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| 3GPP TS 29.598 V18.4.0 (2023-12) | |
| Technical Specification | |
| 3rd Generation Partnership Project;  Technical Specification Group Core Network and Terminals;  5G System; Unstructured Data Storage Services  Stage 3;  (Release 18) | |
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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:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

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

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

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

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

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

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

**can** indicates that something is possible

**cannot** indicates that something is impossible

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

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

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

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

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

In addition:

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

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

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

# 1 Scope

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

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] OpenAPI: "OpenAPI Specification Version 3.0.0", <https://spec.openapis.org/oas/v3.0.0>.

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

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

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

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

[11] IETF RFC 9113: " HTTP/2".

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

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

[14] IETF RFC 6902: "JavaScript Object Notation (JSON) Patch".

[15] IETF RFC 9110: "HTTP Semantics".

[16] Void.

[17] IETF RFC 9111: " HTTP Caching".

[18] ISO/IEC 14977: "Information technology – Syntactic metalanguage - Extended BNF".

[19] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[20] IETF RFC 2045: "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies".

[21] IETF RFC 2046: "Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types".

[22] IETF RFC 3986: "Uniform Resource Identifier (URI): Generic Syntax".

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

void

## 3.2 Symbols

void

## 3.3 Abbreviations

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

5GC 5G Core Network

BNF Backus–Naur Form

EBNF Extended BNF

CP Control Plane

MIME Multipurpose Internet Mail Extensions

NF Network Function

UDSF Unstructured Data Storage Function

# 4 Overview

The UDSF, as depicted in Figure 4.1-1 below, is described in clause 4.2.5 of 3GPP TS 23.501 [2]. Any of the 5GS NFs can make use of the UDSF to store and retrieve unstructured data, i.e., data that is not defined in 3GPP specifications, and can make use of the UDSF to run timers and get notified on timer expiry. The UDSF is deployed in the same network where the CP NF is located and the same UDSF may be shared by all the NFs in the PLMN to store/retrieve their respective data or an NF may have its own UDSF depending on operator configuration.

NOTE 1: Structured data in this specification refers to data for which the structure is defined in 3GPP specifications. Unstructured data refers to data for which the structure is not defined in 3GPP specifications.



Figure 4.1-1: Reference model – UDSF

# 5 Services offered by the UDSF

## 5.1 Introduction

The UDSF offers the following services via the Nudsf service based interface:

- Nudsf\_DataRepository Service

NOTE: This service corresponds to the Nudsf\_UnstructuredDataManagement service in 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3].

- Nudsf\_Timer Service

Table 5.1-1 summarizes the corresponding APIs defined for this specification.

Table 5.1-1: API Descriptions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Service Name | Clause | Description | OpenAPI Specification File | apiName | Annex |
| Nudsf\_DataRepository | 6.1 | UDSF Data Repository Service | TS29598\_Nudsf\_DataRepository.yaml | nudsf-dr | A.2 |
| Nudsf\_Timer | 6.2 | UDSF Timer Service | TS29598\_Nudsf\_Timer.yaml | nudsf-timer | A.3 |

## 5.2 Nudsf\_DataRepository Service

### 5.2.1 Service Description

The UDSF is acting as an NF Service Producer. It provides UDSF data repository service to the NF service consumer. Any NF may use the UDSF to store unstructured data.

NOTE 1: Structured data in this specification refers to data for which the structure is defined in 3GPP specifications. Unstructured data refers to data for which the structure is not defined in 3GPP specifications.

### 5.2.2 Service Operations

#### 5.2.2.1 Introduction

For the Nudsf\_DataRepository service, the following service operations are defined:

- Query

- Create

- Update

- Delete

- Notify

- Subscribe

- Unsubscribe

#### 5.2.2.2 Query

##### 5.2.2.2.1 General

The following procedures using the Query service operation are supported:

- Record Retrieval

- Meta Retrieval

- Blocks Retrieval

- Block Retrieval

- Search

- Subscriptions Retrieval

- Individual Subscription Retrieval

- Meta Schema Retrieval

##### 5.2.2.2.2 Record Retrieval

Figure 5.2.2.2.2-1 shows a scenario where the NF service consumer sends a request to the UDSF to retrieve a record that matches the provided recordId and optionally includes the query parameter supported-features.



Figure 5.2.2.2.2-1: Requesting a Record

1. The NF service consumer (any NF) sends a GET request to the resource indicated by recordId.

2a. On success, the UDSF responds with "200 OK" with the message body containing the record.

2b. If the record for the given recordId does not exist in the UDSF, the HTTP status code "404 Not Found" shall be returned optionally including additional error information in the response body (in the ProblemDetails element).

2c. If one or more conditions in the given request header fields evaluated to false, the HTTP status code "412 Precondition Failed" shall be returned optionally including additional error information in the response body (in the ExtendedProblemDetails element). The UDSF may include the stored record in the ProblemDetailsExtension.

2d. If the request header fields did not include any preconditions (i.e. "if-\*"), the HTTP status code "500 Internal Server Error" may be returned optionally including additional error information in the response body (in the ExtendedProblemDetails element). The UDSF may include the stored record in the ProblemDetailsExtension.

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 Meta Retrieval

Figure 5.2.2.2.3-1 shows a scenario where the NF service consumer sends a request to the UDSF to retrieve meta data associated with the provided recordId and optionally includes the query parameter supported-features.



Figure 5.2.2.2.3-1: Requesting Meta for a Record

1. The NF service consumer (any NF) sends a GET request to the meta resource associated with the record indicated by recordId.

2a. On success, the UDSF responds with "200 OK" with the message body containing the RecordMeta.

2b. If the record for the given recordId and thus the RecordMeta does not exist in the UDSF, the HTTP status code "404 Not Found" shall be returned optionally including additional error information in the response body (in the ProblemDetails element).

2c. If one or more conditions in the given request header fields evaluated to false, the HTTP status code "412 Precondition Failed" shall be returned optionally including additional error information in the response body (in the ExtendedProblemDetails element). The UDSF may include the stored record in the ProblemDetailsExtension.

2d. If the request header fields did not include any preconditions (i.e. "if-\*"), the HTTP status code "500 Internal Server Error" may be returned optionally including additional error information in the response body (in the ExtendedProblemDetails element). The UDSF may include the stored record in the ProblemDetailsExtension.

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 Blocks Retrieval

Figure 5.2.2.2.4-1 shows a scenario where the NF service consumer sends a request to the UDSF to retrieve (all) the blocks associated with the provided recordId and optionally includes the query parameter supported-features.



Figure 5.2.2.2.4-1: Requesting Blocks

1. The NF service consumer (any NF) sends a GET request to the resource indicated by recordId.

2a. On success, the UDSF responds with "200 OK" with the message body containing the Blocks associated with the record.

2b. If a Block for the given recordId does not exist in the UDSF, the HTTP status code "204 No Content" shall be returned.

2c. If the request header fields did not include any preconditions (i.e. "if-\*"), the HTTP status code "500 Internal Server Error" may be returned optionally including additional error information in the response body (in the ExtendedProblemDetails element). The UDSF may include the stored record in the ProblemDetailsExtension.

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 Block Retrieval

Figure 5.2.2.2.5-1 shows a scenario where the NF service consumer sends a request to the UDSF to retrieve a single block associated with the provided recordId and blockId and optionally includes the query parameter supported-features.



Figure 5.2.2.2.5-1: Requesting a Block

1. The NF service consumer (any NF) sends a GET request to the resource indicated by recordId and blockId.

2a. On success, the UDSF responds with "200 OK" with the message body containing the Block associated with the blockId.

2b. If the Block for the given recordId and blockId does not exist in the UDSF, the HTTP status code "404 Not Found" shall be returned optionally including additional error information in the response body (in the ProblemDetails element).

2c. If one or more conditions in the given request header fields evaluated to false, the "412 Precondition Failed" shall be returned optionally including additional error information in the response body (in the ExtendedProblemDetails element). The UDSF may include the stored record in the ProblemDetailsExtension.

2d. If the request header fields did not include any preconditions (i.e. "if-\*"), the HTTP status code "500 Internal Server Error" may be returned optionally including additional error information in the response body (in the ExtendedProblemDetails element). The UDSF may include the stored record in the ProblemDetailsExtension.

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 Search

Figure 5.2.2.2.6-1 shows a scenario where the NF service consumer sends a request to the UDSF to search a record that matches the provided search criteria.

The request contains the query parameters filter and optionally supported-features, limit-range, and count-indicator.

- If the CombinedSearchRetrieve feature is supported may contain the query parameters retrieve-records and max-payload-size.

- If the BulkOperations feature is supported, the query parameter filter may contain a list of record IDs identifying the records to be retrieved.

- If the AdvancedCounting feature is supported, the query parameter tag-count-filter may be present instead of filter.



Figure 5.2.2.2.6-1: Searching for Records

1. The NF service consumer (any NF) sends a GET request to the Records resource with the filter query parameter indicating the search criteria.

2a. On success, the UDSF responds with "200 OK" with the message body containing the RecordSearchResult.

2b. If the UDSF is not able to return any record for the given search criteria, the HTTP status code "204 No Content" shall be returned.

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 Subscriptions Retrieval

Figure 5.2.2.2.7-1 shows a scenario where the NF service consumer sends a request to the UDSF to retrieve all subscriptions associated with the provided storageId and optionally includes the query parameter supported-features and limit-range.



Figure 5.2.2.2.7-1: Requesting Subscriptions

1. The NF service consumer (any NF) sends a GET request to the resource indicated by the storageId.

2. On success, the UDSF responds with "200 OK" with the message body containing the NotificationSubscriptions associated with the storageId (if any).

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 Individual Subscription Retrieval

Figure 5.2.2.2.8-1 shows a scenario where the NF service consumer sends a request to the UDSF to retrieve a subscription associated with the provided storageId and subscriptionId.



Figure 5.2.2.2.8-1: Requesting an Individual Subscription

1. The NF service consumer (any NF) sends a GET request to the resource indicated by the storageId and the subscriptionId.

2a. On success, the UDSF responds with "200 OK" with the message body containing the NotificationSubscription.

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 Meta Schema Retrieval

Figure 5.2.2.2.9-1 shows a scenario where the NF service consumer sends a request to the UDSF to retrieve a meta schema that matches the provided schemaId and optionally includes the query parameter supported-features.



Figure 5.2.2.2.9-1: Requesting a Meta Schema

1. The NF service consumer (any NF) sends a GET request to the resource indicated by schemaId.

2a. On success, the UDSF responds with "200 OK" with the message body containing the meta schema.

2b. If the meta schema for the given schemaId does not exist in the UDSF, the HTTP status code "404 Not Found" shall be returned optionally 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.

#### 5.2.2.3 Create

##### 5.2.2.3.1 General

The following procedures using the Create service operation are supported:

- Record Create

- Block Create

- Meta Schema Create

##### 5.2.2.3.2 Record Create

Figure 5.2.2.3.2-1 shows a scenario where the NF service consumer sends a request to the UDSF to create a record with the provided recordId.

The request contains the recordId and optionally the query parameters supported-features and get-previous.



Figure 5.2.2.3.2-1: Create a Record

1. The NF service consumer (any NF) sends a PUT request to create the resource indicated by recordId. The request body contains the meta, zero or more blocks. The record meta information is mandatory and shall be the first part and the remaining parts of the request body (if any) shall be child blocks. If the record meta information is received with record expiry details, UDSF shall create an implicit subscription locally and notify the NF service consumer on record expiry.

2a. On success, "201 Created" shall be returned, the content of the PUT response should contain the representation of the created resource, and the "Location" header shall be present and shall contain the URI of the created resource.

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.

##### 5.2.2.3.3 Block Create

Figure 5.2.2.3.3-1 shows a scenario where the NF service consumer sends a request to the UDSF to create a block with the provided blockId.

The request contains the blockid and optionally the query parameters supported-features and get-previous.



Figure 5.2.2.3.3-1: Create a Block

1. The NF service consumer (any NF) sends a PUT request to create the resource indicated by blockId.

2a. On success, "201 Created" shall be returned, the content of the PUT response should contain the representation of the created resource, and the "Location" header shall be present and shall contain the URI of the created resource.

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.

##### 5.2.2.3.4 Meta Schema Create

Figure 5.2.2.3.4-1 shows a scenario where the NF service consumer sends a request to the UDSF to create a meta schema with the provided schemaId.

The request contains the schemaId and optionally the query parameters supported-features and get-previous.



Figure 5.2.2.3.4-1: Create a Meta Schema

1. The NF service consumer (any NF) sends a PUT request to create the resource indicated by schemaId. The request body contains the meta schema.

2a. On success, "201 Created" shall be returned, the contentof the PUT response should contain the representation of the created resource, and the "Location" header shall be present and shall contain the URI of the created resource.

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.

#### 5.2.2.4 Update

##### 5.2.2.4.1 General

The following procedures using the Update service operation are supported:

- Record Update

- Block Update

- Meta Update

- Subscription Notification Update

- Meta Schema Update

##### 5.2.2.4.2 Record Update

Figure 5.2.2.4.2-1 shows a scenario where the NF service consumer sends a request to the UDSF to update a record with the provided recordId.

The request contains the recordId and optionally the query parameters supported-features and get-previous.

The update shall include meta, zero or more blocks. The record meta information shall be the first part and is mandatory and the remaining parts of the body (if any) shall be interpreted as child blocks. Existing record, meta and blocks shall be discarded and the new record, meta and blocks (if any) shall be created.

NOTE: The order of the returned blocks in the response is not guaranteed and can be different from the order used to create them.



Figure 5.2.2.4.2-1: Update a record

1. The NF service consumer shall send a PUT request to the resource representing the record that is to be updated, and may include meta, zero or more blocks. The record meta information is mandatory and shall be the first part and the remaining parts of the request body (if any) shall be child blocks. An existing record, i.e., meta and blocks shall be discarded and the new record, meta and blocks (if any) shall be created.

2a. On success, the UDSF shall respond with "204 No Content" if no record is returned, i.e. the get-previous query parameter was not included in the request.

2b. On success, the UDSF shall respond with "200 OK" if a record is returned, i.e. the get-previous query parameter was included in the request, or due to operator's policy, the ttl value in the request exceeded the maximum value allowed.

2c. On failure, the UDSF shall respond with "412 Precondition Failed" if one or more conditions given in the request header fields evaluated to false. The RecordBody shall include the stored Record if the get-previous query parameter was included in the request.

2d. On failure, the UDSF may respond with "409 Conflict" if the request fields did not include any preconditions (i.e. "if-\*"), optionally including additional error information in the response body (in the ExtendedProblemDetails element). The UDSF may include the stored record in the ProblemDetailsExtension.

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.

##### 5.2.2.4.3 Block Update

Figure 5.2.2.4.3-1 shows a scenario where the NF service consumer sends a request to the UDSF to update a block with the provided blockId.

The request contains the recordId, blockId and the optional query parameters supported-features, get-previous and the data that is to be updated.



Figure 5.2.2.4.3-1: Update a block

1. The NF service consumer shall send a PUT request to the resource representing the block that is to be updated.

2a. On success, the UDSF shall respond with "204 No Content" if no record is returned, i.e. the get-previous query parameter was not included in the request.

2b. On success, the UDSF shall respond with "200 OK" if a record is returned, i.e. the get-previous query parameter was included in the request.

2c. On failure, the UDSF shall respond with "412 Precondition Failed" if one or more conditions given in the request header fields evaluated to false. The BlockBody shall be included with the stored Block if the get-previous query parameter was included in the request.

2d. On failure, the UDSF may respond with "409 Conflict" if the request fields did not include any preconditions (i.e. "if-\*"), optionally including additional error information in the response body (in the ExtendedProblemDetails element). The UDSF may include the stored record in the ProblemDetailsExtension.

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.

##### 5.2.2.4.4 Meta Update

Figure 5.2.2.4.4-1 shows a scenario where the NF service consumer sends a request to the UDSF to update the meta data associated with the provided recordId and optionally the query parameter supported-features and the data that is to be updated.



Figure 5.2.2.4.4-1: Update meta

1. The NF service consumer shall send a PATCH request to the resource representing the meta of the record.

2a. On success, if all the modification instructions in the PATCH request have been implemented, the UDSF shall respond with "204 No Content".

2b. On partial success, i.e. if one or more modification instructions have been discarded, "200 OK" with the execution report, shall be returned.

2c. On failure, the UDSF shall respond with "404 Not Found" if the record indicated by the recordId and thus the meta does not exist and may shall include the ProblemDetails.

2d. On failure, the UDSF shall respond with "412 Precondition Failed" if one or more conditions given in the request header fields evaluated to false, and optionally including additional error information in the response body (in "ExtendedProblemDetails" element). The UDSF may include the meta of the stored record in the ProblemDetailsExtension.

2e. On failure, the UDSF may respond with "409 Conflict" if the request fields did not include any preconditions (i.e. "if-\*") and optionally including additional error information in the response body (in "ExtendedProblemDetails" element). The UDSF may include the meta of the stored record in the ProblemDetailsExtension.

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.

##### 5.2.2.4.5 Subscription Notification Update

Figure 5.2.2.4.5-1 shows a scenario where the NF service consumer sends a request to the UDSF to update the Individual Subscription Notification identified with the storageId and subscriptionId and optionally the query parameter supported-features and the data that is to be updated.



Figure 5.2.2.4.5-1: Update Subscription Notification

1. The NF service consumer shall send a PATCH request to the resource representing the subscriptionId.

2a. On success, if all the modification instructions in the PATCH request have been implemented, the UDSF shall respond with "204 No Content".

2b. On partial success, i.e. if one or more modification instructions have been discarded, "200 OK" with the execution report, shall be returned.

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.

##### 5.2.2.4.6 Subscription Notification Update using PUT

Figure 5.2.2.4.6-1 shows a scenario where the NF service consumer sends a request to the UDSF to update a subscription to notifications of data change using PUT. The request contains the subscriptionId and the NotificationSubscription and optionally the query parameter supported-features.



Figure 5.2.2.4.6-1: NF service consumer updates subscription to notifications

1. The NF service consumer sends a PUT request to the resource indicated by the storageId and the subscriptionId. The parameter clientId shall be included. If the resource indicated in URI exists and was created by the Client identified by the clientId, the UDSF shall apply the update of the subscription.

2a. On success, the UDSF shall respond with "200 OK" and include the updated NotificationSubscription. The expiry attribute of the received NotificationSubscription may indicate a value or a value different from the request, if due to an operator policy, an expiry time is enforced or if the value in the request exceeded a maximum allowed expiry time.

2b. On failure, if one or more monitoredResourceUris from the request don't exist in the UDSF, 409 Conflict shall be returned together with the non-existing monitoredResourceUris.

2c. On failure, if the service operation cannot be authorized due to e.g. the resource indicated in URI exists but the clientId in the PUT request does not match the clientId of the existing resource, the UDSF shall respond with "403 Forbidden" and optionally 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.

##### 5.2.2.4.7 Meta Schema Update

Figure 5.2.2.4.7-1 shows a scenario where the NF service consumer sends a request to the UDSF to update a meta schema with the provided schemaId.

The request contains the schemaId, the complete new meta schema and optionally the query parameters supported-features and get-previous.



Figure 5.2.2.4.7-1: Update a meta schema

1. The NF service consumer shall send a PUT request to the resource representing the record that is to be updated, the request body shall include the complete new meta schema.

2a. On success, the UDSF shall respond with "204 No Content" if no meta schema is returned, i.e. the get-previous query parameter was not included in the request.

2b. On success, the UDSF shall respond with "200 OK" if a meta schema is returned, i.e. the get-previous query parameter was included in the request.

2c. On failure, the UDSF shall respond with "404 Not Found" if realm or storage does not exist.

2d On failure, the UDSF shall respond with "501 Not Implemented" if meta schema update is not implemented by the UDSF.

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.

#### 5.2.2.5 Delete

##### 5.2.2.5.1 General

The following procedures using the Delete service operation are supported:

- Record Delete

- Block Delete

- Meta Schema Delete

- Bulk Records Delete

##### 5.2.2.5.2 Record Delete

Figure 5.2.2.5.2-1 shows a scenario where the NF service consumer sends a request to the UDSF to Delete a record with the provided recordId.

