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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

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# Contents

# Foreword

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

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# 1 Scope

The present specification provides the stage 3 definition of the Binding Support Management Service of the 5G System.

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The stage 2 definition and related procedures for Binding Support Management Service is specified in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [4].

The 5G System stage 3 call flows are provided in 3GPP TS 29.513 [5].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [6] and 3GPP TS 29.501 [7].

The Binding Support Management Service is provided by the Binding Support Function (BSF).

# 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 23.503: "Policy and Charging Control Framework for the 5G System; Stage 2".

[5]        3GPP TS 29.513: "5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".

[6]        3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[7]        3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

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

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

[10]       3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces Stage 3".

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

[12]       3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

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

[14]       3GPP TS 29.213: " Policy and Charging Control signalling flows and Quality of Service (QoS) parameter mapping".

[15]       3GPP TS 33.501: "Security architecture and procedures for 5G system".

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

[17]       3GPP TS 23.527: "5G System; Restoration Procedures".

[18]        3GPP TR 21.900: "Technical Specification Group working methods".

[19]        3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G System (5GS)".

[20]        IETF RFC 7396: "JSON Merge Patch".

[21]        3GPP TS 29.512: "5G System; Session Management Policy Control Service; 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].

| | |
|---|---|
| 5G-RG | 5G Residential Gateway |
| AF | Application Function |
| BSF | Binding Support Function |
| DNN | Data Network Name |
| DRA | Diameter Routing Agent |
| HTTP | Hypertext Transfer Protocol |
| FN-RG | Fixed Network Residential Gateway |
| FQDN | Fully Qualified Domain Name |
| GPSI | Generic Public Subscription Identifier |
| JSON | JavaScript Object Notation HTTP   Hypertext Transfer Protocol |
| MAC | Media Access Control |
| NEF | Network Exposure Function |
| NRF | Network Repository Function |
| NWDAF | Network Data Analytics Function |
| PCF | Policy Control Function |
| SMF | Session Management Function |
| S-NSSAI | Single Network Slice Selection Assistance Information |
| SUPI | Subscription Permanent Identifier |
| UDR | Unified Data Repository |

# 4        Binding Support Management Service

## 4.1        Service Description

### 4.1.1        Overview

The Binding Support Management Service as defined in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [4], is provided by the Binding Support Function (BSF).

The Nbsf_Management service is used for the BSF to provide a PDU session binding functionality, which ensures that an AF request for a certain PDU Session reaches the relevant PCF holding the PDU Session information.

This service:

- allows NF service consumers to register, update and remove the binding information; and

- allows NF service consumers to retrieve the binding information.

## 4.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Policy and Charging related 5G architecture is also described in 3GPP TS 23.503 [4] and 3GPP TS 29.513 [5].

The Binding Support Management Service (Nbsf_Management) is exhibited by the Binding Support Function (BSF).

Known consumers of the Nbsf_Management service are:

- Policy Control Function (PCF)

- Network Exposure Function (NEF)

- Application Function (AF); and

- Network Data Analytics Function (NWDAF)

As described in 3GPP TS 23.503 [4], the BSF is a function that can be deployed standalone or can be the functionality provided by other network functions, such as PCF, UDR, NRF, SMF.

NOTE 1: The PCF accesses the Nbsf_Management service at the BSF via an internal interface when it is collocated with BSF.

NOTE 2: The DRA decides to select a BSF based on user IP address range when the DRA has no binding information for the subscriber to get the relevant PCF address. DRA and BSF coexistence is described in 3GPP TS 29.513 [5], Annex A.
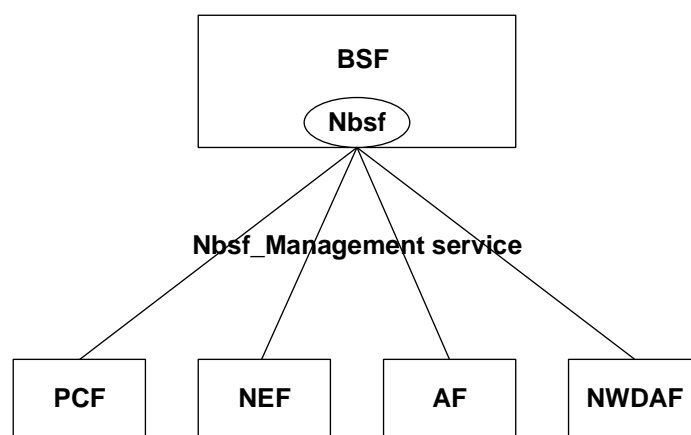


**Figure 4.1.2-1: Reference Architecture for the Nbsf_Management service; SBI representation**

## 4.1.3 Network Functions

### 4.1.3.1 Binding Support Function (BSF)

The BSF:

- stores the binding information for a certain PDU Session; and

- discovers the binding information (e.g. the address information of the selected PCF).

The BSF allows NF service consumers (e.g. PCF) to register, update and remove the binding information, and allows NF service consumers (e.g. AF, NEF, NWDAF) to discover the binding information (e.g. the address information of the selected PCF).

The BSF can be deployed standalone or can be collocated with other network functions, such as PCF, UDR, NRF and SMF.

### 4.1.3.2 NF Service Consumers

The Policy Control Function (PCF):

- registers the binding information in the BSF for a UE when an IPv4 address and/or IPv6 prefix is allocated, or a MAC address is used for the PDU session;

- updates the binding information in the BSF when a UE address information is changed for the PDU Session; and

- removes the binding information in the BSF when an IPv4 address and/or IPv6 prefix is released, or a MAC address is not used for the PDU Session.

The Network Exposure Function (NEF):

- provides a means for the Application Functions to securely interact with the Policy framework for policy control to 3GPP network. During the procedure, it needs to discover the selected PCF by using the Nbsf_Management_Discovery service operation.

The Application Function (AF):

- discover the selected PCF by using the Nbsf_Management_Discovery service operation when it is allowed to interact directly with the policy framework for policy control.

The Network Data Analytics Function (NWDAF):

- discover the selected PCF by using the Nbsf_Management_Discovery service operation.

## 4.2 Service Operations

### 4.2.1 Introduction

**Table 4.2.1-1: Operations of the Nbsf_Management Service**

| Service operation name | Description | Initiated by |
|---|---|---|
| Nbsf_Management_Register | This service operation is used to register the binding information for a UE when an IPv4 address and/or an IPv6 prefix is allocated for an IP PDU Session or a MAC address is used for an Ethernet PDU session. | NF service consumer (PCF) |
| Nbsf_Management_Deregister | This service operation is used to deregister the binding information for a UE. | NF service consumer (PCF) |
| Nbsf_Management_Discovery | This service operation is used by an NEF or AF or NWDAF to discover a selected PCF. | NF service consumer (NEF, AF, NWDAF) |
| Nbsf_Management_Update | This service operation is used to update an existing session binding information for a UE (i.e. UE address(es) for a PDU Session). | NF service consumer (PCF) |

### 4.2.2 Nbsf_Management_Register Service Operation

#### 4.2.2.1 General

This service operation allows the NF service consumer (e.g. PCF) to register the session binding information for a UE in the BSF by providing the user identity, the DNN, the UE address(es) and the selected PCF address for a certain PDU Session to the BSF, and BSF stores the information.

If the BindingUpdate feature is not supported and if the NF service consumer (e.g. PCF) receives a new UE address (e.g. IPv6 prefix) and already registered session binding information for this PDU session, the NF service consumer (e.g. PCF) shall register a new session binding information in the BSF.

