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Contents

Intellectual Property Rights	2
Foreword.....	2
Modal verbs terminology.....	2
Foreword.....	5
1 Scope	6
2 References	6
3 Definitions and abbreviations.....	6
3.1 Definitions	6
3.2 Abbreviations	7
4 Overview	7
5 Services offered by the SMSF.....	7
5.1 Introduction	7
5.2 Nsmsf_SMSService Service	7
5.2.1 Service Description.....	7
5.2.2 Service Operations	8
5.2.2.1 Introduction.....	8
5.2.2.2 Activate	8
5.2.2.2.1 General	8
5.2.2.2.2 Registration procedure using Activate service operation	8
5.2.2.3 Deactivate.....	9
5.2.2.3.1 General	9
5.2.2.3.2 De-Registration procedure using Deactivate service operation	9
5.2.2.4 UplinkSMS.....	9
5.2.2.4.1 General	9
5.2.2.4.2 Procedures of sending SMS payload in uplink direction using UplinkSMS service operation.....	10
6 API Definitions	10
6.1 Nsmsf_SMSService Service API	10
6.1.1 API URI.....	10
6.1.2 Usage of HTTP	10
6.1.2.1 General	10
6.1.2.2 HTTP standard headers	10
6.1.2.2.1 General	10
6.1.2.2.2 Content type	11
6.1.2.3 HTTP custom headers	11
6.1.2.3.1 General	11
6.1.2.4 HTTP multipart messages	11
6.1.3 Resources.....	11
6.1.3.1 Overview	11
6.1.3.2 Resource: UEContexts	12
6.1.3.2.1 Description	12
6.1.3.2.2 Resource Definition.....	12
6.1.3.2.3 Resource Standard Methods	13
6.1.3.3 Resource: UEContext.....	13
6.1.3.3.1 Description	13
6.1.3.3.2 Resource Definition.....	13
6.1.3.3.3 Resource Standard Methods	13
6.1.3.3.3.1 PUT.....	13
6.1.3.3.3.2 DELETE	14
6.1.3.3.4 Resource Custom Operations	15
6.1.3.3.4.1 Overview.....	15
6.1.3.3.4.2 Operation: sendsms	15
6.1.3.3.4.2.1 Description	15
6.1.3.3.4.2.2 Operation Definition	15

6.1.4	Custom Operations without associated resources	15
6.1.5	Notifications	15
6.1.6	Data Model	16
6.1.6.1	General	16
6.1.6.2	Structured data types	16
6.1.6.2.1	Introduction	16
6.1.6.2.2	Type: UeSmsContextData	17
6.1.6.2.3	Type: SmsRecordData	17
6.1.6.2.4	Void	17
6.1.6.2.5	Type: SmsRecordDeliveryData	18
6.1.6.3	Simple data types and enumerations	18
6.1.6.3.1	Introduction	18
6.1.6.3.2	Simple data types	18
6.1.6.3.3	Enumeration: SmsDeliveryStatus	18
6.1.6.4	Binary data	18
6.1.6.4.1	Introduction	18
6.1.6.4.2	SMS Payload Information	18
6.1.7	Error Handling	19
6.1.7.1	General	19
6.1.7.2	Protocol Errors	19
6.1.7.3	Application Errors	19
6.1.8	Feature negotiation	19
6.1.9	Security	19
Annex A (normative): OpenAPI specification.....		20
A.1	General	20
A.2	Nsmsf_SMSService API	20
Annex B (Informative): HTTP Multipart Messages.....		24
B.1	Example of HTTP multipart message	24
B.2	OpenAPI specification of multipart body	24
Annex C (informative): Change history		25
History		26

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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 SMSF.

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

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

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
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- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".
- [3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".
- [4] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".
- [5] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".
- [6] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".
- [7] IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".
- [8] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".
- [9] IETF RFC 2387: "The MIME Multipart/Related Content-type".
- [10] IETF RFC 2045: "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies".
- [11] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS)".
- [12] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".
- [13] 3GPP TS 33.501: "Security architecture and procedures for 5G system".
- [14] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".
- [15] 3GPP TS 29.510: "Network Function Repository Services; Stage 3".

3 Definitions and abbreviations

3.1 Definitions

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

3.2 Abbreviations

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

5GC	5G Core Network
AMF	Access Management Function
JSON	Javascript Object Notation
SMSF	SMS Function

4 Overview

Within the 5GC, the SMSF offers services to the AMF via the Nsmsf service based interface (see 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3]).

