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TECHNICAL SPECIFICATION

**5G;  
5G System;  
Network Slice Selection Services;  
Stage 3  
(3GPP TS 29.531 version 19.6.0 Release 19)**

Sample Document



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**Keywords**

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# Contents

Intellectual Property Rights .....	2
Legal Notice .....	2
Modal verbs terminology.....	2
Foreword.....	6
1 Scope .....	8
2 References .....	8
3 Definitions and abbreviations.....	9
3.1 Definitions .....	9
3.2 Abbreviations .....	9
4 Overview .....	9
4.1 Introduction .....	9
5 Services offered by the NSSF .....	10
5.1 Introduction .....	10
5.2 Nnssf_NSSelection Service.....	10
5.2.1 Service Description.....	10
5.2.2 Service Operations .....	11
5.2.2.1 Introduction.....	11
5.2.2.2 GET.....	11
5.2.2.2.1 General .....	11
5.2.2.2.2 Get service operation of Nnssf_NSSelection service .....	12
5.2.2.2.3 Get service operation of Nnssf_NSSelection service during the PDU session establishment.....	13
5.2.2.2.4 Get service operation of Nnssf_NSSelection service during UE configuration update procedure.....	14
5.2.2.2.5 Get service operation of Nnssf_NSSelection service during the PDN Connection Establishment .....	16
5.2.2.2.6 Get service operation of Nnssf_NSSelection service to retrieve the network slice information .....	16
5.3 Nnssf_NSSAIAvailability Service .....	17
5.3.1 Service Description.....	17
5.3.2 Service Operations .....	18
5.3.2.1 Introduction.....	18
5.3.2.2 Update Service Operation .....	18
5.3.2.2.1 General .....	18
5.3.2.3 Subscribe Service Operation .....	19
5.3.2.3.1 Creation of a subscription.....	19
5.3.2.3.2 Modification of a subscription.....	20
5.3.2.4 Unsubscribe Service Operation.....	21
5.3.2.4.1 General .....	21
5.3.2.5 Notify Service Operation .....	21
5.3.2.5.1 General .....	21
5.3.2.6 Delete Service Operation .....	23
5.3.2.6.1 General .....	23
5.3.2.7 Options Service Operation .....	23
5.3.2.7.1 General .....	23
6 API Definitions .....	24
6.1 Nnssf_NSSelection Service API .....	24
6.1.1 API URI.....	24
6.1.2 Usage of HTTP.....	24
6.1.2.1 General .....	24
6.1.2.2 HTTP standard headers .....	25
6.1.2.2.1 General .....	25
6.1.2.2.2 Content type .....	25
6.1.2.3 HTTP custom headers .....	25

