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Stage 3)



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Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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 7159: "The JavaScript Object Notation (JSON) Data Interchange Format".
- [10] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces 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].

API	Application Programming Interface
BSF	Binding Support Function
HTTP	Hypertext Transfer Protocol
NF	Network Function

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

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

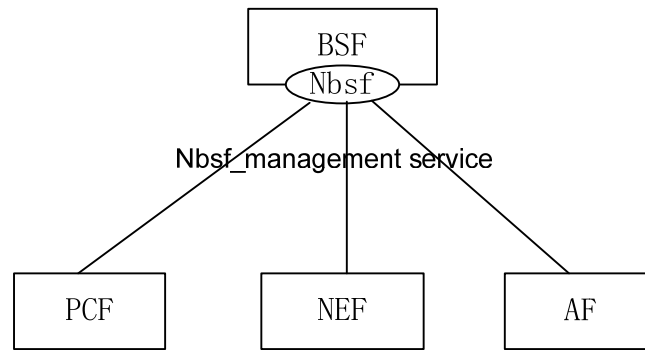


Figure 4.1.2-1: Reference Architecture for the Nbsf_management service; SBI representation

4.1.3 Network Functions

4.1.3.1 Binding Support Function (BSF)

The BSF provides:

- stores the binding information for a certain PDU Session; and
- discovers the selected PCF according to the binding information.

The BSF allows PCFs to register, update and remove the binding information from it, and allows NF consumers to discover 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 and deregisters the binding information in BSF for a UE when an IP address is allocated, updated or released for a 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 service discovery service operation.

The Application Function (AF):

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

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 IP address is allocated for a PDU Session.	NF consumer (PCF)
Nbsf_Management_Deregister	This service operation is used to deregister the binding information for a UE when the PDU Session is released.	NF consumer (PCF)
Nbsf_Management_Discovery	This service operation is used by an NEF or AF to discover a selected PCF .	NF consumer (NEF, AF)

4.2.2 Nbsf_Management_Register Service Operation

4.2.2.1 General

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

4.2.2.2 Register a new PCF Session binding information

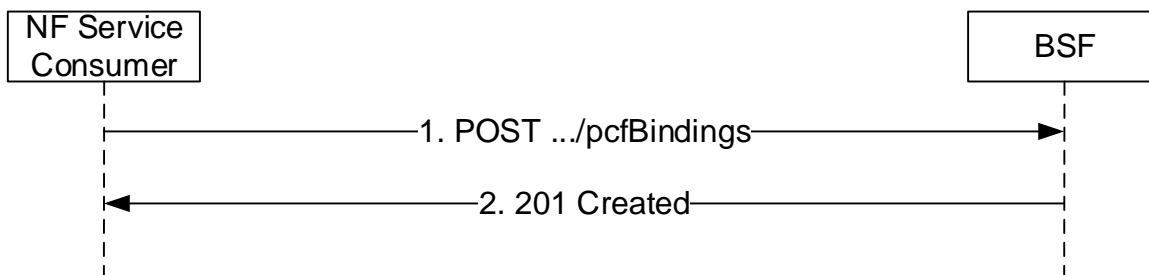


Figure 4.2.2.2-1: NF service consumer register a new PCF Session binding information

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-NNSAI,.NSI) in message body. The PcfBinding data structure provided in the request body shall include:

- UE address(es);
- PCF id;

and may include:

- DNN;
- SUPI;
- GPSI; and
- S-NNSAI.

Upon the 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;
- store the binding information.

If the BSF created an "Individual PCF Session Binding" resource, the BSF shall respond with "201 Created" 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}".

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 by providing an IP-address for a certain PDU Session to the BSF. It is executed by deleting a given resource identified by an "IP-address". The operation is invoked by issuing a DELETE request on the URI representing the specific session binding information.