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

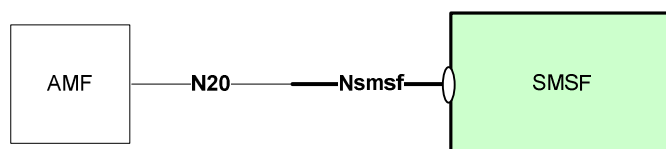


Figure 4-1: Reference model – SMSF

The functionalities supported by the SMSF are listed in subclause 6.2.13 of 3GPP TS 23.501 [2].

The services and service operations provided by the Nsmsf interface are listed in subclause 5.2.9 of 3GPP TS 23.502 [3].

5 Services offered by the SMSF

5.1 Introduction

The SMSF supports the following services.

Table 5.1-1: NF Services provided by SMSF

Service Name	Description	Example Consumer
Nsmsf_SMSService	This service allows AMF to authorize SMS and activate SMS for the served user on SMSF.	AMF

5.2 Nsmsf_SMSService Service

5.2.1 Service Description

The Nsmsf_SMSService service provides the service capability for the NF Service Consumer (e.g. AMF) to authorize SMS and activate SMS for a service user on SMSF. The following are the key functionalities of this NF service:

- Activation or deactivation of SMS service for a given service user, which results in creating/updating/deleting an UE Context for SMS in SMSF;
- Send SMS payload in uplink direction to SMSF;

The Nsmsf_SMSservice service supports the following service operations.

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

Service Operations	Description	Operation Semantics	Example Consumer(s)
Activate	Activate SMS service for a given service user, which results in creating or updating a UE Context for SMS in SMSF.	Request/Response	AMF
Deactivate	Deactivate SMS service for a given service user, which results in deleting a UE Context for SMS in SMSF.	Request/Response	AMF
UplinkSMS	Send SMS payload in uplink direction to SMSF;	Request/Response	AMF

5.2.2 Service Operations

5.2.2.1 Introduction

This subclause introduces the related procedures using Nsmsf_SMSservice service operations for supporting SMS service.

5.2.2.2 Activate

5.2.2.2.1 General

The Activate service operation shall be used by the NF Service Consumer (e.g. AMF) to activate SMS service for a given service user, which results in creating or updating an individual UE Context for SMS in the SMSF, in the following procedures:

- Registration Procedure for SMS over NAS (see subclause 4.13.3.1 of 3GPP TS 23.502 [3]);
- Registration Update Procedure for SMS over NAS due to AMF change (see subclause 4.13.3.1 of 3GPP TS 23.502 [3]);

There shall be only one individual UE Context for SMS per service user.

5.2.2.2.2 Registration procedure using Activate service operation

The NF Service Consumer (e.g. AMF) shall activate SMS service for a given service user by using the HTTP PUT method as shown in Figure 5.2.2.2.2-1.

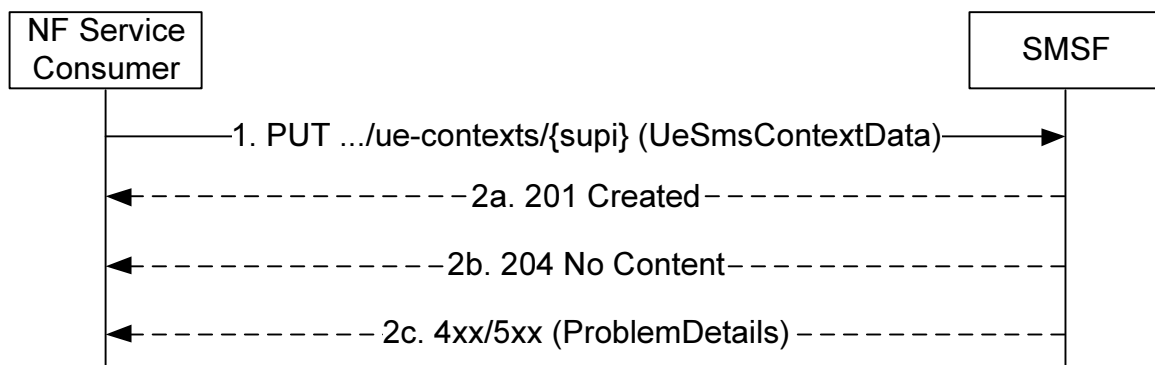


Figure 5.2.2.2.2-1: Activation of SMS service

1. The NF Service Consumer (e.g. AMF) shall send a PUT request to the resource representing the UE Context for SMS (i.e. .../ue-contexts/{supi}) in the SMSF to activate SMS service for a given service user. The payload body of the PUT request shall contain a representation of the individual UE Context resource to be created or updated.