The request contains the record id and optionally the query parameters supported-features and get-previous.



Figure 5.2.2.5.2-1: Delete a record

1. The NF service consumer shall send a DELETE request to the resource representing the record. The UDSF shall delete any resource associated with the resource (meta and block(s)).

2a. On success, the UDSF shall respond with "204 No Content" if no record is returned, i.e. the get-previous query parameter was not included in the request.

2b. On success, the UDSF shall respond with "200 OK" if a record is returned, i.e. the get-previous query parameter was included in the request.

2c. On failure, the UDSF shall respond with "404 Not Found" if the record does not exist and may include the ProblemDetails.

2d. On failure, the UDSF shall respond with "412 Precondition Failed" if one or more conditions given in the request header fields evaluated to false and the get-previous query parameter was included in the request. The RecordBody shall be included if the get-previous query parameter was included in the request.

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.

##### 5.2.2.5.3 Block Delete

Figure 5.2.2.5.3-1 shows a scenario where the NF service consumer sends a request to the UDSF to Delete a block with the provided blockId.

The request contains the recordId, blockId and optionally the query parameters supported-features and get-previous.



Figure 5.2.2.5.3-1: Delete a block

1. The NF service consumer shall send a DELETE request to the resource representing the block.

2a. On success, the UDSF shall respond with "204 No Content" if no block is returned, i.e. the get-previous query parameter was not included in the request.

2b. On success, the UDSF shall respond with "200 OK" if a block is returned, i.e. the get-previous query parameter was included in the request.

2c. On failure, the UDSF shall respond with "404 Not Found" if the block does not exist and may include the ProblemDetails.

2d. On failure, the UDSF shall respond with "412 Precondition Failed" if one or more conditions given in the request header fields evaluated to false. The BlockBody shall be included if the get-previous query parameter was included in the request.

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.

##### 5.2.2.5.4 Meta Schema Delete

Figure 5.2.2.5.4-1 shows a scenario where the NF service consumer sends a request to the UDSF to Delete a meta schema with the provided schemaId.

The request contains the schemaId and optionally the query parameters supported-features and get-previous.



Figure 5.2.2.5.4-1: Delete a meta schema

1. The NF service consumer shall send a DELETE request to the resource representing the meta schema.

2a. On success, the UDSF shall respond with "204 No Content" if no meta schema is returned, i.e. the get-previous query parameter was not included in the request.

2b. On success, the UDSF shall respond with "200 OK" if a meta schema is returned, i.e. the get-previous query parameter was included in the request.

2c. On failure, the UDSF shall respond with "404 Not Found" if the meta schema does not exist or "403 Forbidden" if the meta schema is still referenced by existing records, and may include the ProblemDetails.

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.

##### 5.2.2.5.5 Bulk Records Delete

Figure 5.2.2.5.5-1 shows a scenario where the NF service consumer sends a request to the UDSF to Delete records identified by a filter.

The request contains the query parameter filter and optionally the query parameter supported-features.



Figure 5.2.2.5.5-1: Delete records matching a filter

1. The NF service consumer shall send a DELETE request to the resource representing the records. The request shall contain a filter query parameter identifying the records to be deleted. The UDSF shall delete any resource associated with the matching records (meta and block(s)). To delete all records and any associated resources the filter query parameter shall consist of SearchComparison with a value of "GTE" for the ComparisonOperator, defined in table 6.1.6.3.3-1.

2a. On success, the UDSF shall respond with "200 OK" with the message body containing the RecordIdList identifying the deleted records.

2b. The UDSF shall respond with "204 No Content" if no records matching the filter could be found.

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.

#### 5.2.2.6 Notify

##### 5.2.2.6.1 General

The following procedures using the Notify service operation are supported:

- Record Expiry Notify

- Notification due to Data Change

- Subscription Expiry Notification

##### 5.2.2.6.2 Record Expiry Notify

Figure5.2.2.6.2-1 shows a scenario where the UDSF notifies the NF service consumer of the expired record.

The Notify is sent by the UDSF to the NF Service Consumer when the record expires as indicated by the time to live (ttl) attribute of RecordMeta.



Figure 5.2.2.6.2-1: Record Expiry Notify

1. The UDSF shall send a POST request to the callback URI. The request shall contain the record details.

2a. On success, "204 No content" shall be returned by the NF Service Consumer to UDSF.

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.

##### 5.2.2.6.3 Notification due to Data Change

Figure 5.2.2.6.3-1 shows a scenario where the UDSF notifies the NF service consumer of a change to data associated with a block or a record triggered by one or more a Subscription to Notification.



Figure 5.2.2.6.3-1: Notification due to Data Change

1. The UDSF shall send a POST request to the callback URI. The request shall contain the RecordNotification details.

2. On success, "204 No content" shall be returned by the NF Service Consumer to UDSF.

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.

##### 5.2.2.6.4 Subscription Expiry Notification

Figure 5.2.2.6.4-1 shows a scenario where the UDSF notifies the NF service consumer of an expired subscription to data change.



Figure 5.2.2.6.4-1: Subscription Expiry Notification

1. The UDSF shall send a POST request to the expiryCallbackReference URI. The request shall contain the NotificationInfo.

2. On success, "204 No content" shall be returned by the NF Service Consumer to UDSF.

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.

#### 5.2.2.7 Subscribe

##### 5.2.2.7.1 General

The following procedures using the Subscribe service operation are supported:

- Subscription to notification of data change

##### 5.2.2.7.2 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 UDSF to subscribe to notifications of data change. The request contains the subscriptionId, the NotificationSubscription and optionally the query parameter supported-features.



Figure 5.2.2.7.2-1: NF service consumer subscribes to notifications

1. The NF service consumer sends a PUT request to the resource indicated by the storageId and the subscriptionId. The parameter clientId shall be included. If the resource indicated in URI doesn't exist, the UDSF shall trigger the creation of the subscription.

2a. On success, the UDSF responds with "201 Created"with the message body containing the NotificationSubscription. The expiry attribute of the received NotificationSubscription may indicate a value or a value different from the request, if due to an operator policy, an expiry time is enforced or if the value in the request exceeded a maximum allowed expiry time.

2b. On failure, if one or more monitoredResourceUris from the request don't exist in the UDSF, 409 Conflict shall be returned together with the non-existing monitoredResourceUris.

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.

#### 5.2.2.8 Unsubscribe

##### 5.2.2.8.1 General

The following procedures using the Unsubscribe service operation are supported:

- Unsubscription to notification of data change

##### 5.2.2.8.2 Unsubscription to notifications of data change

Figure 5.2.2.8.2-1 shows a scenario where the NF service consumer sends a request to the UDSF to Unsubscribe to notifications of data change. The request contains the subscriptionId, and query parameter client-id, optionally query parameters supported-features and get-previous.



Figure 5.2.2.8.2-1: NF service consumer unsubscribes to notifications

1. The NF service consumer sends a DELETE request to the resource representing the subscription to notification of data change which is indicated by the subscriptionId.

2a. On success, the UDSF shall respond with "204 No Content" if an empty response body is returned, i.e. the get-previous query parameter was not included in the request.

2b. On success, the UDSF shall respond with "200 OK" with NotificationSubscription containing the NotificationSubscription value before the delete if get-previous was indicated in the request.

2c. If the service operation cannot be authorized due to e.g. the client-id query parameter does not match the clientId of the existing resource, the UDSF shall respond with "403 Forbidden" with including additional error information in the response body (in "ProblemDetails" element).

2d. If there is no valid subscription to notification of data change which is indicated by the request, the UDSF shall respond with "404 Not Found" with including additional error information in the response body (in "ProblemDetails" element).

2e. If one or more conditions given in the request header fields evaluated to false, the UDSF shall respond with "412 Precondition Failed". NotificationSubscription shall be included in the response if get-previous was indicated in the request.

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 Nudsf\_Timer Service

### 5.3.1 Service Description

The UDSF is acting as an NF Service Producer. It provides UDSF timer service to the NF service consumer. Any NF may use the UDSF to run timers, search for timers, and get notifications on expiry.

### 5.3.2 Service Operations

#### 5.3.2.1 Introduction

For the Nudsf\_Timer service, the following service operations are defined:

- Start

- Update

- Stop

- Search

- Notify

#### 5.3.2.2 Start

##### 5.3.2.2.1 General

The following procedures using the Start service operation are supported:

- Timer Start

##### 5.3.2.2.2 Timer Start

Figure 5.3.2.2.2-1 shows a scenario where the NF service consumer sends a request to the UDSF to start a (new or existing) timer identified by the provided timerId.



Figure 5.3.2.2.2-1: Starting a Timer

1. The NF service consumer (any NF) sends a PUT request to the resource indicated by timerId.

2. On success, the UDSF responds with "204 No Content" or "201 Created".

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 Update

##### 5.3.2.3.1 General

The following procedures using the Update service operation are supported:

- Timer Update

##### 5.3.2.3.2 Timer Update

Figure 5.3.2.3.2-1 shows a scenario where the NF service consumer sends a request to the UDSF to update an existing timer identified by the provided timerId.



Figure 5.3.2.3.2-1: Modifying a Timer

1. The NF service consumer (any NF) sends a PATCH request to the resource indicated by timerId.

2a. On success, if all the modification instructions in the PATCH request have been implemented, the UDSF shall respond with "204 No Content".

2b. On partial success, i.e. if one or more modification instructions have been discarded, "200 OK" with the execution report, shall be returned.

2c. On failure, the UDSF shall respond with "404 Not Found" if the timer indicated by the timerId does not exist and may include the ProblemDetails.

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 Stop

##### 5.3.2.4.1 General

The following procedures using the Stop service operation are supported:

- Single Timer Stop

- Multiple Timer Stop

##### 5.3.2.4.2 Single Timer Stop

Figure 5.3.2.4.2-1 shows a scenario where the NF service consumer sends a request to the UDSF to stop an existing timer identified by the provided timerId.



Figure 5.3.2.4.2-1: Stopping a single Timer

1. The NF service consumer (any NF) sends a DELETE request to the resource indicated by timerId.

2a. On success, the UDSF shall respond with "204 No Content".

2b. On failure, the UDSF shall respond with "404 Not Found" if the timer does not exist and may include the ProblemDetails.

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.

##### 5.3.2.4.3 Multiple Timer Stop

Figure 5.3.2.4.3-1 shows a scenario where the NF service consumer sends a request to the UDSF to stop all timers matching a provided filter.



Figure 5.3.2.4.3-1: Stopping multiple Timers

1. The NF service consumer (any NF) sends a DELETE request to the timers resource containing a filter Query Parameter.

2a. On success, the UDSF shall respond with "200 OK" with a message body containing the list of stopped timers.

2b. The UDSF shall respond with "204 No Content" if no timers matching the filter could be found.

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 Search

##### 5.3.2.5.1 General

The following procedures using the Search service operation are supported:

- Expired Timer Search

- Tagged Timer Search

##### 5.3.2.5.2 Expired Timer Search

Figure 5.3.2.5.2-1 shows a scenario where the NF service consumer sends a request to the UDSF to search for expired timers matching a provided expired-filter.



Figure 5.3.2.5.2-1: Searching for expired Timers

1. The NF service consumer (any NF) sends a GET request to the timers resource containing an expired-filter Query Parameter.

2a. On success, the UDSF shall respond with "200 OK" with a message body containing the list of expired timers matching the expired-filter.

2b. The UDSF shall respond with "204 No Content" if no timers matching the filter could be found.

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 Tagged Timer Search

Figure 5.3.2.5.3-1 shows a scenario where the NF service consumer sends a request to the UDSF to search for tagged timers matching a provided filter.



Figure 5.3.2.5.3-1: Searching for tagged Timers

1. The NF service consumer (any NF) sends a GET request to the timers resource containing a filter Query Parameter.

2a. On success, the UDSF shall respond with "200 OK" with a message body containing the list of tagged timers matching the filter.

2b. The UDSF shall respond with "204 No Content" if no timers matching the filter could be found.

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 Notify

##### 5.3.2.6.1 General

The following procedures using the Notify service operation are supported:

- Timer Expiry Notify

##### 5.3.2.6.2 Timer Expiry Notify

Figure5.3.2.6.2-1 shows a scenario where the UDSF notifies the NF service consumer of the expired timer.

The Notify is sent by the UDSF to the NF Service Consumer when the timer expires as indicated by the expires attribute of the Timer.



Figure 5.3.2.6.2-1: Timer Expiry Notify

1. The UDSF shall send a POST request to the callback URI. The request shall contain the timer that has expired.

2. On success, "204 No content" shall be returned by the NF Service Consumer to UDSF.

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.

# 6 API Definitions

## 6.1 Nudsf\_DataRepository Service API

### 6.1.1 Introduction

The Nudsf\_DataRepository service shall use the Nudsf\_DataRepository API.

The API URI of the Nudsf\_DataRepository API shall be:

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

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

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].

- The <apiName>shall be "nudsf-dr".

- The <apiVersion> shall be "v1".

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

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

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

#### 6.1.2.2 HTTP standard headers

##### 6.1.2.2.1 General

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

##### 6.1.2.2.2 Content type

The following content types shall be supported:

- JSON, IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".

- "Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 9457 [13].

- JSON Patch (IETF RFC 6902 [14]). The use of the JSON Patch format in a HTTP request body shall be signalled by the content type "application/json-patch+json".

Multipart messages shall also be supported possibly indicating other content-types as described in clause 6.1.2.4.

##### 6.1.2.2.3 Cache-Control

As described in IETF RFC 9111 [17] clause 5.2, a "Cache-Control" header should be included in HTTP responses carrying a representation of cacheable resources. 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 9110 [15] clause 8.8.3, an "ETag" (entity-tag) header should be included in HTTP responses carrying a representation of cacheable or modifiable resources to allow an NF Service Consumer performing a conditional GET request with an "If-None-Match" header or a conditional PUT/PATCH/DELETE request with an "If-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 9110 [15] clause 13.1.2, an NF Service Consumer may issue conditional GET or PUT requests towards UDSF by including an "If-None-Match" header in HTTP requests containing one or several entity tags received in previous responses for the same resource.

If the If-None-Match header is included with the PUT method, it shall be used with a value of "\*" to prevent the inadvertent modification of an existing representation of the target resource when the client believes that the resource does not have a current representation.

##### 6.1.2.2.6 If-Match

As described in IETF RFC 7232 [15] clause 13.1.1, an NF Service Consumer may issue conditional PUT/PATCH/DELETE request towards UDSF by including an "If-Match" header in HTTP requests containing an entity tag received in previous responses for the same resource.

##### 6.1.2.2.7 Last-Modified

As described in IETF RFC 9110 [15] clause 8.8.2, a "Last-Modified" header should be included in HTTP responses carrying a representation of cacheable resources to allow an NF Service Consumer performing a conditional request with "If-Modified-Since" header.

##### 6.1.2.2.8 If-Modified-Since

As described in IETF RFC 9110 [15] clause 13.1, an NF Service Consumer may issue conditional GET request towards UDSF, by including an "If-Modified-Since" header in HTTP requests.

##### 6.1.2.2.9 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 9110 [15] clause 15.3.1.

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

If the UDSF included an "ETag" header with the resource then a conditional GET request for this resource shall be performed with the "If-None-Match" header, and a PUT/PATCH/DELETE request for this resource shall be performed with the "If-Match" header.

##### 6.1.2.2.10 Content-Location

As described in IETF RFC 9110 [15] clause 8.7, the UDSF shall include the Content-Location header set to the URI of the expired Record when sending a Notification to an NF Consumer.

#### 6.1.2.3 HTTP custom headers

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

#### 6.1.2.4 HTTP multipart messages

##### 6.1.2.4.1 General

HTTP multipart messages shall be supported to transfer the opaque Record and Block Information in the following service operations (and HTTP messages):

- Record (PUT/GET/DELETE)

- BlockCollection (GET)

- RecordNotification (POST)

NOTE: In the clauses below, this specification deviates in the definition of the Content-Id header from IETF RFC 2045 [20] in that there is no need for the Content-Id to be "world unique", as in this specification the Content-Id is only required to be unique within the context of a Record, BlockCollection or RecordNotification.

##### 6.1.2.4.2 Record

The Record is encoded as an HTTP multipart message with the multipart/mixed content-type as described in IETF RFC 2046 [21].

The boundary parameter is used to delimit each part (Start of parts to RecordMeta, RecordMeta to Block, Block to Block and Block to End of parts) and shall be set to a value as in accordance with IETF  RFC 2046 [21].

The RecordMeta part shall be the first part, and shall always be present. It shall include a Content-Id header that may be set to an unquoted value of "meta" or any other suitable value, for example as described in IETF RFC 2045 [20], the Content-Type (see IETF RFC 2045 [20]) header set to "application/json" and include JSON content for the RecordMeta.

Zero or more Block parts may follow the RecordMeta Part. For each Block part in the HTTP multipart/mixed message, the Block part shall include a Content-Id header identifying the Block with the value of the blockId, a Content-Type (see IETF RFC 2045 [20]) header indicating the MIME type of the Block (any value), e.g. application/octet-stream, application/json or another applicable MIME type and the Content-Transfer-Encoding (see IETF RFC 2045 [20]) header with an appropriate value.

##### 6.1.2.4.3 BlockCollection

The BlockCollection is encoded as an HTTP multipart message with the multipart/parallel content-type as described in IETF RFC 2046 [21].

The boundary parameter is used to delimit each part (Start of parts to Block, Block to Block and Block to End of parts) and shall be set to a value as in accordance with IETF  RFC 2046 [21].

For the BlockCollection, zero or more Block parts may be included. For each Block part in the HTTP multipart/parallel message, the Block part shall include a Content-Id header identifying the Block with the value of the blockId, a Content-Type header indicating the MIME type of the Block (any value) e.g. application/octet-stream, application/json or another applicable MIME type and the Content-Transfer-Encoding (see IETF RFC 2045 [20]) header with an appropriate value.

##### 6.1.2.4.4 RecordNotification

The RecordNotification is encoded as an HTTP multipart message with the multipart/mixed content-type as described in IETF RFC 2046 [21].

The boundary parameter is used to delimit each part (Start of parts to RecordNotification, RecordNotification to RecordMeta, RecordMeta to Block, Block to Block and Block to End of parts) and shall be set to a value in accordance with IETF  RFC 2046 [21].

The RecordNotification shall be the first part, and shall always be present. It shall include a Content-Id header set to an unquoted value of "meta" or any other suitable value, for example as described in IETF RFC 2045 [20], the Content-Type (see IETF RFC 2045 [20]) header set to "application/json" and include JSON content for the NotificationDescription.

The RecordMeta part shall be the second part, and shall always be present. It shall include a Content-Id header set to an unquoted value of "meta" or any other suitable value, for example as described in IETF RFC 2045 [20], the Content-Type (see IETF RFC 2045 [20]) header set to "application/json" and include JSON content for the RecordMeta.

Zero or more Block parts may follow the RecordMeta Part. For each Block part in the HTTP multipart/mixed message, the Block part shall include a Content-Id header identifying the Block with the value of the blockId, a Content-Type (see IETF RFC 2045 [20]) header indicating the MIME type of the Block (any value), e.g. application/octet-stream, application/json or another applicable MIME type and the Content-Transfer-Encoding (see IETF RFC 2045 [20]) header with an appropriate value.

### 6.1.3 Resources

#### 6.1.3.1 Overview



Figure 6.1.3.1-1: Resource URI structure of the nudsf-dr 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 | Resource URI | HTTP method or custom operation | Description |
| RecordCollection  (Collection) | /{realmId}/{storageId}/records | GET | Search for records |
| DELETE | Delete records |
| Record  (Document) | /{realmId}/{storageId}/records/{recordId} | GET | Retrieve a record |
| PUT | Create or update a record |
| DELETE | Delete a record |
| Meta  (Document) | /{realmId}/{storageId}/records/{recordId}/meta | GET | Retrieve the meta of a record |
| PATCH | Modify the meta of a record |
| BlockCollection  (Collection) | /{realmId}/{storageId}/records/{recordId}/blocks | GET | Retrieve all the blocks of a record |
| Block  (Document) | /{realmId}/{storageId}/records/{recordId}/blocks/{blockId} | GET | Retrieve a block |
| PUT | Create or update a block |
| DELETE | Delete a block |
| NotificationSubscriptions (Collection) | /{realmId}/{storageId}/subs-to-notify | GET | Retrieve existing subscriptions |
| Individual NotificationSubscription (Document) | /{realmId}/{storageId}/subs-to-notify/{subscriptionId} | DELETE | Delete the subscription identified by {subscriptionId}, i.e. unsubscribe to notification for change of data |
| PATCH | Update an individual Subscription to notification |
| PUT | Create or update a subscription to notification, |
| GET | Retrieve an individual Subscription to notification |
| Meta Schema  (Document) | /{realmId}/{storageId}/meta-schemas/{schemaId} | GET | Retrieve a Meta Schema |
| PUT | Create or update a Meta Schema |
| DELETE | Delete a Meta Schema |

#### 6.1.3.2 Resource: RecordCollection (Collection)

##### 6.1.3.2.1 Description

This resource represents the collection of records within a storage. It can be used to search for specific records matching specific filter criteria.

