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Contents

Foreword

This Technical Specification has been produced by the 3rd 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 9113: "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 Specification Version 3.0.0", https://spec.openapis.org/oas/v3.0.0.

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

[13] IETF RFC 9457: "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 DDNMF	5G Direct Discovery Name Management Function
5G-RG	5G Residential Gateway
AF	Application Function
AM	Access and Mobility Management
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
MBSF	Multicast/Broadcast Service Function
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
TSCTSF	Time Sensitive Communication and Time Synchronization Function
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 to provide:

- a PCF for a PDU session binding functionality, which ensures that a request for a certain PDU Session reaches the relevant PCF holding that PDU Session information, or ensures that the same PCF is selected for multiple PDU sessions.
- a PCF for an MBS session binding functionality, which ensures that for location-dependent MBS services, a request for a certain MBS Session reaches the relevant PCF holding that MBS Session information.
- a PCF for a UE binding functionality, which ensures that a request for Access and Mobility related Policy Authorization for a UE reaches the relevant PCF for a UE.
- Subscription to notification events about a newly registered or deregistered PCF for a UE or PCF for a PDU session.

This service:

- allows NF service consumers to register, update and remove binding information;
- allows NF service consumers to retrieve binding information;
- allows NF service consumers to subscribe to notifications of registration/deregistration events of newly registered or deregistered PCF for a UE or PCF for a PDU session.

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).

The known consumers of the Nbsf_Management service are:

- Policy Control Function (PCF);
- Network Exposure Function (NEF);
- Application Function (AF);
- Multicast/Broadcast Service Function (MBSF);
- 5G Direct Discovery Name Management Function (5G DDNMF);
- Network Data Analytics Function (NWDAF); and
- Time Sensitive Communication and Time Synchronization Function (TSCTSF).

As described in 3GPP TS 23.503 [4], the BSF is a function that can be deployed standalone or as a 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 for a PDU session address. DRA and BSF coexistence is described in 3GPP TS 29.513 [5], Annex A.

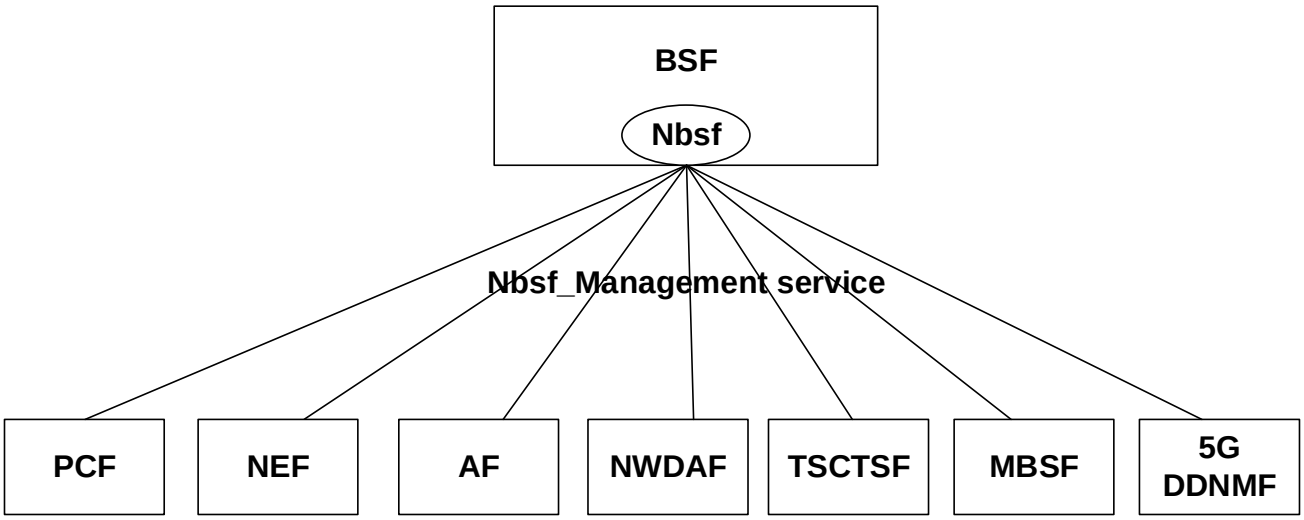

Figure 4.1.2-1: Reference Architecture for the Nbsf_Management service; SBI representation

NOTE 3: The PCF in the figure represents both, the PCF for a UE and the PCF for a PDU session. The PCF for a UE and the PCF for a PDU session separately and independently register themselves at the BSF, regardless they are deployed in the same NF instance or separately in different NF instances. In the case of the PCF for a UE, the NF service consumer can be a V-PCF for a UE, which queries the BSF in the HPLMN to discover and select the same H-PCF for the UE that is serving the UE in the HPLMN.

4.1.3 Network Functions

4.1.3.1 Binding Support Function (BSF)

The BSF:

- stores the binding information for a certain PDU Session;
- stores the binding information for a certain MBS Session;
- stores the binding information for a certain UE;
- enables the subscription to notifications of PCF for a PDU session registration/deregistration events;
- enables the subscription to notifications of PCF for a UE registration/deregistration events; and
- enables the discovery of binding information (e.g. the address information of the selected PCF for a PDU session).