### 4.2.2.2 Register a new PCF Session binding information
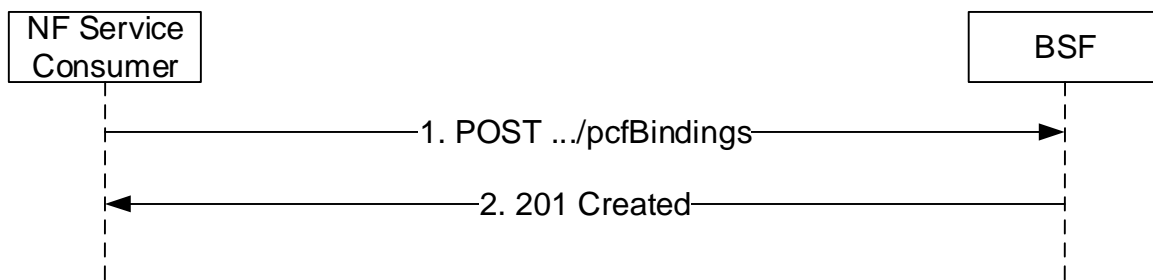


**Figure 4.2.2.2-1: NF service consumer register a new PCF Session binding information**

The NF service consumer shall invoke the Nbsf_Management_Register service operation to register the session binding information for a UE in the BSF. The NF service consumer shall send an HTTP POST request with "{apiRoot}/nbsf-management/v1/pcfBindings" as Resource URI representing the "PCF Session Bindings", as shown in figure 4.2.2.2-1, step 1, to create a binding information for an "Individual PCF Session Binding" according to the information (e.g. UE address(es), SUPI, GPSI, DNN, S-NSSAI) in message body. The "PcfBinding" data structure provided in the request body shall include:

- if the "MultiUeAddr" feature is not supported or if the feature not yet known, address information of the served UE consisting of:

    (i) either IP address information consisting of:

        + the IPv4 address encoded as "ipv4Addr" attribute; and/or

        + the /128 IPv6 address, the IPv6 address prefix or an IPv6 prefix shorter than/64 encoded as "ipv6Prefix" attribute; or

    (ii) the MAC address encoded as "macAddr48" attribute;

    Otherwise, address information of the served UE consisting of:

    (i) any IP address information consisting of:

        + the IPv4 address encoded as "ipv4Addr" attribute;

        + the /128 IPv6 address, the IPv6 address prefix or an IPv6 prefix shorter than /64encoded as "ipv6Prefix" attribute; and/or

        + the additional /128 IPv6 addresses, the IPv6 address prefixes or IPv6 prefixes shorter than /64 encoded as "addIpv6Prefixes" attribute; or

    (ii) the MAC address encoded as "macAddr48" attribute and/or the additional MAC addresses encoded as "addMacAddrs" attribute;

When the "TimeSensitiveNetworking" feature is supported by the PCF as defined in subclause 5.8 of 3GPP TS 29.512 [21], the address information of the served UE contains the MAC address of the DS-TT encoded in "macAddr48" attribute as received by the PCF when reporting the bridge information attribute

- PCF address information consisting of:

    (i) if the PCF supports the Npcf_PolicyAuthorization service:

        + the FQDN of the PCF encoded as "pcfFqdn" attribute; and/or

        + a description of IP endpoints at the PCF hosting the Npcf_PolicyAuthorization service encoded as "pcfIpEndPoints" attribute; and

    (ii) if the PCF supports the Rx interface:

        + the Diameter host id of the PCF encoded as "pcfDiamHost"; and

+ the Diameter realm of the PCF encoded as "pcfDiamRealm" attributes;

- DNN encoded as "dnn" attribute; and

- S-NSSAI encoded as "snssai" attribute;

- If the "SamePcf" feature defined in subclause 5.8 is supported and the PCF determines based on operator policies that the same PCF shall be selected for the SM Policy associations:

    (i)  PCF address information for Npcf_SMPolicyControl service consisting of:

        + the FQDN of the PCF encoded as "pcfSmFqdn" attribute; or

        + a description of IP endpoints at the PCF hosting the Npcf_SMPolicyControl service encoded as "pcfSmIpEndPoints" attribute; and

    (ii) the parameters combination for selecting the same PCF encoded within the "paraCom" attribute;

- Framed routes consisting of:

    (i)  one or more framed routes within the "ipv4FrameRouteList" attribute for IPv4; and/or

    (ii) one or more framed routes within the "ipv6FrameRouteList" attribute fro IPv6;

and may include:

- SUPI encoded as "supi" attribute;

- GPSI encoded as "gpsi" attribute; and

- IPv4 address domain encoded as "ipDomain" attribute.

Upon the reception of an HTTP POST request with: "{apiRoot}/nbsf-management/v1/pcfBindings" as Resource URI and "PcfBinding" data structure as request body, the BSF shall:

- create new binding information;

- assign a bindingId; and

- store the binding information.

The PCF as NF service consumer may provide PCF Id in "pcfId" attribute and recovery timestamp in "recoveryTime" attribute. The BSF may use the "pcfId" attribute to supervise the status of the PCF as described in subclause 5.2 of 3GPP TS 29.510 [12] and perform necessary clean up upon status change of the PCF later, and/or both the "pcfId" attribute and the "recoveryTime" attribute in clean up procedure as described in subclause 6.4 of 3GPP TS 23.527 [17].

The PCF as NF service consumer may provide PCF Set Id within the "pcfSetId" attribute and "bindLevel" attribute set to NF_SET or provide PCF Set Id within the "pcfSetId" attribute, PCF instance Id within the "pcfId" attribute and "bindLevel" attribute set to NF_INSTANCE.

If the BSF created an "Individual PCF Session Binding" resource, the BSF shall respond with "201 Created" status code with the message body containing a representation of the created binding information, as shown in figure 4.2.2.2-1, step 2. The BSF shall include a Location HTTP header field. The Location header field shall contain the URI of the created binding information i.e. "{apiRoot}/nbsf-management/v1/pcfBindings/{bindingId}".

If errors occur when processing the HTTP POST request, the PCF shall apply error handling procedures as specified in subclause 5.7.

If the "SamePcf" feature defined in subclause 5.8 is supported, and if the "paraCom" attribute is included in the HTTP POST message and the BSF detects that there is an existing PCF binding information for the indicated combination within the "paraCom" attribute, the BSF shall reject the request with an HTTP "403 Forbidden" status code and shall include the "ExtProblemDetails" data structure within the response. Within the ExtProblemDetails data structure, the BSF shall include FQDN of the existing PCF hosting the Npcf_SMPolicyControl service within the "pcfSmFqdn" attribute or the description of IP endpoints at the existing PCF hosting the Npcf_SMPolicyControl service within the "pcfSmIpEndPoints" attribute of "BindingResp" data structure and the "cause" attribute of the "ProblemDetails" data structure set to "EXISTING_BINDING_INFO_FOUND".

## 4.2.3 Nbsf_Management_Deregister Service Operation

### 4.2.3.1 General

This service operation allows the service consumer to remove the session binding information for a UE in the BSF. It is executed by deleting a given resource identified by an "Individual PCF Session Binding" resource identifier. The operation is invoked by issuing an HTTP DELETE request on the URI representing the specific session binding information.

### 4.2.3.2 Deregister an individual PCF Session binding information
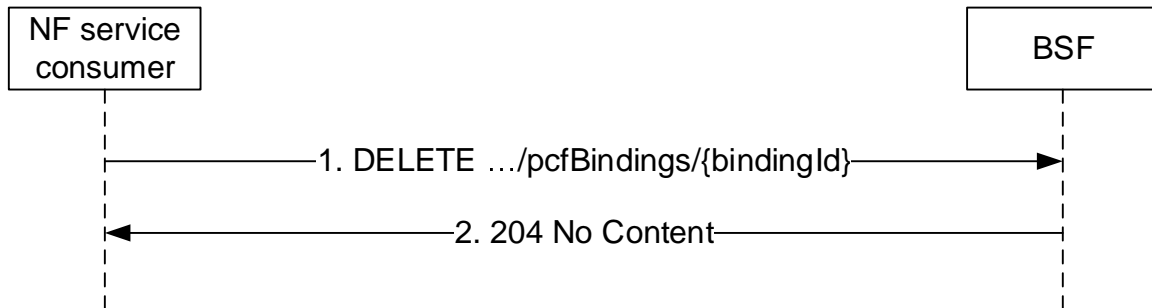


**Figure 4.2.3.2-1: Session Binding Information Deregistration**

The NF service consumer shall invoke the Nbsf_Management_Deregister service operation to deregister the session binding information for a UE in the BSF. The NF service consumer shall send an HTTP DELETE request with "{apiRoot}/nbsf-management/v1/pcfBindings/{bindingId}" as Resource URI, where "{bindingId}" is the "Individual PCF Session Binding" resource identifier that is to be deleted, as shown in figure 4.2.3.2-1, step 1.

Upon the reception of an HTTP DELETE request with: "{apiRoot}/nbsf-management/v1/pcfBindings/{bindingId}" as Resource URI, the BSF shall:

-    remove the corresponding binding information.

If the HTTP DELETE request message from the NF service consumer is accepted, the BSF shall respond with "204 No Content" status code, as shown in figure 4.2.3.2-1, step 2.

If the Individual PCF Session Binding resource does not exist, the BSF shall respond with "404 Not Found" error code.

## 4.2.4 Nbsf_Management_Discovery Service Operation

### 4.2.4.1 General

This service operation allows the service consumer to use the HTTP GET method to obtain the address information of the selected PCF.

