduction

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

## 6.4.6.3.2 Simple data types

The simple data types defined in table 6.4.6.3.2-1 shall be supported.

**Table 6.4.6.3.2-1: Simple data types**

| Type Name       | Type Definition | Description   |
|-----------------|-----------------|---|
| MaxNumOfReports | integer         | Maximum number of reports.<br>Minimum: 1  |
| Referenceld     | integer         | Referenceld is used as key in a map of MonitoringConfigurations;<br>see clause 6.4.6.2.2. |

## 6.4.6.3.3 Enumeration: EventType

**Table 6.4.6.3.3-1: Enumeration EventType**

| Enumeration value                | Description                    |
|----------------------------------|--------------------------------|
| "LOSS_OF_CONNECTIVITY"           | Loss of connectivity           |
| "UE_REACHABILITY_FOR_DATA"       | UE reachability for data       |
| "UE_REACHABILITY_FOR_SMS"        | UE reachability for SMS        |
| "LOCATION_REPORTING"             | Location Reporting             |
| "CHANGE_OF_SUPI_PEI_ASSOCIATION" | Change of SUPI-PEI association |
| "ROAMING_STATUS"                 | Roaming Status                 |
| "COMMUNICATION_FAILURE"          | Communication Failure          |
| "AVAILABILITY_AFTER_DDN_FAILURE" | Availability after DDN failure |

## 6.4.6.3.4 Enumeration: LocationAccuracy

**Table 6.4.6.3.4-1: Enumeration LocationAccuracy**

| Enumeration value | Description                      |
|-------------------|----------------------------------|
| "CELL_LEVEL"      | change of cell shall be reported |
| "TA_LEVEL"        | change of TA shall be reported   |

## 6.4.6.3.5 Enumeration: AssociationType

**Table 6.4.6.3.5-1: Enumeration AssociationType**

| Enumeration value | Description  |
|-------------------|--|
| "IMEI_CHANGE"     | The event shall be reported if the association between IMSI and IMEI has changed; if only the Software Version (SV) has changed, no event shall be reported. |
| "IMEISV_CHANGE"   | The event shall be reported if the association between IMSI and IMEI, or SV, or both, has changed (this includes the case where only the SV has changed).    |

## 6.4.7 Error Handling

## 6.4.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

## 6.4.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

## 6.4.7.3 Application Errors

The common application errors defined in the Table 5.2.7.2-1 in 3GPP TS 29.500 [4] may also be used for the Nudm\_EventExposure service. The following application errors listed in Table 6.4.7.3-1 are specific for the Nudm\_EventExposure service.

Table 6.4.7.3-1: Application errors

| Application Error                     | HTTP status code    | Description   |
|---------------------------------------|---------------------|---|
| MONITORING_NOT_ALLOWED                | 403 Forbidden       | The subscriber does not have the necessary subscription for monitoring with the requested Event Type. |
| USER_NOT_FOUND                        | 404 Not Found       | The user does not exist   |
| CONTEXT_NOT_FOUND                     | 404 Not Found       | It is used when no corresponding context exists.  |
| UNSUPPORTED_MONITORING_EVENT_TYPE     | 501 Not Implemented | The monitoring configuration contains unsupported event type.   |
| UNSUPPORTED_MONITORING_REPORT_OPTIONS | 501 Not Implemented | The monitoring configuration contains unsupported report options.                                     |

## 6.4.8 Feature Negotiation

The optional features in table 6.4.8-1 are defined for the Nudm\_EE API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

**Table 6.4.8-1: Supported Features**

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

## 6.4.9 Security

As indicated in 3GPP TS 33.501 [6] and 3GPP TS 29.500 [4], the access to the Nudm\_EE API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [18]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [19]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nudm\_EE API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [19], 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 Nudm\_EE service.

The Nudm\_EE API defines a single scope "nudm-ee" for OAuth2 authorization (as specified in 3GPP TS 33.501 [6]) for the entire API, and it does not define any additional scopes at resource or operation level.

## 6.5 Nudm\_ParameterProvision Service API

### 6.5.1 API URI

URIs of this API shall have the following root:

```
{apiRoot}/{apiName}/{apiVersion}/
```

where "apiRoot" is defined in clause 4.4.1 of 3GPP TS 29.501 [5], the "apiName" shall be set to "nudm-pp" and the "apiVersion" shall be set to "v1" for the current version of this specification.

### 6.5.2 Usage of HTTP

#### 6.5.2.1 General

HTTP/2, as defined in IETF RFC 7540 [13], 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].

HTTP messages and bodies for the Nudm\_PP service shall comply with the OpenAPI [14] specification contained in Annex A6.

#### 6.5.2.2 HTTP standard headers

##### 6.5.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

##### 6.5.2.2.2 Content type

The following content types shall be supported:

JSON, as defined in IETF RFC 8259 [15], signalled by the content type "application/json".

The Problem Details JSON Object (IETF RFC 7807 [16] signalled by the content type "application/problem+json"

JSON Merge Patch, as defined in IETF RFC 7396 [17], signalled by the content type "application/merge-patch+json"

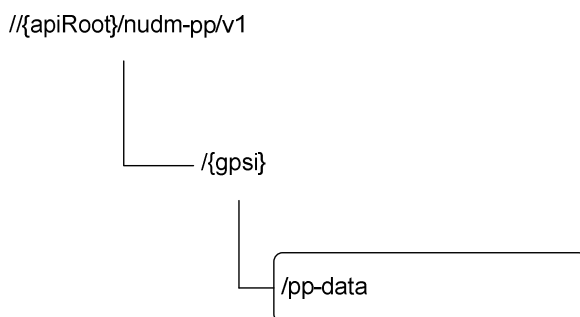
### 6.5.2.3 HTTP custom headers

#### 6.5.2.3.1 General

The usage of HTTP custom headers shall be supported as specified in clause 5.2.3 of 3GPP TS 29.500 [4].

## 6.5.3 Resources

### 6.5.3.1 Overview



**Figure 6.5.3.1-1: Resource URI structure of the Nudm\_PP API**

Table 6.5.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 6.5.3.1-1: Resources and methods overview**

| Resource name | Resource URI       | HTTP method or custom operation | Description                                  |
|---------------|--------------------|---------------------------------|--|
| PpData        | //{{gpsi}}/pp-data | PATCH                           | Modify the UE's modifiable subscription data |

### 6.5.3.2 Resource: PpData

#### 6.5.3.2.1 Description

This resource is used to represent Parameter Provisioning Data.

#### 6.5.3.2.2 Resource Definition

Resource URI: {apiRoot}/nudm-pp/v1/{gpsi}/pp-data

This resource shall support the resource URI variables defined in table 6.5.3.2.2-1.

**Table 6.5.3.2.2-1: Resource URI variables for this resource**

| Name    | Definition  |
|---------|---|
| apiRoot | See clause 6.5.1  |
| gpsi    | Represents the Generic Public Subscription Identifier (see 3GPP TS 23.501 [2] clause 5.9.8)<br>pattern: "(msisdn-[0-9]{5,15} extid-[^@]+@[^@]+.+)") |

### 6.5.3.2.3 Resource Standard Methods

#### 6.5.3.2.3.1 PATCH

This method shall support the URI query parameters specified in table 6.5.3.2.3.1-1.

**Table 6.5.3.2.3.1-1: URI query parameters supported by the PATCH method on this resource**

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

This method shall support the request data structures specified in table 6.5.3.2.3.1-2 and the response data structures and response codes specified in table 6.5.3.2.3.1-3.

**Table 6.5.3.2.3.1-2: Data structures supported by the PATCH Request Body on this resource**

| Data type | P | Cardinality | Description   |
|-----------|---|-------------|---|
| PpData    | M | 1           | The AMF registration for non 3GPP access is modified with the received information. |

**Table 6.5.3.2.3.1-3: Data structures supported by the PATCH Response Body on this resource**

| Data type      | P | Cardinality | Response codes | Description  |
|----------------|---|-------------|----------------|--|
| n/a            |   |             | 204 No Content | Upon success, an empty response body shall be returned   |
| ProblemDetails | M | 1           | 404 Not Found  | The "cause" attribute shall be set to the following application error:<br>- USER_NOT_FOUND           |
| ProblemDetails | M | 1           | 403 Forbidden  | The "cause" attribute shall be set to the following application error:<br>- MODIFICATION_NOT_ALLOWED |

NOTE: In addition common data structures as listed in table 6.2.7-1 are supported.

## 6.5.4 Custom Operations without associated resources

In this release of this specification, no custom operations without associated resources are defined for the Nudm\_ParameterProvision Service.

## 6.5.5 Notifications

In this release of this specification, no notifications are defined for the Nudm\_ParameterProvision Service.

## 6.5.6 Data Model

### 6.5.6.1 General

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

Table 6.5.6.1-1 specifies the data types defined for the Nudm\_PP service API.

**Table 6.5.6.1-1: Nudm\_PP specific Data Types**

| Data type                    | Clause defined | Description                   |
|------------------------------|----------------|-------------------------------|
| PpData                       | 6.5.6.2.2      | Parameter Provision Data      |
| CommunicationCharacteristics | 6.5.6.2.3      | Communication Characteristics |
| PpSubsRegTimer               | 6.5.6.2.4      |                               |
| PpActiveTime                 | 6.5.6.2.5      |                               |

Table 6.5.6.1-2 specifies data types re-used by the Nudm\_PP service API from other APIs, including a reference and when needed, a short description of their use within the Nudm\_PP service API.

**Table 6.5.6.1-2: Nudm\_PP re-used Data Types**

| Data type         | Reference          | Comments              |
|-------------------|--------------------|-----------------------|
| DurationSec       | 3GPP TS 29.571 [7] | Time value in seconds |
| SupportedFeatures | 3GPP TS 29.571 [7] |                       |
| NfInstanceId      | 3GPP TS 29.571 [7] |                       |
| ProblemDetails    | 3GPP TS 29.571 [7] |                       |
| Gpsi              | 3GPP TS 29.571 [7] |                       |

## 6.5.6.2 Structured data types

### 6.5.6.2.1 Introduction

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

### 6.5.6.2.2 Type: PpData

**Table 6.5.6.2.2-1: Definition of type PpData**

| Attribute name               | Data type                    | P | Cardinality | Description                   |
|------------------------------|------------------------------|---|-------------|-------------------------------|
| supportedFeatures            | SupportedFeatures            | O | 0..1        |                               |
| communicationCharacteristics | CommunicationCharacteristics | O | 0..1        | communication characteristics |

### 6.5.6.2.3 Type: CommunicationCharacteristics

**Table 6.5.6.2.3-1: Definition of type CommunicationCharacteristics**

| Attribute name  | Data type       | P | Cardinality | Description  |
|-----------------|-----------------|---|-------------|--|
| ppSubsRegTimer  | PpSubsRegTimer  | O | 0..1        | AF provisionedSubscribed periodic registration timer; nullable |
| ppActiveTime    | PpActiveTime    | O | 0..1        | AF provisioned active time; nullable                           |
| ppDIPacketCount | PpDIPacketCount | O | 0..1        | AF provisioned DL Buffering Suggested Packet Count; nullable   |

### 6.5.6.2.4 Type: PpSubsRegTimer

**Table 6.5.6.2.4-1: Definition of type PpSubsRegTimer**

| Attribute name | Data type    | P | Cardinality | Description                          |
|----------------|--------------|---|-------------|--------------------------------------|
| subsRegTimer   | DurationSec  | M | 1           | value in seconds                     |
| afInstanceId   | NfInstanceId | M | 1           | NF Instance Id of the originating AF |
| referenceld    | Referenceld  | M | 1           | Transaction Reference ID             |



## 6.5.6.2.5 Type: PpActiveTime

**Table 6.5.6.2.5-1: Definition of type PpActiveTime**

| Attribute name | Data type    | P | Cardinality | Description                          |
|----------------|--------------|---|-------------|--------------------------------------|
| activeTime     | DurationSec  | M | 1           | value in seconds                     |
| afInstanceld   | NfInstanceld | M | 1           | NF Instance Id of the originating AF |
| referenceld    | Referenceld  | M | 1           | Transaction Reference ID             |

## 6.5.6.3 Simple data types and enumerations

## 6.5.6.3.1 Introduction

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

## 6.5.6.3.2 Simple data types

The simple data types defined in table 6.5.6.3.2-1 shall be supported.

**Table 6.5.6.3.2-1: Simple data types**

| Type Name       | Type Definition | Description |
|-----------------|-----------------|-------------|
| Referenceld     | integer         |             |
| PpDIPacketCount | integer         | nullable    |

## 6.5.6.3.3 Enumeration: &lt;EnumType1&gt;

**Table 6.5.6.3.3-1: Enumeration <EnumType1>**

| Enumeration value | Description |
|-------------------|-------------|
|                   |             |

## 6.5.7 Error Handling

## 6.5.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

## 6.5.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

## 6.5.7.3 Application Errors

The common application errors defined in the Table 5.2.7.2-1 in 3GPP TS 29.500 [4] may also be used for the Nudm\_ParameterProvision service. The following application errors listed in Table 6.5.7.3-1 are specific for the Nudm\_ParameterProvision service.

The application errors defined for the Nudm\_UECM service are listed in Table 6.5.7.3-1.

**Table 6.5.7.3-1: Application errors**

| Application Error        | HTTP status code | Description  |
|--------------------------|------------------|--|
| MODIFICATION_NOT_ALLOWED | 403 Forbidden    | The subscriber does not have the necessary subscription for external parameter provisioning. |
| USER_NOT_FOUND           | 404 Not Found    | The User does not exist.   |

## 6.5.8 Feature Negotiation

The optional features in table 6.5.8-1 are defined for the Nudm\_PP API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

**Table 6.5.8-1: Supported Features**

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

## 6.5.9 Security

As indicated in 3GPP TS 33.501 [6] and 3GPP TS 29.500 [4], the access to the Nudm\_PP API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [18]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [19]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nudm\_PP API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [19], clause 5.8.2.2.

