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1 Scope

The present document specifies the stage 3 protocol and data model for the Nsmf Service Based Interface. It provides stage 3 protocol definitions and message flows, and specifies the API for each service offered by the SMF other than the Session Management Event Exposure service.

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [4] and 3GPP TS 29.501 [5].

The Session Management Event Exposure Service is specified in 3GPP TS 29.508 [6].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

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- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".
- [3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".
- [4] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".
- [5] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".
- [6] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".
- [7] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".
- [8] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".
- [9] 3GPP TS 38.413: "NG Radio Access Network (NG-RAN); NG Application Protocol (NGAP)".
- [10] IETF RFC 2387: "The MIME Multipart/Related Content-type".
- [11] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".
- [12] IETF RFC 2045: "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies".
- [13] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".
- [14] IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".
- [15] OpenAPI Initiative, "OpenAPI 3.0.0 Specification", <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md>.
- [16] 3GPP TS 29.274: "3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".
- [17] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

- [18] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".
- [19] 3GPP TS 29.510: "Network Function Repository Services; Stage 3".
- [20] 3GPP TS 29.518: "5G System; Access and Mobility Management Service; Stage 3".
- [21] 3GPP TS 23.380: "IMS Restoration Procedures".
- [22] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace; Trace control and configuration management".
- [23] IETF RFC 7807: "Problem Details for HTTP APIs".
- [24] 3GPP TS 23.527: "5G System; Restoration Procedures".
- [25] 3GPP TS 32.255: "Charging management; 5G data connectivity domain charging; stage 2".
- [26] 3GPP TS 32.291: "Charging management; 5G system, charging service; Stage 3".
- [27] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".
- [28] 3GPP TR 21.900: "Technical Specification Group working methods".

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].

| | |
|------|-----------------------------|
| DNN | Data Network Name |
| HR | Home Routed |
| JSON | Javascript Object Notation |
| LADN | Local Area Data Network |
| SM | Session Management |
| SMF | Session Management Function |

4 Overview

4.1 Introduction

Within the 5GC, the SMF offers services to the AMF, other SMF (V-SMF or H-SMF), PCF and NEF via the Nsmf service based interface (see 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3]).

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

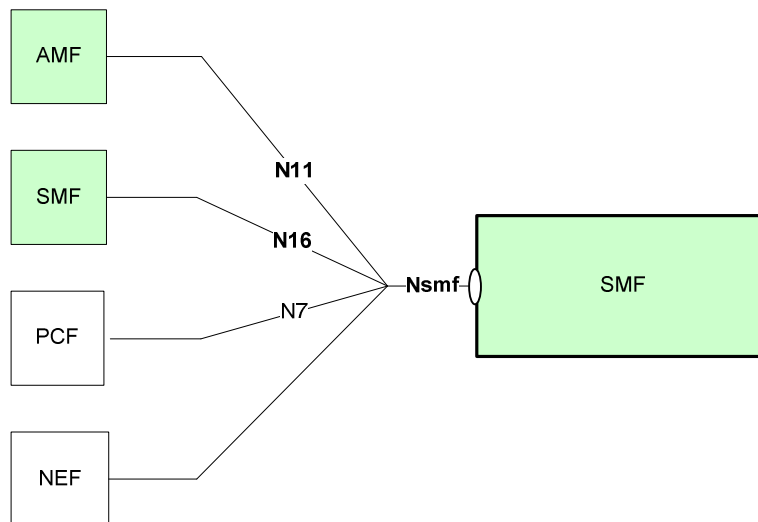


Figure 4.1-1: Reference model – SMF

The functionalities supported by the SMF are listed in clause 6.2.2 of 3GPP TS 23.501 [2].

5 Services offered by the SMF

5.1 Introduction

The SMF supports the following services.