##### 6.1.3.2.2 Resource Definition

Resource URI: **{apiRoot}/nudsf-dr/<apiVersion>/{realmId}/{storageId}/records**

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 |
| realmId | Represents the realm Id. |
| storageId | Represents the storage Id. |

##### 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 | Applicability |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6 |  |
| filter | SearchExpression | C | 0..1 | The filter criteria for searching the records of the storage.  If the tag-count-filter query parameter is included, then this parameter shall not be included. |  |
| limit-range | Uinteger | C | 0..1 | When set, the returned response shall contain at the most the number of record references specified by the parameter value.  If the count-indicator parameter is set in the request, this parameter shall be ignored. |  |
| count-indicator | boolean | C | 0..1 | If this parameter is set, the number of records that matched the criteria shall be returned and no record references shall be returned.  If the retrieve-records or tag-count-filter query parameters are included, then this parameter shall not be included. |  |
| retrieve-records | RetrieveRecords | C | 0..1 | If this parameter is set, the content of records that matched the criteria shall be returned.  If the count-indicator is set or the tag count-filter query parameter is included, then this parameter shall not be included. | CombinedSearchRetrieve |
| max-payload-size | Uinteger | O | 0..1 | Maximum content size (before compression, if any) of the response, expressed in kilo octets.  When present, the UDSF shall limit the number of Records or Meta returned in the response so as not to exceed the maximum content size indicated in the request. | CombinedSearchRetrieve |
| tag-count-filter | map(CountExpression) | C | 1..N | The filter criteria for counting the records of the storage.  If the tag-count-filter parameter is included, then the filter, count-indicator and retrieve-records parameters shall not be included.  The key to the map is a unique string identifying the specific CountExpression. | AdvancedCounting |

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 |
| RecordSearchResult | M | 1 | 200 OK | The search result containing the record references matching the filter. |
| n/a |  |  | 204 No Content | The search did not result in any matching record references. |
| NOTE: The manadatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

6.1.3.2.3.2 DELETE

This method shall support the URI query parameters specified in table 6.1.3.2.3.2-1.

Table 6.1.3.2.3.2-1: URI query parameters supported by the DELETE method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6 |  |
| filter | SearchExpression | M | 1 | The filter criteria for identifying the records to be deleted.  To delete all records, the SearchComparison shall use a value of "GTE" for the ComparisonOperator defined in table 6.1.6.3.3-1.  The value of the "tag" shall be set to "". | BulkOperations |

This method shall support the request data structures specified in table 6.1.3.2.3.2-2 and the response data structures and response codes specified in table 6.1.3.2.3.2-3.

Table 6.1.3.2.3.2-2: Data structures supported by the DELETE Request Body on this resource

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

Table 6.1.3.2.3.2-3: Data structures supported by the DELETE Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | The bulk deletion request did not result in any matching records to be deleted. |
| RecordIdList | M | 1 | 200 OK | Contains the list of record IDs identifying the deleted records. |
| NOTE: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

#### 6.1.3.3 Resource: Record (Document)

##### 6.1.3.3.1 Description

This resource represents a record within a storage.

##### 6.1.3.3.2 Resource Definition

Resource URI: **{apiRoot}/nudsf-dr/<apiVersion>/{realmId}/{storageId}/records/{recordId}**

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 |
| realmId | Represents the realm Id where the record is stored |
| storageId | Represents the storage Id where the record is stored |
| recordId | Represents the record Id of the record |

##### 6.1.3.3.3 Resource Standard Methods

6.1.3.3.3.1 GET

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 GET method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| 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 6.1.3.3.3.1-2 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 GET Request Body on this resource

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| RecordBody | M | 1 | 200 OK | A response body containing the record. |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be used to indicate one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -RECORD\_NOT\_FOUND |
| ExtendedProblemDetails | O | 0..1 | 412 Precondition Failed | The "cause" attribute shall be set to the following application error:  - INCORRECT\_CONDITIONAL\_GET\_REQUEST  The UDSF may include the stored record in the ProblemDetailsExtension. |
| ExtendedProblemDetails | O | 0..1 | 500 Internal Server Error | The "cause" attribute may be set to the following application error:  - DATABASE\_INCONSISTENCY  The UDSF shall include the stored record in the ProblemDetailsExtension if the cause is "DATABASE\_INCONSISTENCY". |
| NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

6.1.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 6.1.3.3.3.2-1.

Table 6.1.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6 |  |
| get-previous | boolean | O | 0..1 | Request to return the previous record content if a record already exists in the targeted storage for the same record identifier. |  |

When creating or replacing the record, meta and zero or more blocks shall be included. The record meta information shall be the first part and is mandatory. The remaining parts of the body (if any) shall be the blocks to be updated or created. See clause 6.1.2.4 for details on the encoding.

If the operation updates an existing record, then the existing record and its blocks shall be discarded and replaced by the meta and blocks supplied with the request. This also applies to the case when no new blocks are included, i.e. the old blocks (if any) shall be deleted from the record.

This method shall support the request data structures specified in table 6.1.3.3.3.2-2 and the response data structures and response codes specified in table 6.1.3.3.3.2-3.

Table 6.1.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| Record | M | 1 | The record that is to be created including meta and zero or more blocks. |

Table 6.1.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| RecordBody | M | 1 | 200 OK | Upon successful update of a record, a response body containing the previous record value (if get-previous was indicated in the request, and if one exists) will be returned |
| RecordBody | O | 0..1 | 201 Created | Upon successful creation of a record, a response body of the created record shall be returned. If due to operator's policy the value of the ttl (if any) in the request exceeded a maximum allowed ttl value with the ttl set to the value applied by the UDSF. |
| n/a |  |  | 204 No Content | Upon successful update of a record, an empty response is returned or if no previous record value was requested. |
| ProblemDetails | O | 0..1 | 403 FORBIDDEN | If the UDSF (based on operator policy), determines to apply a ttl value of the recordMeta different from the ttl value (if any) of the request, the get-previous query-parameter is present in the request and the request applies to a record that already exists in the UDSF, the "cause" attribute shall be set to one of the following application errors:  -TTL\_VALUE\_NOT\_ALLOWED |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be used to indicate one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND |
| RecordBody | O | 0..1 | 412 Precondition Failed | If one or more conditions given in the request header fields evaluated to false and get-previous was indicated in the request, the UDSF shall include the RecordBody in the response. |
| ExtendedProblemDetails | O | 0..1 | 409 Conflict | The "cause" attribute may be set to the following application error:  - DATABASE\_INCONSISTENCY\_PUT\_REQUEST  The UDSF shall include the stored record in the ProblemDetailsExtension if the cause is "DATABASE\_INCONSISTENCY\_PUT\_REQUEST". |
| NOTE: The mandatory HTTP error status code for the PUT method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

6.1.3.3.3.3 DELETE

This method shall support the URI query parameters specified in table 6.1.3.3.3.3-1.

Table 6.1.3.3.3.3-1: URI query parameters supported by the DELETE method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6 |  |
| get-previous | boolean | O | 0..1 | Request to return the record content if a record exists in the targeted storage for the same record identifier. |  |

This method shall support the request data structures specified in table 6.1.3.3.3.3-2 and the response data structures and response codes specified in table 6.1.3.3.3.3-3.

Table 6.1.3.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

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

Table 6.1.3.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| RecordBody | O | 0..1 | 200 OK | Upon success, and a response body containing the record value with meta and associated blocks (if any), if get-previous was indicated in the request. |
| n/a |  |  | 204 No Content | Upon success and no response body containing the record was requested. |
| RecordBody | O | 0..1 | 412 Precondition Failed | If one or more conditions given in the request header fields evaluated to false and get-previous was indicated in the request, the UDSF shall include the RecordBody in the response. |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be used to indicate one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -RECORD\_NOT\_FOUND |
| NOTE: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

#### 6.1.3.4 Resource: Meta (Document)

##### 6.1.3.4.1 Description

This resource represents the meta associated with a record.

##### 6.1.3.4.2 Resource Definition

Resource URI: **{apiRoot}/nudsf-dr/<apiVersion>/{realmId}/{storageId}/records/{recordId}/meta**

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 |
| realmId | Represents the realm Id where the record is stored |
| storageId | Represents the storage Id where the record is stored |
| recordId | Represents the record Id of the record |

##### 6.1.3.4.3 Resource Standard Methods

6.1.3.4.3.1 GET

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 GET method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| 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 6.1.3.4.3.1-2 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 GET Request Body on this resource

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| RecordMeta | M | 1 | 200 OK | A response body containing the record meta will be returned. |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -RECORD\_NOT\_FOUND |
| Extended ProblemDetails | O | 0..1 | 412 Precondition Failed | The "cause" attribute shall be set to the following application error:  - INCORRECT\_CONDITIONAL\_GET\_REQUEST  The UDSF shall include the RecordMeta in the ProblemDetailsExtension. |
| Extended ProblemDetails | O | 0..1 | 500 Internal Server Error | The "cause" attribute may be set to the following application error:  - DATABASE\_INCONSISTENCY  The UDSF shall include the RecordMeta in the ProblemDetailsExtension if the cause is "DATABASE\_INCONSISTENCY". |
| NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

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 | Applicability |
| 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 6.1.3.4.3.2-2 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 |
| array(patchItem) | M | 1..N | A collection of patch items to apply on the record meta. |

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 |
| n/a |  |  | 204 No Content | Upon successful modification, there is no body in the response message. (NOTE 2) |
| PatchResult | M | 1 | 200 OK | If one or more modification instructions have been discarded, the execution report is returned. (NOTE 2) |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute maybe used to indicate one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -RECORD\_NOT\_FOUND |
| ExtendedProblemDetails | O | 0..1 | 412 Precondition Failed | The "cause" attribute shall be set to the following application error:  - INCORRECT\_CONDITIONAL\_GET\_REQUEST  The UDSF shall include the RecordMeta in the ProblemDetailsExtension. |
| ExtendedProblemDetails | O | 0..1 | 409 Conflict | The "cause" attribute may be set to the following application error:  - DATABASE\_INCONSISTENCY\_PUT\_REQUEST  The UDSF shall include the RecordMeta in the ProblemDetailsExtension if the cause is "DATABASE\_INCONSISTENCY\_PUT\_REQUEST". |
| NOTE 1: In addition common data structures as listed in table 6.1.7.3-1are supported.  NOTE 2: If all the modification instructions in the PATCH request have been implemented, the UDSF shall respond with 204 No Content response; if some of the modification instructions in the PATCH request have been discarded, the UDSF shall respond with PatchResult. | | | | |

#### 6.1.3.5 Resource: BlockCollection (Collection)

##### 6.1.3.5.1 Description

This resource represents the collection of blocks of associated with a record.

##### 6.1.3.5.2 Resource Definition

Resource URI: **{apiRoot}/nudsf-dr/<apiVersion>/{realmId}/{storageId}/records/{recordId}/blocks**

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 |
| realmId | Represents the realm Id where the record is stored |
| storageId | Represents the storage Id where the record is stored |
| recordId | Represents the record Id of the record |

##### 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 | Applicability |
| 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 6.1.3.5.3.1-2 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 |
| array(Block) | M | 1..N | 200 OK | A response body containing one or more blocks. |
| n/a |  |  | 204 No Content | The BlockCollection did not contain any blocks. |
| NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

#### 6.1.3.6 Resource: Block (Document)

##### 6.1.3.6.1 Description

This resource represents a record within a storage.

##### 6.1.3.6.2 Resource Definition

Resource URI: **{apiRoot}/nudsf-dr/<apiVersion>/{realmId}/{storageId}/records/{recordId}/blocks/{blockId}**

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 |
| realmId | Represents the realm Id where the record is stored |
| storageId | Represents the storage Id where the record is stored |
| recordId | Represents the record Id of the record |
| blockId | Represents the block Id of the block |

##### 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 | Applicability |
| 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 6.1.3.6.3.1-2 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 |
| BlockBody | M | 1 | 200 OK | Upon success, a response body containing the requested block is returned. |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute maybe used to indicate one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -RECORD\_NOT\_FOUND  -BLOCK\_NOT\_FOUND |
| ExrendedProblemDetails | O | 0..1 | 412 Precondition Failed | The "cause" attribute shall be set to the following application error:  - INCORRECT\_CONDITIONAL\_GET\_REQUEST  The UDSF shall include the stored record in the ProblemDetailsExtension. |
| ExtendedProblemDetails | O | 0..1 | 500 Internal Server Error | The "cause" attribute may be set to the following application error:  - DATABASE\_INCONSISTENCY  The UDSF shall include the stored record in the ProblemDetailsExtension if the cause is "DATABASE\_INCONSISTENCY". |
| NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

6.1.3.6.3.2 PUT

This method shall support the URI query parameters specified in table 6.1.3.6.3.2-1.

Table 6.1.3.6.3.2-1: URI query parameters supported by the PUT method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6 |  |
| get-previous | boolean | O | 0..1 | Request to return the previous block content if a block already exists in the targeted storage for the same block identifier. |  |

If the operation updates an existing block, then the existing block shall be discarded and replaced by the block supplied with the request.

This method shall support the request data structures specified in table 6.1.3.6.3.2-2 and the response data structures and response codes specified in table 6.1.3.6.3.2-3.

Table 6.1.3.6.3.2-2: Data structures supported by the PUT Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| Block | M | 1 | The block definition that shall be created. A Content-Type http header can be set to specify the media type of the block's opaque content. If the media-type is not included, the media-type shall be set to application/octet-stream. |

Table 6.1.3.6.3.2-3: Data structures supported by the PUT Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| BlockBody | M | 1 | 200 OK | Upon successful update of a block, a response body containing the previous record value ((if get-previous was indicated in the request and if one exists) will be returned |
| n/a |  |  | 201 Created | Upon successful creation of a record, an empty response shall be returned. |
| n/a |  |  | 204 No Content | Upon successful update of a record, an empty response is returned if no previous record value was requested. |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be used to indicate one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -RECORD\_NOT\_FOUND |
| BlockBody | O | 0..1 | 412 Precondition Failed | If one or more conditions given in the request header fields evaluated to false and get-previous was indicated in the request, the UDSF shall include the BlockBody in the response. |
| ExtendedProblemDetails | O | 0..1 | 409 Conflict | The "cause" attribute may be used to indicate the following application error:  - DATABASE\_INCONSISTENCY\_PUT\_REQUEST  The UDSF shall include the stored recored in the ProblemDetailsExtension if the cause is "DATABASE\_INCONSISTENCY\_PUT\_REQUEST". |
| NOTE: The mandatory HTTP error status code for the PUT method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

6.1.3.6.3.3 DELETE

This method shall support the URI query parameters specified in table 6.1.3.6.3.3-1.

Table 6.1.3.6.3.3-1: URI query parameters supported by the DELETE method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6 |  |
| get-previous | boolean | O | 0..1 | Request to return the previous block content (if any). |  |

This method shall support the request data structures specified in table 6.1.3.6.3.3-2 and the response data structures and response codes specified in table 6.1.3.6.3.3-3.

Table 6.1.3.6.3.3-2: Data structures supported by the DELETE Request Body on this resource

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

Table 6.1.3.6.3.3-3: Data structures supported by the DELETE Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| BlockBody | O | 0..1 | 200 OK | Upon success, and a response body containing the block was requested. |
| n/a |  |  | 204 No Content | Upon success, and no response body containing the block was requested. |
| BlockBody | O | 0..1 | 412 Precondition Failed | If one or more conditions given in the request header fields evaluated to false and get-previous was indicated in the request, the UDSF shall include the BlockBody in the response. |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be used to indicate one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -RECORD\_NOT\_FOUND  -BLOCK\_NOT\_FOUND |
| NOTE: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

#### 6.1.3.7 Resource: NotificationSubscriptions

##### 6.1.3.7.1 Description

This resource is used to represent notification subscriptions.

##### 6.1.3.7.2 Resource Definition

Resource URI: **{apiRoot}/nudsf-dr/<apiVersion>/{realmId}/{storageId}/subs-to-notify**

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 |
| realmId | Represents the realm Id. |
| storageId | Represents the storage Id. |

##### 6.1.3.7.3 Standard Methods

6.1.3.7.3.2 GET

This method shall support the URI query parameters specified in table 6.1.3.7.3.2-1.

Table 6.1.3.7.3.2-1: 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 |
| limit-range | Uinteger | C | 0..1 | When set, the returned response shall contain at the most the number of Notification Subscriptions specified by the parameter value. |

This method shall support the request data structures specified in table 6.1.3.7.3.2-2 and the response data structures and response codes specified in table 6.1.3.7.3.2-3.

Table 6.1.3.7.3.2-2: Data structures supported by the GET Request Body on this resource

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

Table 6.1.3.7.3.2-3: Data structures supported by the GET Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| array(NotificationSubscription) | M | 0..N | 200 OK | Upon success, a response body containing the individual subscriptions shall be returned. |
| ProblemDetails | O | 0..1 | 404 NOT FOUND | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND |
| NOTE: The manadatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

#### 6.1.3.8 Resource: IndividualNotificationSubscription

##### 6.1.3.8.1 Description

This resource is used to represent an individual subscriber data subscriptions to notifications.

##### 6.1.3.8.2 Resource Definition

Resource URI: **{apiRoot}/nudsf-dr/<apiVersion>/{realmId}/{storageId}/subs-to-notify/{subscriptionId}**

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 |
| realmId | Represents the realm Id. |
| storageId | Represents the storage Id. |
| subscriptionId | The subscriptionId identifies an individual NotficiationSubscription. |

##### 6.1.3.8.3 Resource Standard Methods

6.1.3.8.3.1 DELETE

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 DELETE method on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| client-id | ClientId | M | 1 | The client-id is used by the UDSF to guard against deletion of notification subscriptions that do not belong to the same NF or NFSet. |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6 |
| get-previous | boolean | O | 0..1 | Request to return the associated NotificationSubscription if it exist. |

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 DELETE Request Body on this resource

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

Table 6.1.3.8.1-3: Data structures supported by the DELETE Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| NotificationSubscription | O | 0..1 | 200 OK | Upon successful delete of a NotificationSubscription, a response body containing the NotificationSubscription value before the delete shall be returned if get-previous was indicated in the request. |
| n/a |  |  | 204 NO CONTENTt | Upon success, an empty response body shall be returned. |
| ProblemDetails | O | 0..1 | 403 FORBIDDEN | If the client-id query parameter does not match the clientId of the existing resource, 403 FORBIDDEN shall be returned and the "cause" attribute may be used to indicate one of the following application errors:  - SUBSCRIPTION\_EXISTS |
| ProblemDetails | O | 0..1 | 404 NOT FOUND | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -SUBSCRIPTION\_NOT\_FOUND |
| NotificationSubscription | O | 0..1 | 412 PRECONDITION FAILED | 412 PRECONDITION FAILED is returned if one or more conditions given in the request header fields evaluated to false. If get-previous was indicated in the request, the UDSF shall include the NotificationSubscription in the response. |
| NOTE: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

6.1.3.8.3.2 PATCH

This method shall support the URI query parameters specified in table 6.1.3.8.3.2-1.

Table 6.1.3.8.3.2-1: URI query parameters supported by the PATCH 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 6.1.3.8.3.2-2 and the response data structures and response codes specified in table 6.1.3.8.3.2-3.