**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 Nudm\_PP service.

The Nudm\_PP API defines a single scope "nudm-pp" for OAuth2 authorization (as specified in 3GPP TS 33.501 [6]) for the entire API, 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 Nudm Service API(s). 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 the public 3GPP file server in the following locations (see clause 5B of the 3GPP TR 21.900 [30] for further information):

- <https://www.3gpp.org/ftp/Specs/archive/OpenAPI/<Release>/>, and
- <https://www.3gpp.org/ftp/Specs/<Plenary>/<Release>/OpenAPI/>.

NOTE 2: To fetch the OpenAPI specification file after CT#83 plenary meeting for Release 15 in the above links <Plenary> must be replaced with the date the CT Plenary occurs, in the form of year-month (yyyy-mm), e.g. for CT#83 meeting <Plenary> must be replaced with value "2019-03" and <Release> must be replaced with value "Rel-15".

## A.2 Nudm\_SDM API

```
openapi: 3.0.0

info:
  version: '2.0.3'
  title: 'Nudm_SDM'
  description: |
    Nudm Subscriber Data Management Service.
    © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.503 Unified Data Management Services, version 15.6.0
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.503/'

servers:
  - url: '{apiRoot}/nudm-sdm/v2'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause clause 4.4 of 3GPP TS 29.501.

security:
  - oAuth2ClientCredentials:
    - nudm-sdm
  - {}

paths:
  /{supi}:
    get:
      summary: retrieve multiple data sets
      operationId: GetDataSets
      tags:
        - Retrieval of multiple data sets
      parameters:
        - name: supi
          in: path
          description: Identifier of the UE
```

```

    required: true
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  - name: dataset-names
    in: query
    style: form
    explode: false
    description: List of dataset names
    required: true
    schema:
      $ref: '#/components/schemas/DatasetNames'
  - name: plmn-id
    in: query
    description: serving PLMN ID
    content:
      application/json:
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
  - name: supported-features
    in: query
    description: Supported Features
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
  - name: If-None-Match
    in: header
    description: Validator for conditional requests, as described in RFC 7232, 3.2
    schema:
      type: string
  - name: If-Modified-Since
    in: header
    description: Validator for conditional requests, as described in RFC 7232, 3.3
    schema:
      type: string
responses:
  '200':
    description: Expected response to a valid request
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/SubscriptionDataSets'
    headers:
      Cache-Control:
        description: Cache-Control containing max-age, as described in RFC 7234, 5.2
        schema:
          type: string
      ETag:
        description: Entity Tag, containing a strong validator, as described in RFC 7232, 2.3
        schema:
          type: string
      Last-Modified:
        description: Timestamp for last modification of the resource, as described in RFC
7232, 2.2
        schema:
          type: string
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
/{supi}/nssai:
  get:
    summary: retrieve a UE's subscribed NSSAI
    operationId: GetNSSAI
    tags:
      - Slice Selection Subscription Data Retrieval
    parameters:
      - name: supi
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      - name: supported-features

```

```

    in: query
    description: Supported Features
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
  - name: plmn-id
    in: query
    description: serving PLMN ID
    content:
      application/json:
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
  - name: If-None-Match
    in: header
    description: Validator for conditional requests, as described in RFC 7232, 3.2
    schema:
      type: string
  - name: If-Modified-Since
    in: header
    description: Validator for conditional requests, as described in RFC 7232, 3.3
    schema:
      type: string
responses:
  '200':
    description: Expected response to a valid request
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/Nssai'
    headers:
      Cache-Control:
        description: Cache-Control containing max-age, as described in RFC 7234, 5.2
        schema:
          type: string
      ETag:
        description: Entity Tag, containing a strong validator, as described in RFC 7232, 2.3
        schema:
          type: string
      Last-Modified:
        description: Timestamp for last modification of the resource, as described in RFC
7232, 2.2
        schema:
          type: string
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
/{supi}/am-data:
  get:
    summary: retrieve a UE's Access and Mobility Subscription Data
    operationId: GetAmData
    tags:
      - Access and Mobility Subscription Data Retrieval
    parameters:
      - name: supi
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      - name: supported-features
        in: query
        description: Supported Features
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      - name: plmn-id
        in: query
        description: serving PLMN ID
        content:
          application/json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
      - name: If-None-Match

```

```

    in: header
    description: Validator for conditional requests, as described in RFC 7232, 3.2
    schema:
      type: string
  - name: If-Modified-Since
    in: header
    description: Validator for conditional requests, as described in RFC 7232, 3.3
    schema:
      type: string
responses:
  '200':
    description: Expected response to a valid request
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/AccessAndMobilitySubscriptionData'
    headers:
      Cache-Control:
        description: Cache-Control containing max-age, as described in RFC 7234, 5.2
        schema:
          type: string
      ETag:
        description: Entity Tag, containing a strong validator, as described in RFC 7232, 2.3
        schema:
          type: string
      Last-Modified:
        description: Timestamp for last modification of the resource, as described in RFC
7232, 2.2
        schema:
          type: string
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
/{supi}/smf-select-data:
  get:
    summary: retrieve a UE's SMF Selection Subscription Data
    operationId: GetSmfSelData
    tags:
      - SMF Selection Subscription Data Retrieval
    parameters:
      - name: supi
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      - name: supported-features
        in: query
        description: Supported Features
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      - name: plmn-id
        in: query
        description: serving PLMN ID
        content:
          application/json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
      - name: If-None-Match
        in: header
        description: Validator for conditional requests, as described in RFC 7232, 3.2
        schema:
          type: string
      - name: If-Modified-Since
        in: header
        description: Validator for conditional requests, as described in RFC 7232, 3.3
        schema:
          type: string
    responses:
      '200':
        description: Expected response to a valid request

```

```

    content:
      application/json:
        schema:
          $ref: '#/components/schemas/SmfSelectionSubscriptionData'
    headers:
      Cache-Control:
        description: Cache-Control containing max-age, as described in RFC 7234, 5.2
        schema:
          type: string
      ETag:
        description: Entity Tag, containing a strong validator, as described in RFC 7232, 2.3
        schema:
          type: string
      Last-Modified:
        description: Timestamp for last modification of the resource, as described in RFC
7232, 2.2
        schema:
          type: string
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
    default:
      description: Unexpected error
  /{supi}/ue-context-in-smf-data:
    get:
      summary: retrieve a UE's UE Context In SMF Data
      operationId: GetUeCtxInSmfData
      tags:
        - UE Context In SMF Data Retrieval
      parameters:
        - name: supi
          in: path
          description: Identifier of the UE
          required: true
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        - name: supported-features
          in: query
          description: Supported Features
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      responses:
        '200':
          description: Expected response to a valid request
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UeContextInSmfData'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
  /{supi}/ue-context-in-smsf-data:
    get:
      summary: retrieve a UE's UE Context In SMSF Data
      operationId: GetUeCtxInSmsfData
      tags:
        - UE Context In SMSF Data Retrieval
      parameters:
        - name: supi
          in: path
          description: Identifier of the UE
          required: true
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        - name: supported-features
          in: query

```

```

    description: Supported Features
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
  responses:
    '200':
      description: Expected response to a valid request
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/UeContextInSmsfData'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
/{supi}/trace-data:
  get:
    summary: retrieve a UE's Trace Configuration Data
    operationId: GetTraceConfigData
    tags:
      - Trace Configuration Data Retrieval
    parameters:
      - name: supi
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      - name: supported-features
        in: query
        description: Supported Features
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      - name: plmn-id
        in: query
        description: serving PLMN ID
        content:
          application/json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
      - name: If-None-Match
        in: header
        description: Validator for conditional requests, as described in RFC 7232, 3.2
        schema:
          type: string
      - name: If-Modified-Since
        in: header
        description: Validator for conditional requests, as described in RFC 7232, 3.3
        schema:
          type: string
    responses:
      '200':
        description: Expected response to a valid request
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TraceDataResponse'
    headers:
      Cache-Control:
        description: Cache-Control containing max-age, as described in RFC 7234, 5.2
        schema:
          type: string
      ETag:
        description: Entity Tag, containing a strong validator, as described in RFC 7232, 2.3
        schema:
          type: string
      Last-Modified:
        description: Timestamp for last modification of the resource, as described in RFC
7232, 2.2
        schema:
          type: string
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'

```



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'404':
  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
'500':
  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  description: Unexpected error
/{supi}/sm-data:
  get:
    summary: retrieve a UE's Session Management Subscription Data
    operationId: GetSmData
    tags:
      - Session Management Subscription Data Retrieval
    parameters:
      - name: supi
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      - name: supported-features
        in: query
        description: Supported Features
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      - name: single-nssai
        in: query
        content:
          application/json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      - name: dnn
        in: query
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
      - name: plmn-id
        in: query
        content:
          application/json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
      - name: If-None-Match
        in: header
        description: Validator for conditional requests, as described in RFC 7232, 3.2
        schema:
          type: string
      - name: If-Modified-Since
        in: header
        description: Validator for conditional requests, as described in RFC 7232, 3.3
        schema:
          type: string
    responses:
      '200':
        description: Expected response to a valid request
        content:
          application/json:
            schema:
              type: array
              items:
                $ref: '#/components/schemas/SessionManagementSubscriptionData'
              minItems: 1
        headers:
          Cache-Control:
            description: Cache-Control containing max-age, as described in RFC 7234, 5.2
            schema:
              type: string
          ETag:
            description: Entity Tag, containing a strong validator, as described in RFC 7232, 2.3
            schema:
              type: string
          Last-Modified:
            description: Timestamp for last modification of the resource, as described in RFC
7232, 2.2
            schema:
              type: string
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'

```

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    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
/{supi}/sms-data:
  get:
    summary: retrieve a UE's SMS Subscription Data
    operationId: GetSmsData
    tags:
      - SMS Subscription Data Retrieval
    parameters:
      - name: supi
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      - name: supported-features
        in: query
        description: Supported Features
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      - name: plmn-id
        in: query
        content:
          application/json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
      - name: If-None-Match
        in: header
        description: Validator for conditional requests, as described in RFC 7232, 3.2
        schema:
          type: string
      - name: If-Modified-Since
        in: header
        description: Validator for conditional requests, as described in RFC 7232, 3.3
        schema:
          type: string
    responses:
      '200':
        description: Expected response to a valid request
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SmsSubscriptionData'
        headers:
          Cache-Control:
            description: Cache-Control containing max-age, as described in RFC 7234, 5.2
            schema:
              type: string
          ETag:
            description: Entity Tag, containing a strong validator, as described in RFC 7232, 2.3
            schema:
              type: string
          Last-Modified:
            description: Timestamp for last modification of the resource, as described in RFC
7232, 2.2
            schema:
              type: string
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
/{supi}/sms-mng-data:
  get:
    summary: retrieve a UE's SMS Management Subscription Data
    operationId: GetSmsMngtData
    tags:

```

```

- SMS Management Subscription Data Retrieval
parameters:
- name: supi
  in: path
  description: Identifier of the UE
  required: true
  schema:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
- name: supported-features
  in: query
  description: Supported Features
  schema:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
- name: plmn-id
  in: query
  content:
    application/json:
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
- name: If-None-Match
  in: header
  description: Validator for conditional requests, as described in RFC 7232, 3.2
  schema:
    type: string
- name: If-Modified-Since
  in: header
  description: Validator for conditional requests, as described in RFC 7232, 3.3
  schema:
    type: string
responses:
'200':
  description: Expected response to a valid request
  content:
    application/json:
      schema:
        $ref: '#/components/schemas/SmsManagementSubscriptionData'
  headers:
    Cache-Control:
      description: Cache-Control containing max-age, as described in RFC 7234, 5.2
      schema:
        type: string
    ETag:
      description: Entity Tag, containing a strong validator, as described in RFC 7232, 2.3
      schema:
        type: string
    Last-Modified:
      description: Timestamp for last modification of the resource, as described in RFC
7232, 2.2
      schema:
        type: string
'400':
  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
'404':
  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
'500':
  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  description: Unexpected error
/{supi}/sdm-subscriptions:
  post:
    summary: subscribe to notifications
    operationId: Subscribe
    tags:
      - Subscription Creation
    parameters:
      - name: supi
        in: path
        description: SUPI of the user
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  requestBody:
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/SdmSubscription'

```

```

    required: true
  responses:
    '201':
      description: Expected response to a valid request
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SdmSubscription'
      headers:
        Location:
          description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nudm-sdm/<apiVersion>/{supi}/sdm-subscriptions/{subscriptionId}'
          required: true
          schema:
            type: string
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '501':
      $ref: 'TS29571_CommonData.yaml#/components/responses/501'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
  callbacks:
    datachangeNotification:
      '{request.body#/callbackReference}':
        post:
          requestBody:
            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/ModificationNotification'
  responses:
    '204':
      description: Successful Notification response
    '307':
      description: Temporary Redirect
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
      headers:
        Location:
          description: 'Contains the new Callback URI of the target NF Service Consumer
(e.g. AMF) to which the request is redirected'
          required: true
          schema:
            type: string
    '308':
      description: Permanent Redirect
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
      headers:
        Location:
          description: 'Contains the new Callback URI of the target NF Service Consumer
(e.g. AMF) to which the request is redirected'
          required: true
          schema:
            type: string
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
/{supi}/sdm-subscriptions/{subscriptionId}:
  delete:

```

```

summary: unsubscribe from notifications
operationId: Unsubscribe
tags:
  - Subscription Deletion
parameters:
  - name: supi
    in: path
    description: SUPI of the user
    required: true
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  - name: subscriptionId
    in: path
    description: Id of the SDM Subscription
    required: true
    schema:
      type: string
responses:
  '204':
    description: Successful response
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
patch:
summary: modify the subscription
operationId: Modify
tags:
  - Subscription Modification
parameters:
  - name: supi
    in: path
    description: SUPI of the user
    required: true
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  - name: subscriptionId
    in: path
    description: Id of the SDM Subscription
    required: true
    schema:
      type: string
requestBody:
  content:
    application/merge-patch+json:
      schema:
        $ref: '#/components/schemas/SdmSubsModification'
      required: true
responses:
  '200':
    description: Expected response to a valid request
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/SdmSubscription'
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
/{gpsi}/id-translation-result:
get:
summary: retrieve a UE's SUPI
operationId: GetSupi
tags:
  - GPSI to SUPI Translation
parameters:
  - name: gpsi
    in: path