Depending on whether the target UE Context for SMS has already been created, the SMSF performs 2a or 2b:

- 2a. If the target UE Context for SMS is not created in SMSF, the SMSF retrieves subscription data from the UDM, performs service authorization for the given UE, and create UE Context for SMS for this UE;

If successful, "201 Created" shall be returned, the payload body of the POST response shall contain the representation of the created resource and the "Location" header shall contain the URI of the created resource.

- 2b. If the target UE Context for SMS has already been created, the SMSF updates the UE Context for SMS with the NF Service Consumer (e.g. AMF) provided parameters.

If successful, "204 No Content" shall be returned.

- 2c. On failure, the appropriate HTTP status code (e.g. "403 Forbidden") indicating the error shall be returned.

A ProblemDetails IE shall be included in the payload body of PUT response, with the "cause" attribute of ProblemDetails set to application error codes specified in table 6.1.7.3-1.

5.2.2.3 Deactivate

5.2.2.3.1 General

The Deactivate service operation shall be used by the NF Service Consumer (e.g. AMF) to deactivate SMS service for a given service user, which results in deleting an individual UE Context for SMS in the SMSF, in the following procedures:

- De-Registration Procedure for SMS over NAS (see subclause 4.13.3.2 of 3GPP TS 23.502 [3]);

5.2.2.3.2 De-Registration procedure using Deactivate service operation

The NF Service Consumer (e.g. AMF) shall deactivate SMS service for a given service user by using the HTTP DELETE method as shown in Figure 5.2.2.3.2-1.

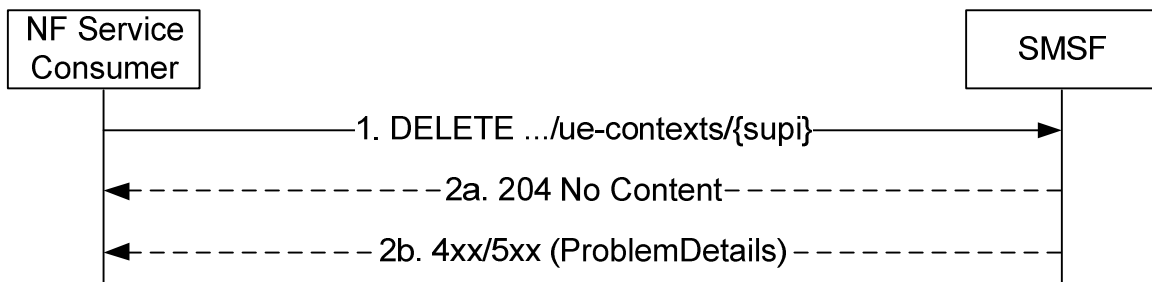


Figure 5.2.2.3.2-1: Deactivation of SMS service

1. The NF Service Consumer (e.g. AMF) shall send a DELETE request to the resource representing the UE Context for SMS (i.e. .../ue-contexts/{supi}) in the SMSF.

- 2a. The SMSF deactivates the SMS service for the service user, and deletes the UE context for SMS from the SMSF.

On success, "204 No Content" shall be returned.

- 2b. On failure, the appropriate HTTP status code (e.g. "403 Forbidden") indicating the error shall be returned.

A ProblemDetails IE shall be included in the payload body of DELETE response, with the "cause" attribute of ProblemDetails set to application error codes specified in table 6.1.7.3-1.

5.2.2.4 UplinkSMS

5.2.2.4.1 General

The UplinkSMS service operation shall be used by NF Service Consumer (e.g. AMF) to send SMS payload (e.g. SMS message or Ack) in the uplink direction to SMSF, in the following procedures:

- MO SMS delivery procedure (see subclause 4.13.3.3-4.13.3.5 of 3GPP TS 23.502 [3]);
- MT SMS delivery procedure (see subclause 4.13.3.6-4.13.3.8 of 3GPP TS 23.502 [3]);

5.2.2.4.2 Procedures of sending SMS payload in uplink direction using UplinkSMS service operation

The NF Service Consumer (e.g. AMF) shall send SMS payload in uplink direction by using the "sendsms" custom operation as shown in Figure 5.2.2.4.2-1.