Table 6.1.3.8.3.2-2: Data structures supported by the PATCH Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| array(PatchItem) | M | 1..N | Contains the delta data of the Notification Subscription to be updated. |

Table 6.1.3.8.3.2-3: Data structures supported by the PATCH Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 NO CONTENT | Upon successful modification, there is no body in the response message. (NOTE 2) |
| PatchResult | M | 1 | 200 OK | Upon success, the execution report is returned. (NOTE 2) |
| ProblemDetails | O | 0..1 | 404 NOT FOUND | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -SUBSCRIPTION\_NOT\_FOUND |
| NOTE 1: In addition common data structures as listed in table 6.1.7.3-1are supported.  NOTE 2: If all the modification instructions in the PATCH request have been implemented, the UDSF shall respond with 204 No Content response; if some of the modification instructions in the PATCH request have been discarded, the UDSF shall respond with 200 OK and include the PatchResult. | | | | |

6.1.3.8.3.3 GET

This method shall support the URI query parameters specified in table 6.1.3.8.3.3-1.

Table 6.1.3.8.3.3-1: 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 6.1.3.8.3.3-2 and the response data structures and response codes specified in table 6.1.3.8.3.3-3.

Table 6.1.3.8.3.3-2: Data structures supported by the GET Request Body on this resource

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

Table 6.1.3.8.3.3-3: Data structures supported by the GET Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| NotificationSubscription | M | 1 | 200 OK | Upon success, a response body containing the individual subscriptions shall be returned. |
| ProblemDetails | O | 0..1 | 404 NOT FOUND | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -SUBSCRIPTION\_NOT\_FOUND |
| NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

6.1.3.8.3.4 PUT

This method shall support the URI query parameters specified in table 6.1.3.8.3.4-1.

Table 6.1.3.8.3.4-1: URI query parameters supported by the PUT method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| 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 6.1.3.8.3.4-2 and the response data structures and response codes specified in table 6.1.3.8.3.4-3.

Table 6.1.3.8.3.4-2: Data structures supported by the PUT Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| NotificationSubscription | M | 1 | The Notification Subscription. |

Table 6.1.3.8.3.4-3: Data structures supported by the PUT Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response codes | Description |
| NotificationSubscription | M | 1 | 201 CREATED | Upon success, the created NotificationSubscription is returned.  The HTTP response shall include a "Location" HTTP header that contains the resource URI of the created resource. |
| NotificationSubscription | M | 1 | 200 OK | Upon success, the updated NotificationSubscription is returned. |
| ProblemDetails | O | 0..1 | 404 NOT FOUND | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND |
| ProblemDetails | O | 0..1 | 403 FORBIDDEN | If the clientId of the PUT request does not match the clientId of the existing resource, 403 FORBIDDEN shall be returned and the "cause" attribute may be used to indicate one of the following application errors:  - SUBSCRIPTION\_EXISTS |
| array(Uri) | O | 1..N | 409 CONFLICT | If one or more monitoredResourceUris from the request don't exist in the UDSF, 409 CONFLICT shall be returned together with the non-existing monitoredResourceUris. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

#### 6.1.3.9 Resource: Meta Schema (Document)

##### 6.1.3.9.1 Description

This resource represents a meta schema within a storage.

##### 6.1.3.9.2 Resource Definition

Resource URI: **{apiRoot}/nudsf-dr/v1/{realmId}/{storageId}/meta-schemas/{schemaId}**

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 |
| realmId | Represents the realm Id where the schema is stored |
| storageId | Represents the storage Id where the schema is stored |
| schemaId | Represents the schema Id of the schema |

##### 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 | Applicability |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6. | Meta Schema |

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 |
| MetaSchema | M | 1 | 200 OK | A response body containing the meta schema. |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be used to indicate one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -SCHEMA\_NOT\_FOUND |
| NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

6.1.3.9.3.2 PUT

This method shall support the URI query parameters specified in table 6.1.3.9.3.2-1.

Table 6.1.3.9.3.2-1: URI query parameters supported by the PUT method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6 | Meta Schema |
| get-previous | boolean | O | 0..1 | Request to return the previous meta schema content if the meta schema already exists in the targeted storage for the same schema identifier. | Meta Schema |

This method shall support the request data structures specified in table 6.1.3.9.3.2-2 and the response data structures and response codes specified in table 6.1.3.9.3.2-3.

Table 6.1.3.9.3.2-2: Data structures supported by the PUT Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| MetaSchema | M | 1 | The schema that is to be created/updated. |

Table 6.1.3.9.3.2-3: Data structures supported by the PUT Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| MetaSchema | M | 1 | 200 OK | Upon successful update of a schema, a response body containing the previous schema value (if get-previous was indicated in the request, and if one exists) will be returned |
| MetaSchema | M | 1 | 201 Created | Upon successful creation of a schema, a response body of the created schema schall be returned.  The HTTP response shall include a "Location" HTTP header that contains the resource URI of the created resource. |
| n/a |  |  | 204 No Content | Upon successful update of a schema, an empty response is returned if no previous schema value was requested. |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be used to indicate one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND |
| NOTE: The mandatory HTTP error status code for the PUT method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.1.3.9.3.2-4: Headers supported by the 201 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | Contains the URI of the newly created resource, according to the structure: {apiRoot}/nudsf-dr/<apiVersion>/{realmId}/{storageId}/meta-schemas/{schemaId} |

6.1.3.9.3.3 DELETE

This method shall support the URI query parameters specified in table 6.1.3.9.3.3-1.

Table 6.1.3.9.3.3-1: URI query parameters supported by the DELETE method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6 | Meta Schema |
| get-previous | boolean | O | 0..1 | Request to return the schema content if a schema exists in the targeted storage for the same schema identifier. | Meta Schema |

This method shall support the request data structures specified in table 6.1.3.9.3.3-2 and the response data structures and response codes specified in table 6.1.3.9.3.3-3.

Table 6.1.3.9.3.3-2: Data structures supported by the DELETE Request Body on this resource

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

Table 6.1.3.9.3.3-3: Data structures supported by the DELETE Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| MetaSchema | O | 0..1 | 200 OK | Upon success, a response body containing the schema value, if get-previous was indicated in the request. |
| n/a |  |  | 204 No Content | Upon success, if get-previous was not indicated in the request.. |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be used to indicate one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -SCHEMA\_NOT\_FOUND |
| NOTE: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

### 6.1.4 Custom Operations without associated resources

None.

### 6.1.5 Notifications

#### 6.1.5.1 General

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

#### 6.1.5.2 Timer Expiry Notification

##### 6.1.5.2.1 Description

The Timer Expiry Notification is used by the NF service producer to report to an NF Consumer that the Record has expired as indicated by the ttl attribute (if set) of RecordMeta and if a callbackReference was set in the RecordMeta.

##### 6.1.5.2.2 Target URI

The Callback URI **"{callbackReference}"** shall be used with the callback URI variables defined in table 6.1.5.2.2-1.

Table 6.1.5.2.2-1: Target URI variables for this resource

|  |  |
| --- | --- |
| Name | Definition |
| callbackReference | string formatted as URI with the Callback Uri |

##### 6.1.5.2.3 Standard Methods

6.1.5.2.3.1 POST

This method shall support the request data structures specified in table 6.1.5.2.3.1-1 and the response data structures and response codes specified in table 6.1.5.2.3.1-1.

Table 6.1.5.2.3.1-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| RecordBody | M | 1 | The RecordBody of the record that was deleted. |

Table 6.1.5.2.3.1-3: Data structures supported by the POST 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: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

#### 6.1.5.3 Notification due to Data Change

##### 6.1.5.3.1 Description

The Notification due to Data Change is used by the UDSF to report to an NF Consumer that a Record that is part of a NotificationSubscription has been updated or deleted.

##### 6.1.5.3.2 Target URI

The Callback URI **"{callbackReference}"** shall be used with the callback URI variables defined in table 6.1.5.3.2-1.

Table 6.1.5.3.2-1: Callback URI variables for this resource

|  |  |
| --- | --- |
| Name | Definition |
| callbackReference | String formatted as URI with the Callback Uri |

##### 6.1.5.3.3 Standard Methods

6.1.5.3.3.1 POST

This method shall support the request data structures specified in table 6.1.5.3.3.1-1 and the response data structures and response codes specified in table 6.1.5.3.3.1-1.

Table 6.1.5.3.3.1-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| RecordNotification | M | 1 | The notification with the record information. |

Table 6.1.5.3.3.1-3: Data structures supported by the POST 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: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

#### 6.1.5.4 Subscription Expiry Notification

##### 6.1.5.4.1 Description

The Subscription Expiry Notification is used by the UDSF to report to an NF Consumer that a Subscription to Notification due to Data Change has expired or is about to expire.

##### 6.1.5.4.2 Target URI

The Callback URI **"{expiryCallbackReference}"** shall be used with the callback URI variables defined in table 6.1.5.4.2-1.

Table 6.1.5.4.2-1: Callback URI variables for this resource

|  |  |
| --- | --- |
| Name | Definition |
| expiryCallbackReference | String formatted as URI with the Callback URI |

##### 6.1.5.4.3 Standard Methods

6.1.5.4.3.1 POST

This method shall support the request data structures specified in table 6.1.5.4.3.1-1 and the response data structures and response codes specified in table 6.1.5.4.3.1-1.

Table 6.1.5.4.3.1-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| NotificationInfo | M | 1 | The notification info with expired subscriptions. |

Table 6.1.5.4.3.1-3: Data structures supported by the POST 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: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

### 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 data types defined for the Nudsf service based interface protocol. For simple data types defined for the Nudsf\_DataRepository service API see table 6.1.6.3.2-1.

Table 6.1.6.1-1: Nudsf specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Clause defined | Description | Applicability |
| RecordSearchResult | 6.1.6.2.2 | Record Search Result |  |
| RecordMeta | 6.1.6.2.3 | Record Meta |  |
| RecordBody | 6.1.6.2.4 | Record Body |  |
| Record | 6.1.6.2.5 | Record |  |
| BlockBody | 6.1.6.2.6 | Block Body |  |
| Block | 6.1.6.2.7 | Block |  |
| SearchCondition | 6.1.6.2.8 | Search Condition |  |
| SearchComparison | 6.1.6.2.9 | Search Comparison |  |
| ComparisonOperator | 6.1.6.3.3 | Comparison Operator |  |
| ConditionOperator | 6.1.6.3.4 | Condition Operator |  |
| SearchExpression | 6.1.6.4.1 | Search Expression |  |
| NotificationSubscription | 6.1.6.2.10 | Notification Subscription |  |
| RecordNotification | 6.1.6.2.11 | Record Notification |  |
| NotificationDescription | 6.1.6.2.12 | Notification Description |  |
| SubscriptionFilter | 6.1.6.2.13 | Subscription Filter |  |
| ClientId | 6.1.6.2.14 | Client Identity |  |
| MetaSchema | 6.1.6.2.15 | Meta Schema | Meta Schema |
| TagType | 6.1.6.2.16 | Tag Type | Meta Schema |
| RecordIdList | 6.1.6.2.17 | List of Record IDs | BulkOperations |
| NotificationInfo | 6.1.6.2.18 | Notification Info |  |
| RecordOperation | 6.1.6.3.5 | Record Operation |  |
| SchemaId | 6.1.6.3.2 | Identifier of a Meta Schema | Meta Schema |
| KeyType | 6.1.6.3.6 | Key Type | Meta Schema |
| RetrieveRecords | 6.1.6.3.7 | Request to return matching records | CombinedSearchRetrieve |

Table 6.1.6.1-2 specifies data types re-used by the Nudsf service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nudsf service based interface.

Table 6.1.6.1-2: Nudsf re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| SupportedFeatures | 3GPP TS 29.571 [19] | see 3GPP TS 29.500 [4] clause 6.6. |  |
| PatchItem | 3GPP TS 29.571 [19] | Data structure used for JSON patch. |  |
| PatchResult | 3GPP TS 29.571 [19] |  |  |
| Uri | 3GPP TS 29.571 [19] |  |  |
| DateTime | 3GPP TS 29.571 [19] |  |  |
| NfInstanceId | 3GPP TS 29.571 [19] |  |  |
| NfSetId | 3GPP TS 29.571 [19] |  |  |

#### 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: RecordSearchResult

Table 6.1.6.2.2-1: Definition of type RecordSearchResult

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| count | Uinteger | M | 1 | The number of records found by the search.  If the tag-count-filter parameter is included, then the count should be set to 0.  This attribute should be ignored if the tag-count-filter query parameter was included in the request. |  |
| references | array(Uri) | O | 1..N | The Record references found by the search. |  |
| supportedFeatures | SupportedFeatures | O | 0..1 | See clause 6.1.8 |  |
| matchingRecords | map(Record) | C | 1..N | This attribute contains the records that match the search filters provided in the request. The key of the map is the recordId. It shall be present if the search request included an instruction to include record content in the response.  The map may contain a subset of the matching records in the case where inclusion of more records would result in the content size exceeding the max-payload-size received in the request (if any). | CombinedSearchRetrieve |
| tagCountResult | map(TagCount) | C | 1..N | This attribute contains the result of the advanced counting.  The key to the map is the unique identifier used to identify the Advanced Counting map in the GET operation. It shall be present if the tag-count-filter was included in the request. | AdvancedCounting |

##### 6.1.6.2.3 Type: RecordMeta

Table 6.1.6.2.3-1: Definition of type RecordMeta

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| tags | map(array(string)) | O | 1..N(1..M) | A map of tag name/values pairs, where the tag name is a unique string name that is the primary key of the map and is paired with an array of string values. |  |
| ttl | DateTime | O | 0..1 | ttl refers to the lifetime of the record. After the expiry, the record shall be deleted. |  |
| callbackReference | Uri | O | 0..1 | The Uri where the NF Service Consumer shall receive notification on the expiry of the Record as indicated by the ttl attribute if desired. |  |
| schemaId | SchemaId | O | 0..1 | Id of the MetaSchema to which the tags comply to | Meta Schema |

##### 6.1.6.2.4 Type: RecordBody

Table 6.1.6.2.4-1: Definition of type RecordBody

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| record | Record | M | 1 | The record. |  |

##### 6.1.6.2.5 Type: Record

Table 6.1.6.2.5-1: Definition of type Record

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| meta | RecordMeta | M | 1 | The meta of a record. |  |
| blocks | array(Block) | O | 1..N | The block(s) (if any) making up the record. |  |

##### 6.1.6.2.6 Type: BlockBody

Table 6.1.6.2.6-1: Definition of type BlockBody

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| n/a | Block | M | 1 | The block. |  |

##### 6.1.6.2.7 Type: Block

Table 6.1.6.2.7-1: Definition of type Block

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| value | Any Type | M | 1 | The block value of any data type. |  |

##### 6.1.6.2.8 Type: SearchCondition

Table 6.1.6.2.8-1: Definition of type SearchCondition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| cond | ConditionOperator | M | 1 | Logical operator ("AND", "OR" or "NOT") |  |
| units | array(SearchExpression) | M | 1..N | For the logical "NOT" operator indicated in the cond attribute, only one member shall be present in the array.  For the logical "AND" or "OR" operators indicated in the cond attribute, at least two members shall be present in the array and all the members in the array shall be interpreted as logically concatenated with the logical operator. |  |
| schemaId | SchemaId | O | 0..1 | When included, the search is limited to records which have the given schemaId value stored in their RecordMeta | Meta Schema |

##### 6.1.6.2.9 SearchComparison

Table 6.1.6.2.9-1: Definition of type SearchComparison

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| op | ComparisonOperator | M | 1 | Comparison operator |  |
| tag | string | M | 1 | This attribute contains the tag name of an array of strings. |  |
| value | string | M | 1 | The array of strings indicated in the tag attribute compares to the value of this attribute. |  |

##### 6.1.6.2.10 Type: NotificationSubscription

Table 6.1.6.2.10-1: Definition of type NotificationSubscription

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| clientId | ClientId | M | 1 | Identity of the NF or NFSet for which the subscription applies. |  |
| callbackReference | Uri | M | 1 | Identifies the NF or NF pool where the notification shall be sent. |  |
| expiryCallbackReference | Uri | C | 0..1 | Identifies the NF or NF pool where the expiry notification shall be sent.  Shall be present if the expiryNotification is present. |  |
| expiry | DateTime | C | 0..1 | This IE shall be included in a subscription response, if, based on operator policy and taking into account the expiry time included in the request, the UDSF needs to include an expiry time. The expiry time, based on operator policy, may indicate a value that is sooner than the NF consumer requested.  The absence of this attribute in the subscription response indicates that the subscription does not have an expiry time. |  |
| expiryNotification | Uinteger | O | 0..1 | This attribute when present in the request, indicates to the UDSF that the UDSF shall Notify the NF Consumer about the expiry of the subscription if this capability is supported by the UDSF.  -A value of 0 in the subscription request indicates that the UDSF shall notify the NF Consumer upon subscription expiry.  -A value greater than 0 in the subscription request, indicates the number of seconds before the expiry of the subscription that the UDSF shall notify the NF Consumer about the expiry.  -A value that results in the notification to occur in the past shall be treated the same as a value of 0 was received.  A UDSF that supports this capability shall include the attribute in the subscription response and in the Notification, set to the value received in the request (or set to 0 if the notification would occur in the past as described above).  For example, if the expiry time in the subscription request indicates a time 100 seconds from now and the expiryNotification indicates 110 seconds, the UDSF shall return a value of 0 in the subscription response, meaning the NF Consumer will be notified upon subscription expiry. |  |
| subFilter | SubscriptionFilter | O | 0..1 | If not included, the subscription applies to all Create, Delete and Update events of the storage. |  |
| supportedFeatures | SupportedFeatures | O | 0..1 | Used to negotiate the applicability of optional features |  |

##### 6.1.6.2.11 Type: RecordNotification

Table 6.1.6.2.11-1: Definition of type RecordNotification

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| descriptor | NotificationDescription | M | 1 | The block value of any data type. |  |
| meta | RecordMeta | M | 1 | The meta of a record. |  |
| blocks | array(Block) | O | 1..n | The block(s) (if any) making up the record. |  |

##### 6.1.6.2.12 Type: NotificationDescription

Table 6.1.6.2.12-1: Definition of type NotificationDescription

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| recordRef | Uri | M | 1 | The reference of the record triggering the Notification. |  |
| operationType | RecordOperation | M | 1 | The operation type. |  |
| subscriptionId | string | O | 0..1 | This IE shall contain the subscriptionId that uniquely identifies the subscription to notification within a storage when present. |  |

##### 6.1.6.2.13 Type: SubscriptionFilter

Table 6.1.6.2.13-1: Definition of type SubscriptionFilter

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| monitoredResourceUris | array(Uri) | O | 1..N | A set of URIs that identify the records for which a modification of the representation 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 [22], also see NOTE 1.  The monitored resource shall indicate an existing record.  If not present, the subscription is applied to all records within the storage and a modification of the representation of any record within the storage triggers a notification. |  |
| operations | array(RecordOperation) | O | 0..3 | The operations that shall generate a notification.  If the monitoredResourceUris is present, only "UPDATED" and "DELETED" are allowed values, any other value shall be ignored.  If the attribute is not present, all applicable operations shall apply to the subscription. |  |
| NOTE 1: The UDSF should handle only the relative-path part (apiSpecificResourceUriPart, see 3GPP TS 29.501 [5] clause 4.4.1) and ignore possible inconsistencies (caused by e.g. an SCP) in the base URI part. | | | | | |

##### 6.1.6.2.14 Type: ClientId

Table 6.1.6.2.14-1: Definition of type ClientId

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| nfId | NfInstanceId | C | 0..1 | The NF Instance Id uniquely identifying the NF Consumer.  Shall be present if the nfSetId is absent. |  |
| nfSetId | NfSetId | C | 0..1 | The NF Set Id of the NF Consumer.  Shall be present if the nfId is absent. |  |

##### 6.1.6.2.15 Type: MetaSchema

Table 6.1.6.2.15-1: Definition of type MetaSchema

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| schemaId | SchemaId | M | 1 | Id of the schema. Used as reference. | Meta Schema |
| metaTags | array(TagType) | M | 1..N | Array of tag types that describe the schema | Meta Schema |