### 4.2.4.2 Retrieve the PCF Session binding information for a given tuple
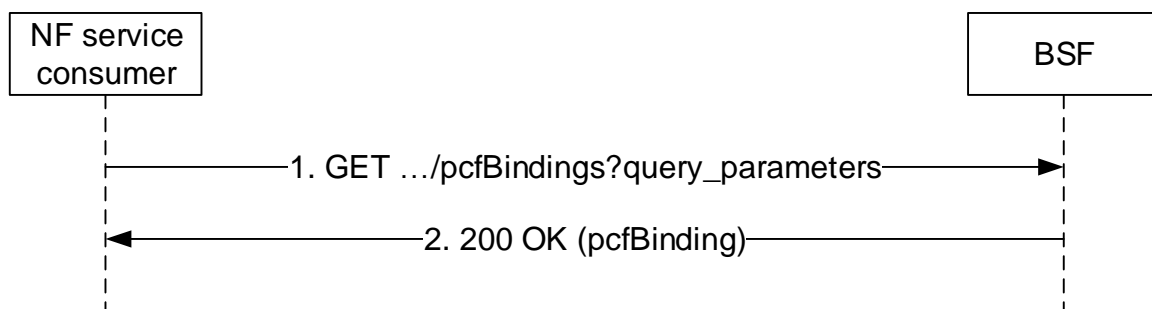


**Figure 4.2.4.2-1: NF service consumer retrieve the PCF Session binding information for a given tuple**

The NF service consumer shall invoke the Nbsf_Management_Discovery service operation to obtain address information of the selected PCF for a PDU session in the BSF. The NF service consumer shall send an HTTP GET request with "{apiRoot}/nbsf-management/v1/pcfBindings" as Resource URI, where "query parameters" shall include:

- UE address;

and may include:

- SUPI or GPSI;

- DNN and optionally S-NSSAI; and

- IPv4 address domain.

NOTE: The query parameters S-NSSAI and/or IPv4 address domain is helpful in the scenario of IPv4 address overlapping where the same IPv4 address may be allocated to UE PDU sessions.

Upon the reception of an HTTP GET request with: "{apiRoot}/nbsf-management/v1/pcfBindings" as Resource URI, the BSF shall search the corresponding binding information. If "ipv6Prefix" is used as an UE IPv6 address in the query parameter, the BSF shall use the longest prefix match to find a matching IPv6 prefix so that the IPv6 address in the query parameter is within the address range covered by that matching IPv6 prefix. The IPv6 address in the query parameter shall be formatted as an IPv6 prefix value including the trailing prefix length "/128". If the framed routes exists in the binding information, the BSF shall use framed routes to match the UE address in the query parameter.

If the HTTP request message from the NF service consumer is accepted and a session binding resource matching the query parameters exists, the BSF shall reply with a "200 OK" HTTP response, as shown in figure 4.2.4.2-1, step 2, containing the corresponding "PcfBinding" data structure, as provided by the PCF during the Nbsf_Management_Register Service Operation in the response body containing PCF addressing information, and if available, the related PCF Set Id and PCF instance Id. If there is no PCF session binding information matching the query parameters, the BSF shall respond with "204 No Content".

NOTE 2: If the NF service consumer (such as the AF or NEF) is not able to reach the received PCF address(es) the NF service consumer can use the PCF Set Id and the PCF instance Id as specified in 3GPP TS 29.513 [5] subclause 6.2.

If the "PCF Session Bindings" resource does not exist, the BSF shall respond with "404 Not Found" HTTP error code. If an invalid combination of query parameters (i.e. a combination without UE address) is contained in the request URI, the BSF shall respond with an "400 Bad Request" HTTP error code containing "MANDATORY_QUERY_PARAM_MISSING" as application error within the ProblemDetails IE. If more than one PCF Session Binding resources are found, the BSF shall respond with "400 Bad Request" HTTP error code containing "MULTIPLE_BINDING_INFO_FOUND" as application error within the ProblemDetails IE.

## 4.2.5    Nbsf_Management_Update Service Operation

### 4.2.5.1    General

This service operation allows the NF service consumer to update an existing session binding information for a UE in the BSF by providing information to be updated (e.g. the UE address(es)) for a PDU Session, and BSF updates the session binding information.

### 4.2.5.2 Update an existing PCF Session binding information
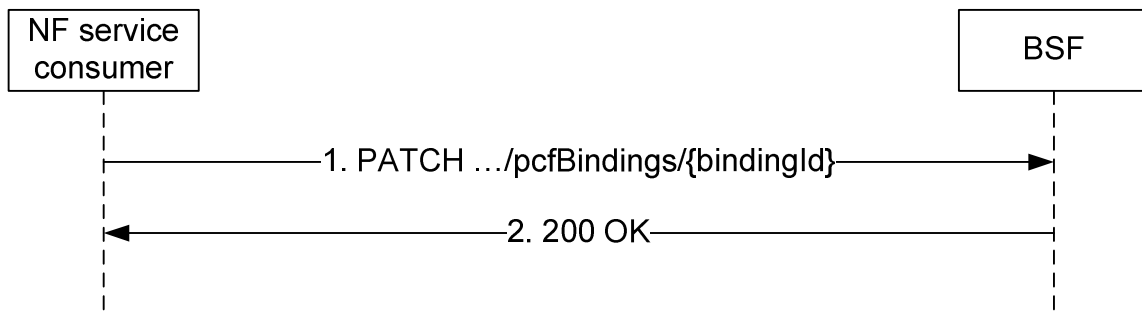


**Figure 4.2.5.2-1: NF service consumer update an existing PCF Session binding information**

If the feature "BindingUpdate" is supported, the NF service consumer shall invoke the Nbsf_Management_Update service operation to update the session binding information for a UE in the BSF. The NF service consumer shall send an HTTP PATCH request with "{apiRoot}/nbsf-management/v1/pcfBindings/{bindingId}" as Resource URI, where "{bindingId}" is the "Individual PCF Session Binding" resource identifier that is to be updated, as shown in figure 4.2.5.2-1, step 1. The "PcfBindingPatch" data structure provided in the request body shall contain the information to be updated as follows.

The "PcfBindingPatch" data structure:

- for the IP address information of the served UE:

    a) shall contain the "ipv4Addr" attribute if the IPv4 address is modified and may contain the "ipDomain" attribute if the IPv4 address domain is modified. To remove the IPv4 address the "ipv4Addr" attribute shall be set to "null" and if applicable, the "ipDomain" attribute shall be set to "null"; and/or

    b) shall contain the "ipv6Prefix" attribute if the IPv6 address information is modified. The "ipv6Prefix" attribute shall be set to "null" if the IPv6 address information is removed; and/or

    c) if the "MultiUeAddr" feature is supported, shall contain:

        1) the "addIpv6Prefixes" attribute containing the new complete list of additional IPv6 Address Prefixes if the additional IPv6 address information is modified; or

        2) the "addIpv6Prefixes" attribute set to "null" if all additional IPv6 Address Prefixes are removed; or

- for the MAC address information of the served UE:

    a) shall contain the "macAddr48" attribute if the MAC address is modified. The "macAddr48" attribute shall be set to "null" if the MAC address is removed; and/or

    b) if the "MultiUeAddr" feature is supported, shall contain:

        1) the "addMacAddrs" attribute containing the new complete list of additional MAC addresses if the additional MAC address information is modified; or

        2) the "addMacAddrs" attribute set to "null" if all additional MAC addresses are removed; or

- for the PCF instance and the associated PCF address information of the PCF holding the SM policy association, should contain if a new PCF instance is selected:

    a) the PCF instance ID encoded as "pcfId" attribute;

    b) if the PCF supports the Npcf_PolicyAuthorization service:

        1) the FQDN of the PCF encoded as "pcfFqdn" attribute; and/or

        2) a description of IP endpoints at the PCF hosting the Npcf_PolicyAuthorization service encoded as "pcfIpEndPoints" attribute; and/or

    c) if the PCF supports the Rx interface:

1) the Diameter host id of the PCF encoded as "pcfDiamHost"; and

2) the Diameter realm of the PCF and "pcfDiamRealm" attributes.

If the BSF cannot successfully fulfil the received HTTP PATCH request due to the internal BSF error or due to the error in the HTTP PATCH request, the BSF shall send the HTTP error response as specified in subclause 5.7.

Otherwise, upon the reception of the HTTP PATCH request with: "{apiRoot}/nbsf-management/v1/pcfBindings/{bindingId}" as Resource URI and the "PcfBindingPatch" data structure as request body, the BSF shall update the binding information.