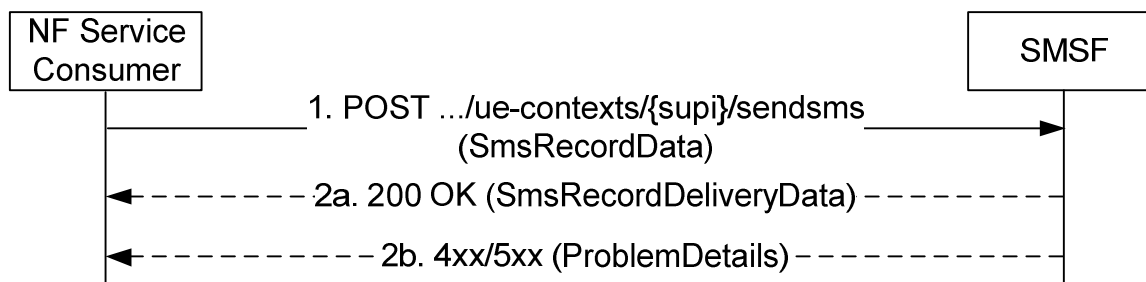


Figure 5.2.2.4.2-1: Send SMS payload in uplink direction

1. The NF Service Consumer (e.g. AMF) shall send a POST request to the resource representing the UEContext (i.e. .../ue-contexts/{supi}/sendsms) of the SMSF. The payload body of the POST request shall contain the SMS record to be sent.
- 2a. On receiving the POST request with SMS payload, the SMSF forwards the SMS payload to SMS-GMSC/IW MSC/IP-SM-GW/SMS Router. The interaction between SMSF and SMS-GMSC/IW MSC/IP-SM-GW/SMS Router is out of the scope of this specification.

If successful, "200 OK" shall be returned. If needed, the payload body of the POST response shall contain the status of SMS record delivery attempts at the SMSF.
- 2b. On failure, the appropriate HTTP status code (e.g. "403 Forbidden") indicating the error shall be returned.

A ProblemDetails IE shall be included in the payload body of POST response, with the "cause" attribute of ProblemDetails set to application error codes specified in table 6.1.7.3-1.

6 API Definitions

6.1 Nsmsf_SMSservice Service API

6.1.1 API URI

URIs of this API shall have the following root:

```
{apiRoot}/{apiName}/{apiVersion}/
```

where the "apiName" shall be set to "nsmsf-sms" and the "apiVersion" shall be set to "v1" for the current version of this specification.

6.1.2 Usage of HTTP

6.1.2.1 General

HTTP/2, as defined in IETF RFC 7540 [7], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

6.1.2.2 HTTP standard headers

6.1.2.2.1 General

The usage of HTTP standard headers is specified in subclause 5.2.2 of 3GPP TS 29.500 [4].

6.1.2.2.2 Content type

The JSON format shall be supported. The use of the JSON format (IETF RFC 8259 [8]) shall be signalled by the content type "application/json". See also subclause 5.4 of 3GPP TS 29.500 [4].

Multipart messages shall also be supported (see subclause 6.1.2.4) using the content type "multipart/related", comprising:

- one JSON body part with the "application/json" content type; and
- one or multiple binary body parts with 3gpp vendor specific content subtypes.

The 3gpp vendor specific content subtypes defined in Table 6.1.2.2.2-1 shall be supported.

Table 6.1.2.2.2-1: 3GPP vendor specific content subtypes

content subtype	Description
vnd.3gpp.sms	Binary encoded payload, encoding SMS payload, as specified in 3GPP TS 23.040 [11] and 3GPP TS 24.011 [12].
NOTE:	Using 3GPP vendor content subtypes allows to describe the nature of the opaque payload (e.g. SMS payload) without having to rely on metadata in the JSON payload.

See subclause 6.1.2.4 for the binary payloads supported in the binary body part of multipart messages.

6.1.2.3 HTTP custom headers

6.1.2.3.1 General

In this release of this specification, no custom headers specific to the Nsmsf_SMSservice service are defined. For 3GPP specific HTTP custom headers used across all service based interfaces, see clause 5.2.3 of 3GPP TS 29.500 [4].