4.2.3.2 Deregister an individual PCF Session binding information

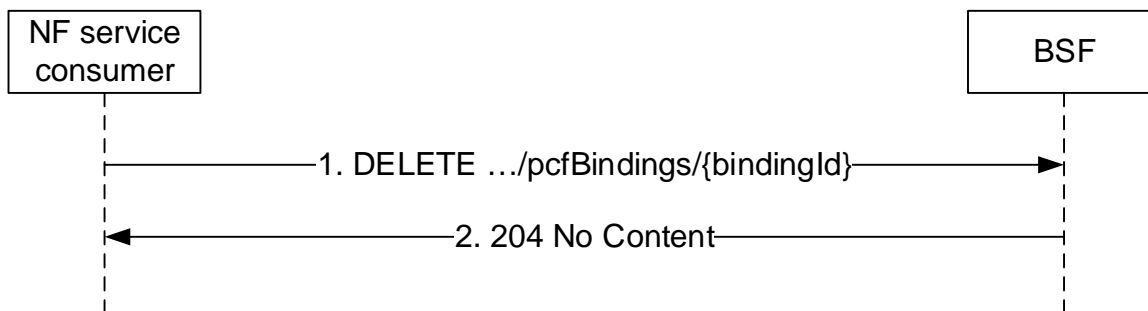


Figure 4.2.3.2-1: Session Binding Information Deregistration

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 event subscriptionId of the existing subscription that is to be deleted..

Upon the 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 request message from the NF service consumer is accepted, the BSF shall respond with "204 No Content". If the Individual PCF Session Binding resource does not exist, the BSF shall respond with "404 Not Found".

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 selected PCF ID.

4.2.4.2 Retrieve the PCF Session binding information for a given tuple

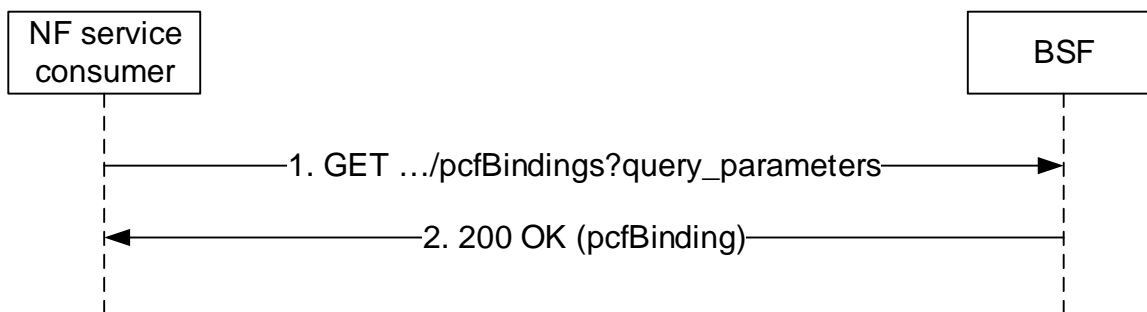


Figure 4.2.4.2-1: NF service consumer retrieve the PCF Session binding information for a given tuple

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

- UE address(es); or
- the tuple UE address, DNN, S-NNSAI; or
- the tuple SUPI, DNN, S-NNSAI; or
- the tuple GPSI, DNN, S-NNSAI; or
- the tuple UE address, DNN, SUPI/GPSI, S-NNSAI.

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

- search the corresponding binding information.

If the HTTP request message from the NF service consumer is accepted, the BSF shall respond the PCF id within the pcfBinding data structure with "200 OK". If the PCF Session Binding resource does not exist, the BSF shall respond with "404 Not Found".

5 Nbsf_Management Service API

5.1 Introduction

The Nbsf_management Service shall use the Nbsf_management API.

The request URI used in each HTTP request from the NF service consumer towards the BSF shall have the structure defined in subclause 4.4.1 of 3GPP TS 29.501 [2], i.e.:

{apiRoot}/{apiName}/{apiVersion}/{apiSpecificResourceUriPart}

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [2].
- 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 7159 [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].

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.

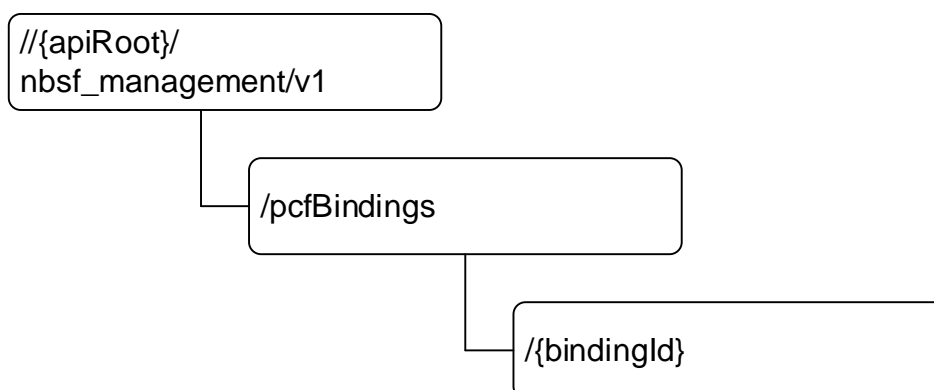


Figure 5.3.1-1: Resource URI structure of the Nbsf_Management API

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 IP address in BSF.
		GET	Retrieve the Session binding PCF ID or address of a given tuple (UE IP address(es), SUPI; GPSI, DNN, snssai).
Individual PCF Session Binding	{apiRoot}/nbsf-management/v1/pcfBindings/{bindingId}	DELETE	Deregister existing PCF Session binding information from 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 IP addresses registered in the BSF.