6.1.2.3.1	General .....	25
6.1.3	Resources .....	25
6.1.3.1	Overview .....	25
6.1.3.2	Resource: Network Slice Information .....	26
6.1.3.2.1	Description .....	26
6.1.3.2.2	Resource Definition .....	26
6.1.3.2.3	Resource Standard Methods .....	26
6.1.3.2.4	Resource Custom Operations .....	28
6.1.4	Custom Operations without associated resources .....	29
6.1.5	Notifications .....	29
6.1.6	Data Model .....	29
6.1.6.1	General .....	29
6.1.6.2	Structured data types .....	30
6.1.6.2.1	Introduction .....	30
6.1.6.2.2	Type: AuthorizedNetworkSliceInfo .....	31
6.1.6.2.3	Type: SubscribedSnsai .....	35
6.1.6.2.4	Void .....	36
6.1.6.2.5	Type: AllowedSnsai .....	36
6.1.6.2.6	Type: AllowedNssai .....	36
6.1.6.2.7	Type: NsiInformation .....	37
6.1.6.2.8	Type: MappingOfSnsai .....	37
6.1.6.2.9	Void .....	38
6.1.6.2.10	Type: SliceInfoForRegistration .....	38
6.1.6.2.11	Type: SliceInfoForPDUSession .....	41
6.1.6.2.12	Type: ConfiguredSnsai .....	41
6.1.6.2.13	Type: SliceInfoForUEConfigurationUpdate .....	42
6.1.6.2.14	Type: NsagInfo .....	44
6.1.6.2.15	Type: SnsaiInfo .....	44
6.1.6.3	Simple data types and enumerations .....	44
6.1.6.3.1	Introduction .....	44
6.1.6.3.2	Simple data types .....	44
6.1.6.3.3	Enumeration: RoamingIndication .....	45
6.1.6.4	Binary data .....	45
6.1.7	Error Handling .....	45
6.1.7.1	General .....	45
6.1.7.2	Protocol Errors .....	45
6.1.7.3	Application Errors .....	45
6.1.8	Feature negotiation .....	45
6.1.9	Security .....	46
6.1.10	HTTP redirection .....	46
6.2	Nssf_NSSAIAvailability Service API .....	47
6.2.1	API URI .....	47
6.2.2	Usage of HTTP .....	47
6.2.2.1	General .....	47
6.2.2.2	HTTP standard headers .....	47
6.2.2.2.1	General .....	47
6.2.2.2.2	Content type .....	47
6.2.2.2.3	Accept-Encoding .....	47
6.2.2.3	HTTP custom headers .....	48
6.2.2.3.1	General .....	48
6.2.3	Resources .....	48
6.2.3.1	Overview .....	48
6.2.3.2	Resource: NSSAI Availability Document .....	49
6.2.3.2.1	Description .....	49
6.2.3.2.2	Resource Definition .....	49
6.2.3.2.3	Resource Standard Methods .....	49
6.2.3.3	Resource: NSSAI Availability Notification Subscriptions Collection .....	53
6.2.3.3.1	Description .....	53
6.2.3.3.2	Resource Definition .....	53
6.2.3.3.3	Resource Standard Methods .....	53
6.2.3.4	Resource: Individual NSSAI Availability Notification Subscriptions .....	55
6.2.3.4.1	Description .....	55

6.2.3.4.2	Resource Definition .....	55
6.2.3.4.3	Resource Standard Methods .....	55
6.2.3.5	Resource: NSSAI Availability Store .....	57
6.2.3.5.1	Description .....	57
6.2.3.5.2	Resource Definition .....	57
6.2.3.5.3	Resource Standard Methods .....	57
6.2.4	Custom Operations without associated resources .....	58
6.2.5	Notifications .....	59
6.2.5.1	General .....	59
6.2.5.2	NSSAI Availability Notification .....	59
6.2.5.2.1	Description .....	59
6.2.5.2.2	Notification Definition .....	59
6.2.5.2.3	Notification Standard Methods .....	59
6.2.6	Data Model .....	60
6.2.6.1	General .....	60
6.2.6.2	Structured data types .....	61
6.2.6.2.1	Introduction .....	61
6.2.6.2.2	Type: NssaiAvailabilityInfo .....	62
6.2.6.2.3	Type: SupportedNssaiAvailabilityData .....	62
6.2.6.2.4	Type: AuthorizedNssaiAvailabilityData .....	63
6.2.6.2.5	Type: RestrictedNssai .....	64
6.2.6.2.6	Type: AuthorizedNssaiAvailabilityInfo .....	64
6.2.6.2.7	Type: PatchDocument .....	64
6.2.6.2.8	Type: NssfEventSubscriptionCreateData .....	65
6.2.6.2.9	Type: NssfEventSubscriptionCreatedData .....	67
6.2.6.2.10	Type: NssfEventNotification .....	68
6.2.6.2.11	Type: SnsaiReplacementSubscribeInfo .....	70
6.2.6.2.12	Type: NsiUnavailabilitySubscribeInfo .....	70
6.2.6.3	Simple data types and enumerations .....	70
6.2.6.3.1	Introduction .....	70
6.2.6.3.2	Simple data types .....	71
6.2.6.3.3	Enumeration: NssfEventType .....	71
6.2.6.4	Binary data .....	71
6.2.7	Error Handling .....	71
6.2.7.1	General .....	71
6.2.7.2	Protocol Errors .....	71
6.2.7.3	Application Errors .....	71
6.2.8	Feature negotiation .....	72
6.2.9	Security .....	73
6.2.10	HTTP redirection .....	74
<b>Annex A (normative): OpenAPI specification .....</b>		<b>75</b>
A.1	General .....	75
A.2	Nssf_NSSelection API .....	75
A.3	Nssf_NSSAIAvailability API .....	81
<b>Annex B (informative): Change history .....</b>		<b>93</b>
History .....		97