6.1.2.4 HTTP multipart messages

HTTP multipart messages shall be supported, to transfer opaque SMS payload (e.g. SMS message, CP Ack, etc.), in the following service operations (and HTTP messages):

- UplinkSMS service operation;

HTTP multipart messages shall include one JSON body part and one or multiple binary body parts comprising content of SMS payload content (see subclause 6.1.6.4).

The JSON body part shall be the "root" body part of the multipart message. It shall be encoded as the first body part of the multipart message. The "Start" parameter does not need to be included.

The multipart message shall include a "type" parameter (see IETF RFC 2387 [9]) specifying the media type of the root body part, i.e. "application/json".

- NOTE: The "root" body part (or "root" object) is the first body part the application processes when receiving a multipart/related message, see IETF RFC 2387 [9]. The default root is the first body within the multipart/related message. The "Start" parameter indicates the root body part, e.g. when this is not the first body part in the message.

A binary body part shall include a Content-ID header (see IETF RFC 2045 [10]), and the JSON body part shall make a reference to the binary body part using the Content-ID header field.

Examples of multipart/related messages can be found in Annex B.

6.1.3 Resources

6.1.3.1 Overview

The figure 6.1.3.1-1 describes the resource URI structure of the Nsmsf-sms API.

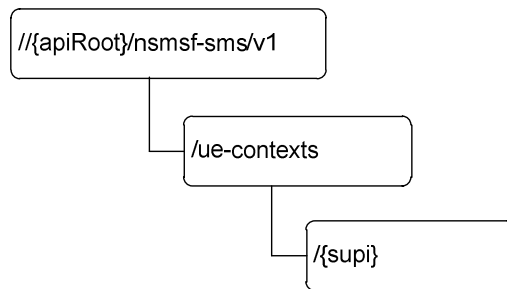


Figure 6.1.3.1-1: Resource URI structure of the nsmsf-sms API

Table 6.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.1.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
UEContexts (Store)	{apiRoot}/nsmsf_sms/v1/ue-contexts	N/A	No HTTP method has been defined for this resource.
UEContext (Document)	{apiRoot}/nsmsf_sms/v1/ue-contexts/{supi}	PUT	It is used for the Activate service operation, for the purpose of: - Activate SMS service for a given UE, which results in creating an individual UE Context resource in SMSF. - Update SMS service parameters for a given UE, which results in updating an existing individual UE Context resource in SMSF.
		DELETE	It is used for the Deactivate service operation, for the purpose of: - Deactivate SMS service for a given UE, which results in deleting an existing individual UE Context resource in SMSF.
		sendsms (POST)	It is used for the UplinkSMS service operation, to allow NF Service Consumer to send SMS payload in uplink direction.

6.1.3.2 Resource: UEContexts

6.1.3.2.1 Description

This resource represents the collection of UE Context for SMS in SMSF.

This resource is modelled with the Store resource archetype (see subclause C.2 of 3GPP TS 29.501 [5]).

No HTTP method has been defined for this resource.

6.1.3.2.2 Resource Definition

Resource URI: {apiRoot}/nsmsf-sms/v1/ue-contexts

This resource shall support the resource URI variables defined in table 6.1.3.2.2-1.

Table 6.1.3.2.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	See subclause 6.1.1

6.1.3.2.3 Resource Standard Methods

No HTTP method has been defined for the UE Context collection resource.

6.1.3.3 Resource: UEContext

6.1.3.3.1 Description

This resource represents an individual UE Context for SMS in SMSF.

This resource is modelled with the Document resource archetype (see subclause C.2 of 3GPP TS 29.501 [5]).

A PUT method to this resource can be invoked by the NF Service Consumer (e.g. AMF) to:

- activate SMS service for a given UE, which results in creating new individual UE Context for SMS in SMSF, during the Registration procedure for SMS over NAS (see 3GPP TS 23.502 [3] subclause 4.13.3.1);
- update SMS service parameters for a given UE, which results in updating individual UE Context for SMS in SMSF, , during the Registration Update procedure due to AMF change (see 3GPP TS 23.502 [3] subclause 4.13.3.1).

A DELETE method to this resource can be invoked by the NF Service Consumer (e.g. AMF) to:

- deactivate SMS service for a given UE, which results in deleting existing individual UE Context for SMS in SMSF, during the De-Registration procedure form SMS over NAS (see 3GPP TS 23.502 [3] subclause 4.13.3.2).

