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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 Nsoraf Service Based Interface. It provides stage 3 protocol definitions and message flows, and specifies the API for each service offered by the SOR-AF.

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3]. The stage 2 architecture and procedures for 5G Steering of Roaming are specified in 3GPP TS 23.122 [14].

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

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

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

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

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

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

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

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

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

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

[11] IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".

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

[13] IETF RFC 7807: "Problem Details for HTTP APIs".

[14] 3GPP TS 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode".

[15] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

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

[17] 3GPP TS 31.115: "Secured packet structure for (Universal) Subscriber Identity Module (U)SIM Toolkit applications".

# 3 Definitions, symbols and abbreviations

## 3.1 Terms

**SoR Information:** In this specification, this refers to the following HPLMN information:

a) an indication of whether the SOR-AF requires the UDM to request an acknowledgement from the UE for successful reception of the Steering of Roaming information; and

b) one of the following:

- a list of preferred PLMN/access technology combinations with an indication that it is included;

- a secured packet with an indication that it is included; or

- the HPLMN indication that 'no change of the "Operator Controlled PLMN Selector with Access Technology" list stored in the UE is needed and thus no list of preferred PLMN/access technology combinations is provided'.

NOTE: The secured packet contains the list of preferred PLMN/access technology combinations encapsulated with a security mechanism as described in 3GPP TS 31.115 [17].

## 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].

NF Network Function

JSON Javascript Object Notation

SOR-AF Steering Of Roaming Application Function

SoR Steering of Roaming

SUPI Subscription Permanent Identifier

UE User Equipment

UDM Unified Data Management

# 4 Overview

## 4.1 Introduction

Within the 5GC, the Steering Of Roaming Application Function (SOR-AF) provides services (see 3GPP TS 23.122 [14]) to NF service consumers (e.g. UDM) via the Nsoraf service based interface.

NOTE: The generation and calculation of the SoR information and associated roaming business logic are out of scope of this document.

Figure°4.1-1 depicts the reference architecture of the SOR-AF.



Figure 4.1-1: Reference model – SOR-AF

# 5 Services offered by the SOR-AF

## 5.1 Introduction

The SOR-AF offers the following services to NF consumers (e.g. UDM) via the Nsoraf service based interface:

- Nsoraf\_SteeringOfRoaming

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

Table 5.1-1: APIs Description

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Service Name** | **Clause** | **Description** | **OpenAPI Specification File** | **apiName** | **Annex** |
| Nsoraf\_SteeringOfRoaming | 6.1 | Nsoraf Steering Of Roaming Service | TS29550\_Nsoraf\_SOR.yaml | nsoraf-sor | A.2 |

## 5.2 Nsoraf\_SteeringOfRoaming Service

### 5.2.1 Service Description

The Nsoraf\_SteeringOfRoaming (Nsoraf\_SOR) service provides Steering of Roaming services to NF consumers (e.g. UDM) to enable the retrieval of SoR information (i.e. the list of preferred PLMN/access technology combinations or an indication that no update to the list of preferred PLMN/access technology combinations is needed) to be conveyed to the UE, as specified in Annex C of 3GPP°TS°23.122 [14]. The latter specifies the 5GS control plane mechanism for Steering of Roaming that aims at allowing the HPLMN to update the "Operator Controlled PLMN Selector with Access Technology" list in the UE by providing and updating this list of preferred PLMN/access technology combinations.

### 5.2.2 Service Operations

#### 5.2.2.1 Introduction

For the Nsoraf\_SteeringOfRoaming service, the following service operations are defined:

- Get

- Info

#### 5.2.2.2 Get

##### 5.2.2.2.1 General

This service operation is used by a NF consumer (e.g. UDM) to retrieve SoR information.

The returned information can consist of either:

- a list of preferred PLMN/access technology combinations;

- a secured packet;

- neither of them.

NOTE: The secured packet contains the list of preferred PLMN/access technology combinations encapsulated with a security mechanism as described in 3GPP TS 31.115 [17].

The following procedures are supported using the "Get" service operation:

- SoR Information Retrieval

##### 5.2.2.2.2 SoR Information Retrieval

Figure 5.2.2.2.2-1 depicts a scenario where a NF consumer (e.g. UDM) sends a request to the SOR-AF to retrieve the SoR information for a UE (see also clause C.2 in Annex C of 3GPP°TS°23.122°[14]).

The request contains the UE's identity (/{supi}) and a set of query parameters (e.g. PLMN ID of the visited PLMN the UE is roaming in).



Figure 5.2.2.2.2-1: SoR Information Retrieval Procedure

1. The NF service consumer (e.g. UDM) sends a GET request to the resource representing the SoR information (sor-information), with query parameters indicating the PLMN ID and other relevant information (e.g. Access type).