##### 6.1.6.2.16 Type: TagType

Table 6.1.6.2.16-1: Definition of type TagType

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| tagName | string | M | 1 | Name of the tag. Used as reference. Refers to the unique tag string name that is the primary key of the map and is paired with an array of string values in the RecordMeta tags IE | Meta Schema |
| keyType | KeyType | M | 1 | Type of key | Meta Schema |
| sort | boolean | C | 0..1 | Shall be present if keyType is "SEARCH\_KEY" or "SEARCH\_AND\_COUNT\_KEY"  true: indicates that searches based on "GT", "GTE", "LT" and / or "LTE" are expected. false: indicates otherwise | Meta Schema |
| presence | boolean | O | 0..1 | true: indicates that presence of the tag is mandatory in the RecordMeta false (default): indicates that presence of the tag is optional in the RecordMeta | Meta Schema |

##### 6.1.6.2.17 Type: RecordIdList

Table 6.1.6.2.17-1: Definition of type RecordIdList

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| recordIdList | array(string) | M | 1..N | List of Record IDs to be retrieved | BulkOperations |

##### 6.1.6.2.18 Type: NotificationInfo

Table 6.1.6.2.18-1: Definition of type NotificationInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| expiredSubscriptions | array(NotificationSubscription) | M | 1 | An array of one or more expired subscriptions. |  |

##### 6.1.6.2.19 Type: CountExpression

Table 6.1.6.2.19-1: Definition of type CountExpression

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| tag | string | O | 0..1 | The name of the tag to be searched for in the record.  The tag may be included for TOTAL\_COUNT countType.  If the "tag" is not included the UDSF shall return the total count of "records" in the storage.  The tag shall be included for UNIQUE\_COUNT and AGGREGATE\_COUNT countTypes. |  |
| countType | TagCountType | M | 1 | The type of count to be returned. |  |
| filter | SearchExpression | O | 0..1 | The filter criteria for searching the records of the storage. |  |

##### 6.1.6.2.20 Type: TagCount

Table 6.1.6.2.20-1: Definition of type TagCount

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| tag | string | C | 0..1 | The name of the tag counted.  If the countType received in the CountExpression is TOTAL\_COUNT or UNIQUE\_COUNT, then this attribute shall be set to the tag received in the CountExpression.  The tag may be included if the countType received in the CountExpression is set to AGGREGATE\_COUNT. |  |
| count | Uinteger | C | 0..1 | This attribute contains the unique number of instances of the tag found by the search for countType UNIQUE\_COUNT.  If the countType received in the CountExpression is TOTAL\_COUNT, then this attribute contains the total number of instances of the tag found by the search or the total number of records in the storage.  If the countType received in the CountExpression is AGGREGATE\_COUNT, then this attribute contains the sum of all the values of the tag. |  |
| valueCount | array(ValueCount) | C | 1..N | This attribute contains the count for each value of the tag and shall be included for AGGREGATE countType. |  |

##### 6.1.6.2.21 Type: ValueCount

Table 6.1.6.2.21-1: Definition of type ValueCount

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| value | string | M | 1 | The value of the tag counted. |  |
| count | Uinteger | M | 1 | The number of occurrences of the value found. |  |

#### 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 | Applicability |
| SchemaId | string | Id of the schema. Used as reference. | Meta Schema |

##### 6.1.6.3.3 Enumeration: ComparisonOperator

The enumeration ComparisonOperator represents the comparison of an array of strings to a string value. The comparison shall be based on lexicographical order. It shall comply with the provisions defined in table 6.1.6.3.3-1.

Table 6.1.6.3.3-1: Enumeration ComparisonOperator

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "EQ" | The array contains the string value. |  |
| "NEQ" | The array does not contain the string value. | AdvancedQuery |
| "GT" | The array contains a string that is greater than the string value. | AdvancedQuery |
| "GTE" | The array contains a string that is greater than or equal to the string value. | AdvancedQuery |
| "LT" | The array contains a string that is less than the string value. | AdvancedQuery |
| "LTE" | The array contains a string that is less than or equal to the string value. | AdvancedQuery |

NOTE: It's recommended to use GT/GTE/LT/LTE on single value tags. If not, the logical operator "NOT" applied over the comparison operator "GT" evaluates to "true" if there are no members in the array that are greater than the value.

##### 6.1.6.3.4 Enumeration: ConditionOperator

Table 6.1.6.3.4-1: Enumeration ConditionOperator

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "AND" | Logical "AND" |  |
| "OR" | Logical "OR" |  |
| "NOT" | Logical "NOT" |  |

##### 6.1.6.3.5 Enumeration: RecordOperation

Table 6.1.6.3.5-1: Enumeration RecordOperation

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "CREATED" | Indicates a Create record operation |  |
| "UPDATED" | Indicates an Update record operation |  |
| "DELETED" | Indicates a Delete record operation |  |

##### 6.1.6.3.6 Enumeration: KeyType

Table 6.1.6.3.6-1: Enumeration KeyType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "UNIQUE\_KEY" | Tags with this key type may be used for search and will result in no or one matching records. | Meta Schema |
| "SEARCH\_KEY" | Tags with this key type may be used for search and will result in no, one or more matching records. | Meta Schema |
| "COUNT\_KEY" | Tags with this key type may be used for count. | Meta Schema |
| "SEARCH\_AND\_COUNT\_KEY" | Tags with this key type may be used for seach and count. | Meta Schema |
| "OTHER\_TAG" | Tags with this key type may not be used for search or count. | Meta Schema |

##### 6.1.6.3.7 Enumeration: RetrieveRecords

Table 6.1.6.3.7-1: Enumeration RetrieveRecords

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "ONLY\_META" | Only the META of matching records are requested to be included in the RecordSearchResult. | CombinedSearchRetrieve |
| "META\_AND\_BLOCKS" | META and BLOCKS of matching records are requested to be included in the RecordSearchResult. | CombinedSearchRetrieve |

##### 6.1.6.3.8 Enumeration: TagCountType

Table 6.1.6.3.8-1: Enumeration TagCountType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "AGGREGATE\_COUNT" | The count of all values for the specified tag from all records is requested to be returned. |  |
| "UNIQUE\_COUNT" | The count of unique values of a tag from records matching the search expression is requested to be returned. |  |
| "TOTAL\_COUNT" | If the "tag" is provided in the AdvancedCounting then the count of total values of a tag from records matching the search expression is requested to be returned.  Otherwise, the total number of records of the storage is requested to be returned. |  |

#### 6.1.6.4 Data types describing alternative data types or combinations of data types

##### 6.1.6.4.1 Type: SearchExpression

Table 6.1.6.4.1-1: Definition of type SearchExpression as a list of mutually exclusive alternatives

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Cardinality | Description | Applicability |
| SearchCondition | 1 | A search expression with logic operators | AdvancedQuery,  AdvancedCounting |
| SearchComparison | 1 | A minimum unit of the search expression |  |
| RecordIdList | 1 | List of Record IDs identifying records to be retrieved | BulkOperations |

##### 6.1.6.4.2 Type: ExtendedProblemDetails

This data type is the "ProblemDetails" data type defined in 3GPP TS 29.571 [19] but extended with "ProblemDetailExtension" data type.

Table 6.1.6.4.2-1 Definition of type ExtendedProblemDetails as a list of to be combined data types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Cardinality | Description | Applicability |
| ProblemDetails | 1 | The “ProblemDetails” data structure is specified in clause 5.2.4.1 of 3GPP TS 29.571 [19]. |  |
| ProblemDetailsExtension | 1 | Contains either the stored record or meta of the record associated with the error. |  |

##### 6.1.6.4.3 Type: ProblemDetailExtension

Table 6.1.6.4.3-1: Definition of type ProblemDetailExtension as a list of mutually exclusive alternatives

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Cardinality | Description | Applicability |
| Record | 0..1 | The stored record |  |
| RecordMeta | 0..1 | The meta of a stored record |  |

### 6.1.7 Error Handling

#### 6.1.7.1 General

For the Nudsf\_DataRepository API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [4].

In addition, the requirements in the following clauses are applicable for the Nudsf\_DataRepository API.

#### 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 application errors defined for the Nudsf\_DataRepository service are listed in Table 6.1.7.3-1.

Table 6.1.7.3-1: Application errors

|  |  |  |
| --- | --- | --- |
| Application Error | HTTP status code | Description |
| TTL\_VALUE\_NOT\_ALLOWED | 403 Forbidden | The ttl value indicated in the request exceeds the maximum value allowed in the UDSF. |
| SUBSCRIPTION\_EXISTS | 403 Forbidden | The subscription indicated in the HTTP/2 request is not authorized to be operated. |
| SCHEMA\_IN\_USE | 403 Forbidden | The schema cannot be deleted as it is still referenced by existing records. |
| REALM\_NOT\_FOUND | 404 Not Found | The realm indicated in the HTTP/2 request is unavailable in the UDSF. |
| STORAGE\_NOT\_FOUND | 404 Not Found | The storage indicated in the HTTP/2 request is unavailable in the UDSF. |
| RECORD\_NOT\_FOUND | 404 Not Found | The record indicated in the HTTP/2 request is unavailable in the UDSF. |
| BLOCK\_NOT\_FOUND | 404 Not Found | The block indicated in the HTTP/2 request is unavailable in the UDSF. |
| SUBSCRIPTION\_NOT\_FOUND | 404 Not Found | The subscription indicated in the HTTP/2 request is unavailable in the UDSF. |
| SCHEMA\_NOT\_FOUND | 404 Not Found | The schema indicated in the HTTP/2 request is unavailable in the UDSF. |
| DATABASE\_INCONSISTENCY\_PUT\_REQUEST | 409 Conflict | Indicates that the request could not be processed because of conflict in the current state of the resource, |
| INCORRECT\_CONDITIONAL\_GET\_REQUEST | 412 Precondition Failed | One or more conditions given in the request header fields evaluated to false when tested in the UDSF. |
| DATABASE\_INCONSISTENCY | 500 Internal Server Error | Requested data cannot be returned due to database inconsistency |

### 6.1.8 Feature negotiation

The optional features in table 6.1.8-1 are defined for the Nudsf\_DataRepository 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 | AdvancedQuery | If an NF consumer detects that the UDSF supports the AdvancedQuery feature, it may use values of the ComparisonOperator besides "EQ" and may also use the cond attribute of the SearchCondition.  If an NF consumer detects that the UDSF does not support the AdvancedQuery feature, it shall only use a value of "EQ" of the ComparisonOperator and shall not use the cond attribute of the SearchCondition. |
| 2 | Meta Schema | This feature supports optimization of UDSF data storage and allows the UDSF to know in advance how data search access by the NF consumer is expected.  If the NF consumer detects that the UDSF does not support the Meta Schema feature, it shall not make use of the procedures for storing, updating and deleting Meta Schemas. |
| 3 | CombinedSearchRetrieve | This feature supports optimization of search and retrieval of records stored in the UDSF. When searching records (see clause 5.2.2.2.6), consumers supporting this feature can instruct the supporting UDSF to return matching records in addition to the matching records' URIs.  If the NF consumer detects that the UDSF does not support the CombinedSearchRetrieve feature, it shall not include the query parameters retrieve-records and max-payload-size in record search requests. |
| 4 | BulkOperations | This feature supports optimization for retrieval/deletion of huge number of records identified by a list of record IDs.  When the CombinedSearchRetrieve feature has been used to request retrieval of matching records but only a subset of matching records have been received due to maximum content size limitations, the consumers supporting this feature can instruct the supporting UDSF to return remaining records identified by a recordIdList.  If the NF consumer detects that the UDSF does not support the BulkOperations feature, it shall not include the RecordIdList in the filter query parameter in record search requests. |
| 5 | AdvancedCounting | This feature supports retrieval of aggregate, total and unique tag counts, from the UDSF. When querying for tag counts the user can specify a tag-count-filter query parameter consisting of countType and optional Tag and filter according to which a map tagCount is returned. Refer to B.2 for example.  If the NF consumer detects that the UDSF does not support the AdvancedCounting feature, it shall not include the tag-count-filter query parameter in record search requests. |

### 6.1.9 Security

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

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the <API Name> API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Nudsf\_DataRepository service.

The Nudsf\_DataRepository API defines the following scopes for OAuth2 authorization.

Table 6.1.9-1: Oauth2 scopes defined in Nudsf\_DR API

|  |  |
| --- | --- |
| Scope | Description |
| "nudsf-dr" | Access to the Nudsf\_DR API |
| "nudsf-dr:record:read" | Access to read records |
| "nudsf-dr:record:modify" | Access to update records |
| "nudsf-dr:record:create" | Access to create records |
| "nudsf-dr:record-meta:read" | Access to read a record’s meta |
| "nudsf-dr:record-meta:modify" | Access to update a record’s meta |
| "nudsf-dr:block:read" | Access to read blocks |
| "nudsf-dr:block:create" | Access to create blocks |
| "nudsf-dr:block:modify" | Access to update blocks |
| "nudsf-dr:subscription:read" | Access to read subscriptions |
| "nudsf-dr:subscription:modify" | Access to update subscriptions |
| "nudsf-dr:subscription:create" | Access to create subscriptions |
| "nudsf-dr:meta-schema:read" | Access to read meta schema |
| "nudsf-dr:meta-schema:modify" | Access to update meta schema |
| "nudsf-dr:meta-schema:create" | Access to create meta schema |

## 6.2 Nudsf\_Timer Service API

### 6.2.1 Introduction

The Nudsf\_Timer service shall use the Nudsf\_Timer API.

The API URI of the Nudsf\_Timer API shall be:

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

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

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].

- The <apiName>shall be "nudsf-timer".

- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 6.2.3.

### 6.2.2 Usage of HTTP

#### 6.2.2.1 General

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

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

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

#### 6.2.2.2 HTTP standard headers

##### 6.2.2.2.1 General

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

##### 6.2.2.2.2 Content type

The following content types shall be supported:

- JSON, IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".

- "Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 9457 [13].

- JSON Patch (IETF RFC 6902 [14]). The use of the JSON Patch format in a HTTP request body shall be signalled by the content type "application/json-patch+json".

#### 6.2.2.3 HTTP custom headers

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

### 6.2.3 Resources

#### 6.2.3.1 Overview



Figure 6.2.3.1-1: Resource URI structure of the nudsf-timer 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 | Resource URI | HTTP method or custom operation | Description |
| Timers  (Store) | /{realmId}/{storageId}/timers | GET | Search and retrieve timers matching a filter |
| DELETE | Stop (delete) timers matching a filter |
| Individual Timer  (Document) | /{realmId}/{storageId}/timers/{timerId} | PUT | Start (create) or update (replace) a timer |
| PATCH | Modify a timer |
| DELETE | Stop (delete) a timer |
| GET | Retrieve a timer |

#### 6.2.3.2 Resource: Timers (Store)

##### 6.2.3.2.1 Description

This resource represents the collection of timers within a storage. It can be used to search for specific timers matching specific filter criteria, and to delete specific timers matching specific filter criteria.

##### 6.2.3.2.2 Resource Definition

Resource URI: **{apiRoot}/nudsf-timer/<apiVersion>/{realmId}/{storageId}/timers**

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 6.1.1 |
| realmId | Represents the realm Id. |
| storageId | Represents the storage Id. |

##### 6.2.3.2.3 Resource Standard Methods

6.2.3.2.3.1 GET

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 GET method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6 |  |
| filter | SearchExpression | C | 0..1 | The filter criteria for searching the timers of the storage.  Shall be present if expired-filter is absent; otherwise may be present. |  |
| expired-filter | NullValue | C | 0..1 | A timer matches the expired-filter if the timer's expiry time is earlier than the current time.  Shall be present if filter is absent; otherwise may be present. |  |
| NOTE: If the query parameters filter and expired-filter are both present in the request, the result shall contain all timers that match both query parameters. | | | | | |

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 GET Request Body on this resource

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| TimerIdList | M | 1 | 200 OK | The search result containing the IDs of timers matching the filter. |
| n/a |  |  | 204 No Content | The search did not result in any matching timers. |
| ProblemDetails | O | 0..1 | 404 NOT FOUND | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND |
| NOTE: The manadatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

6.2.3.2.3.2 DELETE

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 DELETE method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| supported-features | SupportedFeatures | O | 0..1 | see 3GPP TS 29.500 [4] clause 6.6 |  |
| filter | SearchExpression | C | 0..1 | The filter criteria for identifying the timers of the storage that are to be deleted.  Shall be present if expired-filter is absent; otherwise may be present. |  |
| expired-filter | NullValue | C | 0..1 | Presence of this query parameter indicates that only expired timers are to be deleted.  Shall be present if filter is absent; otherwise may be present. |  |
| NOTE: If the query parameters filter and expired-filter are both present in the request, all timers that match both query parameters shall be deleted. | | | | | |

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 DELETE Request Body on this resource

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| TimerIdList | M | 1 | 200 OK | Contains the list of timer IDs identifying the deleted timers. |
| n/a |  |  | 204 No Content | The search did not result in any matching timers. |
| ProblemDetails | O | 0..1 | 404 NOT FOUND | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND |
| NOTE: The manadatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

#### 6.2.3.3 Resource: Individual Timer (Document)

##### 6.2.3.3.1 Description

This resource represents an individual timer within a storage.

##### 6.2.3.3.2 Resource Definition

Resource URI: **{apiRoot}/nudsf-timer/<apiVersion>/{realmId}/{storageId}/timers/{timerId}**

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 6.1.1 |
| realmId | Represents the realm Id. |
| storageId | Represents the storage Id. |
| timerId | Represents the timer Id. |

##### 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 | Applicability |
| 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 6.2.3.3.3.1-2 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 |
| Timer | M | 1 | The timer to be created or replaced. |

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 |
| n/a |  |  | 201 Created | Upon successful creation of a timer, an empty response shall be returned. |
| n/a |  |  | 204 No Content | Upon successful replacement of a timer, an empty response shall be returned. |
| ProblemDetails | O | 0..1 | 404 NOT FOUND | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND |
| NOTE: The manadatory HTTP error status code for the PUT method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

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 | Applicability |
| 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 6.2.3.3.3.2-2 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 |
| array(PatchItem) | M | 1..N | Contains the delta data of the Timer to be updated. |

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 successful modification of a timer, an empty response shall be returned. |
| PatchResult | M | 1 | 200 OK | Upon success, the execution report is returned. (NOTE 2) |
| ProblemDetails | O | 0..1 | 404 NOT FOUND | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -TIMER\_NOT\_FOUND |
| NOTE 1: In addition common data structures as listed in table 6.1.7.3-1 are supported.  NOTE 2: If all the modification instructions in the PATCH request have been implemented, the UDSF shall respond with 204 No Content response; if some of the modification instructions in the PATCH request have been discarded, the UDSF shall respond with 200 OK and include the PatchResult. | | | | |

6.2.3.3.3.3 DELETE

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 DELETE method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| 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 6.2.3.3.3.3-2 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 DELETE 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 DELETE Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | Upon successful deletion of a timer, an empty response shall be returned. |
| ProblemDetails | O | 0..1 | 404 NOT FOUND | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -TIMER\_NOT\_FOUND |
| NOTE: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

6.2.3.3.3.4 GET

This method shall support the URI query parameters specified in table 6.2.3.3.3.4-1.

Table 6.2.3.3.3.4-1: URI query parameters supported by the GET method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| 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 6.2.3.3.3.4-2 and the response data structures and response codes specified in table 6.2.3.3.3.4-3.

Table 6.2.3.3.3.4-2: Data structures supported by the GET Request Body on this resource

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

Table 6.2.3.3.3.4-3: Data structures supported by the GET Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| Timer | M | 1 | 200 OK | Upon success the timer shall be returned. |
| ProblemDetails | O | 0..1 | 404 NOT FOUND | The "cause" attribute shall be set to one of the following application errors:  -REALM\_NOT\_FOUND  -STORAGE\_NOT\_FOUND  -TIMER\_NOT\_FOUND |
| NOTE: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

### 6.2.4 Custom Operations without associated resources

None.

### 6.2.5 Notifications

#### 6.2.5.1 General

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

#### 6.2.5.2 Timer Expiry Notification

##### 6.2.5.2.1 Description

The Timer Expiry Notification is used by the NF service producer to report to an NF Consumer that the Timer has expired as indicated by the expires attribute of Timer and if a callbackReference was set in the Timer.