```

```

    description: Identifier of the UE
    required: true
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
  - name: supported-features
    in: query
    description: Supported Features
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
  - name: If-None-Match
    in: header
    description: Validator for conditional requests, as described in RFC 7232, 3.2
    schema:
      type: string
  - name: If-Modified-Since
    in: header
    description: Validator for conditional requests, as described in RFC 7232, 3.3
    schema:
      type: string
responses:
  '200':
    description: Expected response to a valid request
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/IdTranslationResult'
    headers:
      Cache-Control:
        description: Cache-Control containing max-age, as described in RFC 7234, 5.2
        schema:
          type: string
      ETag:
        description: Entity Tag, containing a strong validator, as described in RFC 7232, 2.3
        schema:
          type: string
      Last-Modified:
        description: Timestamp for last modification of the resource, as described in RFC
7232, 2.2
        schema:
          type: string
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  description: Unexpected error
/{supi}/am-data/sor-ack:
  put:
    summary: Nudm_Sdm Info service operation
    operationId: SorAckInfo
    tags:
      - Providing acknowledgement of Steering of Roaming
    parameters:
      - name: supi
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AcknowledgeInfo'
    responses:
      '204':
        description: Successful acknowledgement
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:

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```
      description: Unexpected error
/{supi}/am-data/upu-ack:
  put:
    summary: Nudm_Sdm Info for UPU service operation
    operationId: UpuAck
    tags:
      - Providing acknowledgement of UE Parameters Update
    parameters:
      - name: supi
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AcknowledgeInfo'
    responses:
      '204':
        description: Successful acknowledgement
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error
/shared-data:
  get:
    summary: retrieve shared data
    operationId: GetSharedData
    tags:
      - Retrieval of shared data
    parameters:
      - name: shared-data-ids
        in: query
        description: List of shared data ids
        required: true
        style: form
        explode: false
        schema:
          $ref: '#/components/schemas/SharedDataIds'
      - name: supportedFeatures
        in: query
        description: Supported Features
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      - name: If-None-Match
        in: header
        description: Validator for conditional requests, as described in RFC 7232, 3.2
        schema:
          type: string
      - name: If-Modified-Since
        in: header
        description: Validator for conditional requests, as described in RFC 7232, 3.3
        schema:
          type: string
    responses:
      '200':
        description: Expected response to a valid request
        content:
          application/json:
            schema:
              type: array
              items:
                $ref: '#/components/schemas/SharedData'
              minItems: 1
        headers:
          Cache-Control:
            description: Cache-Control containing max-age, as described in RFC 7234, 5.2
            schema:
              type: string
          ETag:
            description: Entity Tag, containing a strong validator, as described in RFC 7232, 2.3
            schema:
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        type: string
      Last-Modified:
        description: Timestamp for last modification of the resource, as described in RFC
7232, 2.2
        schema:
          type: string
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error
  /shared-data-subscriptions:
    post:
      summary: subscribe to notifications for shared data
      operationId: SubscribeToSharedData
      tags:
        - Subscription Creation for shared data
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SdmSubscription'
            required: true
      responses:
        '201':
          description: Expected response to a valid request
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/SdmSubscription'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nudm-sdm/<apiVersion>/shared-data-subscriptions/{subscriptionId}'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      default:
        description: Unexpected error
    callbacks:
      datachangeNotification:
        '{request.body#/callbackReference}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/ModificationNotification'
            responses:
              '204':
                description: Successful Notification response
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '404':
                $ref: 'TS29571_CommonData.yaml#/components/responses/404'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
            default:
              description: Unexpected error
  /shared-data-subscriptions/{subscriptionId}:
    delete:
      summary: unsubscribe from notifications for shared data
      operationId: UnsubscribeForSharedData
      tags:
        - Subscription Deletion for shared data
      parameters:

```



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- name: subscriptionId
  in: path
  description: Id of the Shared data Subscription
  required: true
  schema:
    type: string
responses:
  '204':
    description: Successful response
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
patch:
  summary: modify the subscription
  operationId: ModifySharedDataSubs
  tags:
    - Subscription Modification
  parameters:
    - name: subscriptionId
      in: path
      description: Id of the SDM Subscription
      required: true
      schema:
        type: string
  requestBody:
    content:
      application/merge-patch+json:
        schema:
          $ref: '#/components/schemas/SdmSubsModification'
    required: true
  responses:
    '200':
      description: Expected response to a valid request
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SdmSubscription'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
    default:
      description: Unexpected error

/group-data/group-identifiers:
get:
  summary: Mapping of Group Identifiers
  operationId: GetGroupIdentifiers
  tags:
    - Group Identifiers
  parameters:
    - name: ext-group-id
      in: query
      description: External Group Identifier
      required: false
      schema:
        $ref: '#/components/schemas/ExtGroupId'
    - name: int-group-id
      in: query
      description: Internal Group Identifier
      required: false
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
    - name: supported-features
      in: query
      description: Supported Features
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    - name: If-None-Match

```

```

    in: header
    description: Validator for conditional requests, as described in RFC 7232, 3.2
    schema:
      type: string
  - name: If-Modified-Since
    in: header
    description: Validator for conditional requests, as described in RFC 7232, 3.3
    schema:
      type: string
responses:
  '200':
    description: Expected response to a valid request
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/GroupIdentifiers'
    headers:
      Cache-Control:
        description: Cache-Control containing max-age, as described in RFC 7234, 5.2
        schema:
          type: string
      ETag:
        description: Entity Tag, containing a strong validator, as described in RFC 7232, 2.3
        schema:
          type: string
      Last-Modified:
        description: Timestamp for last modification of the resource, as described in RFC
7232, 2.2
        schema:
          type: string
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nudm-sdm: Access to the nudm-sdm API

  schemas:

# COMPLEX TYPES:

DatasetNames:
  type: array
  items:
    $ref: '#/components/schemas/DataSetName'
  minItems: 2
  uniqueItems: true

SubscriptionDataSets:
  type: object
  properties:
    amData:
      $ref: '#/components/schemas/AccessAndMobilitySubscriptionData'
    smfSelData:
      $ref: '#/components/schemas/SmfSelectionSubscriptionData'
    uecSmfData:
      $ref: '#/components/schemas/UeContextInSmfData'
    uecSmsfData:
      $ref: '#/components/schemas/UeContextInSmsfData'
    smsSubsData:
      $ref: '#/components/schemas/SmsSubscriptionData'
    smData:
      type: array
      items:

```

```
    $ref: '#/components/schemas/SessionManagementSubscriptionData'
    minItems: 1
  traceData:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/TraceData'
  smsMngData:
    $ref: '#/components/schemas/SmsManagementSubscriptionData'

UeContextInSmsfData:
  type: object
  properties:
    smsfInfo3GppAccess:
      $ref: '#/components/schemas/SmsfInfo'
    smsfInfoNon3GppAccess:
      $ref: '#/components/schemas/SmsfInfo'

SmsfInfo:
  type: object
  required:
    - smsfInstanceId
    - plmnId
  properties:
    smsfInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    plmnId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'

AccessAndMobilitySubscriptionData:
  type: object
  properties:
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    gpsis:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
    internalGroupIds:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
      minItems: 1
    subscribedUeAmbr:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/AmbrRm'
    nssai:
      $ref: '#/components/schemas/Nssai'
    ratRestrictions:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
    forbiddenAreas:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Area'
    serviceAreaRestriction:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/ServiceAreaRestriction'
    coreNetworkTypeRestrictions:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/CoreNetworkType'
    rfspIndex:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/RfspIndexRm'
    subsRegTimer:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSecRm'
    ueUsageType:
      $ref: '#/components/schemas/UeUsageType'
    mpsPriority:
      $ref: '#/components/schemas/MpsPriorityIndicator'
    mcsPriority:
      $ref: '#/components/schemas/McsPriorityIndicator'
    activeTime:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSecRm'
    dlPacketCount:
      $ref: '#/components/schemas/DlPacketCount'
    sorInfo:
      $ref: '#/components/schemas/SorInfo'
    upuInfo:
      $ref: '#/components/schemas/UpuInfo'
    micoAllowed:
      $ref: '#/components/schemas/MicoAllowed'
```

```

sharedAmDataIds:
  type: array
  items:
    $ref: '#/components/schemas/SharedDataId'
  minItems: 1
odbPacketServices:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/OdbPacketServices'
subscribedDnnList:
  type: array
  items:
    anyOf:
      - $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
      - $ref: 'TS29571_CommonData.yaml#/components/schemas/WildcardDnn'
nssaiInclusionAllowed:
  type: boolean
  default: false

SmfSelectionSubscriptionData:
  type: object
  properties:
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    subscribedSnssaiInfos:
      type: object
      additionalProperties:
        $ref: '#/components/schemas/SnssaiInfo'
    sharedSnssaiInfosId:
      $ref: '#/components/schemas/SharedDataId'

SnssaiInfo:
  type: object
  required:
    - dnnInfos
  properties:
    dnnInfos:
      type: array
      items:
        $ref: '#/components/schemas/DnnInfo'
      minItems: 1

DnnInfo:
  type: object
  required:
    - dnn
  properties:
    dnn:
      anyOf:
        - $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        - $ref: 'TS29571_CommonData.yaml#/components/schemas/WildcardDnn'
    defaultDnnIndicator:
      $ref: '#/components/schemas/DnnIndicator'
    lboRoamingAllowed:
      $ref: '#/components/schemas/LboRoamingAllowed'
    iwkEpsInd:
      $ref: '#/components/schemas/IwkEpsInd'
    dnnBarred:
      type: boolean

Nssai:
  type: object
  required:
    - defaultSingleNssais
  properties:
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    defaultSingleNssais:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      minItems: 1
    singleNssais:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      minItems: 1
  nullable: true

```

```

UeContextInSmfData:
  type: object
  properties:
    pduSessions:
      description: A map (list of key-value pairs where PduSessionId serves as key) of
PduSessions
      type: object
      additionalProperties:
        $ref: '#/components/schemas/PduSession'
      pgwInfo:
        type: array
        items:
          $ref: '#/components/schemas/PgwInfo'
        minItems: 1
      emergencyInfo:
        $ref: '#/components/schemas/EmergencyInfo'

EmergencyInfo:
  type: object
  oneOf:
    - required:
      - pgwFqdn
    - required:
      - pgwIpAddress
  properties:
    pgwFqdn:
      type: string
    pgwIpAddress:
      $ref: '#/components/schemas/IpAddress'
    smfInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'

PduSession:
  type: object
  required:
    - dnn
    - smfInstanceId
    - plmnId
  properties:
    dnn:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
    smfInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    plmnId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'

PgwInfo:
  type: object
  required:
    - dnn
    - pgwFqdn
  properties:
    dnn:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
    pgwFqdn:
      type: string
    plmnId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'

SessionManagementSubscriptionData:
  type: object
  required:
    - singleNssai
  properties:
    singleNssai:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
    dnnConfigurations:
      description: A map (list of key-value pairs where Dnn, or optionally the Wildcard DNN,
serves as key) of DnnConfigurations
      type: object
      additionalProperties:
        $ref: '#/components/schemas/DnnConfiguration'
    internalGroupIds:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
      minItems: 1

```

```
sharedDnnConfigurationsId:
  $ref: '#/components/schemas/SharedDataId'
odbPacketServices:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/OdbPacketServices'

DnnConfiguration:
  type: object
  required:
    - pduSessionTypes
    - sscModes
  properties:
    pduSessionTypes:
      $ref: '#/components/schemas/PduSessionTypes'
    sscModes:
      $ref: '#/components/schemas/ScsModes'
    iwkEpsInd:
      $ref: '#/components/schemas/IwkEpsInd'
    5gQosProfile:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SubscriberDefaultQos'
    sessionAmbr:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Ambr'
    3gppChargingCharacteristics:
      $ref: '#/components/schemas/3GppChargingCharacteristics'
    staticIpAddress:
      type: array
      items:
        $ref: '#/components/schemas/IpAddress'
      minItems: 1
      maxItems: 2
    upSecurity:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/UpSecurity'

IpAddress:
  type: object
  oneOf:
    - required:
        - ipv4Addr
      - required:
        - ipv6Addr
    - required:
        - ipv6Prefix
  properties:
    ipv4Addr:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
    ipv6Addr:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
    ipv6Prefix:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'

PduSessionTypes:
  type: object
  required:
    - defaultSessionType
  properties:
    defaultSessionType:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionType'
    allowedSessionTypes:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionType'
      minItems: 1

ScsModes:
  type: object
  required:
    - defaultScsMode
  properties:
    defaultScsMode:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/ScsMode'
    allowedScsModes:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ScsMode'
      minItems: 1
      maxItems: 2

SmsSubscriptionData:
  type: object
```

```
properties:
  smsSubscribed:
    $ref: '#/components/schemas/SmsSubscribed'
  sharedSmsSubsDataId:
    $ref: '#/components/schemas/SharedDataId'

SmsManagementSubscriptionData:
  type: object
  properties:
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    mtSmsSubscribed:
      type: boolean
    mtSmsBarringAll:
      type: boolean
    mtSmsBarringRoaming:
      type: boolean
    moSmsSubscribed:
      type: boolean
    moSmsBarringAll:
      type: boolean
    moSmsBarringRoaming:
      type: boolean
    sharedSmsMngDataIds:
      type: array
      items:
        $ref: '#/components/schemas/SharedDataId'
      minItems: 1