Table 5.1-1: NF Services provided by SMF

| Service Name | Description | Example Consumer |
|--------------------|---|-------------------|
| Nsmf_PDUSession | This service manages the PDU sessions and uses the policy and charging rules received from the PCF. The service operations exposed by this NF service allows the consumer NFs to establish, modify and delete the PDU sessions. | V-SMF, H-SMF, AMF |
| Nsmf_EventExposure | This service exposes the events happening on the PDU sessions to the consumer NFs. | PCF, NEF, AMF |

The Nsmf_EventExposure service is specified in 3GPP TS 29.508 [6].

5.2 Nsmf_PDUSession Service

5.2.1 Service Description

The Nsmf_PDUSession service operates on the PDU Sessions. The service operations exposed by this service allow other NFs to establish, modify and release the PDU Sessions. The following are the key functionalities of this NF service:

- Creation, modification and deletion of SM contexts for PDU Sessions upon receiving N1 message notification from AMF carrying the NAS SM messages; an SM context represents an association between the NF Service Consumer (e.g. AMF) and the SMF for a PDU session;
- Retrieval of SM contexts of PDU sessions, e.g. to move PDU sessions towards the EPC using the N26 interface;
- Creation, modification and deletion of PDU sessions between the V-SMF and H-SMF, in HR roaming scenarios;

- Association of policy and charging rules with PDU Sessions and binding the policy and charging rules to flows;
- Interacting with the UPF over N4 for creating, modifying and releasing user plane sessions;
- Process user plane events from the UPF and apply the corresponding policy and charging rules.

The Nsmf_PDUSession service supports the following service operations.

Table 5.2.1-1: Service operations supported by the Nsmf_PDUSession service

| Service Operations | Description | Operation Semantics | Example Consumer(s) |
|--|--|---------------------|---------------------|
| Create SM Context | Create an SM context in SMF, or in V-SMF in HR roaming scenarios, for a PDU session. | Request/Response | AMF |
| Update SM Context | Update the SM context of a PDU session and/or provide the SMF with N1 or N2 SM information received from the UE or from the AN. | Request/Response | AMF |
| Release SM Context | Release the SM context of a PDU session when the PDU session has been released. | Request/Response | AMF |
| Notify SM Context Status (see NOTE 1) | Notify the NF Service Consumer about the status of an SM Context of a PDU session (e.g. the SM Context is released within the SMF). | Subscribe/Notify | AMF |
| Retrieve SM Context (see NOTE 2) | Retrieve an SM context of a PDU session from SMF, or from V-SMF in HR roaming scenarios, for 5GS to EPS mobility. | Request/Response | AMF |
| Create | Create a PDU session in the H-SMF, in HR roaming scenarios. | Request/Response | V-SMF |
| Update | Update a PDU session in the H-SMF or V-SMF, in HR roaming scenarios. | Request/Response | V-SMF, H-SMF |
| Release | Release a PDU session in the H-SMF, in HR roaming scenarios. | Request/Response | V-SMF |
| Notify Status (see NOTE 3) | Notify the NF Service Consumer about the status of a PDU session (e.g. the PDU session is released due to local reasons within the H-SMF). | Subscribe/Notify | V-SMF |
| NOTE 1: This corresponds to the SMContextStatusNotify service operation defined in 3GPP TS 23.502 [3]. | | | |
| NOTE 2: This corresponds to the ContextRequest service operation defined in 3GPP TS 23.502 [3]. | | | |
| NOTE 3: This corresponds to the StatusNotify service operation defined in 3GPP TS 23.502 [3]. | | | |

5.2.2 Service Operations

5.2.2.1 Introduction

See Table 5.2.1-1 for an overview of the service operations supported by the Nsmf_PDUSession service.

5.2.2.2 Create SM Context service operation

5.2.2.2.1 General

The Create SM Context service operation shall be used to create an individual SM context, for a given PDU session, in the SMF, or in the V-SMF for HR roaming scenarios.