##### 6.2.5.2.2 Target URI

The Callback URI **"{callbackReference}"** shall be used with the callback URI variables defined in table 6.2.5.2.2-1.

Table 6.2.5.2.2-1: Target URI variables for this resource

|  |  |
| --- | --- |
| Name | Definition |
| callbackReference | string formatted as URI with the Callback Uri |

##### 6.2.5.2.3 Standard Methods

6.2.5.2.3.1 POST

This method shall support the request data structures specified in table 6.2.5.2.3.1-1 and the response data structures and response codes specified in table 6.2.5.2.3.1-1.

Table 6.2.5.2.3.1-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| Timer | M | 1 | The timer that expired |

Table 6.2.5.2.3.1-3: Data structures supported by the POST 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: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

### 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 data types defined for the Nudsf\_Timer service API. For simple data types defined for the Nudsf\_Timer service API see table 6.2.6.3.2-1.

Table 6.2.6.1-1: Nudsf\_Timer specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Clause defined | Description | Applicability |
| Timer | 6.2.6.2.2 | Timer |  |

Table 6.2.6.1-2 specifies data types re-used by the Nudsf\_Timer service API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nudsf\_Timer service API.

Table 6.2.6.1-2: Nudsf\_Timer re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| SupportedFeatures | 3GPP TS 29.571 [19] | see 3GPP TS 29.500 [4] clause 6.6. |  |
| PatchItem | 3GPP TS 29.571 [19] | Data structure used for JSON patch. |  |
| PatchResult | 3GPP TS 29.571 [19] |  |  |
| Uri | 3GPP TS 29.571 [19] |  |  |
| DateTime | 3GPP TS 29.571 [19] |  |  |
| NullValue | 3GPP TS 29.571 [19] |  |  |
| DurationSec | 3GPP TS 29.571 [19] |  |  |
| SearchExpression | 6.1.6.4.1 |  |  |

#### 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: Timer

Table 6.2.6.2.2-1: Definition of type Timer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| timerId | TimerId | C | 0..1 | Identifier of the timer; shall be present in Notification request messages; otherwise shall be absent. |  |
| expires | DateTime | M | 1 | Point in time of expiry  For timer with periodicRepetition it refers to the first time the timer expires. |  |
| metaTags | map(array(string)) | O | 1..N | A map (list of key-value pairs where tagName serves as key) of tagValue lists. |  |
| callbackReference | Uri | O | 0..1 | The URI where the NF Service Consumer shall receive notification on the expiry of the Timer.  Shall be absent from Notification request messages. |  |
| deleteAfter | Uinteger | O | 0..1 | If specified, the timer resource will be deleted following a period after the (last) expires time of the number of seconds defined by the deleteAfter value. If not specified, the timer shall be deleted immediately after the (last) expires time. |  |
| periodicRepetition | DurationSec | O | 0..1 | If present, the timer shall be restarted after (each) expiry with the number of seconds defined by the periodicRepetition value, as often as indicated by the repetitionCount attribute. | PeriodicTimer |
| repetitionCount | Uinteger | C | 0..1 | Shall be present if periodicRepetition is present. It indicates the number of repetitions after first expiry. Minimum value shall be 1. | PeriodicTimer |

##### 6.2.6.2.3 Type: TimerIdList

Table 6.2.6.2.3-1: Definition of type TimerIdList

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| timerIds | array(TimerId) | M | 1..N | List of Timer IDs |  |

#### 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 | Applicability |
| TimerId | string | Id of a timer. Used as reference. |  |

### 6.2.7 Error Handling

#### 6.2.7.1 General

For the Nudsf\_Timer API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [4].

In addition, the requirements in the following clauses are applicable for the Nudsf\_Timer API.

#### 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 application errors defined for the Nudsf\_Timer service are listed in Table 6.2.7.3-1.

Table 6.2.7.3-1: Application errors

|  |  |  |
| --- | --- | --- |
| Application Error | HTTP status code | Description |
| REALM\_NOT\_FOUND | 404 Not Found | The realm indicated in the HTTP/2 request is unavailable in the UDSF. |
| STORAGE\_NOT\_FOUND | 404 Not Found | The storage indicated in the HTTP/2 request is unavailable in the UDSF. |
| TIMER\_NOT\_FOUND | 404 Not Found | The Timer indicated in the HTTP/2 request is unavailable in the UDSF. |
| EXPIRES\_VALUE\_NOT\_ALLOWED | 403 Forbidden | The timer could not be started as the expires time is in the past. |

### 6.2.8 Feature negotiation

The optional features in table 6.1.8-1 are defined for the Nudsf\_Timer 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 | PeriodicTimer | Support of periodic timer. |

### 6.2.9 Security

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

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nudsf\_Timer API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Nudsf\_Timer service.

The Nudsf\_Timer API defines the following scopes for OAuth2 authorization.

Table 6.2.9-1: Oauth2 scopes defined in Nudsf\_Timer API

|  |  |
| --- | --- |
| Scope | Description |
| "nudsf-timer" | Access to the Nudsf\_Timer API |
| "nudsf-timer:timer:read" | Access to read timers |
| "nudsf-timer:timer:modify" | Access to update timers |
| "nudsf-timer:timer:create" | Access to create timers |

Annex A (normative):  
OpenAPI specification

# A.1 General

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

This Annex takes precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API(s).

NOTE: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification files contained in this 3GPP Technical Specification are available on a Git-based repository that uses the GitLab software version control system (see 3GPP TS 29.501 [5] clause 5.3.1 and 3GPP TR 21.900 [7] clause 5B).

# A.2 Nudsf\_DataRepository API

openapi: 3.0.0

info:

title: Nudsf\_DataRepository

version: 1.2.0-alpha.5

description: |

Nudsf Data Repository Service.

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externalDocs:

description: 3GPP TS 29.598 UDSF Services, V18.4.0.

url: 'https://www.3gpp.org/ftp/Specs/archive/29\_series/29.598/'

servers:

- url: '{apiRoot}/nudsf-dr/v1'

variables:

apiRoot:

default: https://example.com

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

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

paths:

/{realmId}/{storageId}/records:

summary: Access to all Records of a Storage

description: >-

root of all Records of a Storage

get:

summary: Records search with get

description: Retrieve one or multiple Records based on filter

operationId: SearchRecord

tags:

- Record CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:record:read

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: limit-range

in: query

description: The most number of record references to fetch

schema:

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

- name: filter

in: query

description: Query filter using conditions on tags

content:

application/json:

schema:

$ref: '#/components/schemas/SearchExpression'

- name: count-indicator

in: query

description: Indicates whether the number of records that matched the criteria shall be returned.

schema:

type: boolean

default: false

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

- name: retrieve-records

in: query

description: Indicates whether the UDSF is requested to include matching records within the response.

schema:

$ref: '#/components/schemas/RetrieveRecords'

- name: max-payload-size

in: query

description: Indicates the number of kilo octets the consumer is prepared to receive

schema:

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

- name: tag-count-filter

in: query

description: Indicates the parameters for advanced counting feature

schema:

$ref: '#/components/schemas/CountExpression'

responses:

'200':

description: Successful case. Response contains result of the search.

content:

application/json:

schema:

$ref: '#/components/schemas/RecordSearchResult'

'204':

description: >-

The search condition does not match any Record.

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

delete:

summary: Bulk Deletion of Records

description: Delete multiple Records based on filter

operationId: BulkDeleteRecords

tags:

- Record CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:record:modify

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: filter

in: query

required: true

content:

application/json:

schema:

$ref: '#/components/schemas/SearchExpression'

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200':

description: Successful case. Response contains RecordIdList.

content:

application/json:

schema:

$ref: '#/components/schemas/RecordIdList'

'204':

description: Successful case.

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/{realmId}/{storageId}/records/{recordId}:

summary: Access to a specific Record, identified by its RecordId

description: >-

Access to a specific Record

get:

summary: Record access

description: retrieve one specific Record

operationId: GetRecord

tags:

- Record CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:record:read

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: recordId

in: path

description: Identifier of the Record

required: true

schema:

type: string

example: 'UserRecordValue000000001'

- name: If-None-Match

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.2

schema:

type: string

- name: If-Modified-Since

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.3

schema:

type: string

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200' : #result ok

$ref: '#/components/responses/RecordBody'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'412':

$ref: '#/components/responses/412'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: '#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

put:

summary: Create/Modify Record

description: Create or Modify a Record with a user provided RecordId

operationId: CreateOrModifyRecord

tags:

- Record CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:record:create

parameters:

- name: realmId

in: path

description: Identifier(name) of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: recordId

in: path

description: Identifier of the Record

required: true

schema:

type: string

example: UserRecordValue000000001

- name: If-None-Match

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.2

schema:

type: string

- name: If-Match

in: header

description: Record validator for conditional requests, as described in RFC 9110, 13.1.2

schema:

type: string

- name: get-previous

in: query

description: Retrieve the Record before update

required: false

schema:

type: boolean

default: false

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

requestBody:

$ref: '#/components/requestBodies/RecordBody'

callbacks:

recordExpired:

'{$request.body#/callbackReference}':

post:

parameters:

- name: Content-Location

in: header

description: The expired record URI

schema:

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

requestBody:

$ref: '#/components/requestBodies/RecordBody'

responses:

'204':

description: Callback executed successfully

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

responses:

'200' : # Update with return

$ref: '#/components/responses/RecordBody'

'201':

description: >-

Create case. The resource has been successfully created, location header indicates

the URI of the created Record.

$ref: '#/components/responses/RecordBody'

headers:

Location:

$ref: '#/components/headers/Location'

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'204': # Update without return

description: >-

Update case. The resource has been successfully updated and no

additional content is included in the response message.

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'408':

$ref: 'TS29571\_CommonData.yaml#/components/responses/408'

'409':

$ref: '#/components/responses/409'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'412': # Return Record value if get-previous=true

$ref: '#/components/responses/RecordBody'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

delete:

summary: Delete a Record with an user provided RecordId

operationId: DeleteRecord

tags:

- Record CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:record:modify

parameters:

- name: realmId

in: path

description: Identifier(name) of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: recordId

in: path

description: Identifier of the Record

required: true

schema:

type: string

example: UserRecordValue000000001

- name: If-Match

in: header

description: Record validator for conditional requests, as described in RFC 9110, 13.1.1

schema:

type: string

- name: get-previous

in: query

description: Retrieve the Record before delete

required: false

schema:

type: boolean

default: false

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200':

$ref: '#/components/responses/RecordBodyDelete'

'204':

description: Successful case.

headers:

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'408':

$ref: 'TS29571\_CommonData.yaml#/components/responses/408'

'412': # Return return value if get-previous=true

$ref: '#/components/responses/RecordBody'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/{realmId}/{storageId}/records/{recordId}/meta:

summary: Access to the meta of a specific Record, identified by its RecordId

description: >-

Access to the meta of a specific Record

get:

summary: Record's meta access

description: retrieve meta of a specific Record

operationId: GetMeta

tags:

- Record CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:record-meta:read

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: recordId

in: path

description: Identifier of the Record

required: true

schema:

type: string

example: 'UserRecordValue000000001'

- name: If-None-Match

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.2

schema:

type: string

- name: If-Modified-Since

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.3

schema:

type: string

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200':

description: Expected response to a valid request

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

content:

application/json:

schema:

$ref: '#/components/schemas/RecordMeta'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'412':

$ref: '#/components/responses/412'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: '#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

patch: # patch meta data

summary: Record's meta update

description: update meta of a specific Record

operationId: UpdateMeta

tags:

- Record CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:record-meta:modify

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: recordId

in: path

description: Identifier of the Record

required: true

schema:

type: string

example: 'UserRecordValue000000001'

- name: If-Match

in: header

description: Record validator for conditional requests, as described in RFC 9110, 13.1.1

schema:

type: string

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

requestBody:

description: Meta data to patch

content:

application/json-patch+json:

example: '[{ "op": "replace", "path": "/tags/ueId", "value": "450005" }, { "op": "remove", "path": "/tags/recordId" }]'

schema:

type: array

items:

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

minItems: 1

required: true

responses:

'200':

description: >-

One or more modification instructions have been discarded, the execution report is returned in response PatchResult.

content:

application/json:

example:

schema:

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

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'204':

description: >-

Successful case. The meta has been successfully updated and no return is expected.

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'408':

$ref: 'TS29571\_CommonData.yaml#/components/responses/408'

'409':

$ref: '#/components/responses/409'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'412':

$ref: '#/components/responses/412'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/{realmId}/{storageId}/records/{recordId}/blocks:

summary: Access to the Blocks of a specific Record, identified by its RecordId

description: >-

Access to the Blocks of a specific Record

get:

summary: Record's Blocks access

description: retrieve all Blocks of a specific Record

operationId: GetBlockList

tags:

- Block CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:block:read

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: recordId

in: path

description: Identifier of the Record

required: true

schema:

type: string

example: 'UserRecordValue000000001'

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200':

description: Expected response to a successful request

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

content:

multipart/parallel:

schema:

type: object

properties:

blocks:

type: array

description: >-

an array of Block parts, can be empty

items:

$ref: '#/components/schemas/Block'

encoding:

blocks:

contentType: '\*/\*' # Block content type can be of any type.

headers:

Content-Id: # Block identifier is defined by the Content-Id header.

schema:

type: string

required: true

Content-Transfer-Encoding:

schema:

type: string

required: true

'204':

description: Successful response, the record contains no blocks

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'412':

$ref: '#/components/responses/412'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: '#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/{realmId}/{storageId}/records/{recordId}/blocks/{blockId}:

summary: Access to a Block of a specific Record, identified by its BlockId

description: >-

Access to a specific Block of a specific Record

get:

summary: Retrieve a specific Block

description: retrieve a specific Block

operationId: GetBlock

tags:

- Block CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:block:read

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: recordId

in: path

description: Identifier of the Record

required: true

schema:

type: string

example: 'UserRecordValue000000001'

- name: blockId

in: path

description: Id of the Block

required: true

schema:

type: string

example: 'userDefjson01'

- name: If-None-Match

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.2

schema:

type: string

- name: If-Modified-Since

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.3

schema:

type: string

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200':

$ref: '#/components/responses/BlockBody'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'412':

$ref: '#/components/responses/412'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: '#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

put:

summary: Create or Update a specific Block in a Record.

description: Create or update a specific Block, related to a Record

operationId: CreateOrModifyBlock

tags:

- Block CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:block:create

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: recordId

in: path

description: Identifier of the Record

required: true

schema:

type: string

example: 'UserRecordValue000000001'

- name: blockId

in: path

description: Id of the Block

required: true

schema:

type: string

example: 'userDefjson01'

- name: get-previous

in: query

description: Retrieve the Block before update

required: false

schema:

type: boolean

default: false

- name: If-None-Match

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.2

schema:

type: string

- name: If-Match

in: header

description: Record validator for conditional requests, as described in RFC 9110, 13.1.1

schema:

type: string

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

requestBody:

description: information on the Block to create

required: true

content:

'\*/\*':

schema:

$ref: '#/components/schemas/Block'

responses:

'200':

$ref: '#/components/responses/BlockBody'

'201':

description: >-

Creation case. The Block has been successfully created. Location header indicates the URI of the created Block.

headers:

Location:

$ref: '#/components/headers/Location'

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'204':

description: >-

Successful case. The resource has been successfully updated.

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'408':

$ref: 'TS29571\_CommonData.yaml#/components/responses/408'

'409':

$ref: '#/components/responses/409'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'412': # Return previous Block value if get-previous=true

$ref: '#/components/responses/BlockBody'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

delete:

summary: Delete a specific Block. Then update the Record

description: delete a specific Block, related to a Record

operationId: DeleteBlock

tags:

- Block CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:block:modify

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: recordId

in: path

description: Identifier of the Record

required: true

schema:

type: string

example: 'UserRecordValue000000001'

- name: blockId

in: path

description: Id of the Block

required: true

schema:

type: string

example: 'userDefjson01'

- name: get-previous

in: query

description: Retrieve the Block before delete

required: false

schema:

type: boolean

default: false

- name: If-Match

in: header

description: Record validator for conditional requests, as described in RFC 9110, 13.1.1

schema:

type: string

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200':

$ref: '#/components/responses/BlockBodyDelete'

'204':

description: >-

Successful case. The Block has been successfully deleted.

headers:

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'408':

$ref: 'TS29571\_CommonData.yaml#/components/responses/408'

'412': # Return previous Block value if get-previous=true

$ref: '#/components/responses/BlockBody'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/{realmId}/{storageId}/subs-to-notify:

summary: The notification subscription collection resource

description: >-

Access to the subscription resource

get:

summary: Notification subscription retrieval

description: retrieve all notification subscriptions of the storage

operationId: GetNotificationSubscriptions

tags:

- NotificationSubscriptions CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:subscription:read

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: limit-range

in: query

description: The maximum number of NotificationSubscriptions to fetch

schema:

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

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200':

description: Expected response to a valid request

content:

application/json:

schema:

type: array

items:

$ref: '#/components/schemas/NotificationSubscription'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/{realmId}/{storageId}/subs-to-notify/{subscriptionId}:

summary: The notification subscription resource

description: >-

Access to the subscription resource

get:

summary: Notification subscription retrieval

description: retrieve a single notification subscription of the storage

operationId: GetNotificationSubscription

tags:

- NotificationSubscription CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:subscription:read

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: subscriptionId

in: path

description: Identifier of the NotificationSubscription

required: true

schema:

type: string

example: Subscription01

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

- name: If-None-Match

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.2

schema:

type: string

- name: If-Modified-Since

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.3

schema:

type: string

responses:

'200':

description: Expected response to a valid request

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

content:

application/json:

schema:

$ref: '#/components/schemas/NotificationSubscription'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

delete:

summary: Delete a Notification Subscription of the storage

description: delete a single subscriptions of the storage

operationId: DeleteNotificationSubscription

tags:

- NotificationSubscription CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:subscription:modify

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: subscriptionId

in: path

description: Identifier of the NotificationSubscription

required: true

schema:

type: string

example: Subscription01

- name: client-id

in: query

description: Identifies the NF or NFSet

required: true

schema:

$ref: '#/components/schemas/ClientId'

- name: get-previous

in: query

description: Retrieve the NotificationSubscription before delete

required: false

schema:

type: boolean

default: false

- name: If-Match

in: header

description: Record validator for conditional requests, as described in RFC 9110, 13.1.1

schema:

type: string

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200':

description: Deleted NotificationSubscription if requested with get-previous

content:

application/json:

schema:

type: array

items:

$ref: '#/components/schemas/NotificationSubscription'

'204':

description: >-

Successful case. The SubscriptionNotification has been successfully deleted.

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'408':

$ref: 'TS29571\_CommonData.yaml#/components/responses/408'

'412':

description: Return previous NotificationSubscription value if get-previous=true

content:

application/json:

schema:

$ref: '#/components/schemas/NotificationSubscription'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

patch: # patch NotificationSubscription data

summary: NotificationSubscription update

description: update a specific NotificationSubscription

operationId: UpdateNotificationSubscription

tags:

- NotificationSubscription CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:subscription:modify

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: subscriptionId

in: path

description: Identifier of the NotificationSubscription

required: true

schema:

type: string

example: Subscription01

- name: If-Match

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.1

schema:

type: string

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

requestBody:

description: data to patch

content:

application/json-patch+json:

example: 'TBD'

schema:

type: array

items:

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

minItems: 1

required: true

responses:

'200':

description: >-

One or more modification instructions have been discarded, the execution report is returned in response PatchResult.

content:

application/json:

example:

schema:

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

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'204':

description: >-

Successful case. The meta has been successfully updated and no return is expected.