SdmSubscription:
  type: object
  required:
    - nfInstanceId
    - callbackReference
    - monitoredResourceUris
  properties:
    nfInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    implicitUnsubscribe:
      type: boolean
    expires:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
    callbackReference:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    amfServiceName:
      $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/ServiceName'
    monitoredResourceUris:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      minItems: 1
    singleNssai:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
    dnn:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
    subscriptionId:
      type: string
    plmnId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'

SdmSubsModification:
  type: object
  properties:
    expires:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
    monitoredResourceUris:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      minItems: 1

ModificationNotification:
  type: object
  required:
    - notifyItems
  properties:
    notifyItems:
      type: array
```

```

    items:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NotifyItem'
    minItems: 1

IdTranslationResult:
  type: object
  required:
    - supi
  properties:
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    supi:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
    gpsi:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'

AcknowledgeInfo:
  type: object
  required:
    - provisioningTime
  properties:
    sorMacIue:
      $ref: 'TS29509_Nausf_SorProtection.yaml#/components/schemas/SorMac'
    upuMacIue:
      $ref: 'TS29509_Nausf_UPUProtection.yaml#/components/schemas/UpuMac'
    securedPacket:
      $ref: '#/components/schemas/SecuredPacket'
    provisioningTime:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'

SorInfo:
  type: object
  properties:
    steeringContainer:
      $ref: '#/components/schemas/SteeringContainer'
    ackInd:
      $ref: 'TS29509_Nausf_SorProtection.yaml#/components/schemas/AckInd'
    sorMacIausf:
      $ref: 'TS29509_Nausf_SorProtection.yaml#/components/schemas/SorMac'
    countersor:
      $ref: 'TS29509_Nausf_SorProtection.yaml#/components/schemas/CounterSor'
    provisioningTime:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
  required:
    - ackInd
    - provisioningTime

SharedDataIds:
  type: array
  items:
    $ref: '#/components/schemas/SharedDataId'
  minItems: 1
  uniqueItems: true

UpuInfo:
  type: object
  properties:
    upuDataList:
      type: array
      items:
        $ref: 'TS29509_Nausf_UPUProtection.yaml#/components/schemas/UpuData'
      minItems: 1
    upuRegInd:
      $ref: '#/components/schemas/UpuRegInd'
    upuAckInd:
      $ref: 'TS29509_Nausf_UPUProtection.yaml#/components/schemas/UpuAckInd'
    upuMacIausf:
      $ref: 'TS29509_Nausf_UPUProtection.yaml#/components/schemas/UpuMac'
    counterUpu:
      $ref: 'TS29509_Nausf_UPUProtection.yaml#/components/schemas/CounterUpu'
    provisioningTime:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
  required:
    - upuDataList
    - upuAckInd
    - upuRegInd
    - provisioningTime

```



```

SharedData:
  type: object
  required:
    - sharedDataId
  properties:
    sharedDataId:
      $ref: '#/components/schemas/SharedDataId'
    sharedAmData:
      $ref: '#/components/schemas/AccessAndMobilitySubscriptionData'
    sharedSmsSubsData:
      $ref: '#/components/schemas/SmsSubscriptionData'
    sharedSmsMngSubsData:
      $ref: '#/components/schemas/SmsManagementSubscriptionData'
    sharedDnnConfigurations:
      type: object
      additionalProperties:
        $ref: '#/components/schemas/DnnConfiguration'
    sharedTraceData:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/TraceData'
    sharedSnssaiInfos:
      type: object
      additionalProperties:
        $ref: '#/components/schemas/SnssaiInfo'

TraceDataResponse:
  type: object
  properties:
    traceData:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/TraceData'
    sharedTraceDataId:
      $ref: '#/components/schemas/SharedDataId'

SteeringContainer:
  oneOf:
    - type: array
      items:
        $ref: 'TS29509_Nausf_SoRProtection.yaml#/components/schemas/SteeringInfo'
      minItems: 1
    - $ref: '#/components/schemas/SecuredPacket'

GroupIdentifiers:
  type: object
  properties:
    extGroupId:
      $ref: '#/components/schemas/ExtGroupId'
    intGroupId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'

# SIMPLE TYPES:

UeUsageType:
  type: integer

MpsPriorityIndicator:
  type: boolean

McsPriorityIndicator:
  type: boolean

DnnIndicator:
  type: boolean

LboRoamingAllowed:
  type: boolean

SmsSubscribed:
  type: boolean

3GppChargingCharacteristics:
  type: string

DlPacketCount:
  type: integer
  minimum: -1

MicoAllowed:

```

```

    type: boolean

  SharedDataId:
    type: string
    pattern: '^[0-9]{5,6}-.+$$'

  IwkEpsInd:
    type: boolean

  SecuredPacket:
    type: string
    format: base64

  UpuRegInd:
    type: boolean

  ExtGroupId:
    type: string
    pattern: '^extgroupid-[^@]+@[^@]+$$'

# ENUMS:

  DataSetName:
    anyOf:
      - type: string
        enum:
          - AM
          - SMF_SEL
          - UEC_SMF
          - UEC_SMSF
          - SMS_SUB
          - SM
          - TRACE
          - SMS_MNG
      - type: string

```

## A.3 Nudm\_UECM API

openapi: 3.0.0

```

info:
  version: '1.0.2'
  title: 'Nudm_UECM'
  description: |
    Nudm Context Management Service.
    © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.503 Unified Data Management Services, version 15.4.0
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.503/'

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

security:
  - oAuth2ClientCredentials:
      - nudm-uecm
  - {}

paths:
  /{ueId}/registrations/amf-3gpp-access:
    put:
      summary: register as AMF for 3GPP access
      operationId: 3GppRegistration
      tags:
        - AMF registration for 3GPP access
      parameters:
        - name: ueId

```

```

    in: path
    description: Identifier of the UE
    required: true
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  requestBody:
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/Amf3GppAccessRegistration'
    required: true
  responses:
    '201':
      description: Created
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/Amf3GppAccessRegistration'
      headers:
        Location:
          description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nudm-uecm/v1/{ueId}/registrations/amf-3gpp-access'
          required: true
          schema:
            type: string
    '200':
      description: OK
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/Amf3GppAccessRegistration'
    '204':
      description: No content
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
  callbacks:
    deregistrationNotification:
      '{request.body#/deregCallbackUri}':
        post:
          requestBody:
            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/DeregistrationData'
          responses:
            '204':
              description: Successful Notification response
            '400':
              $ref: 'TS29571_CommonData.yaml#/components/responses/400'
            '404':
              $ref: 'TS29571_CommonData.yaml#/components/responses/404'
            '500':
              $ref: 'TS29571_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29571_CommonData.yaml#/components/responses/503'
            default:
              description: Unexpected error
    pcscfRestorationNotification:
      '{request.body#/pcscfRestorationCallbackUri}':
        post:
          requestBody:
            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/PcscfRestorationNotification'
          responses:

```

```

    '204':
      description: Successful Notification response
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error

patch:
  summary: Update a parameter in the AMF registration for 3GPP access
  operationId: Update3GppRegistration
  tags:
    - Parameter update in the AMF registration for 3GPP access
  parameters:
    - name: ueId
      in: path
      description: Identifier of the UE
      required: true
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  requestBody:
    content:
      application/merge-patch+json:
        schema:
          $ref: '#/components/schemas/Amf3GppAccessRegistrationModification'
    required: true
  responses:
    '204':
      description: Expected response to a valid request
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '422':
      description: Unprocessable Request
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error

get:
  summary: retrieve the AMF registration for 3GPP access information
  operationId: Get3GppRegistration
  tags:
    - AMF 3Gpp-access Registration Info Retrieval
  parameters:
    - name: ueId
      in: path
      description: Identifier of the UE
      required: true
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/VarUeId'
    - name: supported-features
      in: query
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
  responses:
    '200':
      description: Expected response to a valid request
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/Amf3GppAccessRegistration'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '403':

```

```

    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error

/{ueId}/registrations/amf-non-3gpp-access:
  put:
    summary: register as AMF for non-3GPP access
    operationId: Non3GppRegistration
    tags:
      - AMF registration for non-3GPP access
    parameters:
      - name: ueId
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AmfNon3GppAccessRegistration'
      required: true
    responses:
      '201':
        description: Created
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AmfNon3GppAccessRegistration'
        headers:
          Location:
            description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nudm-uecm/v1/{ueId}/registrations/amf-non-3gpp-access'
            required: true
            schema:
              type: string
      '200':
        description: OK
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AmfNon3GppAccessRegistration'
      '204':
        description: No Content
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error
    callbacks:
      deregistrationNotification:
        '{request.body#/deregCallbackUri}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/DeregistrationData'
            responses:
              '204':
                description: Successful Notification response
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'

```

```

    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
pcscfRestorationNotification:
  '{request.body#/pcscfRestorationCallbackUri}':
    post:
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/PcscfRestorationNotification'
      responses:
        '204':
          description: Successful Notification response
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error
patch:
  summary: update a parameter in the AMF registration for non-3GPP access
  operationId: UpdateNon3GppRegistration
  tags:
    - Parameter update in the AMF registration for non-3GPP access
  parameters:
    - name: ueId
      in: path
      description: Identifier of the UE
      required: true
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  requestBody:
    content:
      application/merge-patch+json:
        schema:
          $ref: '#/components/schemas/AmfNon3GppAccessRegistrationModification'
      required: true
  responses:
    '204':
      description: Expected response to a valid request
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '422':
      description: Unprocessable Request
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
get:
  summary: retrieve the AMF registration for non-3GPP access information
  operationId: GetNon3GppRegistration
  tags:
    - AMF non-3GPP-access Registration Info Retrieval
  parameters:
    - name: ueId
      in: path
      description: Identifier of the UE
      required: true
      schema:

```

```

    $ref: 'TS29571_CommonData.yaml#/components/schemas/VarUeId'
  - name: supported-features
    in: query
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
responses:
  '200':
    description: Expected response to a valid request
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/AmfNon3GppAccessRegistration'
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '403':
    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  description: Unexpected error

/{ueId}/registrations/smf-registrations/{pduSessionId}:
  put:
    summary: register as SMF
    operationId: Registration
    tags:
      - SMF SmfRegistration
    parameters:
      - name: ueId
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      - name: pduSessionId
        in: path
        description: Identifier of the PDU session
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SmfRegistration'
      required: true
    responses:
      '201':
        description: Created
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SmfRegistration'
        headers:
          Location:
            description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nudm-uecm/v1/{ueId}/registrations/smf-registrations/{pduSessionId}'
            required: true
            schema:
              type: string
      '200':
        description: Expected response to a valid request
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SmfRegistration'
      '204':
        description: No content
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'

```

```

'500':
  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  description: Unexpected error
callbacks:
  pcscfRestorationNotification:
    '{request.body#/pcscfRestorationCallbackUri}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PcscfRestorationNotification'
        responses:
          '204':
            description: Successful Notification response
          '400':
            $ref: 'TS29571_CommonData.yaml#/components/responses/400'
          '404':
            $ref: 'TS29571_CommonData.yaml#/components/responses/404'
          '500':
            $ref: 'TS29571_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error

delete:
  summary: delete an SMF registration
  operationId: SmfDeregistration
  tags:
    - SMF Deregistration
  parameters:
    - name: ueId
      in: path
      description: Identifier of the UE
      required: true
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
    - name: pduSessionId
      in: path
      description: Identifier of the PDU session
      required: true
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
  responses:
    '204':
      description: Expected response to a valid request
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '422':
      description: Unprocessable Request
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error

/{ueId}/registrations/smsf-3gpp-access:
  put:
    summary: register as SMSF for 3GPP access
    operationId: 3GppSmsfRegistration
    tags:
      - SMSF registration for 3GPP access
    parameters:
      - name: ueId
        in: path
        description: Identifier of the UE
        required: true

```



```

    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  requestBody:
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/SmsfRegistration'
    required: true
  responses:
    '201':
      description: Created
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SmsfRegistration'
      headers:
        Location:
          description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nudm-uecm/v1/{ueId}/registrations/smsf-3gpp-access'
          required: true
          schema:
            type: string
    '200':
      description: Expected response to a valid request
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SmsfRegistration'
    '204':
      description: No content
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
delete:
  summary: delete the SMSF registration for 3GPP access
  operationId: 3GppSmsfDeregistration
  tags:
    - SMSF Deregistration for 3GPP Access
  parameters:
    - name: ueId
      in: path
      description: Identifier of the UE
      required: true
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  responses:
    '204':
      description: Expected response to a valid request
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '422':
      description: Unprocessable Request
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
get:
  summary: retrieve the SMSF registration for 3GPP access information
  operationId: Get3GppSmsfRegistration
  tags:
    - SMSF 3GPP access Registration Info Retrieval

```

```

parameters:
  - name: ueId
    in: path
    description: Identifier of the UE
    required: true
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
  - name: supported-features
    in: query
    schema:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
responses:
  '200':
    description: Expected response to a valid request
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/SmsfRegistration'
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '403':
    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error

/{ueId}/registrations/smsf-non-3gpp-access:
  put:
    summary: register as SMSF for non-3GPP access
    operationId: Non3GppSmsfRegistration
    tags:
      - SMSF registration for non-3GPP access
    parameters:
      - name: ueId
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SmsfRegistration'
      required: true
    responses:
      '201':
        description: Created
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SmsfRegistration'
        headers:
          Location:
            description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nudm-uecm/v1/{ueId}/registrations/smsf-non-3gpp-access'
            required: true
            schema:
              type: string
      '200':
        description: Expected response to a valid request
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SmsfRegistration'
      '204':
        description: No content
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'

```

```

    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
delete:
  summary: delete SMSF registration for non 3GPP access
  operationId: Non3GppSmsfDeregistration
  tags:
    - SMSF Deregistration for non-3GPP access
  parameters:
    - name: ueId
      in: path
      description: Identifier of the UE
      required: true
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  responses:
    '204':
      description: Expected response to a valid request
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '422':
      description: Unprocessable Request
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
get:
  summary: retrieve the SMSF registration for non-3GPP access information
  operationId: GetNon3GppSmsfRegistration
  tags:
    - SMSF non-3GPP access Registration Info Retrieval
  parameters:
    - name: ueId
      in: path
      description: Identifier of the UE
      required: true
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
    - name: supported-features
      in: query
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
  responses:
    '200':
      description: Expected response to a valid request
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SmsfRegistration'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:

```

