**3GPP TSG-CT WG4 Meeting #110-eC4-223xyz**

**E-Meeting, 12th – 20th May 2022 (was C4-223265)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **29.550** | **CR** | **0031** | **rev** | **1** | **Current version:** | **17.3.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | SOR functionality with SNPNs | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | CT4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | eNPN | | | | |  | ***Date:*** | | | 2022-04-22 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | TS 23.211 clause C.5 indicates:  *3b) The UDM to the SOR-AF: Nsoraf\_SoR\_Get request (SNPN identity, SUPI of the UE, access type (see 3GPP TS 29.571 [72])). The SNPN identity and the access type parameters, indicating where the UE is registering, are stored in the UDM;*  *3c) The SOR-AF to the UDM: Nsoraf\_SoR\_Get response (the SOR-SNPN-SI, the SOR-CMCI, if any, and the "Store the SOR-CMCI in the ME" indicator, if any);*  *Based on the information received in step 3b and any subcribed SNPN or HPLMN specific criteria, the SOR-AF may include the SOR-SNPN-SI, the SOR-CMCI, if any, and optionally the "Store the SOR-CMCI in the ME" indicator, if any.*  SNPN Identity (PlmnIdNid data type) needs to be added to the query parameters in such GET request.  SorInformation data type needs to be extended to include SOR-SNPN-SI related parameters. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | - Keep the existing query parameter "plmn-id", but replace its data type from PlmnId to PlmnIdNid. Given that PlmnIdNid is an extension of PlmnId (i.e. a JSON object of type PlmnIdNid is also compliant as a PlmnId object), such change is backwards-compatible.  - Redefine the steeringContainer attribute of SorInformation, to be able to have SteeringInfo objects in the array, containing a GIN attribute instead of the PLMN-ID/SNPN-ID (note that the original definitions from TS 29.503 and TS 29.509 have the plmnId attribute as mandatory, so they cannot be re-used).  - Add a new feature bit in Supported Features to negotiate the support of the new SNPN parameters. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Stage-2 requirements are not met. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 3.3, 5.2.2.2.2, 6.1.3.2.3.1, 6.1.6.1, 6.1.6.2.2, 6.1.6.2.x (new), 6.1.6.2.y (new), 6.1.8, A.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | This CR introduces backwards-compatible new features with impacts on the following APIs:  - TS29550\_Nsoraf\_SOR.yaml | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\* \* \* First Change \* \* \* \*

# 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://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 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".

[18] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[19] 3GPP TS 29.544: "5G System; Secured Packet Application Function (SP-AF) services; Stage 3".

[xx] 3GPP TS 29.509: "Authentication Server Services; Stage 3".

\* \* \* Next Change \* \* \* \*

## 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].

GIN Group ID for Network Selection

JSON Javascript Object Notation

NF Network Function

SOR-AF Steering Of Roaming Application Function

SoR Steering of Roaming

SUPI Subscription Permanent Identifier

UDM Unified Data Management

UE User Equipment

\* \* \* Next Change \* \* \* \*

##### 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, or SNPN ID of the visited SNPN).



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 or SNPN 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 (i.e. list of preferred PLMN/access technology combinations, the SOR-CMCI, if any, and the "Store the SOR-CMCI in the ME" indicator, if any, or a secured packet by consuming Nspaf services as specified in 3GPP TS 29.544 [19]) 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.

\* \* \* Next Change \* \* \* \*

##### 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 clause 6.1.8, and 3GPP TS 29.500 [4] clause 6.6. |  |
| plmn-id | PlmnIdNid | M | 1 | Identity of the PLMN or SNPN 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. |

\* \* \* Next Change \* \* \* \*

#### 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. |  |
| SteeringContainer | 6.1.6.2.x | It consists of either a list (array) of SteeringInfo objects, or a Secured Packet. |  |
| SteeringInfo | 6.1.6.2.x | Contains a PLMN-ID, or SNPN-ID or a GIN, and, for the case of PLMNs, the preferred access technologies. |  |
| 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 |  |
| PlmnIdNid | 3GPP TS 29.571 [16] | SNPN Identity or GIN |  |
| 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 |  |
| 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) |  |
| SorCmci | 3GPP TS 29.503 [15] | Contains SOR-CMCI as defined in 3GPP TS 24.501 [18] |  |
| AccessTech | 3GPP TS 29.509 [xx] | List of access technologies |  |