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

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

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**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.

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# 1 Scope

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

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.
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- [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 TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".
- [8] IETF RFC 6902: "JavaScript Object Notation (JSON) Patch".
- [9] 3GPP TS 23.003: "Numbering, addressing and identification".
- [10] IETF RFC 9113: "HTTP/2".
- [11] 3GPP TS 33.501: "Security architecture and procedures for 5G system".
- [12] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".
- [13] 3GPP TS 29.510: "Network Function Repository Services; Stage 3".
- [14] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".
- [15] IETF RFC 9457: "Problem Details for HTTP APIs".
- [16] IETF RFC 1952: "GZIP file format specification version 4.3".
- [17] 3GPP TR 21.900: "Technical Specification Group working methods".
- [18] IETF RFC 9110: "HTTP Semantics".
- [19] Void
- [20] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".
- [21] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP); Stage 3".

- [22] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".
- [23] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

## 3 Definitions and abbreviations

### 3.1 Definitions

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

### 3.2 Abbreviations

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

NSAG            Network Slice AS Group

## 4 Overview

### 4.1 Introduction

Within the 5GC, the NSSF offers services to the AMF, SMF, NWDAF and NSSF in a different PLMN via the Nnssf service based interface (see 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3]).

Figure 4.1-1 provides the reference model (in service based interface representation and in reference point representation), with focus on the NSSF and the scope of the present specification.

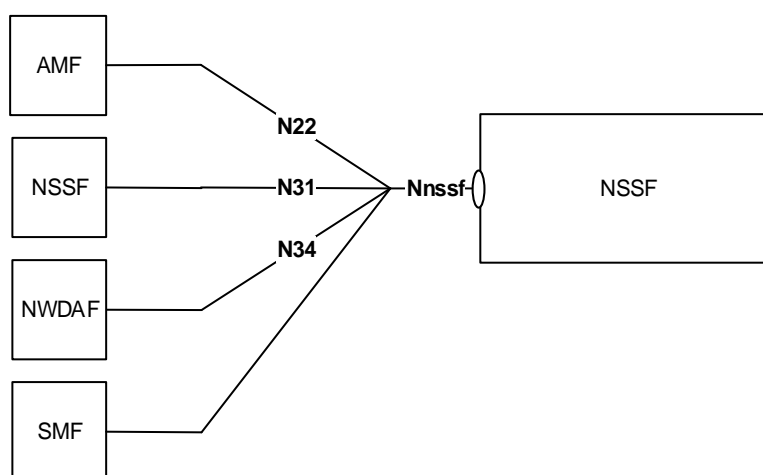


Figure 4.1-1: NSSF in 5G System architecture

The functionalities supported by the NSSF are listed in clause 6.2.14 of 3GPP TS 23.501 [2].

## 5 Services offered by the NSSF

### 5.1 Introduction

The NSSF supports the following services.