The BSF allows NF service consumers (e.g. PCF) to register, update and remove a binding information, and allows NF service consumers (e.g. AF, NEF, NWDAF) to discover a binding information (e.g. the address information of the selected PCF). The BSF also allows NF service consumers (e.g. PCF for a UE, AF, NEF) to subscribe to notifications of PCF registration/deregistration events.

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

4.1.3.2 NF Service Consumers

The Policy Control Function (PCF):

- The PCF for a PDU session:

  a. registers 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;

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

c. removes 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; and

d. discovers the PCF for a UE in the BSF by using the Nbsf_Management_Discovery service operation.

- The PCF for an MBS session:

a. registers binding information in the BSF for an MBS session;

b. updates binding information in the BSF for the MBS session;

c. removes binding information in the BSF for the MBS session.

- The PCF for a UE:

a. registers binding information in the BSF for a UE when an AM/UE Policy Association is established;

b. updates binding information in the BSF when a new PCF instance for a UE is selected;

c. removes binding information in the BSF when the AM/UE Policy Association is terminated; and

d. subscribes with the BSF to notification of registration/deregistration events of the PCF for a PDU session; and

e. (when it is a V-PCF for a UE) discovers the H-PCF for a UE by using the Nbsf_Management_Discovery service operation.

The Network Exposure Function (NEF):

- provides 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 for a PDU session, the selected PCF for an MBS Session (if applicable) or the selected PCF for a UE by using the Nbsf_Management_Discovery service operation and the selected PCF for a UE by using the Nbsf_Management_Subscribe/Notify service operations.

The Application Function (AF):

- discovers the selected PCF for a PDU session, the selected PCF for an MBS Session (if applicable) or the selected PCF for a UE by using the Nbsf_Management_Discovery service operation and the selected PCF for a UE by using the Nbsf_Management_Subscribe/Notify service operations when it is allowed to interact directly with the policy framework for policy control.

The Network Data Analytics Function (NWDAF):

- discovers the selected PCF for a PDU session by using the Nbsf_Management_Discovery service operation.

The Time Sensitive Communication and Time Synchronization Function (TSCTSF)

- discovers the selected PCF for a PDU session by using the Nbsf_Management_Discovery service operation and the selected PCF for a UE by using Nbsf_Management_Subscribe/Notify service operations when it is allowed to interact with the policy framework for time sensitive communication and time synchronization control.

The Multicast/Broadcast Service Function (MBSF):

- discovers the selected PCF for an MBS session by using the Nbsf_Management_Discovery service operation.

The 5G Direct Discovery Name Management Function (5G DDNMF):

- discovers the selected PCF for a UE by using the Nbsf_Management_Subscribe/Notify service operations.

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 PDU session or an MBS session or a UE.	NF service consumer (PCF)
Nbsf_Management_Deregister	This service operation is used to deregister the binding information for a PDU session or an MBS session or a UE.	NF service consumer (PCF)
Nbsf_Management_Discovery	This service operation is used by an NF service consumer to discover a selected PCF for a PDU session or a selected PCF for an MBS session or a selected PCF for a UE.	NF service consumer (NEF, AF, NWDAF, MBSF, TSCTSF, PCF)
Nbsf_Management_Update	This service operation is used to update an existing binding information for a PDU session or an MBS session or a UE.	NF service consumer (PCF)
Nbsf_Management_Subscribe	This service operation is used by an NF service consumer to subscribe or to modify a subscription for event notifications of PCF for the UE or PCF for the PDU session binding related events.	NF service consumer (NEF, AF, PCF, TSCTSF, 5G DDNMF)
Nbsf_Management_Unsubscribe	This service operation is used by an NF service consumer to terminate a previous subscription.	NF service consumer (NEF, AF, PCF, TSCTSF, 5G DDNMF)
Nbsf_Management_Notify	This service operation is used by the BSF to notify binding related event(s) to the NF service consumer which has subscribed to such event(s).	BSF

4.2.2 Nbsf_Management_Register Service Operation

4.2.2.1 General

This service operation allows a NF service consumer (e.g. PCF for a PDU session) 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 the NF service consumer (e.g. PCF for a PDU session) receives a new UE address (e.g. IPv6 prefix) and has already registered session binding information for this PDU session, the NF service consumer (e.g. PCF for a PDU session) shall register a new session binding information in the BSF.

If the SamePcf feature or the ExtendedSamePcf feature is supported, this service operation allows the NF service consumer (e.g. PCF for a PDU session) to check whether PCF addressing information for Npcf_SMPolicyControl service is already registered in the BSF by another PCF for a combination of the UE ID, DNN and S-NSSAI parameters of the PDU session.

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

In addition, this service operation also allows a NF service consumer (e.g. PCF for an MBS session) to register the session binding information for an MBS Session at the BSF, by providing the MBS Session ID, the identifier of the selected PCF for the MBS Session and the related information (e.g. PCF (service) set information), and the BSF stores the information.