If the BSF successfully updated an "Individual PCF Session Binding" resource, the BSF shall respond with "200 OK" status code with the message body containing a representation of the updated session binding information in the "PcfBindingPatch" data structure, as shown in figure 4.2.5.2-1, step 2.

# 5 Nbsf_Management Service API

## 5.1 Introduction

The Nbsf_Management Service shall use the Nbsf_Management API.

The API URI of the Nbsf_Management API shall be:

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

The request URIs used in HTTP requests from the NF service consumer towards the BSF shall have the Resource URI structure defined in subclause 4.4.1 of 3GPP TS 29.501 [7], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [7].

- The <apiName> shall be "nbsf-management".

- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in subclause 5.3.

## 5.2 Usage of HTTP

### 5.2.1 General

HTTP/2, IETF RFC 7540 [8], shall be used as specified in clause 5 of 3GPP TS 29.500 [6].

HTTP/2 shall be transported as specified in subclause 5.3 of 3GPP TS 29.500 [6].

The OpenAPI [11] specification of HTTP messages and content bodies for the Nbsf_Management is contained in Annex A.

### 5.2.2 HTTP standard headers

#### 5.2.2.1 General

See subclause 5.2.2 of 3GPP TS 29.500 [6] for the usage of HTTP standard headers.

## 5.2.2.2 Content type

JSON, IETF RFC 8259 [9], shall be used as content type of the HTTP bodies specified in the present specification as specified in subclause 5.4 of 3GPP TS 29.500 [6]. 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].

JSON object used in the HTTP PATCH request shall be encoded according to "JSON Merge Patch" and shall be signalled by the content type "application/merge-patch+json", as defined in IETF RFC 7396 [20].

## 5.2.3 HTTP custom headers

### 5.2.3.1 General

The Nbsf_Management Service API shall support HTTP custom header fields specified in subclause 5.2.3.2 of 3GPP TS 29.500 [6].

In this release of the specification, no specific custom headers are defined for the Nbsf_Management Service API.

# 5.3 Resources

## 5.3.1 Resource Structure

The structure of the Resource URI of the Nbsf_Management service is shown in figure 5.3.1-1.

{apiRoot}/nbsf-management/v1

/pcfBindings

/{bindingId}
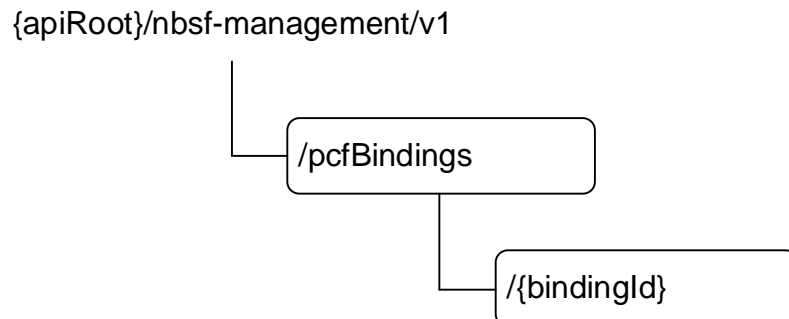
**Figure 5.3.1-1: Resource URI structure of the Nbsf_Management API**

Table 5.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 5.3.1-1: Resources and methods overview**

| Resource name | Resource URI | HTTP method or custom operation | Description |
|---|---|---|---|
| PCF Session Bindings | {apiRoot}/ nbsf-management/v1 /pcfBindings | POST | Register new PCF Session binding information of a given UE address in the BSF. |
| | | GET | Retrieve the Session binding information i.e. PCF address information of a given tuple (UE address, SUPI; GPSI, DNN, S-NSSAI). |
| Individual PCF Session Binding | {apiRoot}/ nbsf-management/v1 /pcfBindings /{bindingId} | DELETE | Deregister existing PCF Session binding information from the BSF. |
| | | PATCH | Update an existing PCF Session binding information in the BSF. |

## 5.3.2 Resource: PCF Session Bindings

### 5.3.2.1 Description

This resource represents a collection of the different PCF Session binding information of given UE address(es) registered in the BSF.

### 5.3.2.2 Resource definition

Resource URI: {apiRoot}/nbsf-management/v1/pcfBindings

This resource shall support the resource URI variables defined in table 5.3.2.2-1.

**Table 5.3.2.2-1: Resource URI variables for this resource**

| Name | Data type | Definition |
|---|---|---|
| apiRoot | string | See subclause 5.1 |

### 5.3.2.3 Resource Standard Methods

#### 5.3.2.3.1 POST

This method shall support the URI query parameters specified in table 5.3.2.3.1-1.

**Table 5.3.2.3.1-1: URI query parameters supported by the POST method on this resource**

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

This method shall support the request data structures specified in table 5.3.2.3.1-2 and the response data structures and response codes specified in table 5.3.2.3.1-3.

**Table 5.3.2.3.1-2: Data structures supported by the POST Request Body on this resource**

| Data type | P | Cardinality | Description |
|---|---|---|---|
| PcfBinding | M | 1 | Register a new Individual PCF binding information. |

**Table 5.3.2.3.1-3: Data structures supported by the POST Response Body on this resource**

| Data type | P | Cardinality | Response codes | Description |
|---|---|---|---|---|
| PcfBinding | M | 1 | 201 Created | The creation of an individual PCF session biding. |
| ExtProblemDetails | O | 0..1 | 403 Forbidden | The existing PCF binding information stored in the BSF for the indicated combination is 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 [6] shall also apply. | | | | |

**Table 5.3.2.3.1-4: 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}/nbsf-management/v1/pcfBindings/{bindingId} |

### 5.3.2.3.2 GET

This method shall support the URI query parameters specified in table 5.3.2.3.2-1.

**Table 5.3.2.3.2-1: URI query parameters supported by the GET method on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| ipv4Addr | Ipv4Addr | C | 0..1 | The IPv4 Address of the served UE. (NOTE 1) (NOTE 3) |
| ipv6Prefix | Ipv6Prefix | C | 0..1 | The IPv6 Address of the served UE. (NOTE 1) (NOTE 3) The NF service consumer shall append '/128' to the IPv6 address in the attribute value. E.g. '2001:db8:85a3::8a2e:370:7334/128'. |
| macAddr48 | MacAddr48 | C | 0..1 | The MAC Address of the served UE. (NOTE 1) |
| dnn | Dnn | O | 0..1 | DNN |
| supi | Supi | O | 0..1 | Subscription Permanent Identifier |
| gpsi | Gpsi | O | 0..1 | Generic Public Subscription Identifier |
| snssai | Snssai | O | 0..1 | The identification of slice. (NOTE 2) |
| ipDomain | string | O | 0..1 | The IPv4 address domain identifier. (NOTE 2) |
| supp-feat | SupportedFeatures | O | 0..1 | To filter irrelevant responses related to unsupported features. |
| NOTE 1: One and only one of query parameter ipv4Addr, ipv6Prefix or macAddr48 shall be present. | | | | |
| NOTE 2: The query parameters snssai and/or ipDomain, if applicable (IPv4 address overlapping), shall be present with query parameter ipv4Addr. | | | | |
| NOTE 3: 5G-RG and FN-RG replaces UE for wireline access support. See 3GPP TS 23.316 [19]. | | | | |
| NOTE 4: The ipv4Addr and ipv6Prefix query parameters may include the IP address of devices in networks behind the UE (see subclause 5.6.14 of 3GPP TS 23.501 [2]). | | | | |

This method shall support the request data structures specified in table 5.3.2.3.2-2 and the response data structures and response codes specified in table 5.3.2.3.2-3.

**Table 5.3.2.3.2-2: Data structures supported by the GET Request Body on this resource**

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

**Table 5.3.2.3.2-3: Data structures supported by the GET Response Body on this resource**

| Data type | P | Cardinality | Response codes | Description |
|---|---|---|---|---|
| PcfBinding | M | 1 | 200 OK | The individual PCF session binding information resource matching the query parameter(s) is returned. |
| n/a | | | 204 No Content | There is no PCF session binding information matching the query parameter(s). |
| ProblemDetails | O | 0..1 | 400 Bad Request | More than one binding information is found. (NOTE 2) |
| NOTE 1: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] shall also apply. | | | | |
| NOTE 2: Failure cases are described in subclause 5.7. | | | | |

## 5.3.3 Resource: Individual PCF Session Binding

### 5.3.3.1 Description

This resource represents a collection of the different PCF Session binding information of given UE address(es) registered in the BSF.