```

clientCredentials:
  tokenUrl: '{nrfApiRoot}/oauth2/token'
  scopes:
    nudm-uecm: Access to the nudm-uecm API

```

```
schemas:
```

```
# COMPLEX TYPES:
```

```

Amf3GppAccessRegistration:
  type: object
  required:
    - amfInstanceId
    - deregCallbackUri
    - guami
    - ratType
  properties:
    amfInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    purgeFlag:
      $ref: '#/components/schemas/PurgeFlag'
    pei:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'
    imsVoPs:
      $ref: '#/components/schemas/ImsVoPs'
    deregCallbackUri:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    amfServiceNameDereg:
      $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/ServiceName'
    pcscfRestorationCallbackUri:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    amfServiceNamePcscfRest:
      $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/ServiceName'
    initialRegistrationInd:
      type: boolean
    guami:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
    backupAmfInfo:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/BackupAmfInfo'
      minItems: 1
    drFlag:
      $ref: '#/components/schemas/DualRegistrationFlag'
    ratType:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
    urrpIndicator:
      type: boolean
    amfEeSubscriptionId:
      type: string
    epsInterworkingInfo:
      type: object
      properties:
        epsIwkPgws:
          description: A map (list of key-value pairs where Dnn serves as key) of EpsIwkPgws
          type: object
          additionalProperties:
            $ref: '#/components/schemas/EpsIwkPgw'

Amf3GppAccessRegistrationModification:
  type: object
  required:
    - guami
  properties:
    guami:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
    purgeFlag:
      $ref: '#/components/schemas/PurgeFlag'
    pei:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'
    imsVoPs:
      $ref: '#/components/schemas/ImsVoPs'
    backupAmfInfo:
      type: array

```

```

    items:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/BackupAmfInfo'
  epsInterworkingInfo:
    type: object
    properties:
      epsIwkPgws:
        description: A map (list of key-value pairs where Dnn serves as key) of EpsIwkPgws
        type: object
        additionalProperties:
          $ref: '#/components/schemas/EpsIwkPgw'

EpsIwkPgw:
  type: object
  required:
    - pgwFqdn
    - smfInstanceId
  properties:
    pgwFqdn:
      type: string
    smfInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'

AmfNon3GppAccessRegistration:
  type: object
  required:
    - amfInstanceId
    - imsVoPs
    - deregCallbackUri
    - guami
    - ratType
  properties:
    amfInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    purgeFlag:
      $ref: '#/components/schemas/PurgeFlag'
    pei:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'
    imsVoPs:
      $ref: '#/components/schemas/ImsVoPs'
    deregCallbackUri:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    amfServiceNameDereg:
      $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/ServiceName'
    pcscfRestorationCallbackUri:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    amfServiceNamePcscfRest:
      $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/ServiceName'
    guami:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
    backupAmfInfo:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/BackupAmfInfo'
      minItems: 1
    ratType:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
    urrpIndicator:
      type: boolean
    amfEeSubscriptionId:
      type: string

AmfNon3GppAccessRegistrationModification:
  type: object
  required:
    - guami
  properties:
    guami:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
    purgeFlag:
      $ref: '#/components/schemas/PurgeFlag'
    pei:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'
    imsVoPs:
      $ref: '#/components/schemas/ImsVoPs'
    backupAmfInfo:

```

```

    type: array
    items:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/BackupAmfInfo'

SmfRegistration:
  type: object
  required:
    - smfInstanceId
    - pduSessionId
    - singleNssai
    - plmnId
  properties:
    smfInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    pduSessionId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
    singleNssai:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
    dnn:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
    emergencyServices:
      type: boolean
    pcsfRestorationCallbackUri:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    plmnId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
    pgwFqdn:
      type: string

SmsfRegistration:
  type: object
  required:
    - smsfInstanceId
    - plmnId
  properties:
    smsfInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    plmnId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
    smsfMAPAddress:
      $ref: '#/components/schemas/E164Number'
    smsfDiameterAddress:
      $ref: '#/components/schemas/NetworkNodeDiameterAddress'

DeregistrationData:
  type: object
  required:
    - deregReason
    - accessType
  properties:
    deregReason:
      $ref: '#/components/schemas/DeregistrationReason'
    accessType:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'

PcsfRestorationNotification:
  type: object
  required:
    - supi
  properties:
    supi:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'

NetworkNodeDiameterAddress:
  type: object
  required:
    - name
    - realm
  properties:
    name:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DiameterIdentity'
    realm:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DiameterIdentity'

```

```

# SIMPLE TYPES:

PurgeFlag:
  type: boolean

E164Number:
  type: string
  pattern: '^[0-9]{1,15}$'

DualRegistrationFlag:
  type: boolean

# ENUMS:

ImsVoPs:
  anyOf:
    - type: string
      enum:
        - HOMOGENEOUS_SUPPORT
        - HOMOGENEOUS_NON_SUPPORT
        - NON_HOMOGENEOUS_OR_UNKNOWN
    - type: string

DeregistrationReason:
  anyOf:
    - type: string
      enum:
        - UE_INITIAL_REGISTRATION
        - UE_REGISTRATION_AREA_CHANGE
        - SUBSCRIPTION_WITHDRAWN
        - 5GS_TO_EPS_MOBILITY
        - 5GS_TO_EPS_MOBILITY_UE_INITIAL_REGISTRATION
        - REREGISTRATION_REQUIRED
    - type: string

```

## A.4 Nudm\_UEAU API

```

openapi: 3.0.0
info:
  version: '1.0.2'
  title: 'NudmUEAU'
  description: |
    UDM UE Authentication Service.
    © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.503 Unified Data Management Services, version 15.6.0
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.503/'

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

security:
  - oAuth2ClientCredentials:
    - nudm-ueau
  - {}

paths:
  /{supiOrSuci}/security-information/generate-auth-data:
    post:
      summary: Generate authentication data for the UE
      operationId: GenerateAuthData
      tags:
        - Generate Auth Data
      parameters:
        - name: supiOrSuci
          in: path
          description: SUPI or SUCI of the user
          required: true
          schema:
            $ref: '#/components/schemas/SupiOrSuci'

```

```

requestBody:
  content:
    application/json:
      schema:
        $ref: '#/components/schemas/AuthenticationInfoRequest'
  required: true
responses:
  '200':
    description: Expected response to a valid request
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/AuthenticationInfoResult'
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '403':
    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '501':
    $ref: 'TS29571_CommonData.yaml#/components/responses/501'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error

/{supi}/auth-events:
  post:
    summary: Create a new confirmation event
    operationId: ConfirmAuth
    tags:
      - Confirm Auth
    parameters:
      - name: supi
        in: path
        description: SUPI of the user
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AuthEvent'
      required: true
    responses:
      '201':
        description: Expected response to a valid request
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AuthEvent'
      headers:
        Location:
          description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nudm-ueau/v1/{supi}/auth-events/{authEventId}'
          required: true
          schema:
            type: string
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:

```



```

tokenUrl: '{nrfApiRoot}/oauth2/token'
scopes:
  nudm-ueau: Access to the nudm-ueau API

```

```
schemas:
```

```
# COMPLEX TYPES:
```

```

AuthenticationInfoRequest:
  type: object
  required:
    - servingNetworkName
    - ausfInstanceId
  properties:
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    servingNetworkName:
      $ref: '#/components/schemas/ServingNetworkName'
    resynchronizationInfo:
      $ref: '#/components/schemas/ResynchronizationInfo'
    ausfInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'

```

```

AuthenticationInfoResult:
  type: object
  required:
    - authType
  properties:
    authType:
      $ref: '#/components/schemas/AuthType'
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    authenticationVector:
      $ref: '#/components/schemas/AuthenticationVector'
    supi:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'

```

```

AuthenticationVector:
  oneOf:
    - $ref: '#/components/schemas/AvEapAkaPrime'
    - $ref: '#/components/schemas/Av5GHeAka'
  discriminator:
    propertyName: avType
  mapping:
    5G_HE_AKA: '#/components/schemas/Av5GHeAka'
    EAP_AKA_PRIME: '#/components/schemas/AvEapAkaPrime'

```

```

AvEapAkaPrime:
  type: object
  required:
    - avType
    - rand
    - xres
    - autn
    - ckPrime
    - ikPrime
  properties:
    avType:
      $ref: '#/components/schemas/AvType'
    rand:
      $ref: '#/components/schemas/Rand'
    xres:
      $ref: '#/components/schemas/Xres'
    autn:
      $ref: '#/components/schemas/Autn'
    ckPrime:
      $ref: '#/components/schemas/CkPrime'
    ikPrime:
      $ref: '#/components/schemas/IkPrime'

```

```

Av5GHeAka:
  type: object
  required:
    - avType
    - rand
    - xresStar
    - autn

```

```
- kausf
properties:
  avType:
    $ref: '#/components/schemas/AvType'
  rand:
    $ref: '#/components/schemas/Rand'
  xresStar:
    $ref: '#/components/schemas/XresStar'
  autn:
    $ref: '#/components/schemas/Autn'
  kausf:
    $ref: '#/components/schemas/Kausf'

ResynchronizationInfo:
  type: object
  required:
    - rand
    - auts
  properties:
    rand:
      $ref: '#/components/schemas/Rand'
    auts:
      $ref: '#/components/schemas/Auts'

AuthEvent:
  type: object
  required:
    - nfInstanceId
    - success
    - timeStamp
    - authType
    - servingNetworkName
  properties:
    nfInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    success:
      $ref: '#/components/schemas/Success'
    timeStamp:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
    authType:
      $ref: '#/components/schemas/AuthType'
    servingNetworkName:
      $ref: '#/components/schemas/ServingNetworkName'

# SIMPLE TYPES:

Autn:
  type: string
  pattern: '^[A-Za-f0-9]{32}$'

Auts:
  type: string
  pattern: '^[A-Za-f0-9]{28}$'

CkPrime:
  type: string
  pattern: '^[A-Za-f0-9]{32}$'

IkPrime:
  type: string
  pattern: '^[A-Za-f0-9]{32}$'

Kausf:
  type: string
  pattern: '^[A-Za-f0-9]{64}$'

Rand:
  type: string
  pattern: '^[A-Za-f0-9]{32}$'

Xres:
  type: string
  pattern: '^[A-Za-f0-9]{8,32}$'

XresStar:
  type: string
  pattern: '^[A-Za-f0-9]{32}$'
```

```

SupiOrSuci:
  type: string
  pattern: '^(\imsi-[0-9]{5,15}|nai-.+|suci-(0-[0-9]{3}-[0-9]{2,3}|[1-7]-.+)-[0-9]{1,4}-(0-0-
.+|[a-fA-F1-9]-([1-9]|1[0-9]|1[0-9]{2}|2[0-4][0-9]|25[0-5])-[a-fA-F0-9]+)|.+)$'

ServingNetworkName:
  type: string
  pattern: '^5G:mnc[0-9]{3}[.]mcc[0-9]{3}[.]3gppnetwork[.]org$'

Success:
  type: boolean

# ENUMS:

AuthType:
  anyOf:
    - type: string
      enum:
        - 5G_AKA
        - EAP_AKA_PRIME
        - EAP_TLS
    - type: string

AvType:
  anyOf:
    - type: string
      enum:
        - 5G_HE_AKA
        - EAP_AKA_PRIME
    - type: string

```

## A.5 Nudm\_EE API

openapi: 3.0.0

```

info:
  version: '1.0.3'
  title: 'Nudm_EE'
  description: |
    Nudm Event Exposure Service.
    © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.503 Unified Data Management Services, version 15.6.0
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.503/'

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

security:
  - oAuth2ClientCredentials:
    - nudm-ee
  - {}

paths:
  /{ueIdentity}/ee-subscriptions:
    post:
      summary: Subscribe
      operationId: CreateEeSubscription
      tags:
        - Create EE Subscription
      parameters:
        - name: ueIdentity
          in: path
          description: Represents the scope of the UE for which the subscription is applied.
          required: true
          schema:

```

```

    type: string
    pattern: '^(\msisdn-[0-9]{5,15}|.+|extid-[@]+@[^@]+|extgroupid-[@]+@[^@]+|anyUE)$'
requestBody:
  content:
    application/json:
      schema:
        $ref: '#/components/schemas/EeSubscription'
    required: true
responses:
  '201':
    description: Expected response to a valid request
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/CreatedEeSubscription'
    headers:
      Location:
        description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nudm-ee/v1/{ueIdentity}/ee-subscriptions/{subscriptionId}'
        required: true
        schema:
          type: string
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '403':
    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '501':
    $ref: 'TS29571_CommonData.yaml#/components/responses/501'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
callbacks:
  eventOccurrenceNotification:
    '{request.body#/callbackReference}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/MonitoringReport'
                minItems: 1
        responses:
          '204':
            description: Successful Notification response
          '400':
            $ref: 'TS29571_CommonData.yaml#/components/responses/400'
          '404':
            $ref: 'TS29571_CommonData.yaml#/components/responses/404'
          '500':
            $ref: 'TS29571_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29571_CommonData.yaml#/components/responses/503'
          default:
            description: Unexpected error

/{ueIdentity}/ee-subscriptions/{subscriptionId}:
  delete:
    summary: Unsubscribe
    operationId: DeleteEeSubscription
    tags:
      - Delete EE Subscription
    parameters:
      - name: ueIdentity
        in: path
        description: Represents the scope of the UE for which the subscription is applied.
Contains the GPSI of the user or the external group ID or any UE.
        required: true
        schema:
          type: string
          pattern: '^(\msisdn-[0-9]{5,15}|.+|extid-[@]+@[^@]+|extgroupid-[@]+@[^@]+|anyUE)$'

```