2a. On success, the SOR-AF responds with the HTTP status code "200 OK" with the message body containing the SoR information for the concerned UE. The response also contains a Cache-Control HTTP header set to the value "no-cache" instructing the NF consumer (e.g. UDM) to not cache the received SoR information.

2b. If there is no valid SoR information for the UE (e.g. the resource does not exist, the SUPI is unknown to the SOR-AF), the SOR-AF responds with the HTTP status code "404 Not Found" including additional error information in the response body (within the "ProblemDetails" IE).

NOTE: An operator configurable timer shall be used by the NF Service Consumer (e.g. UDM) to control the acceptable time during which it shall wait for the GET response from the SOR-AF, as specified in clause C.2 of 3GPP°TS°23.122°[14] (step 3d of the procedure description). The default value and range of this timer is operator specific and shall take into account the importance of the related procedure (e.g. registration procedure).

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 Info

##### 5.2.2.3.1 General

This service operation is used by a NF consumer (e.g. UDM) to provide the SOR-AF with the reception status of the acknowledgment on successful reception of SoR information by the UE, in case an acknowledgment was requested to the UE.

The following procedures are supported using the "Info" service operation:

- SoR Acknowledgment Reception Notification

##### 5.2.2.3.2 SoR Acknowledgment Reception Notification

Figure 5.2.2.3.2-1 depicts a scenario where a NF consumer (e.g. UDM) sends an indication to the SOR-AF on the reception status of SoR information by the UE (see also clauses C.2 and C.3 in Annex C of 3GPP°TS°23.122°[14]).

The request contains the UE's identity (/{supi}), the type of acknowledgment (/sor-information/sor-ack) and the indication (SorAckInfo).



Figure 5.2.2.3.2-1: SoR Acknowledgment Reception Notification procedure

1. The NF service consumer (e.g. UDM) sends a PUT request to the resource representing the SoR information acknowledgment (/{supi}/sor-information/sor-ack) with the SorAckInfo containing an indication on the reception status of SoR information by the UE.

2a. The SOR-AF responds with the HTTP status code "204 No Content".

2b. If there is an error (e.g. the SUPI is unknown to the SOR-AF), the SOR-AF shall respond with the HTTP status code "404 Not Found" including additional error information in the response body (within the "ProblemDetails" IE).

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.

# 6 API Definitions

## 6.1 Nsoraf\_SteeringOfRoaming Service API

### 6.1.1 Introduction

The Nsoraf\_SOR service shall use the Nsoraf\_SOR service API.

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

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

with the following components:

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

- The <apiName>shall be "nsoraf-sor".

- 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 7540 [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 Nsoraf\_SOR 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

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 7807 [13].

##### 6.1.2.2.3 Cache-Control

The "Cache-Control" header set to the value "no-cache" shall be included in HTTP responses for resources that shall not be cached (e.g. SorInformation).

#### 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.

### 6.1.3 Resources

#### 6.1.3.1 Overview

The structure of the Resource URIs of the "Nsoraf\_SOR" service is depicted in Figure 6.1.3.1-1.



Figure 6.1.3.1-1: Resource URI structure of the Nsoraf\_SOR 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 |
| sor-information  (Document) | /{supi}/sor-information | GET | Retrieve the SoR information. |
| sor-ack  (Document) | /{supi}/sor-information/sor-ack | PUT | Inform the SOR-AF of the reception status of the Acknowledgment of successful reception of SoR information by the UE. |

#### 6.1.3.2 Resource: sor-information

##### 6.1.3.2.1 Description

This resource represents the SoR information for a SUPI. It is used by NF consumers (e.g. UDM) to:

- request the retrieval of the SoR information during registration in a VPLMN as specified in clause C.2 in Annex C of 3GPP°TS°23.122°[14].

##### 6.1.3.2.2 Resource Definition

Resource URI: **{apiRoot}/nsoraf-sor/v1/{supi}/sor-information**

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

##### 6.1.3.2.3 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. |  |
| plmn-id | PlmnId | M | 1 | PLMN identity of the PLMN serving the UE. |  |
| access-type | AccessType | O | 0..1 | Access type used by the UE. |  |