### 5.3.3.2 Resource definition

Resource URI: **{apiRoot}/nbsf-management/v1/pcfBindings/{bindingId}**

This resource shall support the resource URI variables defined in table 5.3.3.2-1.

**Table 5.3.3.2-1: Resource URI variables for this resource**

| Name | Data type | Definition |
|---|---|---|
| apiRoot | string | See subclause 5.1 |
| bindingId | string | Represents the individual PCF Session Binding. To enable that the value is used as part of a URI, the string shall only contain characters allowed according to the "lower-with-hyphen" naming convention defined in 3GPP TS 29.501 [7]. |

### 5.3.3.3 Resource Standard Methods

#### 5.3.3.3.1 DELETE

This method shall support the URI query parameters specified in table 5.3.3.3.2-1.

**Table 5.3.3.3.1-1: URI query parameters supported by the DELETE method on this resource**

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

This method shall support the request data structures specified in table 5.3.3.3.1-2 and the response data structures and response codes specified in table 5.3.3.3.1-3.

**Table 5.3.3.3.1-2: Data structures supported by the DELETE Request Body on this resource**

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

**Table 5.3.3.3.1-3: Data structures supported by the DELETE Response Body on this resource**

| Data type | P | Cardinality | Response codes | Description |
|-----------|---|-------------|----------------|-------------|
| n/a | | | 204 No Content | Successful case: The Individual PCF session binding information resource is deleted. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] shall also apply. | | | | |

#### 5.3.3.3.2 PATCH

This method shall support the URI query parameters specified in table 5.3.3.3.2-1.

**Table 5.3.3.3.2-1: URI query parameters supported by the PATCH method on this resource**

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

This method shall support the request data structures specified in table 5.3.3.3.2-2 and the response data structures and response codes specified in table 5.3.3.3.2-3.

**Table 5.3.3.3.2-2: Data structures supported by the PATCH Request Body on this resource**

| Data type | P | Cardinality | Description |
|-----------|---|-------------|-------------|
| PcfBindingPatch | M | 1 | Update an individual PCF binding information. |

**Table 5.3.3.3.2-3: Data structures supported by the PATCH Response Body on this resource**

| Data type | P | Cardinality | Response codes | Description |
|-----------|---|-------------|----------------|-------------|
| PcfBinding | M | 1 | 200 OK | Successful case: The Individual PCF session binding information resource is updated. |
| NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] shall also apply. | | | | |

# 5.4 Custom Operations without associated resources

None in this release of this specification.

# 5.5 Notifications

None in this release of this specification.

# 5.6 Data Model

## 5.6.1 General

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

Table 5.6.1-1 specifies the data types defined for the Nbsf_Management service based interface protocol.

**Table 5.6.1-1: Nbsf_Management specific Data Types**

| Data type | Section defined | Description | Applicability |
|---|---|---|---|
| BindingResp | 5.6.2.6 | Contains the binding information. | SamePcf |
| BindingLevel | 5.6.3.3 | Contains the binding level. | |
| ParameterCombination | 5.6.2.4 | The combination used by the BSF to check whether there is an existing PCF binding information. | SamePcf |
| ExtProblemDetails | 5.6.2.5 | Contains the FQDN or IP endpoints of the existing PCF and cause value if there is an existing PCF binding information for the indicated combination. | SamePcf |
| PcfBinding | 5.6.2.2 | Identifies an Individual PCF binding. | |
| PcfBindingPatch | 5.6.2.3 | Identifies an Individual PCF binding used for Patch method. | BindingUpdate |

Table 5.6.1-2 specifies data types re-used by the Nbsf_Management 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 Nbsf_Management service based interface.

**Table 5.6.1-2: Nbsf_Management re-used Data Types**

| Data type | Reference | Comments | Applicability |
|---|---|---|---|
| DateTime | 3GPP TS 29.571 [10] | | |
| DiameterIdentity | 3GPP TS 29.571 [10] | | |
| Dnn | 3GPP TS 29.571 [10] | | |
| Fqdn | 3GPP TS 29.510 [12] | | |
| Gpsi | 3GPP TS 29.571 [10] | | |
| IpEndPoint | 3GPP TS 29.510 [12] | | |
| Ipv4Addr | 3GPP TS 29.571 [10] | | |
| Ipv4AddrMask | 3GPP TS 29.571 [11] | String identifying an IPv4 address mask. | |
| Ipv4AddrRm | 3GPP TS 29.571 [10] | | |
| Ipv6Prefix | 3GPP TS 29.571 [10] | | |
| Ipv6PrefixRm | 3GPP TS 29.571 [10] | | |
| MacAddr48 | 3GPP TS 29.571 [10] | | |
| NfInstanceId | 3GPP TS 29.571 [10] | | |
| NfSetId | 3GPP TS 29.571 [10] | | |
| ProblemDetails | 3GPP TS 29.571 [10] | Used in error responses to provide more detailed information about an error. | |
| Snssai | 3GPP TS 29.571 [10] | | |
| Supi | 3GPP TS 29.571 [10] | | |
| SupportedFeatures | 3GPP TS 29.571 [10] | Used to negotiate the applicability of the optional features defined in table 5.8-1. | |

## 5.6.2 Structured data types

### 5.6.2.1 Introduction

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

## 5.6.2.2 Type PcfBinding

**Table 5.6.2.2-1: Definition of type PcfBinding**

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|---|---|---|---|---|
| supi | Supi | O | 0..1 | Subscription Permanent Identifier | |
| gpsi | Gpsi | O | 0..1 | Generic Public Subscription Identifier | |
| ipv4Addr | Ipv4Addr | C | 0..1 | The IPv4 Address of the served UE.  (NOTE 4) | |
| ipv6Prefix | Ipv6Prefix | C | 0..1 | The IPv6 Address Prefix of the served UE. (NOTE 4) (NOTE 5) | |
| addIpv6Prefixes | array(Ipv6Prefix) | O | 1..N | The additional IPv6 Address Prefixes of the served UE. (NOTE 4) (NOTE 5) | MultiUeAddr |
| ipDomain | string | O | 0..1 | IPv4 address domain identifier. (NOTE 1) | |
| macAddr48 | MacAddr48 | C | 0..1 | The MAC Address of the served UE. | |
| addMacAddrs | array(MacAddr48) | O | 1..N | The additional MAC Addresses of the served UE. | MultiUeAddr |
| dnn | Dnn | M | 1 | DNN, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. | |
| pcfFqdn | Fqdn | C | 0..1 | FQDN of the PCF hosting the Npcf_PolicyAuthorization service. (NOTE 2) | |
| pcfIpEndPoints | array(IpEndPoint) | C | 1..N | IP end points of the PCF hosting the Npcf_PolicyAuthorization service. (NOTE 2) | |
| pcfDiamHost | DiameterIdentity | C | 0..1 | The diameter host for an individual PCF. (NOTE 3) | |
| pcfDiamRealm | DiameterIdentity | C | 0..1 | The diameter realm for an individual PCF. (NOTE 3) | |
| pcfSmFqdn | Fqdn | O | 0..1 | FQDN of the PCF hosting the Npcf_SMPolicyControl service. (NOTE 7) | SamePcf |
| pcfSmIpEndPoints | array(IpEndPoint) | O | 1..N | IP end points of the PCF hosting the Npcf_SMPolicyControl service. (NOTE 7) | SamePcf |
| snssai | Snssai | M | 1 | The identification of slice. | |
| suppFeat | SupportedFeatures | C | 0..1 | Used to negotiate the supported optional features as described in subclause 5.8. Shall be present in the HTTP POST request/response; or in the HTTP GET response if the "supp-feat" attribute query parameter is included in the HTTP GET request. | |
| pcfId | NfInstanceId | O | 0..1 | PCF instance identifier | |
| pcfSetId | NfSetId | O | 0..1 | The PCF set Id | |
| recoveryTime | DateTime | O | 0..1 | Recovery time of the PCF | |
| paraCom | ParameterCombination | O | 0..1 | If it is included, the BSF shall check whether there is an existing PCF binding information for the indicated combination. (NOTE 6) | SamePcf |
| bindLevel | BindingLevel | O | 0..1 | Contains the level of binding. | |
| ipv4FrameRouteList | array(Ipv4AddrMask) | O | 1..N | List of Framed Route information of IPv4. | |
| ipv6FrameRouteList | array(Ipv6Prefix) | O | 1..N | List of Framed Route information of IPv6. | |