```

    - name: subscriptionId
      in: path
      description: Id of the EE Subscription
      required: true
      schema:
        type: string
  responses:
    '204':
      description: Successful response
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    description: Unexpected error
  patch:
    summary: Patch
    operationId: UpdateEeSubscription
    tags:
      - Update EE Subscription
    parameters:
      - name: ueIdentity
        in: path
        description: Represents the scope of the UE for which the subscription is applied.
        Contains the GPSI of the user or the external group ID or any UE.
        required: true
        schema:
          type: string
          pattern: '^(msisdn-[0-9]{5,15}|.+|extid-[^@]+@[^@]+|extgroupid-[^@]+@[^@]+|anyUE)$'
      - name: subscriptionId
        in: path
        description: Id of the EE Subscription
        required: true
        schema:
          type: string
    requestBody:
      content:
        application/json-patch+json:
          schema:
            type: array
            items:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/PatchItem'
            minItems: 1
      required: true
    responses:
      '204':
        description: Successful response
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  default:
    description: Unexpected error

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nudm-ee: Access to the nudm-ee API

schemas:

# COMPLEX TYPES:

CreatedEeSubscription:
  type: object
  required:
    - eeSubscription
  properties:

```

```

eeSubscription:
  $ref: '#/components/schemas/EeSubscription'
numberOfUes:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/UInteger'
eventReports:
  type: array
  items:
    $ref: '#/components/schemas/MonitoringReport'
  minItems: 1

```

```

EeSubscription:
  type: object
  required:
    - callbackReference
    - monitoringConfigurations
  properties:
    callbackReference:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    monitoringConfigurations:
      description: A map (list of key-value pairs where ReferenceId serves as key) of
MonitoringConfigurations
      type: object
      additionalProperties:
        $ref: '#/components/schemas/MonitoringConfiguration'
      minProperties: 1
      reportingOptions:
        $ref: '#/components/schemas/ReportingOptions'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      subscriptionId:
        type: string

```

```

MonitoringConfiguration:
  type: object
  required:
    - eventType
  properties:
    eventType:
      $ref: '#/components/schemas/EventType'
    immediateFlag:
      type: boolean
    locationReportingConfiguration:
      $ref: '#/components/schemas/LocationReportingConfiguration'
    associationType:
      $ref: '#/components/schemas/AssociationType'

```

```

LocationReportingConfiguration:
  type: object
  required:
    - currentLocation
  properties:
    currentLocation:
      type: boolean
    oneTime:
      type: boolean
    accuracy:
      $ref: '#/components/schemas/LocationAccuracy'

```

```

ReportingOptions:
  type: object
  properties:
    maxNumOfReports:
      $ref: '#/components/schemas/MaxNumOfReports'
    expiry:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'

```

```

MonitoringReport:
  type: object
  required:
    - referenceId
    - eventType
    - timeStamp
  properties:
    referenceId:
      $ref: '#/components/schemas/ReferenceId'
    eventType:
      $ref: '#/components/schemas/EventType'

```

```
report:
  $ref: '#/components/schemas/Report'
gpsi:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
timeStamp:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'

Report:
  oneOf:
    - $ref: '#/components/schemas/ChangeOfSupiPeiAssociationReport'
    - $ref: '#/components/schemas/RoamingStatusReport'

ChangeOfSupiPeiAssociationReport:
  type: object
  required:
    - newPei
  properties:
    newPei:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'

RoamingStatusReport:
  type: object
  required:
    - roaming
    - newServingPlmn
  properties:
    roaming:
      type: boolean
    newServingPlmn:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'

# SIMPLE TYPES:

ReferenceId:
  type: integer

MaxNumOfReports:
  type: integer

# ENUMS:

EventType:
  anyOf:
    - type: string
    enum:
      - LOSS_OF_CONNECTIVITY
      - UE_REACHABILITY_FOR_DATA
      - UE_REACHABILITY_FOR_SMS
      - LOCATION_REPORTING
      - CHANGE_OF_SUP_I_PEI_ASSOCIATION
      - ROAMING_STATUS
      - COMMUNICATION_FAILURE
      - AVAILABILITY_AFTER_DDN_FAILURE
    - type: string

LocationAccuracy:
  anyOf:
    - type: string
    enum:
      - CELL_LEVEL
      - TA_LEVEL
    - type: string

AssociationType:
  anyOf:
    - type: string
    enum:
      - IMEI_CHANGE
      - IMEISV_CHANGE
    - type: string
```

## A.6 Nudm\_PP API

openapi: 3.0.0

info:

```

version: '1.0.1'
title: 'Nudm_PP'
description: |
  Nudm Parameter Provision Service.
  © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.

```

externalDocs:

```

description: 3GPP TS 29.503 Unified Data Management Services, version 15.4.0
url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.503/'

```

servers:

```

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

```

security:

```

- oAuth2ClientCredentials:
  - nudm-pp
- {}

```

paths:

```

/{gpsi}/pp-data:
  patch:
    summary: provision parameters
    operationId: Update
    tags:
      - Subscription Data Update
    parameters:
      - name: gpsi
        in: path
        description: Identifier of the UE
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
    requestBody:
      content:
        application/merge-patch+json:
          schema:
            $ref: '#/components/schemas/PpData'
      required: true
    responses:
      '204':
        description: Expected response to a valid request
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
    default:
      description: Unexpected error

```

components:

```

securitySchemes:
  oAuth2ClientCredentials:
    type: oauth2
    flows:
      clientCredentials:
        tokenUrl: '{nrfApiRoot}/oauth2/token'
        scopes:
          nudm-pp: Access to the nudm-pp API

```

schemas:



## # COMPLEX TYPES:

```
PpData:
  type: object
  properties:
    communicationCharacteristics:
      $ref: '#/components/schemas/CommunicationCharacteristics'
    supportedFeatures:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'

CommunicationCharacteristics:
  type: object
  properties:
    ppSubsRegTimer:
      $ref: '#/components/schemas/PpSubsRegTimer'
    ppActiveTime:
      $ref: '#/components/schemas/PpActiveTime'
    ppDlPacketCount:
      $ref: '#/components/schemas/PpDlPacketCount'

PpSubsRegTimer:
  type: object
  required:
    - subsRegTimer
    - afInstanceId
    - referenceId
  properties:
    subsRegTimer:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
    afInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    referenceId:
      $ref: '#/components/schemas/ReferenceId'
  nullable: true

PpActiveTime:
  type: object
  required:
    - activeTime
    - afInstanceId
    - referenceId
  properties:
    activeTime:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
    afInstanceId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    referenceId:
      $ref: '#/components/schemas/ReferenceId'
  nullable: true
```

## # SIMPLE TYPES:

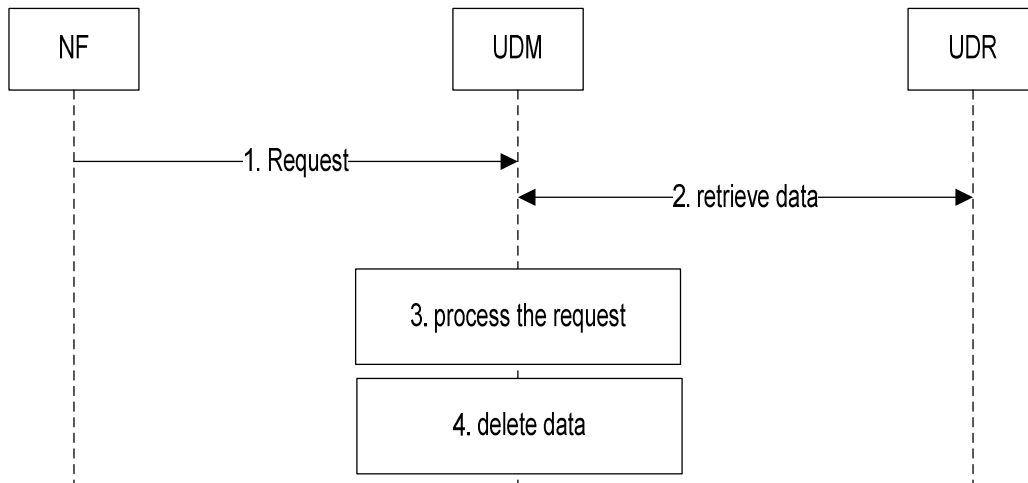
```
ReferenceId:
  type: integer