6.1.3.3.2 Resource Definition

Resource URI: {apiRoot}/nsmsf-sms/v1/ue-contexts/{supi}

This resource shall support the resource URI variables defined in table 6.1.3.3.2-1.

Table 6.1.3.2.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	See subclause 6.1.1
supi	Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2)

6.1.3.3.3 Resource Standard Methods

6.1.3.3.3.1 PUT

This method creates an individual resource of UE Context for SMS in the SMSF, or updates the indicated resource of UE Context for SMS in the SMSF.

This method shall support the URI query parameters specified in table 6.1.3.3.3.1-1.

Table 6.1.3.3.3.1-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.1.3.3.3.1-2 and the response data structures and response codes specified in table 6.1.3.3.3.1-3.

Table 6.1.3.3.3.1-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
UeSmsContextData	M	1	Representation of the UE Context for SMS to be created in the SMSF, or to be updated in the SMSF.

Table 6.1.3.3.3.1-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
UeSmsContextData	M	1	201 Created	This case represents the successful creation of an UE Context for SMS.
n/a			204 No Content	This case represents the successful update of an UE Context for SMS.
ProblemDetails	M	1	403 Forbidden	This case represents the failure of creation / update of an UE Context for SMS. The "cause" attribute of the "ProblemDetails" shall be set to one of the following application error codes: - SERVICE_NOT_ALLOWED, if SMS service is not allowed for the given service user;
ProblemDetails	M	1	404 Not Found	This case represents the failure of creation / update of an UE Context for SMS. The "cause" attribute of the "ProblemDetails" shall be set to one of the following application error codes: - USER_NOT_FOUND, if the provided subscriber identifier is invalid or the service user is not found from UDM; - CONTEXT_NOT_FOUND, if the UE context for SMS to be operated is invalid or not found in SMSF.

6.1.3.3.3.2 DELETE

This method deletes an individual resource of UE Context for SMS in the SMSF.

This method shall support the URI query parameters specified in table 6.1.3.3.3.2-1.

Table 6.1.3.3.3.2-1: 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 6.1.3.3.3.2-2 and the response data structures and response codes specified in table 6.1.3.3.3.2-3.

Table 6.1.3.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.1.3.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents a successful deletion of an UE Context for SMS.
ProblemDetails	M	1	404 Not Found	This case represents an unsuccessful deletion of an UE Context for SMS. The "cause" attribute of the "ProblemDetails" shall be set to one of the following application error codes: - CONTEXT_NOT_FOUND, if the UE context for SMS to be operated is invalid or not found in SMSF.

6.1.3.3.4 Resource Custom Operations

6.1.3.3.4.1 Overview

Table 6.1.3.3.4.1-1: Custom operations

Custom operation URI	Mapped HTTP method	Description
{apiRoot}/nsmf_sms/v1/ue-contexts/{supi}/sendsms	POST	Send SMS payload in uplink direction.

6.1.3.3.4.2 Operation: sendsms

6.1.3.3.4.2.1 Description

This custom operation is used for NF Service Consumers to send SMS record in uplink direction.

6.1.3.3.4.2.2 Operation Definition

This custom operation is used to send a SMS payload to an individual UEContext resource in the SMSF.

This operation shall support the request data structures specified in table 6.1.3.3.4.2.2-1 and the response data structure and response codes specified in table 6.1.3.3.4.2.2-2.

Table 6.1.3.3.4.2.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
SmsRecordData	M	1	Representation of the SMS Record to be created in the SMSF.

Table 6.1.3.3.4.2.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
SmsRecordDeliveryData	M	1	200 OK	This case represents the successful of sending SMS record in uplink direction, with necessary response data.
ProblemDetails	M	1	400 Bad Request	This case represents an unsuccessful delivery of SMS payload. The "cause" attribute of the "ProblemDetails" shall be set to one of the following application error codes: <ul style="list-style-type: none"> - SMS_PAYLOAD_MISSING, if the expected SMS payload content is missing; - SMS_PAYLOAD_ERROR, if error exists in the SMS payload content.
ProblemDetails	M	1	403 Forbidden	This case represents an unsuccessful delivery of SMS payload. The "cause" attribute of the "ProblemDetails" shall be set to one of the following application error codes: <ul style="list-style-type: none"> - SERVICE_NOT_ALLOWED, if SMS service is not allowed for the given service user;
ProblemDetails	M	1	404 Not Found	This case represents an unsuccessful delivery of SMS payload. The "cause" attribute of the "ProblemDetails" shall be set to one of the following application error codes: <ul style="list-style-type: none"> - CONTEXT_NOT_FOUND, if the UE context for SMS to be operated is invalid or not found in SMSF.