**Table 5.1-1: NF Services provided by NSSF**

Service Name	Description	Example Consumer
Nnssf_NSSelection	This service enables Network Slice selection in both the Serving PLMN and the HPLMN.  This service also enables Network Slice selection in the hosting operator's network for Indirect Network Sharing deployments.	AMF, V-NSSF, SMF, NWDAF
Nnssf_NSSAIAvailability	This service enables to update the S-NSSAI(s) the NF service consumer (e.g AMF) supports on a per TA basis on the NSSF and to subscribe and notify any change in status, on a per TA basis, of the SNSSAIs available per TA (unrestricted) and the restricted S-NSSAI(s) per PLMN in that TA in the serving PLMN of the UE.  This service also enables the notification of the Network Slice Replacement and Network Slice Instance Replacement to the NF Service Consumer. This service also enables to subscribe and unsubscribe to the notification of any changes in the status of the NSSAI validity time information.	AMF, V-NSSF

Table 5.1-2 summarizes the corresponding APIs defined for this specification.

**Table 5.1-2: API Descriptions**

Service Name	Clause	Description	OpenAPI Specification File	apiName	Annex
Nnssf_NSSelection	6.1	NSSF Network Slice Selection Service	TS29531_Nnssf_NSSelection.yaml	nnssf-nssselection	A.2
Nnssf_NSSAIAvailability	6.2	NSSF NSSAI Availability Service	TS29531_Nnssf_NSSAIAvailability.yaml	nnssf-nssaiavailability	A.3

## 5.2 Nnssf\_NSSelection Service

### 5.2.1 Service Description

The Nnssf\_NSSelection service is used by an NF Service Consumer (e.g. AMF, SMF, NWDAF or NSSF in a different PLMN) to retrieve the information related to network slice in the non-roaming and roaming case.

It also enables the NSSF to provide to the AMF the Allowed NSSAI and the Configured NSSAI for the Serving PLMN.

It also enables the NSSF to provide to the AMF the NSAG information associated with the Configured NSSAI for the Serving PLMN.

It also enables the NSSF to provide to the SMF+PGW-C the mapping of S-NSSAI(s) of the VPLMN to corresponding HPLMN S-NSSAI(s).

It also enables the NSSF to provide to the NWDAF the NSI ID(s) associated with the requested S-NSSAI.

It also enables the NSSF to provide to the AMF the slice mapping information in the case of Indirect Network Sharing.

The NF service consumer may discover the NSSF in the same PLMN based on the local configuration, or by using the NRF-based discovery procedure as specified in clause 6.3.28 of 3GPP TS 23.501[2]. The addresses of the home NSSF may be either locally configured in the visited NSSF or discovered based on the self-constructed FQDN as specified in 3GPP TS 23.003 [9].

## 5.2.2 Service Operations

### 5.2.2.1 Introduction

For the Nnssf\_NSSelection service the following service operations are defined:

- Get.

### 5.2.2.2 GET

#### 5.2.2.2.1 General

The Get operation shall be invoked by the AMF in the non-roaming or roaming scenario to retrieve:

- The slice selection information including the Allowed NSSAI, Configured NSSAI, target AMF Set or the list of candidate AMF(s), and optionally
  - The Mapping Of Allowed NSSAI;
  - The Mapping Of Configured NSSAI;
  - NSI ID(s) associated with the Network Slice instances of the Allowed NSSAI;
  - NRF(s) to be used to select NFs/services within the selected Network Slice instance(s) and NRF to be used to determine the list of candidate AMF(s) from the AMF Set, during Registration procedure;
  - Information on whether the S-NSSAI(s) not included in the Allowed NSSAI which were part of the Requested NSSAI are rejected in the serving PLMN or in the current TA;
  - The Target NSSAI that includes the S-NSSAI(s) as defined in clause 5.3.4.3.3 of 3GPP TS 23.501 [2], and
  - The NSAG information associated with Configured NSSAI as defined in clause 5.15.14 of 3GPP TS 23.501 [2].
- The NRF to be used to select NFs/services within the selected network slice instance, and optionally the NSI ID associated with the S-NSSAI provided in the input, during the PDU Session Establishment procedure.
- The slice mapping information including the mapping of S-NSSAI(s) of the VPLMN to corresponding HPLMN S-NSSAI(s), which is also applicable to Indirect Network Sharing case.