PpDlPacketCount:
  type: integer
  nullable: true
```

## # ENUMS:

## Annex B (informative): Stateless UDMs

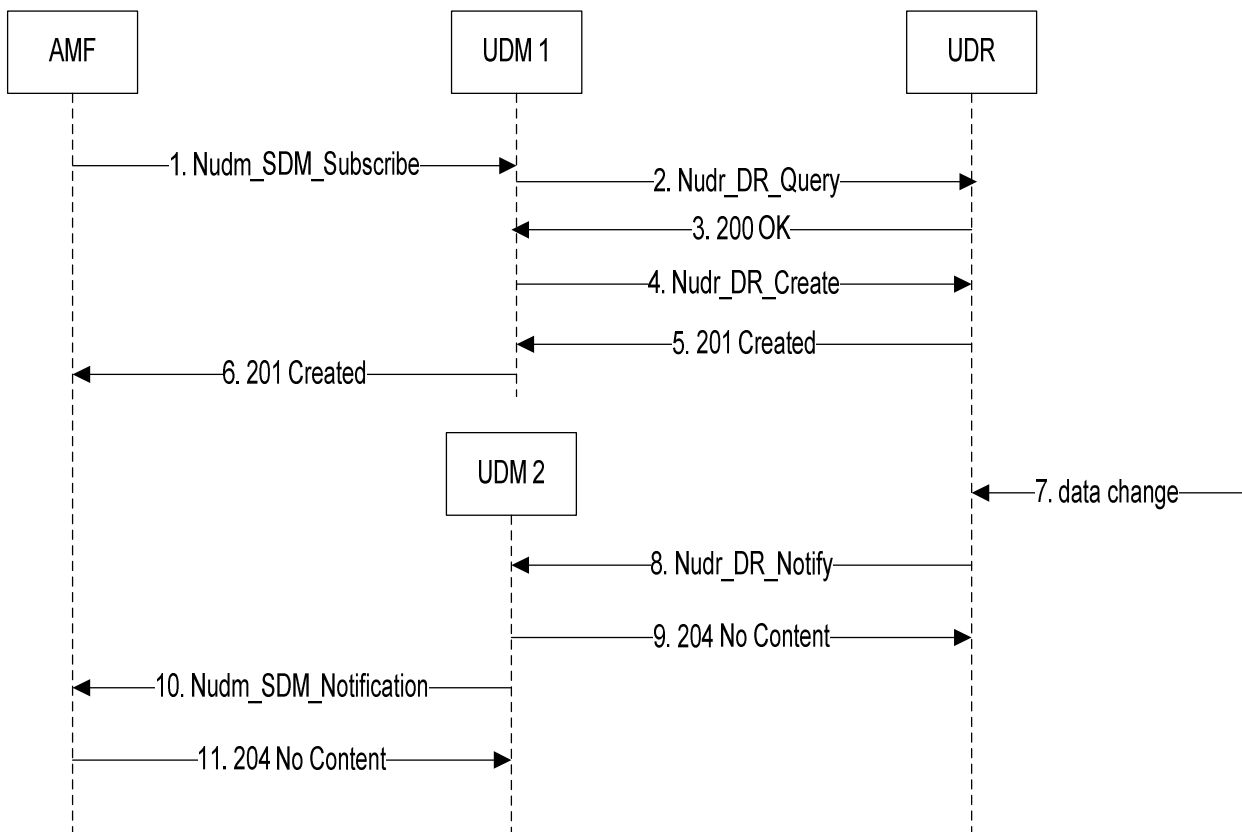
Figure B-1 shows a scenario where the stateless UDM receives and processes a request from an NF.



**Figure B-1: Stateless UDM**

1. The stateless UDM receives a request from an NF. This can be a request to perform an Nudm service, or a Notification that the UDM has previously subscribed to at the NF by means of a service the UDM consumes from the NF. In the later case the NF can be the UDR.
2. The UDM retrieves data from the UDR that are required to process the request. This step can be skipped if the request was a notification from the UDR and contained enough information so that the UDM can process the request.
3. The UDM processes the received request. This can include consuming services from other NFs, consuming services from the UDR (e.g. to update data or subscribe to notifications), and sending notifications to NFs that have subscribed at the UDM to receive notifications, and includes sending the response to the NF (all not shown in the figure).
4. The UDM locally deletes the data retrieved in step 2 and/or received in step 1.

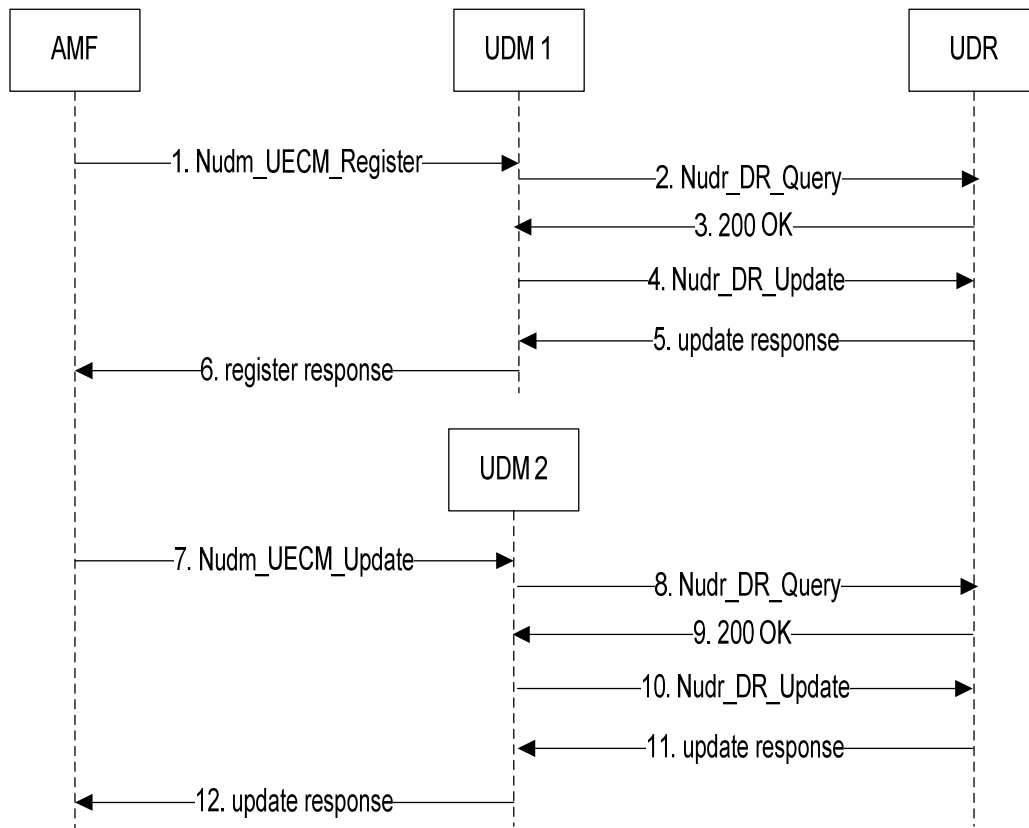
Figure B-2 shows a scenario where an AMF subscribes to notifications of data change (permanent provisioned subscription data) at the stateless UDM. The UDM (UDM 1) stores the subscription to notification in the UE's context data at the UDR.



**Figure B-2: Subscription to notification**

1. The stateless UDM 1 receives a subscribe request from an AMF; see clause 5.2.2.3.2.
- 2.-3 The UDM retrieves UE context data from the UDR to be able to perform required plausibility checks; see 3GPP TS 29.504 [9] clause 5.2.2.2.2.
4. The UDM creates a new sdm subscription at the UDR; see 3GPP TS 29.504 [9] clause 5.2.2.3.3.
5. The UDR sends a 201 Created response containing a subscription ID
6. The UDM send a 201 Created response passing the subscription ID received in step 5 to the AMF.
7. Permanent provisioned Subscription data are modified at the UDR.
8. The UDR selects a suitable UDM and sends a Notification; see 3GPP TS 29.504 [9] clause 5.2.2.8. In addition to the data that have changed, the Notification request message can contain enough (unchanged) information (e.g. the information that has been created in step 4) allowing the UDM to perform step 10 without the need to additionally retrieve information from the UDR.
9. The UDM responds with 204 No Content.
10. The UDM notifies the AMF according to the callback URI of the AMF contained in the Notification received in step 8; see clause 5.2.2.5.2.
11. The AMF responds with 204 No Content.

Figure B-3 shows a scenario where an AMF registers at the stateless UDM. The UDM (UDM 1) stores the registration in the UE's context data at the UDR. The AMF then requests to update the registration e.g. due to change of PEI. This request is sent to UDM2 which belongs to the same UDM group as UDM1.

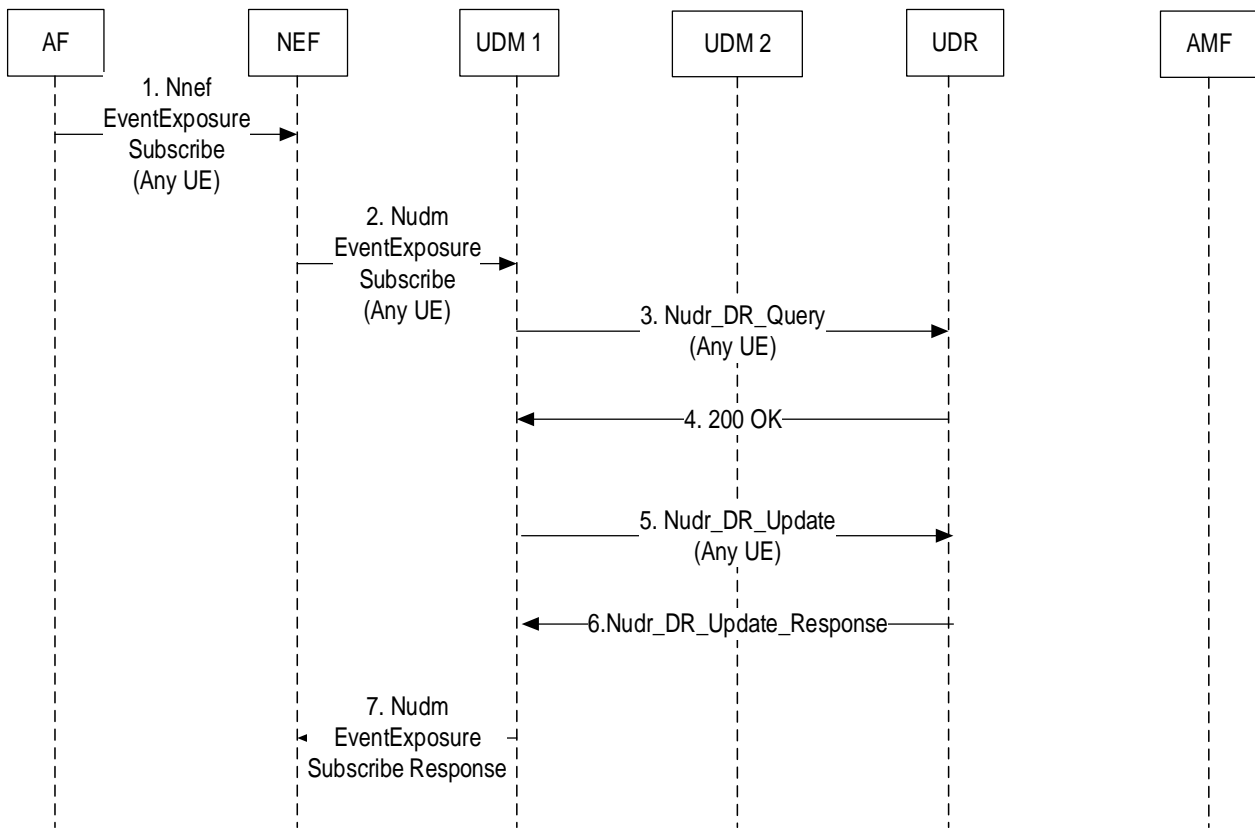


**Figure B-3: AMF Registration and Update**

1. The AMF discovers (by means of NRF query) and selects an UDM and sends the register request;
- 2.-3 The UDM retrieves UE context data from the UDR e.g. to be able to perform required plausibility checks;
- 4.-5 The UDM updates UE context data in the UDR. The UDM also performs other actions not shown in the figure, e.g deregister an old AMF, notify a subscribed NEF, ...
6. The UDM acknowledges the AMF registration. The AMF stores the UDM group ID as discovered and selected in step 1. The UDM locally deletes the data retrieved in step 3.
7. The AMF sends an update request (e.g. change of PEI) to one of the available UDMs (UDM2) that belongs to the same UDM group as UDM1.
- 8.-9. The UDM retrieves UE context data from the UDR e.g. to be able to perform required plausibility checks;
- 10.-11.The UDM updates UE context data in the UDR.The UDM also performs other actions not shown in the figure, e.g. notify a subscribed NEF, ...
12. The UDM sends update response to the AMF and locally deletes the data retrieved in step 9.

**NOTE:** When a previously received Location Header or Callback URI is used for a subsequent UDM contact, the authority part may need to be replaced to point to the selected UDM.

Figure B-4 shows a scenario where an AF requests a subscription for all UEs (any UE) for a given network event. The NEF discovers all UDM NFs providing the necessary service to perform a bulk subscription. If one or several UDM Group IDs are received, NEF selects only one instance of UDM for each Group ID in order to perform the bulk subscription.



**Figure B-4: Any UE Subscription**

1. An AF subscribes to a network event (e.g. SUPI-PEI association change) for any UE (i.e. all UEs)
2. The NEF discovers (by means of NRF query) all UDM instances supporting the required service (e.g. nudm-ee). The NEF selects an UDM instance (e.g. UDM 1) from each UDM Group ID discovered (UDM 1 and UDM 2 are in the same UDM Group ID) and sends the subscribe request. The NEF also stores the UDM Group ID information to select a UDM for subsequent subscriptions.
- 3-4. The UDM retrieves data from the UDR for group of UEs, e.g. to be able to perform required plausibility checks
- 5-6. The UDM stores data for group of UEs in the UDR.
7. The UDM acknowledges the NEF subscription request. The UDM locally deletes the data retrieved in step 3.

Steps 7-12 in Figure B-3 are performed. As result of the subscription, NEF is notified by UDM 2 (change of PEI). Subsequently, when the event occurs for any UE (within the SUPI range, if applicable, served by the UDM Group ID), NEF is notified by either UDM1 or UDM 2.

## Annex C (informative): SUCI encoding

The structure of the Subscription Concealed Identifier (SUCI) is defined in 3GPP TS 23.003 [8].

When SUCI needs to be sent as a character string (e.g. as a string in a JSON payload of any of the service operations defined in the APIs defined in this specification), the SUCI is composed as an UTF-8 character string, where the different components are separated by the "minus" character "-" (UTF-8 0x2D).

These components shall be formatted as follows:

- 1) SUPI Type: a single decimal digit, from 0 to 7, formatted as a single UTF-8 character (UTF-8 0x30 to 0x37)
- 2) Home Network Identifier.  
  
When the SUPI Type is an IMSI, the Home Network Identifier consists on 2 components: MCC and MNC, separated by the "minus" character; these components are formatted as a string of 3 characters for MCC and a string of 2 or 3 characters for MNC (UTF-8 0x30 to 0x39).  
  
When the SUPI type is a Network Specific Identifier, the Home Network Identifier consists of a string of characters with a variable length, formatted as an UTF-8 character string.
- 3) Routing Indicator, consisting of 1 to 4 decimal digits formatted as a string of 1 to 4 characters (UTF-8 0x30 to 0x39).
- 4) Protection Scheme Identifier, consisting in a value in the range of 0 to 15, representing a single hexadecimal digit, formatted as a single UTF-8 character (UTF-8 0x30 to 0x39, or 0x41 to 0x46, or 0x61 to 0x66).
- 5) Home Network Public Key Identifier, consisting in a value in the range 0 to 255, formatted as a sequence of 1 to 3 decimal digits, formatted of 1 to 3 UTF-8 characters (UTF-8 0x30 to 0x39).
- 6) Scheme Output, consisting of a string of UTF-8 characters with a variable length, or a sequence of hexadecimal digits, dependent on the used protection scheme. It represents the output of a public key protection scheme specified in Annex C of 3GPP TS 33.501 [6] or the output of a protection scheme specified by the HPLMN.

### EXAMPLES:

- SUPI is IMSI-based; MCC=123, MNC=45, MSIN: 0123456789

SUPI type: 0 (IMSI)

Routing Identifier: 012

Protection Scheme: 0 (NULL scheme)

Home Network Public Key Identifier: 0

Scheme output = MSIN (cleartext)

SUCI UTF-8 string:

```
"0-123-45-012-0-0-0123456789"
```

NOTE: According to 3GPP TS 33.501 [6] (see annex C.2) the NULL scheme returns the same output as the input (i.e. MSIN in this example), which can be packed BCD coded. However, when formatted as character string in JSON, the scheme output is expected to be reformatted from packed BCD (5 octets in this example) to a sequence of decimal digits in UTF-8 (10 characters in this example).

- SUPI is IMSI-based, MCC=123, MNC=45, MSIN: 9876543210 (coded as 10 hexadecimal digits using 5 octets packed BCD coding: 89, 67, 45, 23, 01)

SUPI type: 0 (IMSI)

Routing Identifier: 0002

Protection Scheme: 1 (Profile A)

Home Network Public Key Identifier: 17

Scheme output = ECC ephemeral public key (32 octets, first bolded part below) + Encrypted MSIN (where MSIN has 10 digits i.e. 5 octets coded as hexadecimal digits using packed BCD coding, italic part below) + MAC tag (8 octets, last bolded part below) = 50 octets = 100 hexadecimal characters (NOTE: the encrypted content below is fictitious).

SUCI UTF-8 string:

```
"0-123-45-0002-1-17-  
e9b9916c911f448d8792e6b2f387f85d3ecab9040049427d9edbb5431b0bc711023be6a057b45d936238aeb7"
```

- SUPI is NAI-based, SUPI = alice@example.com

SUPI type = 1 (Network Specific Identifier)

Routing Identifier: 84

Protection Scheme: 2 (Profile B)

Home Network Public Key Identifier: 250

Scheme output = ECC ephemeral public key (33 octets, first bolded part below) + Encrypted username of NAI (5 octets, italic part below) + MAC tag (8 octets, last bolded part below) = 46 octets = 92 hexadecimal characters (NOTE: the encrypted content below is fictitious)

SUCI UTF-8 string:

```
"1-example.com-84-2-250-  
e9b9916c911f448d8792e6b2f387f85d3ecab9040049427d9edbb5431b0bc71195023be6a057b45d936238aeb7"
```

## Annex D (informative): Change history



| Change history |         |   |    |     |     |  |             |
|----------------|---------|---|----|-----|-----|--|-------------|
| Date           | Meeting | TDoc  | CR | Rev | Cat | Subject/Comment                          | New version |
| 2017-10        | CT4#80  | C4-175320   |    |     |     | TS skeleton                              | 0.1.0       |
| 2017-10        | CT4#80  | C4-175362   |    |     |     | Implementation of pCRs agreed at CT4#80. | 0.2.0       |
| 2017-12        | CT4#81  | C4-176150<br>C4-176153<br>C4-176423<br>C4-176365<br>C4-176424<br>C4-176425  |    |     |     | Implementation of pCRs agreed at CT4#81  | 0.3.0       |
| 2018-01        | CT4#82  | C4-181277<br>C4-181278<br>C4-181239<br>C4-181241<br>C4-181245<br>C4-181280<br>C4-181282<br>C4-181131<br>C4-181247<br>C4-181284<br>C4-181250<br>C4-181273<br>C4-181252<br>C4-181254  |    |     |     | Implementation of pCRs agreed at CT4#82  | 0.4.0       |
| 2018-03        | CT4#83  | C4-182178<br>C4-182270<br>C4-182354<br>C4-182352<br>C4-182274<br>C4-182400<br>C4-182402<br>C4-182356<br>C4-182351<br>C4-182401<br>C4-182268   |    |     |     | Implementation of pCRs agreed at CT4#83  | 0.5.0       |
| 2018-04        | CT4#84  | C4-183124<br>C4-183143<br>C4-183221<br>C4-183225<br>C4-183228<br>C4-183230<br>C4-183232<br>C4-183234<br>C4-183244<br>C4-183300<br>C4-183302<br>C4-183304<br>C4-183305<br>C4-183306<br>C4-183307<br>C4-183308<br>C4-183374<br>C4-183381<br>C4-183382<br>C4-183425<br>C4-183427<br>C4-183430<br>C4-183480<br>C4-183483<br>C4-183486<br>C4-183508<br>C4-183509 |    |     |     | Implementation of pCRs agreed at CT4#84  | 0.6.0       |
| 2018-05        |         |   |    |     |     | "yaml files" added into the zip-file     | 0.6.1       |

|         |        |   |      |   |   |   |        |
|---------|--------|---|------|---|---|---|--------|
| 2018-05 | CT4#85 | C4-184351<br>C4-184356<br>C4-184210<br>C4-184211<br>C4-184358<br>C4-184359<br>C4-184558<br>C4-184559<br>C4-184381<br>C4-184556<br>C4-184423<br>C4-184557<br>C4-184310<br>C4-184572<br>C4-184622 |      |   |   | Implementation of pCRs agreed at CT4#85   | 0.7.0  |
| 2018-06 | CT#80  | CP-181001   |      |   |   | Presented for information and approval.   | 1.0.0  |
| 2018-06 | CT#80  | CP-181196   |      |   |   | Approved in CT#80   | 15.0.0 |
| 2018-09 | CT#81  | CP-182056   | 0001 | 3 | B | UDM receives notification of target/new AMF after AMF planned removal                               | 15.1.0 |
| 2018-09 | CT#81  | CP-182170   | 0002 | 1 | F | DeregistrationData alignment with stage 2   | 15.1.0 |
| 2018-09 | CT#81  | CP-182172   | 0003 | 6 | F | Event subscription alignment with stage 2   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0005 | 5 | F | Data Change Notification  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0004 | 1 | F | NfInstanceId  | 15.1.0 |
| 2018-09 | CT#81  | CP-182049   | 0006 | 3 | F | UDM support for dynamic 5QIs and for standard 5QIs whose default QoS characteristics are overridden | 15.1.0 |
| 2018-09 | CT#81  | CP-182068   | 0007 | 4 | B | Add support for 5G Trace to Nudm_SDM  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0008 | 4 | B | Shared Data   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0009 | 1 | F | Feature Negotiation   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0010 | 2 | F | Nudm_SDM_Get  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0011 | 1 | F | Allowing multiple monitoring reports in a single event occurrence notification                      | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0015 | 1 | F | UDM Data change notification  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0016 | 3 | F | Nudm_SDM_Info Service Operation Description   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0022 |   | F | Authentication Info Result  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0025 | 2 | B | Add MicoAllowed in am-data  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0026 | 2 | B | Introduction of PLMN Id in UECM & UE Authentication Services  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0028 | 2 | F | Mobility Restriction  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0029 | 1 | F | SMSF addresses  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0030 | 4 | F | SMS subscription data   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0031 |   | F | Clause Numbering  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0032 | 1 | F | Formal OpenAPI corrections  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0033 |   | F | GMLC  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0034 |   | F | AUSF Instance Id  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0036 | 2 | F | Avoid stale sdm-subscriptions   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0037 |   | B | Nudm_SDM retrieval of SMS Management Subscription data  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0038 | 1 | F | Nudm_UECM Errors  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0039 |   | F | P-CSCF restoration callbacks  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0040 | 1 | F | Nudm_UEAU Errors  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0041 | 1 | F | Nudm_EE Errors  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0042 | 1 | F | Nudm_PP Errors  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0043 | 2 | F | UDM Group   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0045 | 1 | F | SUCI coding   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0046 | 2 | F | BackUp AMF Info   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0047 | 2 | F | Interworking with EPS indication  | 15.1.0 |
| 2018-09 | CT#81  | CP-182171   | 0048 | 2 | F | Nudm_SDM_Subscribe for SMF  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0050 | 1 | F | User Plane Security Policy  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0051 |   | F | Description of Structured data types  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0054 | 1 | F | Provide DNN with LADN indicator per NSSAI   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0055 |   | F | UE Context In SMF Data Retrieval  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0057 |   | F | Time Stamp in EE Notify   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0058 |   | F | Naming Conventions  | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0059 |   | F | Storage and retrieval of PGW FQDN   | 15.1.0 |
| 2018-09 | CT#81  | CP-182056   | 0060 |   | F | API version number update   | 15.1.0 |
| 2018-12 | CT#82  | CP-183014   | 0061 | 1 | F | Remove key attributes from map elements   | 15.2.0 |
| 2018-12 | CT#82  | CP-183014   | 0062 | 2 | F | imsVoPS for non-3GPP access   | 15.2.0 |
| 2018-12 | CT#82  | CP-183014   | 0063 | 2 | F | Internal-Group Identifier   | 15.2.0 |
| 2018-12 | CT#82  | CP-183014   | 0064 | 2 | F | Stateless AMF support updates   | 15.2.0 |
| 2018-12 | CT#82  | CP-183014   | 0065 | 2 | F | Location Reporting Configuration in Nudm_EE service   | 15.2.0 |
| 2018-12 | CT#82  | CP-183014   | 0066 | 1 | F | Nudm_SDM Errors   | 15.2.0 |
| 2018-12 | CT#82  | CP-183164   | 0067 | 4 | F | Shared Data completion  | 15.2.0 |
| 2018-12 | CT#82  | CP-183014   | 0068 | 1 | F | Cardinality for arrays  | 15.2.0 |
| 2018-12 | CT#82  | CP-183014   | 0069 | 5 | F | Single Registration Flag  | 15.2.0 |

|         |       |           |      |   |   |   |        |
|---------|-------|-----------|------|---|---|---|--------|
| 2018-12 | CT#82 | CP-183014 | 0070 | 2 | F | Adding headers for cache control and conditional request to the Nudm_SubscriberDataManagement Service API | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0072 | 3 | F | Initial Registration  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0076 | 1 | F | Correcting Nudm_UEAuthentication service description  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0078 | 1 | F | Add Serving Network Name to AuthEvent   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0079 | 2 | F | Remove PLMN-ID from AMF registration in OpenAPI   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0080 |   | F | Make ARP mandatory in QoS parameters  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0081 | 1 | F | RAT type  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0082 | 1 | F | Correction in UDM error and response codes  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0083 | 1 | F | Retrieving UE SMSF Context with its own URI   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0084 | 1 | F | Data type associated with Subscribed Default QoS for Default QoS Flow                                     | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0085 | 1 | F | Alignment of pattern for External identifier  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0086 | 1 | F | Callback URI for Deregistration Notification  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0088 | 1 | F | Static Ip Address in DNN Configuration  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0090 |   | F | ImsVoPs type and attribute name correction  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0091 | 1 | F | Clarification on nullable attributes in AmfRegistration types   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0092 |   | F | Retrieval of multiple datasets  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0094 | 2 | F | DeRegistration Reason: Re-registration Required   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0095 |   | F | APIRoot Clarification   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0098 |   | F | Shared Data Ids   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0099 | 1 | F | Subscription lifetime   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0100 | 3 | F | Secured packet in SorInfo   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0103 | 1 | F | Abbreviations   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0104 | 1 | F | Nudm_UECM_Deregistration clarification  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0105 |   | F | Location Header   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0107 | 1 | F | SUCI Encoding   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0108 | 1 | F | S-NSSAI information in SmfRegistration  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0109 |   | F | SUCI NAI Clarification  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0110 | 1 | F | Bulk subscriptions in UDM NF correction   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0111 | 1 | F | Introduction of Barring   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0112 |   | F | UDM Corrections   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0114 | 2 | F | Optionality of OAuth2   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0115 |   | F | Implement MCS priority indicator  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0116 |   | F | API version   | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0117 | 1 | F | Shared Authentication Subscription  | 15.2.0 |
| 2018-12 | CT#82 | CP-183014 | 0118 |   | F | ExternalDocs update   | 15.2.0 |
| 2018-12 |       |           |      |   |   | 'TS29505_Nudr_DataRepository.yaml' changed to 'TS29505_Subscription_Data.yaml' in Nudm_SDM API            | 15.2.1 |
| 2019-03 | CT#83 | CP-190019 | 0119 | 1 | F | Content of attribute singleNssais   | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0120 | 1 | F | Formal OpenAPI corrections  | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0121 | 1 | F | SdmSubscription identification  | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0122 | 1 | F | Clarification on SMS barring  | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0123 | 1 | F | Allow retrieval of AMF registrations with SUPI  | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0125 |   | F | Address Editor's Note on naming conventions   | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0126 |   | F | Remove Editor's Note on authorization   | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0127 |   | F | Remove Editor's Note on data retrieval  | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0128 | 1 | F | Sdm Subscription Modification   | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0130 | 1 | F | LADN Indicator removal  | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0131 | 1 | F | Subscribed DNN List   | 15.3.0 |
| 2019-03 | CT#83 | CP-190065 | 0134 | 2 | F | Emergency Session   | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0137 | 1 | F | Application Errors  | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0138 | 1 | F | Plmn ID in SdmSubscriptions   | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0139 | 1 | F | URRP Indicator  | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0141 | 1 | F | Handling of Multi-PDU during EPS Interworking   | 15.3.0 |
| 2019-03 | CT#83 | CP-190152 | 0143 | 4 | F | UE parameters update support  | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0144 | 1 | F | Cardinality of Datasets-names   | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0145 | 2 | F | Removal of SharedAuthenticationSubscription   | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0146 | 1 | F | Update method for event subscription  | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0147 | 2 | F | SOR correction  | 15.3.0 |
| 2019-03 | CT#83 | CP-190019 | 0148 | 1 | F | Storage of OpenAPI specification files  | 15.3.0 |
| 2019-03 | CT#83 | CP-190204 | 0149 | 1 | F | API version update  | 15.3.0 |
| 2019-06 | CT#84 | CP-191030 | 0150 | 1 | F | Location Header Description   | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0151 |   | F | OperationId   | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0154 | 1 | F | Adding SubId to EESubscription  | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0155 | 2 | F | Essential Corrections and Re-arrange Clause Structure   | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0156 | 2 | F | Partial Deletion of Monitored Resources   | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0158 | 1 | F | Correct the reference in ServingNetworkName in AuthenticationInfoRequest                                  | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0160 | 3 | F | Add trace data retrieval procedure  | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0161 | 1 | F | Group Identifier Translation  | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0162 |   | F | SUCI with Null Protection Scheme  | 15.4.0 |

|         |       |           |      |   |   |   |        |
|---------|-------|-----------|------|---|---|---|--------|
| 2019-06 | CT#84 | CP-191030 | 0164 |   | F | CR 0128r1 was not correctly implemented   | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0166 | 1 | F | Storage of OpenAPI specification files    | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0167 | 1 | F | Sdm-Subscription incorrect attribute name | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0168 | 1 | F | Location header in redirect response      | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0169 |   | F | Application error correction              | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0193 | 1 | F | Storage of SubscriptionId                 | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0195 | 1 | F | Shared Data Ids                           | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0196 | 1 | F | Copyright Note in YAML files              | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0201 |   | F | ODB for SMF                               | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0202 | 2 | F | SUCI encoding                             | 15.4.0 |
| 2019-06 | CT#84 | CP-191030 | 0204 |   | F | 3GPP TS 29.503 API version update         | 15.4.0 |
| 2019-09 | CT#85 | CP-192103 | 0210 | 1 | F | DNN Barring                               | 15.5.0 |
| 2019-09 | CT#85 | CP-192103 | 0220 | 1 | F | Monitored Resource URI                    | 15.5.0 |
| 2019-09 | CT#85 | CP-192119 | 0242 |   | F | API version update                        | 15.5.0 |
| 2019-12 | CT#86 | CP-193027 | 0267 | 2 | F | Missing AssociationType parameter         | 15.6.0 |
| 2019-12 | CT#86 | CP-193027 | 0271 |   | F | Nssai Inclusion Allowed                   | 15.6.0 |
| 2019-12 | CT#86 | CP-193027 | 0279 |   | F | Regular Expression of SuciOrSupi          | 15.6.0 |
| 2019-12 | CT#86 | CP-193027 | 0286 | 1 | F | Wrong reference                           | 15.6.0 |
| 2019-12 | CT#86 | CP-193027 | 0298 | 1 | F | Availability after DDN Failure            | 15.6.0 |
| 2019-12 | CT#86 | CP-193027 | 0301 |   | F | Content Types in Nudm_EE                  | 15.6.0 |
| 2019-12 | CT#86 | CP-193031 | 0308 |   | F | Wildcard DNN                              | 15.6.0 |
| 2019-12 | CT#86 | CP-193043 | 0309 |   | F | API version update                        | 15.6.0 |

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## History

| <b>Document history</b> |              |             |
|-------------------------|--------------|-------------|
| V15.0.0                 | July 2018    | Publication |
| V15.1.0                 | October 2018 | Publication |
| V15.2.1                 | April 2019   | Publication |
| V15.3.0                 | April 2019   | Publication |
| V15.4.0                 | July 2019    | Publication |
| V15.5.0                 | October 2019 | Publication |
| V15.6.0                 | January 2020 | Publication |