| NOTE 1: | The ipDomain attribute may only be provided if the ipv4Addr attribute is present. |
|---------|-----------------------------------------------------------------------------------|
| NOTE 2: | At least one of pcfFqdn or pcfIpEndPoints shall be included if the PCF supports the Npcf_PolicyAuthorization service. |
| NOTE 3: | Both pcfDiamHost and pcfDiamRealm are provided if the PCF supports Rx interface. |
| NOTE 4: | 5G-RG and FN-RG replaces UE for wireline access support. See 3GPP TS 23.316 [19]. |
| NOTE 5: | Pv6 prefix(es) shorter than /64 or ull IPv6 address(es_ with a /128 prefix may be encoded as the "ipv6Prefix" and "addIpv6Prefixes" attributes, according to 3GPP TS 23.316 [19], subclause 8.3.1. |
| NOTE 6: | If the BSF checks that there is an existing PCF binding information for the indicated combination, the BSF shall reject the ongoing registration and return the FQDN or IP endpoints of the existing PCF binding information to the requesting PCF. |
| NOTE 7: | Either the "pcfSmFqdn" attribute or the "pcfSmIpEndPoints" attribute shall be included if the "SamePcf" feature is supported and the PCF determines that the same PCF shall be selected for the SM Policy associations to the parameter combination in the non-roaming or home-routed scenario based on operator's policies and configuration. |

## 5.6.2.3 Type PcfBindingPatch

**Table 5.6.2.3-1: Definition of type PcfBindingPatch**

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|-----------|---|-------------|-------------|---------------|
| ipv4Addr | Ipv4AddrRm | O | 0..1 | The IPv4 Address of the served UE. (NOTE 2) | |
| ipDomain | string | O | 0..1 | IPv4 address domain identifier. (NOTE 1) | |
| ipv6Prefix | Ipv6PrefixRm | O | 0..1 | The IPv6 Address Prefix of the served UE. (NOTE 2) (NOTE 3) | |
| addIpv6Prefixes | array(Ipv6Prefix) | O | 1..N | The additional IPv6 Address Prefixes of the served UE. (NOTE 2) (NOTE 3) | MultiUeAddr |
| macAddr48 | MacAddr48Rm | O | 0..1 | The MAC Address of the served UE. | |
| addMacAddrs | array(MacAddr48 ) | O | 1..N | The additional MAC Addresses of the served UE. | MultiUeAddr |
| pcfId | NfInstanceId | O | 0..1 | PCF instance identifier | |
| pcfFqdn | Fqdn | O | 0..1 | FQDN of the PCF hosting the Npcf_PolicyAuthorization service. | |
| pcfIpEndPoints | array(IpEndPoint) | O | 1..N | IP end points of the PCF hosting the Npcf_PolicyAuthorization service. | |
| pcfDiamHost | DiameterIdentity | O | 0..1 | The diameter host for an individual PCF. | |
| pcfDiamRealm | DiameterIdentity | O | 0..1 | The diameter realm for an individual PCF. | |
| NOTE 1: | If applicable, the consumer (e.g. PCF) shall also request to remove the ipDomain attribute if the ipv4Addr attribute is requested to be removed. | | | | |
| NOTE 2: | 5G-RG and FN-RG replaces UE for wireline access support. See 3GPP TS 23.316 [19]. | | | | |
| NOTE 3: | IPv6 prefix(es) shorter than /64 or full IPv6 address(es) with a /128 prefix can be encoded as the "ipv6Prefix" and "addIpv6Prefixes" attributes, according to 3GPP TS 23.316 [19], subclause 8.3.1. | | | | |

## 5.6.2.4 Type ParameterCombination

**Table 5.6.2.4-1: Definition of type CheckCombination**

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|-----------|---|-------------|-------------|---------------|
| supi | Supi | O | 0..1 | Subscription Permanent Identifier | |
| dnn | Dnn | O | 0..1 | DNN, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. | |
| snssai | Snssai | O | 0..1 | The identification of slice. | |
| NOTE: | At least one of the attributes in this table shall be included. | | | | |

### 5.6.2.5 Type ExtProblemDetails

**Table 5.6.2.5-1: Definition of type ExtProblemDetails as a list of to be combined data types**

| Data Type | P | Cardinality | Description | Applicability |
|---|---|---|---|---|
| ProblemDetails | O | 0..1 | Problem Details | |
| BindingResp | O | 0..1 | PCF Binding Information | |

### 5.6.2.6 Type BindingResp

**Table 5.6.2.6-1: Definition of type BindingResp**

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|---|---|---|---|---|
| pcfSmFqdn | Fqdn | O | 0..1 | FQDN of the PCF hosting the Npcf_SMPolicyControl service. (NOTE) | |
| pcfSmIpEndPoints | array(IpEndPoint) | O | 1..N | IP end points of the PCF hosting the Npcf_SMPolicyControl service. (NOTE) | |
| NOTE: Either the "pcfSmFqdn" attribute or the "pcfSmIpEndPoints" attribute shall be included. | | | | | |

## 5.6.3 Simple data types and enumerations

### 5.6.3.1 Introduction

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

### 5.6.3.2 Simple data types

The simple data types defined in table 5.6.3.2-1 shall be supported.

**Table 5.6.3.2-1: Simple data types**

| Type Name | Type Definition | Description | Applicability |
|---|---|---|---|
| n/a | | | |

### 5.6.3.3 Enumeration: BindingLevel

**Table 5.6.3.3-1: Enumeration BindingLevel**

| Enumeration value | Description | Applicability |
|---|---|---|
| NF_SET | Indicates the NF set level of binding. | |
| NF_INSTANCE | Indicates the NF instance level of binding. | |

## 5.7 Error handling

## 5.7.1 General

HTTP error handling shall be supported as specified in subclause 5.2.4 of 3GPP TS 29.500 [6].

For the Nbsf_Management Service API, HTTP error responses shall be supported as specified in subclause 4.8 of 3GPP TS 29.501 [7]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [6] 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 [6]. In addition, the requirements in the following subclauses shall apply.

## 5.7.2 Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the Nbsf_Management Service API.

## 5.7.3 Application Errors

The application errors defined for the Nbsf_Management Service API are listed in table 5.7.3-1. The PCF shall include in the HTTP status code a "ProblemDetails" data structure with the "cause" attribute indicating the application error as listed in table 5.7.3-1.

**Table 5.7.3-1: Application errors**

| Application Error | HTTP status code | Description |
|---|---|---|
| MULTIPLE_BINDING_INFO_FOUND | 400 Bad Request | Indicates that the BSF found more than one binding resource so it cannot provide the selected PCF to the consumer. (NOTE 1) |
| EXISTING_BINDING_INFO_FOUND | 403 Forbidden | Indicates that the BSF found an existing PCF binding information for the indicated combination. (NOTE 2) |
| NOTE 1: This application error is included in the responses to the GET request. | | |
| NOTE 2: This application error is included in the responses to the POST request. | | |

# 5.8 Feature negotiation

The optional features in table 5.8-1 are defined for the Nbsf_Management Service API. They shall be negotiated using the extensibility mechanism defined in subclause 6.6 of 3GPP TS 29.500 [6].

**Table 5.8-1: Supported Features**

| Feature number | Feature Name | Description |
|---|---|---|
| 1 | MultiUeAddr | This feature indicates the support of multiple UE addresses (IPv6 prefixes or MAC addresses) in the same binding information. |
| 2 | BindingUpdate | The consumer can use this feature for updating the session binding information. |
| 3 | SamePcf | This feature indicates the support of same PCF selection for the indicated combination |

# 5.9 Security

As indicated in 3GPP TS 33.501 [15] and 3GPP TS 29.500 [6], the access to the Nbsf_Management API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [16]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [12]) plays the role of the authorization server.

If OAuth2 is used, a n NF Service Consumer, prior to consuming services offered by the Nbsf_Management API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [12], subclause 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 Nbsf_Management service.

The Nbsf_Management API defines a single scope "nbsf-management" 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

The present Annex contains an OpenAPI [11] specification of HTTP messages and content bodies used by the Nbsf_Management API.

This Annex shall take precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API.

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 file contained in this 3GPP Technical Specification are available on a Git-based repository hosted in ETSI Forge, that uses the GitLab software version control system (see clause 5B of the 3GPP TR 21.900 [18] and subclause 5.3.1 of the 3GPP TS 29.501 [7] for further information).