5.3.2.2 Resource definition

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

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	Definition
apiRoot	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..2	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
n/a			201 Created	The creation of an individual PCF session binding.

5.3.2.3.2 GET

This method shall support the URI query parameters specified in table 5.3.3.3.1-1.

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

Name	Data type	P	Cardinality	Description
ipv4Addr	Ipv4Add	C	0..1	The IPv4 Address of the served UE.
ipv6Prefix	Ipv6Prefix	C	0..1	The Ipv6 Address Prefix of the served UE.
macAddr48	MacAddr48	C	0..1	The MAC Address of the served UE.
dnn	Dnn	C	0..1	DNN
supi	Supi	C	0..1	Subscription Permanent Identifier
gpsi	Gpsi	C	0..1	Generic Public Subscription Identifier
snssai	Snssai	C	0..1	The identification of slice.

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 5.3.2.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.3.2.3.1-3: 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 session binding information resource matching the query parameter(s) is returned.
n/a			404 Not Found	If the PCF Session Binding resource does not exist, the BSF shall respond with "404 Not Found".

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 IP addresses registered in the BSF.

5.3.3.2 Resource definition

Resource URI: {apiRoot}/nbsf-management/v1/pcfBidings/{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	Definition
apiRoot	See subclause 5.1

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
bindingId	string	M	1	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 [2].

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

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 N_{bsf} service based interface protocol.

Table 5.6.1-1: N_{bsf} specific Data Types

Data type	Section defined	Description	Applicability
PcfBinding	5.6.2.2	Identifies an Individual PCF binding.	

Table 5.6.1-2 specifies data types re-used by the N_{bsf} 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 N_{bsf} service based interface.

Table 5.6.1-2: N_{bsf} re-used Data Types

Data type	Reference	Comments	Applicability
DiameterIdentity	3GPP TS 29.571 [10]		
Dnn	3GPP TS 29.571 [10]		
Gpsi	3GPP TS 29.571 [10]		
Ipv4Addr	3GPP TS 29.571 [10]		
Ipv6Prefix	3GPP TS 29.571 [10]		
MacAddr48	3GPP TS 29.571 [10]		
NfInstanceId	3GPP TS 29.571 [10]		
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.

Allowed structures are: array, object.

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	C	0..1	Subscription Permanent Identifier	
gpsi	Gpsi	C	0..1	Generic Public Subscription Identifier	
ipv4Addr	Ipv4Addr	C	0..1	The IPv4 Address of the served UE. (NOTE)	
ipv6Prefix	Ipv6Prefix	C	0..1	The Ipv6 Address Prefix of the served UE. (NOTE)	
macAddr48	MacAddr48	C	0..1	The MAC Address of the served UE.	
dnn	Dnn	C	0..1	DNN	
pcfSvcId	NfInstanceId	M	1	String uniquely identifying the PCF service instance.	
pcfDiamHost	DiameterIdentity	C	0..1	The diameter host for an individual PCF with Diameter interface..	
pcfDiamRealm	DiameterIdentity	C	0..1	The diameter realm for an individual PCF with Diameter interface..	
snssai	Snssai	C	0..1	The identification of slice.	

NOTE: At least one of ipv4Addr, ipv6Prefix and macAddr48 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			

5.7 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 [2]. 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
BINDING_INFORMATION_NOT_FOUND	404 Not Found	Indicates that the modification has failed because the specified PCF Session Bindings or Individual PCF Session Binding does not exist. (NOTE)
NOTE: This application error is included in the responses to the GET and the DELETE requests.		

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

Annex A (normative): OpenAPI specification

A.1 General

This clause shall describe the purpose of the Annex.

A.2 Nbsf_Management API

Annex B (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	CT3#98	CP-181031				TS sent to plenary for approval.	1.0.0
2018-06	CT3#98	CP-181031				TS approved by plenary	15.0.0