The following procedures using the Nbsf_Management_Registration service operation are supported:

- Register a new PCF for a PDU Session binding information.

- Register a new PCF for a UE binding information.
- Register a new PCF for an MBS Session binding information.

4.2.2.2 Register a new PCF for a PDU Session binding information

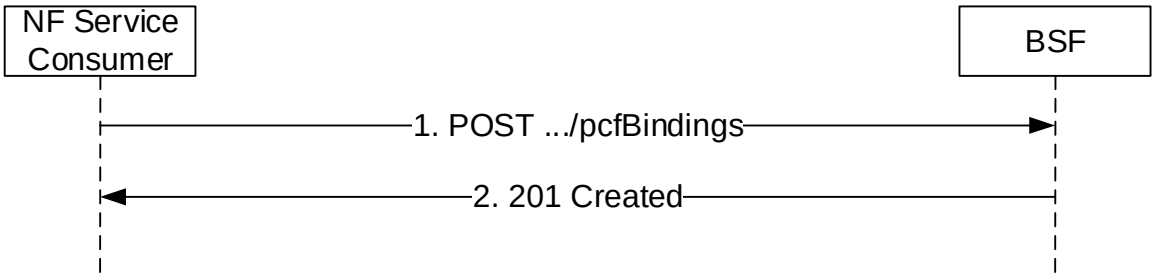

Figure 4.2.2.2-1: NF service consumer register a new PCF for a PDU Session binding information

The NF service consumer shall invoke the Nbsf_Management_Register service operation to register the PDU session binding information for a UE in the BSF. The NF service consumer shall send for this an HTTP POST request with "{apiRoot}/nbsf-management/<apiVersion>/pcfBindings" as Resource URI representing the "PCF for a PDU Session Bindings", as shown in figure 4.2.2.2-1, step 1, to create a binding information for an "Individual PCF for a PDU Session Binding" according to the information (e.g. UE address(es), SUPI, GPSI, DNN, S-NSSAI) in the message body. When the "ExtendedSamePcf" feature is not supported, the "PcfBinding" data structure provided in the request body shall include:

- if the "MultiUeAddr" feature is not supported or 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 /64 encoded as "ipv6Prefix" attribute; and/or

NOTE 1: IPv6 prefix shorter than /64 are received when IPv6 Prefix Delegation applies, as specified in 3GPP TS 29.512 [21]. The /128 IPv6 address applies to wireline and wireless convergence, as described in 3GPP TS 29.512 [21], clause C.2.1.6.

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

NOTE 2: Additional /128 IPv6 addresses and additional IPv6 prefixes shorter than /64 apply for wireline and wireless convergence, as specified in 3GPP TS 29.512 [21], clause C.2.1.6.

  (ii) the MAC address encoded as "macAddr48" attribute and/or the additional MAC addresses encoded as "addMacAddrs" 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;
- S-NSSAI encoded as "snssai" attribute; and
- If the "SamePcf" feature defined in clause 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 if the PCF registers the binding information for the indicated parameter combination for the first time.

NOTE 3: When the "SamePcf" feature is supported, the PCF omits the "paraCom" attribute when creates the corresponding binding information related to the subsequent PDU sessions for the same parameter combination.

and may include:

- SUPI encoded as "supi" attribute;
- GPSI encoded as "gpsi" attribute;

- IPv4 address domain encoded as "ipDomain" attribute; and
- 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 for IPv6.

When the "TimeSensitiveNetworking" feature or the "TimeSensitiveCommunication" feature is supported by the PCF as defined in clause 5.8 of 3GPP TS 29.512 [21], and for Ethernet type of PDU sessions, the address information of the served UE contains the MAC address of the DS-TT port encoded in the "macAddr48" attribute as received by the PCF when the SMF reports the bridge information of the detected TSC user plane node.

NOTE 4: For the integration with time sensitive communication networks using IP type of applications, the address information of the served UE contains the UE IP address of the corresponding PDU session.

When the "ExtendedSamePcf" feature is supported the address information of the served UE may be provided if available, i.e., the "ipv4Addr", the "ipv6Prefix" and/or "addIpv6Prefixes" attributes or the "macAddr48" and/or "addMacAddrs" attributes may be provided if available.

When the "ExtendedSamePcf" feature is supported the PCF address for the Npcf_PolicyAuthorization and/or Rx interface may be provided if available, i.e., the "pcfFqdn" and/or the "pcfIpEndPoints" attributes, and/or the "pcfDiamHost" and/or the "pcfDiamRealm" attributes may be provided if available.

NOTE 5: Before requesting the BSF to check if there is an existing PCF binding information for the same UE ID, S-NSSAI and DNN combination registered by other PCF(s), the PCF determines whether the BSF supports the "SamePcf" and/or "ExtendedSamePcf" features either via local configuration or by checking the BSF profile retrieved from the NRF as specified in 3GPP TS 29.510 [12].

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