The Get operation shall also be invoked by the vNSSF in the roaming scenario to retrieve:

- The hNRF to be used to select NFs/services within the selected network slice instance in the HPLMN, and optionally the NSI ID associated with the S-NSSAI provided in the input, during the PDU Session Establishment procedure, which is also applicable to Indirect Network Sharing case.

The Get operation shall also be invoked by the SMF+PGW-C in VPLMN in the roaming scenario to retrieve:

- The slice mapping information including the mapping of S-NSSAI(s) of the VPLMN to corresponding HPLMN S-NSSAI(s), during the PDN Connection Establishment procedure in EPC.

The Get operation shall also be invoked by the NWDAF to retrieve:

- The NSI ID associated with the S-NSSAI provided in the input.

It is used in the following procedures:

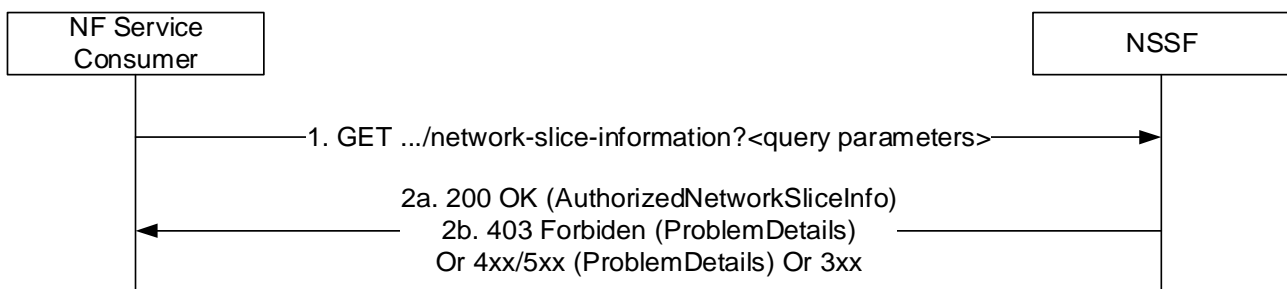
- Registration procedure (see clause 4.2.2.2.2 of 3GPP TS 23.502 [3]);
- Registration with AMF re-allocation (see clause 4.2.2.2.3 of 3GPP TS 23.502 [3]);
- EPS to 5GS handover using N26 interface (see clause 4.11.1.2.2 of 3GPP TS 23.502 [3]);
- EPS to 5GS mobility registration procedure (see clauses 4.11.1.3.3, 4.11.1.3.3A, 4.11.1.3.4 and 4.23.12 of 3GPP TS 23.502 [3]);
- Xn and N2 Handover procedures with PLMN change (see clauses 4.9.1, 4.23.7 and 4.23.11 of 3GPP TS 23.502 [3]);
- UE Configuration Update procedure (see clause 4.2.4.2 of 3GPP TS 23.502 [3]);
- SMF selection for non-roaming and roaming with local breakout (see clause 4.3.2.2.3.2 of 3GPP TS 23.502 [3]) or SMF selection for home-routed roaming scenario (see clause 4.3.2.2.3.3 of 3GPP TS 23.502 [3]);
- PDN Connection Establishment (see clause 4.11.0a.5 of 3GPP TS 23.502 [3]);
- Network Slice load analytics provided by NWDAF (see clause 6.3.4 of 3GPP TS 23.288 [22]).

NOTE: The list of procedures above, which trigger invoking of the Nnssf\_NSSelection\_Get service operation, is not exhaustive.

#### 5.2.2.2.2 Get service operation of Nnssf\_NSSelection service

In this procedure, the NF Service Consumer (e.g. AMF) retrieves the slice selection information including the Allowed NSSAI, Configured NSSAI, target AMF Set or the list of candidate AMF(s) and other optional information.