\* \* \* Next Change \* \* \* \*

##### 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 |
| supportedFeatures | SupportedFeatures | O | 0..1 | Features supported by the SOR-AF (see clause 6.1.8). |  |
| 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.  When the eNPN feature is supported, this IE may contain SOR information for SNPNs or GINs. |  |
| 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"). |  |
| sorCmci | SorCmci | O | 0..1 | When present, provides the SOR-CMCI values as defined in 3GPP TS 24.501 [18]  If "ME Support of SOR-CMCI" as provided in meSupportOfSorCmci from UE to SOR-AF via AMF and UDM is not stored as "supported", then this attribute shall be absent.  Shall be absent if steeringContainer is provided with contents in secured packet. |  |
| storeSorCmciInMe | Boolean | O | 0..1 | When present, indicates "Store the SOR-CMCI in the ME" as supported as defined in 3GPP TS 23.122 [14] and 3GPP TS 24.501 [18].  If sorCmci is absent, then this attribute shall also be absent.  - True: Indicates to store the SOR-CMCI in the ME  - False or absent: Indicates storing the SOR-CMCI in the ME is not required  Shall be absent if steeringContainer is provided with contents in secured packet. |  |
| 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. |  |

\* \* \* Next Change \* \* \* \*

##### 6.1.6.2.x Type: SteeringContainer

Table 6.1.6.2.x.-1: Definition of type SteeringContainer as a list of mutually exclusive alternatives

|  |  |  |
| --- | --- | --- |
| Data type | Cardinality | Description |
| array(SteeringInfo) | 1..N | List of PLMN/AccessTechnologies combinations. |
| SecuredPacket | 1 | A secured packet containing one or more APDUs commands dedicated to Remote File Management. |

\* \* \* Next Change \* \* \* \*

##### 6.1.6.2.y Type: SteeringInfo

Table 6.1.6.2.y-1: Definition of type SteeringInfo

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| plmnId | PlmnId | C | 0..1 | Contains a preferred PLMN identity.  (NOTE) |
| snpnId | PlmnIdNid | C | 0..1 | Contains a preferred SNPN identity.  (NOTE) |
| gin | PlmnIdNid | C | 0..1 | Contains a preferred Group ID for Network Selection.  (NOTE) |
| accessTechList | array(AccessTech) | O | 1..N | This IE is only applicable when plmnId is present, and it shall be absent when snpnId or gin are present.  It contains the preferred access technologies for such PLMN, as listed in clause 6.2.6.3.3 of 3GPP TS 29.509 [xx]. If absent it means that all access technologies are equivalently preferred in such PLMN. |
| NOTE: Exactly one of plmnId, snpnId or gin shall be present. | | | | |

\* \* \* Next Change \* \* \* \*

## 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 |
| x | eNPN | If this feature is supported, the query parameter "plmn-id" (see Table 6.1.3.2.3.1-1) is recognized by the SOR-AF as a PLMN-ID or an SNPN-ID, and the steeringContainer attribute (see clause 6.1.6.2.2) returned by the SOR-AF may include SOR information for SNPNs.  If this feature is not supported, such query parameter is recognized by the SOR-AF as a PLMN-ID, and the steeringContainer attribute contains only SOR information for PLMNs. |

\* \* \* Next Change \* \* \* \*

## A.2 Nsoraf\_SOR API

*(... text not shown for clarity ...)*

/{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 or SNPN ID

required: true

content:

application/json:

schema:

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

- name: access-type

in: query

description: Access type used by the UE

content:

application/json:

schema:

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

*(... text not shown for clarity ...)*

schemas:

#

# COMPLEX DATA TYPES

#

SorInformation:

description: Represents the SoR information to be conveyed to a UE.

type: object

required:

- sorAckIndication

- sorSendingTime

properties:

supportedFeatures:

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

steeringContainer:

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

sorAckIndication:

type: boolean

sorCmci:

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

storeSorCmciInMe:

type: boolean

sorSendingTime:

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

SorAckInfo:

description: >

Represents an indication to the SOR-AF on the reception status of the

acknowledgment of successful reception of SoR Information by a UE.

type: object

required:

- sorAckStatus

- sorSendingTime

properties:

sorAckStatus:

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

sorSendingTime:

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

meSupportOfSorCmci:

type: boolean

SteeringContainer:

description: It consists of either a list (array) of SteeringInfo objects or a Secured Packet

oneOf:

- type: array

items:

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

minItems: 1

- $ref: '#/components/schemas/SecuredPacket'

SteeringInfo:

description: >

Contains either a PLMN-ID, an SNPN-ID or a GIN and, for the case of PLMNs, zero or more

preferred access technologies for accessing such PLMN

type: object

oneOf:

- required: [ plmnId ]

- required: [ snpnId ]

- required: [ gin ]

properties:

plmnId:

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

snpnId:

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

gin:

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

accessTechList:

type: array

items:

$ref: 'TS29509\_Nausf\_SoRProtection.yaml#/components/schemas/AccessTech'

minItems: 1

#

# ENUMS

#

SorAckStatus:

description: >

Represents the reception status of the acknowledgment of successful reception

of SoR Information by a UE.

anyOf:

- type: string

enum:

- ACK\_SUCCESSFUL

- ACK\_NOT\_RECEIVED

- ACK\_NOT\_SUCCESSFUL

- type: string

\* \* \* End of Changes \* \* \* \*