It is used in the following procedures:

- UE requested PDU Session Establishment (see clause 4.3.2 of 3GPP TS 23.502 [3]);
- EPS to 5GS Idle mode mobility or handover using N26 interface (see clause 4.11.1 of 3GPP TS 23.502 [3]);
- EPS to 5GS mobility without N26 interface (see clause 4.11.2.3 3GPP TS 23.502 [3]);

- Handover of a PDU session between 3GPP access and non-3GPP access, when the target AMF does not know the SMF resource identifier of the SM context used by the source AMF, e.g. when the target AMF is not in the PLMN of the N3IWF (see clause 4.9.2.3.2 of 3GPP TS 23.502 [3]), or when the UE is roaming and the selected N3IWF is in the HPLMN (see clause 4.9.2.4.2 of 3GPP TS 23.502 [3]);
- Handover from EPS to 5GC-N3IWF (see clause 4.11.3.1 of 3GPP TS 23.502 [3]);
- Handover from EPC/ePDG to 5GS (see clause 4.11.4.1 of 3GPP TS 23.502 [3]).

There shall be only one individual SM context per PDU session.

The NF Service Consumer (e.g. AMF) shall create an SM context by using the HTTP POST method as shown in Figure 5.2.2.2.1-1.

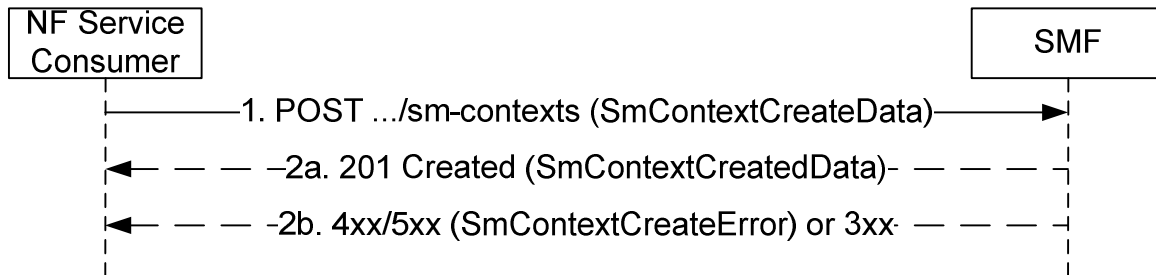


Figure 5.2.2.2.1-1: SM context creation

1. The NF Service Consumer shall send a POST request to the resource representing the SM contexts collection resource of the SMF. The payload body of the POST request shall contain:
 - a representation of the individual SM context resource to be created;
 - the Request Type IE, if it is received from the UE and if the request refers to an existing PDU session or an existing Emergency PDU session, the Request Type IE may be included otherwise;
 - the Old PDU Session ID, if it is received from the UE (i.e. for a PDU session establishment for the SSC mode 3 operation);
 - the indication that the UE is inside or outside of the LADN (Local Area Data Network) service area, if the DNN corresponds to a LADN;
 - a subscription for SM context status notification;
 - the servingNfId identifying the serving AMF;
 - trace control and configuration parameters, if trace is to be activated (see 3GPP TS 32.422 [22]).

For the UE requested PDU Session Establishment procedure in home routed roaming scenario (see clause 4.3.2.2.2 of 3GPP TS 23.502 [3]), the NF Service Consumer shall provide the URI of the Nsmf_PDUSession service of the H-SMF in the hSmfUri IE and may provide the URI of the Nsmf_PDUSession service of additional H-SMFs. The V-SMF shall try to create the PDU session using the hSmfUri IE. If due to communication failure on the N16 interface the V-SMF does not receive any response from the H-SMF, then:

- depending on operator policy, the V-SMF may try reaching the hSmfUri via an alternate path; or
- if additional H-SMF URI is provided, the V-SMF may try to create the PDU session on one of the additional H-SMF(s) provided.

The payload body of the POST request may further contain:

- the name of the AMF service to which SM context status notification are to be sent (see clause 6.5.2.2 of 3GPP TS 29.500 [4]), encoded in the serviceName attribute.

- 2a. On success, "201 Created" shall be returned, the payload body of the POST response shall contain the representation describing the status of the request and the "Location" header shall be present and shall contain the URI of the created resource. The authority and/or deployment-specific string of the apiRoot of the created