## A.2 Nbsf_Management API

```
openapi: 3.0.0
info:
  version: 1.1.0
  title: Nbsf_Management
  description: |
    Binding Support Management Service API.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.521 V16.4.0; 5G System; Binding Support Management Service.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.521/'
servers:
  - url: '{apiRoot}/nbsf-management/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 4.4 of 3GPP TS 29.501.
security:
  - {}
  - oAuth2ClientCredentials:
    - nbsf-management
paths:
  /pcfBindings:
    post:
      summary: Create a new Individual PCF binding information
      operationId: CreatePCFBinding
      tags:
        - PCF Bindings (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/PcfBinding'
      responses:
        '201':
          description: The creation of an individual PCF session binding.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PcfBinding'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nbsf-management/v1/pcfBindings/{bindingId}'
              required: true
```

```
              schema:
                type: string
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          description: The existing PCF binding information stored in the BSF for the indicated
combination is returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ExtProblemDetails'
        '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'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    get:
      summary: Read PCF Bindings information
      operationId: GetPCFBindings
      tags:
        - PCF Bindings (Collection)
      parameters:
        - name: ipv4Addr
          in: query
          description: The IPv4 Address of the served UE.
          required: false
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        - name: ipv6Prefix
          in: query
          description: The IPv6 Address of the served UE. The NF service consumer shall append
'/128' to the IPv6 address in the attribute value. E.g. '2001:db8:85a3::8a2e:370:7334/128'.
          required: false
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
        - name: macAddr48
          in: query
          description: The MAC Address of the served UE.
          required: false
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
        - name: dnn
          in: query
          description: DNN.
          required: false
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        - name: supi
          in: query
          description: Subscription Permanent Identifier.
          required: false
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        - name: gpsi
          in: query
          description: Generic Public Subscription Identifier
          required: false
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        - name: snssai
          in: query
          description: The identification of slice.
          required: false
          content:
            application/json:
```

```
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        - name: ipDomain
          in: query
          description: The IPv4 address domain identifier.
          required: false
          schema:
            type: string
        - name: supp-feat
          in: query
          description: To filter irrelevant responses related to unsupported features
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      responses:
        '200':
          description: The individual PCF session binding session binding information resource
matching the query parameter(s) is returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PcfBinding'
        '204':
          description: There is no PCF session binding information matching the query parameter(s).
        '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'
        '414':
          $ref: 'TS29571_CommonData.yaml#/components/responses/414'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  /pcfBindings/{bindingId}:
    delete:
      summary: Delete an existing Individual PCF Binding information
      operationId: DeleteIndPCFBinding
      tags:
        - Individual PCF Binding (Document)
      parameters:
        - name: bindingId
          in: path
          description: Represents the individual PCF Session Binding.
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content. The Individual PCF session binding information resource is
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'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    patch:
      summary: Update an existing Individual PCF Binding information
```

```
          operationId: UpdateIndPCFBinding
          tags:
            - Individual PCF Binding (Document)
          parameters:
            - name: bindingId
              in: path
              description: Represents the individual PCF Session Binding.
              required: true
              schema:
                type: string
          requestBody:
            description: Parameters to update the existing session binding
            required: true
            content:
              application/merge-patch+json:
                schema:
                  $ref: '#/components/schemas/PcfBindingPatch'
          responses:
            '200':
              description: OK (Successful update of the session binding)
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/PcfBinding'
            '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'
            '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:
            nbsf-management: Access to the Nbsf_Management API
  schemas:
    PcfBinding:
      type: object
      properties:
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        ipv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        ipv6Prefix:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
        addIpv6Prefixes:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
          minItems: 1
          description: The additional IPv6 Address Prefixes of the served UE.
        ipDomain:
          type: string
        macAddr48:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
        addMacAddrs:
```

```
                type: array
                items:
                  $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
                minItems: 1
                description: The additional MAC Addresses of the served UE.
            dnn:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
            pcfFqdn:
              $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/Fqdn'
            pcfIpEndPoints:
              type: array
              items:
                $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/IpEndPoint'
              minItems: 1
              description: IP end points of the PCF hosting the Npcf_PolicyAuthorization service.
            pcfDiamHost:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/DiameterIdentity'
            pcfDiamRealm:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/DiameterIdentity'
            pcfSmFqdn:
              $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/Fqdn'
            pcfSmIpEndPoints:
              type: array
              items:
                $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/IpEndPoint'
              minItems: 1
              description: IP end points of the PCF hosting the Npcf_SMPolicyControl service.
            snssai:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
            suppFeat:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
            pcfId:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
            pcfSetId:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/NfSetId'
            recoveryTime:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
            paraCom:
              $ref: '#/components/schemas/ParameterCombination'
            bindLevel:
              $ref: '#/components/schemas/BindingLevel'
            ipv4FrameRouteList:
              type: array
              items:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4AddrMask'
              minItems: 1
            ipv6FrameRouteList:
              type: array
              items:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
              minItems: 1
          required:
            - dnn
            - snssai
          oneOf:
            - anyOf:
              - required: [ipv4Addr]
              - required: [ipv6Prefix]
              - required: [addIpv6Prefixes]
            - anyOf:
              - required: [macAddr48]
              - required: [addMacAddrs]
          anyOf:
            - anyOf:
              - required: [pcfFqdn]
              - required: [pcfIpEndPoints]
            - required: [pcfDiamHost, pcfDiamRealm]
    PcfBindingPatch:
      type: object
      properties:
        ipv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4AddrRm'
        ipDomain:
          type: string
          nullable: true
        ipv6Prefix:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6PrefixRm'
        addIpv6Prefixes:
```

```
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
          minItems: 1
          description: The additional IPv6 Address Prefixes of the served UE.
          nullable: true
        macAddr48:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48Rm'
        addMacAddrs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
          minItems: 1
          description: The additional MAC Addresses of the served UE.
          nullable: true
        pcfId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
        pcfFqdn:
          $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/Fqdn'
        pcfIpEndPoints:
          type: array
          items:
            $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/IpEndPoint'
          minItems: 1
          description: IP end points of the PCF hosting the Npcf_PolicyAuthorization service.
        pcfDiamHost:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DiameterIdentity'
        pcfDiamRealm:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DiameterIdentity'
    ParameterCombination:
      type: object
      properties:
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        snssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
    ExtProblemDetails:
      allOf:
        - $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
        - $ref: '#/components/schemas/BindingResp'
    BindingResp:
      type: object
      properties:
        pcfSmFqdn:
          $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/Fqdn'
        pcfSmIpEndPoints:
          type: array
          items:
            $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/IpEndPoint'
          minItems: 1
          description: IP end points of the PCF hosting the Npcf_SMPolicyControl service.
    BindingLevel:
      anyOf:
      - type: string
        enum:
          - NF_SET
          - NF_INSTANCE
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      description: >
        Possible values are
        - "NF_SET"
        - "NF_INSTANCE"
```

# Annex B (informative):
# Deployment option to support BSF and DRA coexistence due to network migration

As described in Annex B of 3GPP TS 23.503 [4], the Diameter Routing Agent (DRA) and the BSF can coexist in an operator's network during the network migration to 5GC. The DRA is described in 3GPP TS 29.213 [14] and can be a service consumer of the Nbsf_Management service.

During the Rx session establishment, the DRA can discover the selected PCF for the related subscriber by using the Nbsf_Management_Discovery service operation to obtain the related PCF address if it has no stored binding information derived from an ongoing Gx session for that subscriber.

NOTE 1: For a UE in the EPC there is a Gx session and the DRA stores the binding information. For a UE in the 5GC the Npcf_SmPolicyControl service is used and the BSF stores the binding information.

NOTE 2: If the DRA has no stored binding information derived from an ongoing Gx session for a subscriber, the DRA needs to request new binding information for each Rx session establishment because the information in the BSF could have changed compared to any previous binding information the DRA requested.