This service operation shall also be used to retrieve the slice mapping information including the mapping of S-NSSAI(s) of the VPLMN to corresponding HPLMN S-NSSAI(s) e.g. during registration procedure of Indirect Network Sharing, inter-PLMN mobility procedure and/or mobility procedure within VPLMN from EPS to 5GS.



**Figure 5.2.2.2-1: Retrieve the network slice information during the mobility procedure**

- 1 The AMF shall send a GET request to the NSSF.

If the AMF wants to retrieve the slice selection information, one or more of the following parameters shall be included in the slice-info-request-for-registration query parameter:

- Requested NSSAI and Subscribed S-NSSAI(s) with the indication if marked as default S-NSSAI and the associated subscribed NSSRG information;
- optionally UE support of subscription-based restrictions to simultaneous registration of network slice feature Indication;
- UDM indication to provide all subscribed S-NSSAIs for UEs not indicating support of subscription-based restrictions to simultaneous registration of network slices feature;
- Indication of the support of NSAG by the UE.

If the AMF wants to retrieve the slice mapping information, the following parameters shall be included in the slice-info-request-for-registration query parameter:

- sNssaiForMapping IE and;
- requestMapping IE.

In both scenarios, the AMF shall also include the following parameters in the message:

- PLMN ID of the SUPI in roaming scenarios or in the Indirect Network Sharing case;
- TAI;
- NF type of the NF service consumer and;
- Requester ID.

2a On success, "200 OK" shall be returned when the NSSF is able to find authorized network slice information for the requested network slice selection information, the response body shall include a content containing at least the following parameters:

- Allowed NSSAI and;
- target AMF Set or the list of candidate AMF(s).

The content may additionally contain the following parameters:

- a target AMF Service Set;
- Target NSSAI.

"200 OK" shall also be returned when the NSSF is able to find the requested slicing mapping information, the response body shall include a content containing the mapping of S-NSSAI(s) of the VPLMN to corresponding HPLMN S-NSSAI(s) included in the allowedNssaiList IE.

NSSFs of a PLMN that implement AMF reallocation via RAN by supporting the NGAP REROUTE NAS REQUEST procedure (see clause 8.6.5 of 3GPP TS 38.413 [21]) should return the target AMF set ID in its response. The NSSF may query the NRF to discover target AMF Set if this information is not known by other means (e.g. if not provided by AMF during Nnssf\_NSSAIAvailability\_Update service operation).

If subscribed NSSRG list is provided, the NSSF shall provide the compatible S-NSSAIs in the Allowed NSSAI as defined in clause 5.15.12 of 3GPP TS 23.501 [2] and compatible S-NSSAIs in the Target NSSAI (if provided).

If the request indicated that UE does not support subscription-based restrictions to simultaneous registration of network slice feature, and UDM has requested to provide all subscribed S-NSSAIs for such UEs, Configured NSSAI, if included, shall be provided ignoring the NSSRG restrictions.

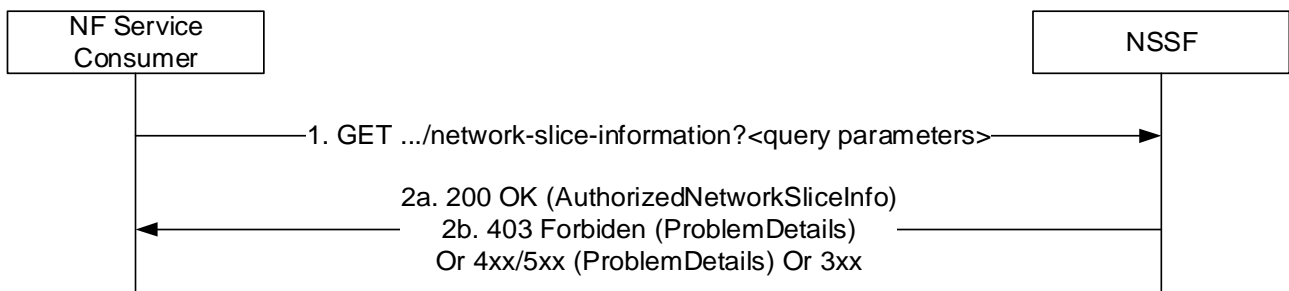
If the AMF has indicated the support of NSAG by the UE, the NSSF shall include the "nsagInfos" attribute with NSAG information if available.