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 |
| SorInformation | M | 1 | 200 OK | Upon success, a response with "200 OK" status code and a response body containing the SoR information as requested by the NF consumer (e.g. UDM) shall be returned by the SOR-AF. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection. The response shall include a Location header field containing a URI pointing to a resource located on alternative SOR-AF or the initial target SOR-AF when this is a redirection triggered by an SCP via another SCP.  (NOTE 2) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. The response shall include a Location header field containing a URI pointing to a resource located on alternative SOR-AF or the initial target SOR-AF when this is a redirection triggered by an SCP via another SCP.  (NOTE 2) |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be set to one of the following application errors:  - USER\_NOT\_FOUND |
| NOTE 1: 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.  NOTE 2: RedirectResponses may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4]. | | | | |

Table 6.1.3.2.3.1-4: Headers supported by the 200 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Data type** | **P** | **Cardinality** | **Description** |
| Cache-Control | string | M | 1 | The Cache-Control HTTP header is set to the value "no-cache" instructing the NF consumer (e.g. UDM) to not cache the received SoR information. |

Table 6.1.3.2.3.1-5: Headers supported by the 307 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | A URI pointing to a resource located on alternative SOR-AF or the initial target SOR-AF when this is a redirection triggered by an SCP via another SCP. |

Table 6.1.3.2.3.1-6: Headers supported by the 308 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | A URI pointing to a resource located on alternative SOR-AF or the initial target SOR-AF when this is a redirection triggered by an SCP via another SCP. |

#### 6.1.3.3 Resource: sor-ack

##### 6.1.3.3.1 Description

This resource represents the notification from the NF consumer (e.g. UDM) of the reception status of the acknowledgment of successful reception of SoR information by the UE as specified in in Annex C of 3GPP°TS°23.122 [14].

##### 6.1.3.3.2 Resource Definition

Resource URI: **{apiRoot}/nsoraf-sor/v1/{supi}/sor-information/sor-ack**

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

##### 6.1.3.3.3 Resource Standard Methods

###### 6.1.3.3.3.1 PUT

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 PUT method on this resource

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

This method shall support the request data structures specified in table 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 PUT Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| SorAckInfo | M | 1 | Contains an indication on the reception status of the acknowledgment of successful reception of SoR information by the UE. |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | Upon success, a response with "204 No Content" status code shall be returned. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection. The response shall include a Location header field containing a URI pointing to a resource located on alternative SOR-AF or the initial target SOR-AF when this is a redirection triggered by an SCP via another SCP.  (NOTE 2) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. The response shall include a Location header field containing a URI pointing to a resource located on alternative SOR-AF or the initial target SOR-AF when this is a redirection triggered by an SCP via another SCP.  (NOTE 2) |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be set to the following application error:  - USER\_NOT\_FOUND |
| NOTE 1: 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.  NOTE 2: RedirectResponses may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4]. | | | | |

Table 6.1.3.3.3.1-4: Headers supported by the 307 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | A URI pointing to a resource located on alternative SOR-AF or the initial target SOR-AF when this is a redirection triggered by an SCP via another SCP. |

### 6.1.4 Custom Operations without associated resources

No custom operations without associated resources are defined for the Nsoraf\_SOR Service.

### 6.1.5 Notifications

#### 6.1.5.1 General

In this release of this specification, no notifications are defined for the Nsoraf\_SOR Service.

### 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 Nsoraf\_SOR service based interface protocol.

Table 6.1.6.1-1: Nsoraf specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Clause defined | Description | Applicability |
| SorInformation | 6.1.6.2.2 | Contains the SoR information to be conveyed to the UE. |  |
| SorAckInfo | 6.1.6.2.3 | Contains an indication to the SOR-AF on the reception status of the acknowledgment of successful reception of SoR Information by the UE. |  |
| SorAckStatus | 6.1.6.3.3 | Contains the reception status of the acknowledgment of successful reception of SoR Information by the UE. |  |

Table 6.1.6.1-2 specifies data types re-used by the Nsoraf\_SOR 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 Nsoraf service based interface.

Table 6.1.6.1-2: Nsoraf re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| PlmnId | 3GPP TS 29.571 [16] | PLMN Identity |  |
| ProblemDetails | 3GPP TS 29.571 [16] | Common data type used in response bodies |  |
| RedirectResponse | 3GPP TS 29.571 [10] | Redirect Response |  |
| SupportedFeatures | 3GPP TS 29.571 [16] | see 3GPP TS 29.500 [4] clause 6.6 |  |
| SteeringContainer | 3GPP TS 29.503 [15] | Contains the SoR Information |  |
| Supi | 3GPP TS 29.571 [16] | Contains the SUPI information. |  |
| DateTime | 3GPP TS 29.571 [16] | Date Time |  |
| AccessType | 3GPP TS 29.571 [16] | Access type (e.g. 3GPP) |  |