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'408':

$ref: 'TS29571\_CommonData.yaml#/components/responses/408'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

put:

summary: NotificationSubscription Create/Update

operationId: CreateAndUpdateNotificationSubscription

tags:

- NotificationSubscription CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:subscription:create

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: subscriptionId

in: path

description: Identifier of the NotificationSubscription

required: true

schema:

type: string

example: Subscription01

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

- name: If-None-Match

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.2

schema:

type: string

- name: If-Match

in: header

description: Record validator for conditional requests, as described in RFC 9110, 13.1.1

schema:

type: string

requestBody:

content:

application/json:

schema:

$ref: '#/components/schemas/NotificationSubscription'

required: true

responses:

'200' : # Update

description: Expected response to a valid update request

content:

application/json:

schema:

$ref: '#/components/schemas/NotificationSubscription'

'201':

description: Expected response to a valid create request

content:

application/json:

schema:

$ref: '#/components/schemas/NotificationSubscription'

headers:

Location:

description: 'Contains the URI of the newly created resource according to the structure: {apiRoot}/nudsf-dr/<apiVersion>/{realmId}/{storageId}/subs-to-notify/{subscriptionId}'

required: true

schema:

type: string

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'408':

$ref: 'TS29571\_CommonData.yaml#/components/responses/408'

'409':

description: Conflict

content:

application/json:

schema:

type: array

items:

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

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'412':

$ref: 'TS29571\_CommonData.yaml#/components/responses/412'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

description: Unexpected error

content:

application/problem+json:

schema:

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

callbacks:

onDataChange:

'{request.body#/callbackReference}':

post:

requestBody:

$ref: '#/components/requestBodies/RecordNotificationBody'

responses:

'204':

description: Callback executed successfully

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

subscriptionExpiryNotification:

'{request.body#/expiryCallbackReference}':

post:

requestBody:

required: true

content:

application/json:

schema:

$ref: '#/components/schemas/NotificationInfo'

responses:

'204':

description: Successful Notification response

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/{realmId}/{storageId}/meta-schemas/{schemaId}:

summary: Access to a specific Meta Schema, identified by its SchemaId

description: >-

Access to a specific Meta Schema

get:

summary: Meta Schema access

description: retrieve one specific Meta Schema

operationId: GetMetaSchema

tags:

- MetaSchema CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:meta-schema:read

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: schemaId

in: path

description: Identifier of the Meta Schema

required: true

schema:

$ref: '#/components/schemas/SchemaId'

- name: If-None-Match

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.2

schema:

type: string

- name: If-Modified-Since

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.3

schema:

type: string

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200' : #result ok

$ref: '#/components/responses/RecordBody'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

put:

summary: Create/Modify Meta Schema

description: Create or Modify a Meta Schema with a user provided SchemaId

operationId: CreateOrModifyMetaSchema

tags:

- MetaSchema CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:meta-schema:create

parameters:

- name: realmId

in: path

description: Identifier(name) of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: schemaId

in: path

description: Identifier of the Meta Schema

required: true

schema:

$ref: '#/components/schemas/SchemaId'

- name: If-None-Match

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.2

schema:

type: string

- name: If-Match

in: header

description: Validator for conditional requests, as described in RFC 9110, 13.1.1

schema:

type: string

- name: get-previous

in: query

description: Retrieve the Meta Schema before update

required: false

schema:

type: boolean

default: false

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

requestBody:

content:

application/json:

schema:

$ref: '#/components/schemas/MetaSchema'

required: true

responses:

'200':

description: Update with return

content:

application/json:

schema:

$ref: '#/components/schemas/MetaSchema'

'201':

description: >-

Create case. The resource has been successfully created, location header indicates

the URI of the created Record.

$ref: '#/components/responses/RecordBody'

headers:

Location:

$ref: '#/components/headers/Location'

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'204': # Update without return

description: >-

Update case. The resource has been successfully updated and no

additional content is included in the response message.

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'408':

$ref: 'TS29571\_CommonData.yaml#/components/responses/408'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'412':

description: Return Meta Schema value if get-previous=true

content:

application/json:

schema:

$ref: '#/components/schemas/MetaSchema'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'501':

$ref: 'TS29571\_CommonData.yaml#/components/responses/501'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

delete:

summary: Delete a Meta Schema with an user provided SchemaId

operationId: DeleteMetaSchema

tags:

- MetaSchema CRUD

security:

- {}

- oAuth2ClientCredentials:

- nudsf-dr

- oAuth2ClientCredentials:

- nudsf-dr

- nudsf-dr:meta-schema:modify

parameters:

- name: realmId

in: path

description: Identifier(name) of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: schemaId

in: path

description: Identifier of the Meta Schema

required: true

schema:

$ref: '#/components/schemas/SchemaId'

- name: If-Match

in: header

description: Record validator for conditional requests, as described in RFC 9110, 13.1.1

schema:

type: string

- name: get-previous

in: query

description: Retrieve the Meta Schema before delete

required: false

schema:

type: boolean

default: false

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200':

description: OK

content:

application/json:

schema:

$ref: '#/components/schemas/MetaSchema'

'204':

description: Successful case.

headers:

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'304':

$ref: '#/components/responses/304'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'408':

$ref: 'TS29571\_CommonData.yaml#/components/responses/408'

'412':

description: Return value if get-previous=true

content:

application/json:

schema:

$ref: '#/components/schemas/MetaSchema'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{nrfApiRoot}/oauth2/token'

scopes:

nudsf-dr: Access to the nudsf-dr API

nudsf-dr:record:read: Access to read records

nudsf-dr:record:modify: Access to update records

nudsf-dr:record:create: Access to create records

nudsf-dr:record-meta:read: Access to read a record's meta

nudsf-dr:record-meta:modify: Access to update a record's meta

nudsf-dr:block:read: Access to read blocks

nudsf-dr:block:modify: Access to update blocks

nudsf-dr:block:create: Access to create blocks

nudsf-dr:subscription:read: Access to read subscriptions

nudsf-dr:subscription:modify: Access to update subscriptions

nudsf-dr:subscription:create: Access to create subscriptions

nudsf-dr:meta-schema:read: Access to read meta schema

nudsf-dr:meta-schema:modify: Access to update meta schema

nudsf-dr:meta-schema:create: Access to create meta schema

schemas:

RecordSearchResult:

description: Count and collection of Record references matching the providing filter.

type: object

properties:

count: # The total number of elements found.

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

references: # The Record references found. If count-indicator is true, no references are sent back.

type: array

items:

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

minItems: 1

supportedFeatures:

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

matchingRecords:

description: A map (list of key-value pairs where recordId serves as key) of Records

type: object

additionalProperties:

$ref: '#/components/schemas/Record'

minProperties: 1

tagCountResult:

description: A map of TagCount (list of key-value pairs with unique indentifier as key)

type: object

items:

$ref: '#/components/schemas/TagCount'

example: {"advancedTagCount1" : {"tag1" : 1}, "advancedTagCount2" : {"tag2" : 2}}

required:

- count

RecordMeta:

description: Meta data of a Record

type: object

properties:

ttl:

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

callbackReference:

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

tags:

type: object # dictionary type

description: >-

A dictionary of {"tagName": [ "tagValue", ...] }. A tag name can be used to retrieve a Record. The tagValue are unique.

additionalProperties:

type: array

items:

type: string

uniqueItems: true

minItems: 1

minProperties: 1

example: '{"ueId" : [ "455345", "455346" ], "recordId" : [ "1000106" ] }'

example: >-

{ "tags" : {"ueId" : [ "455345", "455346" ], "recordId" : [ "1000106" ] }}

schemaId:

$ref: '#/components/schemas/SchemaId'

Record:

description: Definition of a Record

type: object

properties:

meta:

# json representation of the Meta Data

$ref: '#/components/schemas/RecordMeta'

blocks:

# List of multipart data

type: array

description: list of opaque Block's in this Record

items:

$ref: '#/components/schemas/Block'

minItems: 1

required:

- meta

example: >-

{"meta": { "tags" : {"tag1" : ["value1"], "tag2" :["value2"] } }, "blocks": [{"Content-Id": "userDefBinaryBlob", "Content-Type": "text/plain", "content": "QmxvY2sgY29udGVudA=="}, {"Content-Id": "userDefJsonBlob", "Content-Type": "application/json", "content": "{"key": "ftsimpletype-999550000000002", "value": "A3E71A78377179B5B91A;imsi-999550000000123"}]}

RecordIdList:

description: List of Record IDs

type: object

properties:

recordIdList:

type: array

items:

type: string

minItems: 1

required:

- recordIdList

Block:

description: A Block can be of any type

example: >-

"QmxvY2sgY29udGVudA=="

NotificationSubscription:

description: Definition of a notification subscription

type: object

properties:

clientId:

$ref: '#/components/schemas/ClientId'

callbackReference:

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

expiryCallbackReference:

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

expiry:

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

expiryNotification:

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

subFilter:

$ref: '#/components/schemas/SubscriptionFilter'

supportedFeatures:

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

required:

- clientId

- callbackReference

RecordNotification:

description: Definition of a notification on a record

type: object

properties:

descriptor:

# json representation of the notification description

$ref: '#/components/schemas/NotificationDescription'

meta:

# json representation of the Meta Data

$ref: '#/components/schemas/RecordMeta'

blocks:

# List of multipart data

type: array

description: list of opaque Block's in this Record

items:

$ref: '#/components/schemas/Block'

required:

- descriptor

- meta

example: >-

{"descriptor": { "recordRef" : "...", "operationType" : "DELETED"}, "meta": { "tags" : {"tag1" : ["value1"], "tag2" :["value2"] } }, "blocks": [{"Content-Id": "userDefBinaryBlob", "Content-Type": "text/plain", "content": "QmxvY2sgY29udGVudA=="}, {"Content-Id": "userDefJsonBlob", "Content-Type": "application/json", "content": "{"key": "ftsimpletype-999550000000002", "value": "A3E71A78377179B5B91A;imsi-999550000000123"}]}

NotificationDescription:

description: Description of a record notification

type: object

properties:

recordRef:

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

operationType:

$ref: '#/components/schemas/RecordOperation'

subscriptionId:

# unique identifier of the NotificationSubscription

type: string

required:

- recordRef

- operationType

example: >-

{ "record" : "...", "operationType" : "DELETED"}

SubscriptionFilter:

description: A subscription filter

type: object

properties:

monitoredResourceUris:

type: array

description: list of resources applicable to the subscription

items:

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

minItems: 1

operations:

type: array

description: list of resources applicable to the subscription

items:

$ref: '#/components/schemas/RecordOperation'

maxItems: 3

ClientId:

description: Defines the identity of the NF Consumer

type: object

properties:

nfId:

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

nfSetId:

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

RecordOperation:

description: Indicate operation made on a record

anyOf:

- type: string

enum:

- CREATED

- UPDATED

- DELETED

- type: string

ConditionOperator:

description: TBD

anyOf:

- type: string

enum:

- AND

- OR

- NOT

- type: string

ComparisonOperator:

description: TBD

anyOf:

- type: string

enum:

# Equals

- EQ

# Not Equal

- NEQ

# Greater Than

- GT

# Greater Than or Equal

- GTE

# Less Than

- LT

# Less Than or Equal

- LTE

- type: string

CountExpression:

description: A map containing parameters for advanced counting feature with unique key for each request

type: object

properties:

tag:

type: string

countType:

$ref: '#/components/schemas/TagCountType'

filter:

$ref: '#/components/schemas/SearchExpression'

required:

- countType

example:

{"advancedTagCount1":{"tag" : "tag1", countType : UNIQUE\_COUNT , "filter" : NULL}, "advancedTagCount2":{"tag" : "tag2", countType : AGGREGATE\_COUNT, "filter" : NULL}}

TagCountType:

description: Indicate mode of tag count operations

anyOf:

- type: string

enum:

- UNIQUE\_COUNT

- AGGREGATE\_COUNT

- TOTAL\_COUNT

- type: string

TagCount:

description: The TagCount result of a\_Advanced Count request

type: object

properties:

tag:

type: string

count:

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

valueCount:

type: array

items:

$ref: '#/components/schemas/ValueCount'

ValueCount:

description: The AggregateCount map

type: object

properties:

value:

type: string

count:

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

SearchExpression:

description: A logical expression element

type: object

oneOf:

- $ref: '#/components/schemas/SearchCondition'

- $ref: '#/components/schemas/SearchComparison'

- $ref: '#/components/schemas/RecordIdList'

example:

{ "cond": "OR", "units": [ { "op": "EQ", "tag" : "ueId", "value" : "455345" }, { "op": "EQ", "tag" : "supi", "value" : "imsi-999559807001001" } ] }

SearchCondition:

description: A logical condition

type: object

properties:

cond:

$ref: '#/components/schemas/ConditionOperator'

units:

type: array

items:

$ref: '#/components/schemas/SearchExpression'

minItems: 1

schemaId:

$ref: '#/components/schemas/SchemaId'

required:

- cond

- units

example:

{ "cond": "OR", "units": [ { "op": "EQ", "tag" : "ueId", "value" : "455345" }, { "op": "EQ", "tag" : "supi", "value" : "imsi-999559807001001" } ] }

SearchComparison:

description: A comparison to apply on tag/values pairs.

type: object

properties:

op:

$ref: '#/components/schemas/ComparisonOperator'

tag:

type: string

value:

type: string

required:

- op

- tag

- value

example:

{ "op": "EQ", "tag" : "supi", "value" : "imsi-999559807001001" }

MetaSchema:

description: Defines the Meta Schema

type: object

required:

- schemaId

- metaTags

properties:

schemaId:

$ref: '#/components/schemas/SchemaId'

metaTags:

type: array

items:

$ref: '#/components/schemas/TagType'

TagType:

description: Defines the Tag Type

type: object

required:

- tagName

- keyType

properties:

tagName:

type: string

keyType:

$ref: '#/components/schemas/KeyType'

sort:

type: boolean

default: false

presence:

type: boolean

SchemaId:

description: Represents the Identifier of a Meta schema.

type: string

KeyType:

description: Represents the type of a key.

anyOf:

- type: string

enum:

- UNIQUE\_KEY

- SEARCH\_KEY

- COUNT\_KEY

- SEARCH\_AND\_COUNT\_KEY

- OTHER\_TAG

- type: string

RetrieveRecords:

description: Indicates the data to be retrieved.

anyOf:

- type: string

enum:

- ONLY\_META

- META\_AND\_BLOCKS

- type: string

NotificationInfo:

type: object

required:

- expiredSubscriptions

properties:

expiredSubscriptions:

type: array

items:

$ref: '#/components/schemas/NotificationSubscription'

minItems: 1

ExtendedProblemDetails:

description: Extending problemDetails

allOf:

- $ref: 'TS29571\_CommonData.yaml#/components/schemas/ProblemDetails'

- $ref: '#/components/schemas/ProblemDetailsExtension'

ProblemDetailsExtension:

anyOf:

- $ref: '#/components/schemas/Record'

- $ref: '#/components/schemas/RecordMeta'

headers:

Cache-Control:

description: Cache-Control containing max-age, as described in RFC 9111, 5.2

schema:

type: string

ETag:

description: Entity Tag, containing a strong validator, as described in RFC 9110, 8.8.3

schema:

type: string

Last-Modified:

description: Timestamp for last modification of the resource, as described in RFC 9110, 8.8.2

schema:

type: string

Location:

description: Contains the URI of the newly created resource

required: true

schema:

type: string

Retry-After:

description: 'Indicates the time the NF Consumer has to wait before making a new request. It can be a non-negative integer (decimal number) indicating the number of seconds the NF Consumer has to wait before making a new request or an HTTP-date after which the AF can retry a new request.'

schema:

anyOf:

- type: integer

- type: string

requestBodies:

RecordBody:

description: The record multipart request body. The meta part shall be the first part and is mandatory but can be empty and zero or more block parts may follow the meta part.

required: true

content:

multipart/mixed:

schema:

$ref: '#/components/schemas/Record'

encoding:

meta: # The meta part shall be the first part and is mandatory but can be empty

contentType: application/json

headers:

Content-Id:

schema:

type: string

required: true

blocks: # 0 or more block parts may follow the meta part

contentType: '\*/\*' # Block part can be of any type

headers:

Content-Id: # Block identifier is defined by the Content-Id header.

schema:

type: string

required: true

Content-Transfer-Encoding:

schema:

type: string

required: true

RecordNotificationBody:

description: The record notification multipart request body. The descriptor part shall be the first one, followed by record meta part and by zero or more block parts.

required: true

content:

multipart/mixed:

schema:

$ref: '#/components/schemas/RecordNotification'

encoding:

descriptor: # The descriptor part shall be the first part and is mandatory

contentType: application/json

headers:

Content-Id:

schema:

type: string

required: true

meta: # The meta part shall be the second part and is mandatory but can be empty

contentType: application/json

headers:

Content-Id:

schema:

type: string

required: true

blocks: # 0 or more block parts may follow the meta part

contentType: '\*/\*' # Block part can be of any type

headers:

Content-Id: # Block identifier is defined by the Content-Id header.

schema:

type: string

required: true

Content-Transfer-Encoding:

schema:

type: string

required: true

responses:

'304': # Etag response if the value might differ from that sent

description: Not Modified

content:

application/problem+json:

schema:

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

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Retry-After:

$ref: '#/components/headers/Retry-After'

'RecordBody': # Record value with associated headers

description: >-

- 200 Update. The resource has been successfully updated and previous value must be sent in the response message if requested.

- 200 Get. The resource exists, its value must be sent in the response message

- 412 Precondition Failed, the previous value must be sent in response message if requested.

content:

multipart/mixed:

schema:

$ref: '#/components/schemas/Record'

encoding:

meta: # The meta part shall be the first part and is mandatory but can be empty.

contentType: application/json

headers:

Content-Id: # The meta part is identified by the 'meta' Content-Id header.

schema:

type: string

required: true

blocks: # Zero or more block parts may follow the meta part

contentType: '\*/\*' # Block parts can be of any type.

headers:

Content-Id: # Block identifier is defined by the Content-Id header.

schema:

type: string

required: true

Content-Transfer-Encoding:

schema:

type: string

required: true

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'RecordBodyDelete': # Record value with associated headers

description: >-

- 200 Delete. The resource has been successfully delete and previous value must be sent in the response message if requested.

content:

multipart/mixed:

schema:

$ref: '#/components/schemas/Record'

encoding:

meta: # The meta part shall be the first par and is mandatory but can be empty.

contentType: application/json

headers:

Content-Id: # The meta part is identified by the Content-Id header.

schema:

type: string

required: true

blocks: # Zero or more block parts may follow the meta part.

contentType: '\*/\*' # Block parts can be of any type.

headers:

Content-Id: # Block identifier is defined by the Content-Id header.

schema:

type: string

required: true

Content-Transfer-Encoding:

schema:

type: string

required: true

headers:

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'BlockBody': # Block value with associated headers

description: >-

- 200 Update: The resource has been successfully updated and previous value must be sent in the response message if requested.

- 200 Get: The resource exists, its value must be sent in the response message

- 412 Precondition Failed: the previous value must be sent in response message if requested.

content:

'\*/\*':

schema:

$ref: '#/components/schemas/Block'

headers:

Cache-Control:

$ref: '#/components/headers/Cache-Control'

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'BlockBodyDelete': # Block value with associated headers

description: >-

- 200 Delete: The resource has been successfully delete and previous value must be sent in the response message if requested.

content:

'\*/\*':

schema:

$ref: '#/components/schemas/Block'

headers:

ETag:

$ref: '#/components/headers/ETag'

Last-Modified:

$ref: '#/components/headers/Last-Modified'

'409':

description: Conflict

content:

application/problem+json:

schema:

$ref: '#/components/schemas/ExtendedProblemDetails'

'412':

description: Precondition Failed

content:

application/problem+json:

schema:

$ref: '#/components/schemas/ExtendedProblemDetails'

'500':

description: Internal Server Error

content:

application/problem+json:

schema:

$ref: '#/components/schemas/ExtendedProblemDetails'

# A.3 Nudsf\_Timer API

openapi: 3.0.0

info:

title: Nudsf\_Timer

version: 1.1.0-alpha.3

description: |

Nudsf Timer Service.

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externalDocs:

description: 3GPP TS 29.598 UDSF Services, V18.4.0.

url: 'https://www.3gpp.org/ftp/Specs/archive/29\_series/29.598/'

servers:

- url: '{apiRoot}/nudsf-timer/v1'

variables:

apiRoot:

default: https://example.com

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

security:

- {}

- oAuth2ClientCredentials:

- nudsf-timer

paths:

/{realmId}/{storageId}/timers:

summary: Access to all Timers of a Storage

description: >-

root of all Timers of a Storage

get:

summary: Timers search with get

description: Retrieve one or multiple TimerIDs based on filter

operationId: SearchTimer

tags:

- Timer Search

security:

- {}

- oAuth2ClientCredentials:

- nudsf-timer

- oAuth2ClientCredentials:

- nudsf-timer

- nudsf-timer:timer:read

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: filter

in: query

description: Query filter using conditions on tags

content:

application/json:

schema:

$ref: 'TS29598\_Nudsf\_DataRepository.yaml#/components/schemas/SearchExpression'

- name: expired-filter

in: query

description: Used to query for expired timers.

schema:

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

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200':

description: Successful case. Response contains result of the search.

content:

application/json:

schema:

$ref: '#/components/schemas/TimerIdList'

'204':

description: >-

The search condition does not match any Timer.