2b If no slice instances can be found for the requested slice selection information or the requested slice mapping information, then the NSSF shall return a 403 Forbidden response with the "ProblemDetails" IE containing the Application Error "SNSSAI\_NOT\_SUPPORTED" (cf. Table 6.1.7.3-1).

On failure or redirection, the NSSF shall return one of the HTTP status codes together with the response body listed in Table 6.1.3.2.3.1-3.

#### 5.2.2.2.3 Get service operation of Nnssf\_NSSelection service during the PDU session establishment

In this procedure, the NF Service Consumer (e.g. AMF) retrieves the NRF and the optionally the NSI ID of the network slice instance:



**Figure 5.2.2.3-1: Retrieve the network slice information during the PDU session establishment procedure**

1 The NF Service consumer (e.g. AMF or NSSF in the different PLMN) shall send a GET request to the NSSF.

The request shall include query parameters, contain at least the following parameters:

- S-NSSAI;
- S-NSSAI from the HPLMN that maps to the S-NSSAI from the Allowed NSSAI of the Serving PLMN;
- the NF type of the NF service consumer;
- Requester ID and;
- non-roaming/LBO roaming/HR roaming indication.

For the request towards an NSSF in the Serving PLMN, the query parameters shall also contain the PLMN ID of the SUPI and TAI.

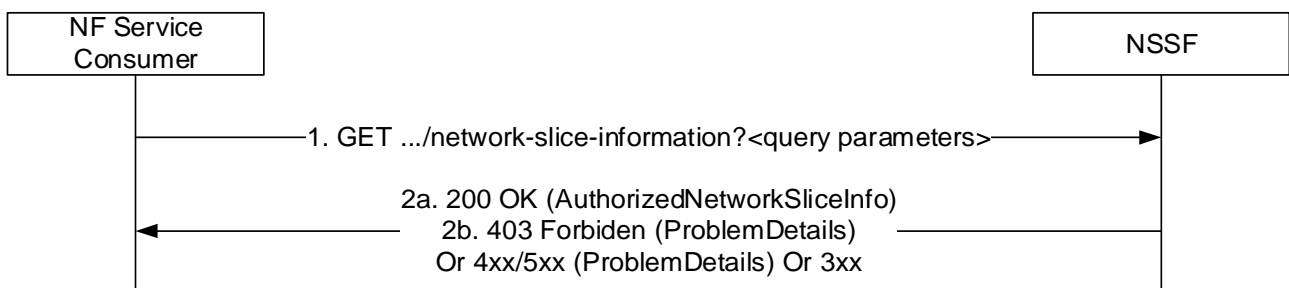
2a On success, "200 OK" shall be returned when the NSSF is able to find network slice instance information for the requested network slice selection information, the response body shall include a content containing at least the NRF to be used to select NFs/services within the selected Network Slice instance;

2b If no slice instances can be found for the requested slice selection information, then the NSSF shall return a 403 Forbidden response with the "ProblemDetails" IE containing the Application Error "SNSSAI\_NOT\_SUPPORTED" (cf. Table 6.1.7.3-1).

On failure or redirection, the NSSF shall return one of the HTTP status codes together with the response body listed in Table 6.1.3.2.3.1-3.

**5.2.2.2.4 Get service operation of Nnssf\_NSSelection service during UE configuration update procedure**

In this procedure, the NF Service Consumer (e.g. AMF) retrieves network slice configuration information (e.g. the Allowed NSSAI and the Configured NSSAI) during the UE configuration update procedure.



**Figure 5.2.2.4-1: Retrieve the network slice information during UE configuration update procedure**