# Annex C (informative): Change history

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | TSG # | TSG Doc. | CR | Rev | Cat | Subject/Comment | New |
| 2018-01 | | | | | | TS skeleton of Binding Support Management Service specification | 0.0.0 |
| 2018-01 | | | | | | Inclusion of documents agreed in CT3#94 C3-180301, C3-180191, C3-180192 and C3-180193. | 0.1.0 |
| 2018-03 | | | | | | Inclusion of documents agreed in CT3#95 C3-181350 and C3-181352. | 0.2.0 |
| 2018-04 | | | | | | Inclusion of documents agreed in CT3#96 C3-182424 and C3-182510. | 0.3.0 |
| 2018-05 | | | | | | Inclusion of documents agreed in CT3#97 C3-183287, C3-183500, C3-183881, C3-183502 and C3-183733. | 0.4.0 |
| 2018-06 | CT#80 | CP-181031 | | | | TS sent to plenary for approval. | 1.0.0 |
| 2018-06 | CT#80 | CP-181031 | | | | TS approved by plenary | 15.0.0 |
| 2018-09 | CT#81 | CP-182015 | 0001 | 2 | F | PCF id correction for BSF | 15.1.0 |
| 2018-09 | CT#81 | CP-182015 | 0002 | | F | Reference update: OpenAPI specification | 15.1.0 |
| 2018-09 | CT#81 | CP-182015 | 0004 | 2 | F | Clarification on mandatory HTTP error status codes | 15.1.0 |
| 2018-09 | CT#81 | CP-182015 | 0005 | 6 | B | OpenAPI for TS 29.521 | 15.1.0 |
| 2018-09 | CT#81 | CP-182015 | 0006 | 1 | F | Description of Structured data types | 15.1.0 |
| 2018-09 | CT#81 | CP-182015 | 0007 | 1 | B | Support of IPv4 overlapping | 15.1.0 |
| 2018-09 | CT#81 | CP-182015 | 0008 | | F | Correction of the service name | 15.1.0 |
| 2018-09 | CT#81 | CP-182015 | 0009 | 1 | F | Resource structure presentation | 15.1.0 |
| 2018-12 | CT#82 | CP-183205 | 0011 | | F | Default value for apiRoot Default value for apiRoot | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0012 | | F | Correction to DELETE Method for Nbsf_Management Service API | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0013 | | F | Correction to Typos in URI Paths | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0015 | | F | API version | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0016 | | F | ExternalDocs OpenAPI field | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0017 | | F | Location header field in OpenAPI | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0018 | 1 | F | Security | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0019 | 1 | F | supported content types | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0020 | 2 | F | HTTP Error responses | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0021 | 2 | F | DRA as service consumer | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0023 | | F | Change presence in BSF binding | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0024 | 1 | F | Presence conditions in yaml file | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0025 | 1 | F | Missing 201 response body for POST to /pcfBindings | 15.2.0 |
| 2019-03 | CT#83 | CP-190113 | 0028 | 2 | F | Handling of unsupported query parameter combinations | 15.3.0 |
| 2019-03 | CT#83 | CP-190113 | 0029 | 1 | F | Correction of description of the Nbsf_Management_Register Service and Nbsf_Management_Discovery service operations | 15.3.0 |
| 2019-03 | CT#83 | CP-190113 | 0030 | | F | BSF resource cleanup | 15.3.0 |
| 2019-03 | CT#83 | CP-190113 | 0031 | 1 | F | Formatting of structured data types in query parameters | 15.3.0 |
| 2019-03 | CT#83 | CP-190113 | 0032 | 1 | F | Correction on the handling of UE addresses | 15.3.0 |
| 2019-03 | CT#83 | CP-190110 | 0033 | 2 | F | Miscellaneous BSF correction | 15.3.0 |
| 2019-03 | CT#83 | CP-190140 | 0034 | 1 | F | OpenAPI Version number update | 15.3.0 |
| 2019-06 | CT#84 | CP-191079 | 0036 | | F | Remove NSI ID | 15.4.0 |
| 2019-06 | CT#84 | CP-191106 | 0037 | 5 | B | Support multiple UE addresses in one binding | 16.0.0 |
| 2019-06 | CT#84 | CP-191106 | 0038 | 5 | B | Binding update support | 16.0.0 |
| 2019-06 | CT#84 | CP-191079 | 0039 | 1 | F | Precedence of OpenAPI file | 15.4.0 |
| 2019-06 | CT#84 | CP-191079 | 0040 | 1 | F | Copyright Note in YAML files | 15.4.0 |
| 2019-06 | CT#84 | CP-191089 | 0041 | 1 | F | Correction of Location header in Nbsf_Management OpenAPI | 16.0.0 |
| 2019-06 | CT#84 | CP-191101 | 0043 | 2 | F | OpenAPI version number update | 16.0.0 |
| 2019-09 | CT#85 | CP-192199 | 0045 | 2 | F | Session binding for IPv6 addresses | 16.1.0 |
| 2019-09 | CT#85 | CP-192156 | 0046 | | F | Support multiple UE addresses in BSF | 16.1.0 |
| 2019-09 | CT#85 | CP-192152 | 0047 | 1 | B | IP address handling in wireline access | 16.1.0 |
| 2019-09 | CT#85 | CP-192234 | 0050 | 2 | F | OpenAPI version update TS 29.521 Rel-16 | 16.1.0 |

| 2019-12 | CT#86 | CP-193197 | 0053 | 3 | B | Same PCF selection for the same UE ID, S-NSSAI and DNN combination | 16.2.0 |
|---------|-------|-----------|------|---|---|---|--------|
| 2019-12 | CT#86 | CP-193197 | 0054 | | F | Update of API version and TS version in OpenAPI file | 16.2.0 |
| 2020-03 | CT#87e | CP-200207 | 0055 | 1 | B | Update of the same PCF selection | 16.3.0 |
| 2020-03 | CT#87e | CP-200207 | 0056 | | B | DNN Clarification | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0058 | 2 | B | Adding NWDAF as Nbsf_management service consumer | 16.3.0 |
| 2020-03 | CT#87e | CP-200207 | 0059 | | F | Resolve editor note for PATCH | 16.3.0 |
| 2020-03 | CT#87e | CP-200207 | 0060 | 1 | F | Miscellaneous errors | 16.3.0 |
| 2020-03 | CT#87e | CP-200253 | 0061 | 1 | F | Support of the Update service operation | 16.3.0 |
| 2020-03 | CT#87e | CP-200214 | 0062 | | F | OpenAPI: usage of the "tags" keyword | 16.3.0 |
| 2020-03 | CT#87e | CP-200260 | 0063 | 1 | B | PCF set Id/PCF Id in Nbsf_Management_Register/Update | 16.3.0 |
| 2020-03 | CT#87e | CP-200215 | 0064 | | F | Correction on PcfBinding | 16.3.0 |
| 2020-03 | CT#87e | CP-200216 | 0065 | | F | Update of OpenAPI version and TS version in externalDocs field | 16.3.0 |
| 2020-06 | CT#88e | CP-201233 | 0066 | 1 | F | Corrections on SamePcf | 16.4.0 |
| 2020-06 | CT#88e | CP-201246 | 0067 | 1 | F | Corrections related to UEaddr | 16.4.0 |
| 2020-06 | CT#88e | CP-201259 | 0068 | 3 | B | Update of PCF address(es) | 16.4.0 |
| 2020-06 | CT#88e | CP-201275 | 0069 | 2 | B | Clarification of the DS-TT MAC address | 16.4.0 |
| 2020-06 | CT#88e | CP-201228 | 0070 | 3 | B | Support of full Frame Routing feature | 16.4.0 |
| 2020-06 | CT#88e | CP-201212 | 0071 | 1 | F | Binding information retrieval: PCF set ID and PCF instance ID | 16.4.0 |
| 2020-06 | CT#88e | CP-201296 | 0073 | 2 | F | Correct use of application error | 16.4.0 |
| 2020-06 | CT#88e | CP-201228 | 0074 | 1 | F | Correct IPv6 prefix | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0076 | 1 | F | Storage of YAML files in ETSI Forge | 16.4.0 |
| 2020-06 | CT#88e | CP-201246 | 0080 | 1 | F | Adding DRA as Nbsf_management service consumer | 16.4.0 |
| 2020-06 | CT#88e | CP-201258 | 0081 | 1 | B | Update of PCF address(es) | 16.4.0 |
| 2020-06 | CT#88e | CP-201256 | 0083 | 1 | F | URI of the Nbsf_Management service | 16.4.0 |
| 2020-06 | CT#88e | CP-201222 | 0085 | 1 | A | Correction to the condition of BSF service operations | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0086 | 1 | F | Optionality of ProblemDetails | 16.4.0 |
| 2020-06 | CT#88e | CP-201233 | 0087 | 1 | F | suppFeat attribute within PcfBinding data | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0088 | 1 | F | Supported headers, Resource Data type and yaml mapping | 16.4.0 |
| 2020-06 | CT#88e | CP-201255 | 0090 | | F | Update of OpenAPI version and TS version in externalDocs field | 16.4.0 |
| 2020-09 | CT#89e | CP-202077 | 0092 | | F | Data type corrections | 16.5.0 |

# History

| Document history | | |
|---|---|---|
| V16.4.0 | August 2020 | Publication |
| V16.5.0 | November 2020 | Publication |
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