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

delete:

summary: Delete one or multiple timers based on filter

operationId: DeleteTimers

tags:

- Timers Delete

security:

- {}

- oAuth2ClientCredentials:

- nudsf-timer

- oAuth2ClientCredentials:

- nudsf-timer

- nudsf-timer:timer:modify

parameters:

- name: realmId

in: path

description: Identifier(name) of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

- name: filter

in: query

description: A filter that determines the set of timers to be deleted

content:

application/json:

schema:

$ref: 'TS29598\_Nudsf\_DataRepository.yaml#/components/schemas/SearchExpression'

- name: expired-filter

in: query

description: Presence indicates that only expired timers are to be deleted.

schema:

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

responses:

'200':

description: Successful case. Response contains result of the search.

content:

application/json:

schema:

$ref: '#/components/schemas/TimerIdList'

'204':

description: Successful case.

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/{realmId}/{storageId}/timers/{timerId}:

summary: Access to a specific Timer, identified by its TimerId

description: >-

Access to a specific Timer

put:

summary: Create/Replace Timer

description: Create or Modify a Timer with a user provided TimerId

operationId: CreateOrModifyTimer

tags:

- Timer Start

security:

- {}

- oAuth2ClientCredentials:

- nudsf-timer

- oAuth2ClientCredentials:

- nudsf-timer

- nudsf-timer:timer:create

parameters:

- name: realmId

in: path

description: Identifier(name) of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: timerId

in: path

description: Identifier of the Timer

required: true

schema:

$ref: '#/components/schemas/TimerId'

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

requestBody:

content:

application/json:

schema:

$ref: '#/components/schemas/Timer'

required: true

responses:

'201':

description: Timer successfully created

'204':

description: Timer successfully replaced

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

callbacks:

timerExpiry:

'{request.body#/callbackReference}':

post:

requestBody:

required: true

content:

application/json:

schema:

$ref: '#/components/schemas/Timer'

responses:

'204':

description: Callback executed successfully

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

patch:

summary: Timer modification

description: update a specific Timer

operationId: UpdateTimer

tags:

- Timer Update

security:

- {}

- oAuth2ClientCredentials:

- nudsf-timer

- oAuth2ClientCredentials:

- nudsf-timer

- nudsf-timer:timer:modify

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: timerId

in: path

description: Identifier of the Timer

required: true

schema:

$ref: '#/components/schemas/TimerId'

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

requestBody:

description: Timer data to patch

content:

application/json-patch+json:

schema:

type: array

items:

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

minItems: 1

required: true

responses:

'200':

description: >-

One or more modification instructions have been discarded, the execution report is returned in response PatchResult.

content:

application/json:

schema:

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

'204':

description: >-

Successful case. The timer has been successfully updated and no return is expected.

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

delete:

summary: Delete a Timer with an user provided TimerId

operationId: DeleteTimer

tags:

- Timer Stop

security:

- {}

- oAuth2ClientCredentials:

- nudsf-timer

- oAuth2ClientCredentials:

- nudsf-timer

- nudsf-timer:timer:modify

parameters:

- name: realmId

in: path

description: Identifier(name) of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: timerId

in: path

description: Identifier of the Timer

required: true

schema:

$ref: '#/components/schemas/TimerId'

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'204':

description: Successful case.

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

get:

summary: Timer access

description: retrieve one specific Timer

operationId: GetTimer

tags:

- Timer Get

security:

- {}

- oAuth2ClientCredentials:

- nudsf-timer

- oAuth2ClientCredentials:

- nudsf-timer

- nudsf-timer:timer:read

parameters:

- name: realmId

in: path

description: Identifier of the Realm

required: true

schema:

type: string

example: Realm01

- name: storageId

in: path

description: Identifier of the Storage

required: true

schema:

type: string

example: Storage01

- name: timerId

in: path

description: Identifier of the Timer

required: true

schema:

$ref: '#/components/schemas/TimerId'

- name: supported-features

in: query

description: Features required to be supported by the target NF

schema:

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

responses:

'200' : #result ok

description: Successful case.

content:

application/json:

schema:

$ref: '#/components/schemas/Timer'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{nrfApiRoot}/oauth2/token'

scopes:

nudsf-timer: Access to the nudsf-timer API

nudsf-timer:timer:read: Access to read timers

nudsf-timer:timer:modify: Access to update timers

nudsf-timer:timer:create: Access to create timers

schemas:

# COMPLEX TYPES:

Timer:

description: Represents a timer.

type: object

required:

- expires

properties:

timerId:

$ref: '#/components/schemas/TimerId'

expires:

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

metaTags:

description: A map (list of key-value pairs where a tagName of type string serves as key) of tagValue lists

type: object

additionalProperties:

type: array

items:

type: string

minItems: 1

minProperties: 1

callbackReference:

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

deleteAfter:

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

periodicRepetition:

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

repetitionCount:

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

TimerIdList:

description: Represents a list of timer IDs.

type: object

required:

- timerIds

properties:

timerIds:

type: array

items:

$ref: '#/components/schemas/TimerId'

minItems: 1

# SIMPLE TYPES:

TimerId:

description: Represents the identifier of a timer.

type: string

Annex B (informative):  
Search Examples

# B.1 Example Search

The conditional expression is defined by the following Extended Backus-Naur Form (EBNF) [18].



Figure B-1: Search Expression

Search\_Expression ::= Search\_Comparison | Search\_Condition



Figure B-2: Search Comparison

Search\_Comparison ::= Tag ( 'EQ' | 'NEQ' | 'GT' | 'GTE' | 'LT' | 'LTE' ) Value



Figure B-3: Search Condition

Search\_Condition ::= Search\_Expression ( ( 'AND' | 'OR' ) [Search\_Expression](https://bottlecaps.de/rr/ui#Search_Expression) )+



Figure B-4: Search ConditionNot

Search\_ConditionNot ::= 'NOT' Search\_Expression

Example:

Find all records where the tag "ueId" is equal to "455345" OR the tag "supi" is equal to "imsi-999559807001001":

{

"cond": "OR",

"units": [

{

"op": "EQ",

"tag" : "ueId",

"value" : "455345"

},

{

"op": "EQ",

"tag" : "supi",

"value" : "imsi-999559807001001"

}

]

}

# B.2 Example AdvancedCounting

Session records:

RecordId1/RecordMeta : { "supi": ["imsi-456123000000006"], "dnn":["nrphone"], "qosFlows":["qf1", "qf2"], "upfNodes":["upfnode1"], "upConnState":"ACTIVATED","ratType":["NR"]... }

RecordId2/RecordMeta : { "supi": ["imsi-456123000000006 ], "dnn":["ims"],"qosFlows":[ "qf1", "qf3" ], "upfNodes":["upfNode1", "upfNode2"], "upConnState":"ACTIVATED","ratType":["WLAN"]...}

RecordId3/RecordMeta : { "supi": ["imsi-456123000001001 ], "dnn":["nrphone"],"qosFlows":["qf1", "qf2"], "upfNodes":["upfNode3"], "upConnState":"DEACTIVATED","ratType":["NR"]... }

RecordId4/RecordMeta : { "supi": ["imsi-456123001032010 ], "dnn":["nrphone"],"qosFlows":["qf1", "qf4"], "upfNodes":["upfNode4"], "upConnState":"ACTIVATED","ratType":["NR"]...}

Example 1: Get Unique count of records with tag= "supi" and upConnState = "ACTIVATED".

Search expression:

{

"advancedTagCount1":

{

"tag" : "supi",

"countType" : "UNIQUE\_COUNT",

"filter" : { "op": "EQ", "tag" : " upConnState ", "value" : " ACTIVATED " }

}

}

Output:

The search found two unique supi in "ACTIVATED" state matching the tag-count-filter.

{"advancedTagCount1" : {"supi" : 2}

Example 2: Get Aggregate count of the tag=qosFlow and DNN="nrPhone".

Search expression:

{

"advancedTagCount1":

{

"tag" : "qosFlows",

"countType" : "AGGREGATE\_COUNT",

"filter" : { "op": "EQ", "tag" : "dnn", "value" : "nrphone" }

}

}

Output:

{"advancedTagCount1" : {[ "qf1": 2, "qf2":1, "qf4":1 ]}

Example 3: Get Aggregate count for tag=qosFlow across all records

Search Expression:

{

"advancedTagCount1":

{

"tag" : "qosFlows",

"countType" : "AGGREGATE\_COUNT",

"filter" : null

}

}

Output:

{ "advancedTagCount1": {[ "qf1": 4, "qf2":2, "qf3":1, “qf4":1 ] }}

Example 4: Get UNIQUE\_COUNT of records for tag=supi

Search Expression:

{

"advancedTagCount1":

{

"tag" : "supi",

"countType" : "UNIQUE\_COUNT",

"filter" : null

}

}

Output:

{"advancedTagCount1": {"supi" : 3}}

Example 5: Request 2 tag counts in one request

- Aggregate count of ratType

- Aggregate count of qosFlows

Search Expression:

{

"advancedTagCount1":

{

"tag" : "ratType",

"countType" : "AGGREGATE\_COUNT",

"filter" : null

},

"advancedTagCount2":

{

"tag" : "qosFlows",

"countType" : "AGGREGATE\_COUNT",

"filter" : null

}

}

Output:

{ "advancedTagCount1": {"NR": 3, "WLAN":1}, "advancedTagCount2": {[ "qf1": 4, "qf2":2, "qf3":1, "qf4":1 ] }}

Example 6: Total count of number of records with tag="supi"

Search Expression:

{

"advancedTagCount1":

{

"tag" : "supi",

"countType" : "TOTAL\_COUNT",

"filter" : null

}

}

Output:

{"advancedTagCount1": {"supi" : 4}}

Annex C (informative):  
HTTP Multipart Examples

# C.1 General

This clause provides examples of the HTTP multipart messages. The examples do not aim to be a complete representation of the HTTP message, e.g. additional information or headers can be included.

This Annex is informative and the normative descriptions in this specification prevail over the description in this Annex if there is any difference.

# C.2 Example HTTP multipart Record

Content-Type: multipart/mixed; boundary=partboundary

--partboundary

Content-Id: meta

Content-Type: application/json; charset=UTF-8

{"tags": { "ueId" : ["455345"], "supi" : ["imsi-999559807001001"] } }

--partboundary

Content-Id: block1

Content-Type: application/json; charset=UTF-8

Content-Transfer-Encoding: binary

{ "firstName": "John", "lastName": "Doe"}

--partboundary

Content-Id: block2

Content-Type: image/png

Content-Transfer-Encoding: binary

<binary representation of png>

--partboundary--'

# C.3 Example HTTP multipart BlockCollection

Content-Type: multipart/parallel; boundary=partboundary

--partboundary

Content-Id: block1

Content-Type: application/json; charset=UTF-8

Content-Transfer-Encoding: binary

{ "firstName": "John", "lastName": "Doe"}

--partboundary

Content-Id: block2

Content-Type: image/png

Content-Transfer-Encoding: base64



--partboundary--'

# C.4 Example HTTP multipart RecordNotification

Content-Type: multipart/mixed; boundary=partboundary

--partboundary

Content-Id: recordnotification

Content-Type: application/json; charset=UTF-8

{"recordRef" : "...", "operationType" : "DELETED" }

--partboundary

Content-Id: meta

Content-Type: application/json; charset=UTF-8

{"tags": { "ueId" : ["455345"], "supi" : ["imsi-999559807001001"] } }

--partboundary

Content-Id: block1

Content-Type: application/json; charset=UTF-8

Content-Transfer-Encoding: binary

{"firstName": "John", "lastName": "Doe"}

--partboundary

Content-Id: block2

Content-Type: image/png

Content-Transfer-Encoding: binary

<binary representation of png>

--partboundary--'

Annex D (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2019-11 | CT4#94 | C4-195489 |  |  |  | Initial Draft. | 0.1.0 |
| 2020-03 | CT4#96 | C4-200359  C4-200360  C4-200584  C4-200585  C4-200586  C4-200654  C4-200905  C4-200920  C4-201226  C4-201230  C4-201235  C4-201236  C4-201237 |  |  |  | Implementation of pCRs agreed at CT4#96. | 0.2.0 |
| 2020-03 | CT#87e | CP-200066 |  |  |  | TS presented for information and approval | 1.0.0 |
| 2020-03 | CT#87e |  |  |  |  | Approved at CT#87e | 16.0.0 |
| 2020-06 | CT#88e | CP-201175 | 0001 | 4 | B | Subscribe To Notify | 16.1.0 |
| 2020-06 | CT#88e | CP-201041 | 0002 |  | C | Removal of Editor's Note | 16.1.0 |
| 2020-06 | CT#88e | CP-201041 | 0003 |  | C | Add supportedFeatures to RecordSearchResult | 16.1.0 |
| 2020-06 | CT#88e | CP-201041 | 0004 |  | F | SearchExpression | 16.1.0 |
| 2020-06 | CT#88e | CP-201041 | 0006 | 1 | F | Miscellaneous Corrections | 16.1.0 |
| 2020-06 | CT#88e | CP-201041 | 0007 | 1 | B | Storage of YAML files in ETSI Forge | 16.1.0 |
| 2020-06 | CT#88e | CP-201041 | 0008 |  | F | 204 missing in OpenAPI | 16.1.0 |
| 2020-06 | CT#88e | CP-201073 | 0009 |  | F | Rel-16 API version and External doc update | 16.1.0 |
| 2020-09 | CT#89e | CP-202116 | 0010 |  | F | Optionality of ProblemDetails in TS29.598 cleanup | 16.2.0 |
| 2020-12 | CT#90e | CP-203052 | 0011 | 1 | F | Misc corrections | 16.3.0 |
| 2020-12 | CT#90e | CP-203035 | 0012 |  | F | Removal of the reference to ETSI Forge | 16.3.0 |
| 2020-12 | CT#90e | CP-203052 | 0013 | 1 | F | Corrections on Subscription and Notification | 16.3.0 |
| 2020-12 | CT#90e | CP-203052 | 0014 | 1 | F | Corrections on yaml of Nudsf\_DataRepository OpenAPI | 16.3.0 |
| 2020-12 | CT#90e | CP-203052 | 0015 | 1 | F | Define Unsubscription to notifications serivce operation | 16.3.0 |
| 2020-12 | CT#90e | CP-203052 | 0016 | 1 | F | Incorrect data type | 16.3.0 |
| 2020-12 | CT#90e | CP-203052 | 0018 |  | F | Resource URI problems clean up | 16.3.0 |
| 2020-12 | CT#90e | CP-203018 | 0019 | 3 | B | Meta Schema | 17.0.0 |
| 2020-12 | CT#90e | CP-203055 | 0022 |  | F | 29.598 Rel-17 API version and External doc update | 17.0.0 |
| 2021-03 | CT#91e | CP-210039 | 0024 | 1 | A | Removal of paging parameters | 17.1.0 |
| 2021-03 | CT#91e | CP-210039 | 0026 | 1 | A | BlockId clarification | 17.1.0 |
| 2021-03 | CT#91e | CP-210034 | 0027 | 1 | F | OpenAPI Reference | 17.1.0 |
| 2021-03 | CT#91e | CP-210090 | 0028 | 2 | B | Nudsf\_Timer Service | 17.1.0 |
| 2021-03 | CT#91e | CP-210029 | 0029 |  | F | 29.598 Rel-17 API version and External doc update | 17.1.0 |
| 2021-06 | CT#92e | CP-211028 | 0031 |  | F | metaTags cardinality in type Timer | 17.2.0 |
| 2021-06 | CT#92e | CP-211028 | 0032 |  | F | Adding some missing description fields to data type definitions in OpenAPI specification files of the Nudsf\_DataRepository API | 17.2.0 |
| 2021-06 | CT#92e | CP-211028 | 0033 |  | F | Adding some missing description fields to data type definitions in OpenAPI specification files of the Nudsf\_Timer API | 17.2.0 |
| 2021-06 | CT#92e | CP-211065 | 0035 |  | A | Nested cardinality R17 | 17.2.0 |
| 2021-06 | CT#92e | CP-211065 | 0037 | 1 | A | Monitored Resource URI | 17.2.0 |
| 2021-06 | CT#92e | CP-211061 | 0039 |  | A | Content-ID | 17.2.0 |
| 2021-06 | CT#92e | CP-211050 | 0040 |  | F | 29.598 Rel-17 API version and External doc update | 17.2.0 |
| 2021-09 | CT#93e | CP-212026 | 0042 |  | B | Combined Search and Retrieval | 17.3.0 |
| 2021-09 | CT#93e | CP-212067 | 0044 |  | A | Removal of enum | 17.3.0 |
| 2021-09 | CT#93e | CP-212059 | 0045 |  | F | 29.598 Rel-17 API version and External doc update | 17.3.0 |
| 2021-12 | CT#94e | CP-213087 | 0047 | 2 | B | Subscription Expiry Notification | 17.4.0 |
| 2021-12 | CT#94e | CP-213086 | 0048 | 1 | B | Support of Bulk Operations | 17.4.0 |
| 2021-12 | CT#94e | CP-213133 | 0050 | 2 | F | Content-id | 17.4.0 |
| 2021-12 | CT#94e | CP-213121 | 0051 |  | F | 29.598 Rel-17 API version and External doc update | 17.4.0 |
| 2022-03 | CT#95e | CP-220024 | 0052 |  | F | Query parameter formatting | 17.5.0 |
| 2022-03 | CT#95e | CP-220066 | 0053 |  | F | 29.598 Rel-17 API version and External doc update | 17.5.0 |
| 2022-06 | CT#96 | CP-221051 | 0054 |  | F | 29.598 Rel-17 API version and External doc update | 17.6.0 |
| 2022-12 | CT#98 | CP-223065 | 0057 | 1 | F | Removing editor's notes from Rel-17 | 17.7.0 |
| 2022-12 | CT#98 | CP-223028 | 0056 | 1 | F | Missing Mandatory Status Codes in OpenAPI | 18.0.0 |
| 2022-12 | CT#98 | CP-223033 | 0058 |  | F | 29.598 Rel-18 API version and External doc update | 18.0.0 |
| 2023-03 | CT#99 | CP-230208 | 0059 | 3 | F | Introducing Advanced Tag Counting | 18.1.0 |
| 2023-03 | CT#99 | CP-230071 | 0060 |  | F | 29.598 Rel-18 API version and External doc update | 18.1.0 |
| 2023-06 | CT#100 | CP-231025 | 0061 |  | B | OAuth2 scopes in the Nudsf APIs | 18.2.0 |
| 2023-06 | CT#100 | CP-231028 | 0063 | 2 | F | Clarification: Delete all records | 18.2.0 |
| 2023-06 | CT#100 | CP-231070 | 0064 |  | F | 29.598 Rel-18 API version and External doc update | 18.2.0 |
| 2023-09 | CT#101 | CP-232033 | 0065 | 2 | F | Correction: Unsubscribe service operation | 18.3.0 |
| 2023-09 | CT#101 | CP-232153 | 0066 | 3 | F | UDSF Error Handling | 18.3.0 |
| 2023-09 | CT#101 | CP-232060 | 0067 |  | F | 29.598 Rel-18 API version and External doc update | 18.3.0 |
| 2023-12 | CT#102 | CP-233029 | 0068 | 1 | B | Periodic Timer | 18.4.0 |
| 2023-12 | CT#102 | CP-233028 | 0069 |  | F | Update and replace obsoleted HTTP RFCs | 18.4.0 |
| 2023-12 | CT#102 | CP-233031 | 0070 |  | F | Replacing obsoleted HTTP RFC 7807 with 9457 | 18.4.0 |
| 2023-12 | CT#102 | CP-233060 | 0071 |  | F | 29.598 Rel-18 API version and External doc update | 18.4.0 |