#### 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: SorInformation

Table 6.1.6.2.2-1: Definition of type SorInformation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| steeringContainer | SteeringContainer | C | 0..1 | When present, this attribute contains the information needed to update the "Operator Controlled PLMN Selector with Access Technology" list stored in the UE, either as an array of preferred PLMN/Access Technologies combinations in priority order (with the first entry in the array indicating the highest priority and the last entry indicating the lowest) or a secured packet.  If no change of the "Operator Controlled PLMN Selector with Access Technology" list stored in the UE is needed, then this attribute shall be absent. |  |
| sorAckIndication | Boolean | M | 1 | This attribute indicates to the NF consumer (e.g. UDM) whether an Acknowledgment of successful reception of SoR information shall be requested to the UE (when set to "True") or not (when set to "False"). |  |
| sorSendingTime | DateTime | M | 1 | Contains the date and time at which SOR-AF returns SorInformation.  It is used to correlate the SoR acknowledgement with the associated SoR information. |  |

##### 6.1.6.2.3 Type: SorAckInfo

Table 6.1.6.2.3-1: Definition of type SorAckInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| sorAckStatus | SorAckStatus | M | 1 | Contains the reception status of the acknowledgment of successful reception of SoR Information by the UE. |  |
| sorSendingTime | DateTime | M | 1 | Contains the date and time at which SOR-AF sent the SorInformation to which the acknowledgment status relates. |  |

#### 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 |
| n/a |  |  |  |

##### 6.1.6.3.3 Enumeration: SorAckStatus

The enumeration SorAckStatus represents an indication to the SOR-AF on whether the acknowledgment of successful reception of SoR information was received from the UE. It shall comply with the provisions defined in table 6.1.6.3.3-1.

Table 6.1.6.3.3-1: Enumeration SorAckStatus

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "ACK\_SUCCESSFUL" | Indicates to the SOR-AF that the acknowledgment of successful reception of SoR information was received from the UE and the integrity check was successful. |  |
| "ACK\_NOT\_RECEIVED" | Indicates to the SOR-AF that the acknowledgment of successful reception of SoR information was NOT received from the UE. |  |
| "ACK\_NOT\_SUCCESSFUL" | Indicates to the SOR-AF that the acknowledgment of successful reception of SoR information was received from the UE and the integrity check was NOT successful. |  |

### 6.1.7 Error Handling

#### 6.1.7.1 General

For the Nsoraf\_SOR 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 Nsoraf\_SOR API.

#### 6.1.7.2 Protocol Errors

No specific procedures for the Nsoraf\_SOR service are specified.

#### 6.1.7.3 Application Errors

The application errors defined for the Nsoraf\_SOR service are listed in Table 6.1.7.3-1.

Table 6.1.7.3-1: Application errors

|  |  |  |
| --- | --- | --- |
| Application Error | HTTP status code | Description |
| USER\_NOT\_FOUND | 404 Not Found | The user does not exist  This error is applicable to all Nsoraf\_SOR operations. |

### 6.1.8 Feature negotiation

The optional features in table 6.1.8-1 are defined for the Nsoraf\_SOR 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 |
| n/a |  |  |

### 6.1.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Nsoraf\_SOR 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 Nsoraf\_SOR 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 Nsoraf\_SOR service.

The Nsoraf\_SOR API defines a single scope "nsoraf-sor" for the entire service, and it does not define any additional scopes at resource or operation level.

Annex A (normative):  
OpenAPI specification

# A.1 General

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

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

NOTE: 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 , 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 Nsoraf\_SOR API

openapi: 3.0.0

info:

title: 'Nsoraf\_SOR'

version: 1.0.2

description: |

Nsoraf Steering Of Roaming Service.

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externalDocs:

description: 3GPP TS 29.550 V16.5.0; Steering Of Roaming Application Function Services.

url: http://www.3gpp.org/ftp/Specs/archive/29\_series/29.550/

servers:

- url: '{apiRoot}/nsoraf-sor/v1'

variables:

apiRoot:

default: https://example.com

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

security:

- {}

- oAuth2ClientCredentials:

- nsoraf-sor

paths:

/{supi}/sor-information:

get:

summary: retrieve the steering of roaming information for a UE

operationId: GetSorInformation

tags:

- SoR Information Retrieval

parameters:

- name: supi

in: path

description: Identifier of the UE

required: true

schema:

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

- name: supported-features

in: query

description: Supported Features

schema:

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

- name: plmn-id

in: query

description: serving PLMN ID

required: true

content:

application/json:

schema:

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

- name: access-type

in: query

description: Access type used by the UE

schema:

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

responses:

'200':

description: Expected response to a valid request

content:

application/json:

schema:

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

headers:

Cache-Control:

description: Cache-Control (as described in RFC 7234) with value "no-cache" to indicate that the returned SoR information should not be cached

schema:

type: string

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

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

'404':

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

'500':

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

'503':

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

default:

description: Unexpected error

/{supi}/sor-information/sor-ack:

put:

summary: SoR Acknowledgment Reception Notification

operationId: SorAckInfo

tags:

- Providing the reception status of the acknowledgement of Steering of Roaming information reception by the UE

parameters:

- name: supi

in: path

description: Identifier of the UE

required: true

schema:

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

requestBody:

required: true

content:

application/json:

schema:

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

responses:

'204':

description: Successful reception of the indication

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

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

'404':

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

'500':

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

'503':

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

default:

description: Unexpected error

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{nrfApiRoot}/oauth2/token'

scopes:

nsoraf-sor: Access to the Nsoraf\_SOR API

schemas:

# API specific definitions

SorInformation:

type: object

required:

- sorAckIndication

- sorSendingTime

properties:

steeringContainer:

$ref: 'TS29503\_Nudm\_SDM.yaml#/components/schemas/SteeringContainer'

sorAckIndication:

type: boolean

sorSendingTime:

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

SorAckInfo:

type: object

required:

- sorAckStatus

- sorSendingTime

properties:

sorAckStatus:

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

sorSendingTime:

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

SorAckStatus:

anyOf:

- type: string

enum:

- ACK\_SUCCESSFUL

- ACK\_NOT\_RECEIVED

- ACK\_NOT\_SUCCESSFUL

- type: string

Annex B (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2019-11 | CT4#95 | C4-195242 |  |  |  | Initial Draft. | 0.1.0 |
| 2020-03 | CT4#96e | C4-200833 |  |  |  | Pseudo-CR on the scope part of SOR-AF API | 0.2.0 |
| 2020-03 | CT4#96e | C4-201197 |  |  |  | Pseudo-CR on the overview part of SOR-AF API | 0.2.0 |
| 2020-03 | CT4#96e | C4-201198 |  |  |  | Pseudo-CR on the definition of Nsoraf service | 0.2.0 |
| 2020-03 | CT4#96e | C4-201206 |  |  |  | Pseudo-CR on the resources part of SOR-AF API | 0.2.0 |
| 2020-03 | CT4#96e | C4-201208 |  |  |  | Pseudo-CR on the data model aspects of SOR-AF API | 0.2.0 |
| 2020-03 | CT4#96e | C4-201209 |  |  |  | Pseudo-CR on the OpenAPI part of SOR-AF API | 0.2.0 |
| 2020-03 | CT-87e | CP-200063 |  |  |  | TS presented for information and approval | 1.0.0 |
| 2020-03 | CT-87e |  |  |  |  | Approved at CT#87e | 16.0.0 |
| 2020-07 | CT#88e | CP-201042 | 0001 |  | F | SoR Information wording clarification | 16.1.0 |
| 2020-07 | CT#88e | CP-201042 | 0002 | 1 | F | Storage of YAML files in ETSI Forge | 16.1.0 |
| 2020-07 | CT#88e | CP-201042 | 0003 |  | F | Miscellaneous Corrections | 16.1.0 |
| 2020-07 | CT#88e | CP-201042 | 0006 | 1 | F | Add Data type column in the URI variables tables | 16.1.0 |
| 2020-07 | CT#88e | CP-201042 | 0007 | 1 | F | Add supported headers tables | 16.1.0 |
| 2020-07 | CT#88e | CP-201042 | 0008 |  | F | Add API descriptions table | 16.1.0 |
| 2020-07 | CT#88e | CP-201042 | 0009 | 2 | B | Remaining input parameters to Nsoraf\_SOR\_Get service operation | 16.1.0 |
| 2020-07 | CT#88e | CP-201042 | 0010 | 1 | B | SoR retrieval response timing control | 16.1.0 |
| 2020-07 | CT#88e | CP-201073 | 0011 |  | F | 29.550 Rel-16 API version and External doc update | 16.1.0 |
| 2020-09 | CT#89e | CP-202115 | 0012 |  | F | Miscellaneous Corrections | 16.2.0 |
| 2020-12 | CT#90e | CP-203035 | 0015 |  | F | Removal of the reference to ETSI forge | 16.3.0 |
| 2021-09 | CT#93e | CP-212246 | 0025 | 1 | F | Redirection answers | 16.4.0 |
| 2022-06 | CT#96 | CP-221064 | 0029 |  | F | access-type query parameter format | 16.5.0 |
| 2022-06 | CT#96 | CP-221303 | 0033 | 1 | F | 29.550 Rel-16 API version and External doc update | 16.5.0 |