6.1.4 Custom Operations without associated resources

In this release of this specification, no custom operations without associated resources are defined.

6.1.5 Notifications

In this release of this specification, no notification procedures are defined.

6.1.6 Data Model

6.1.6.1 General

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

Table 6.1.6.1-1 specifies the data types defined for the Nsmsf service based interface protocol.

Table 6.1.6.1-1: Nsmsf specific Data Types

Data type	Section defined	Description
UeSmsContextData	See 6.1.6.2.2	Information used for activating SMS service for a service user, or updating the parameters for SMS service.
SmsRecordData	See 6.1.6.2.3	Information within request message invoking UplinkSMS service operation, for delivering SMS payload.
SmsRecordDeliveryData	See 6.1.6.2.6	Information for result of invoking UplinkSMS service operation.

Table 6.1.6.1-2 specifies data types re-used by the Nsmsf 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 Nsmsf service based interface.

Table 6.1.6.1-2: Nsmsf re-used Data Types

Data type	Reference	Comments
Supi	3GPP TS 29.571 [6]	Subscription Permanent Identifier
Gpsi	3GPP TS 29.571 [6]	General Public Subscription Identifier
Pei	3GPP TS 29.571 [6]	Permanent Equipment, it contains an IMEI or IMEISV.
Guami	3GPP TS 29.571 [6]	Globally Unique AMF Identifier
AccessType	3GPP TS 29.571 [6]	Access Type (3GPP or non-3GPP access)
UserLocation	3GPP TS 29.571 [6]	User location information
TimeZone	3GPP TS 29.571 [6]	User time zone information
NfInstanceId	3GPP TS 29.571 [6]	NF Instance ID
RefToBinaryData	3GPP TS 29.571 [6]	Information for indicating the binary content of SMS payload.
TraceData	3GPP TS 29.571 [6]	Trace control and configuration parameters
BackupAmfInfo	3GPP TS 29.571 [6]	Backup AMF Information

6.1.6.2 Structured data types

6.1.6.2.1 Introduction

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

6.1.6.2.2 Type: UeSmsContextData

Table 6.1.6.2.2-1: Definition of type UeSmsContextData

Attribute name	Data type	P	Cardinality	Description
supi	Supi	M	1	This IE shall be present, and it shall contain the subscriber permanent identify of the service user.
gpsi	Gpsi	O	0..1	When present, this IE shall contain the generic public subscriber identifier of the service user.
pei	Pei	O	0..1	When present, this IE shall contain the IMEI or IMEISV of the service user.
accessType	AccessType	M	1	This IE shall be present, and it shall contain the access type from which the service user accesses to network.
amfld	NfInstanceId	M	1	This IE shall be present, and it shall contain the NF instance ID of the requesting AMF.
guamis	array(Guami)	O	0..N	When present, this IE shall contain the GUAMI(s) of the AMF.
ueLocation	UserLocation	O	0..1	When present, this IE shall contain the UE location information (e.g. TAI and CGI).
ueTimeZone	TimeZone	O	0..1	When present, this IE shall contain the current time zone of the service user.
traceData	TraceData	O	0..1	Trace Data. The Null value indicates that trace is not active.
backupAmfInfo	array(BackupAmf Info)	C	0..N	This IE shall be included if the NF service consumer is an AMF and the AMF supports the AMF management without UDSF when the UE Context for SMS to be created in the SMSF, or to be updated in the SMSF. The SMSF uses this attribute to do an NRF query in order to invoke later services in a backup AMF e.g. Namf_MT.

6.1.6.2.3 Type: SmsRecordData

Table 6.1.6.2.3-1: Definition of type SmsRecordData

Attribute name	Data type	P	Cardinality	Description
smsRecordId	RecordId	M	1	This IE shall be present, and it shall contain the record id uniquely identify a message carrying SMS payload.
smsPayloads	array(RefToBinaryData)	M	1..N	This IE shall be present, and it shall contain the information of SMS payload (e.g. content ID, etc.)
gpsi	Gpsi	O	0..1	When present, this IE shall contain the global permanent subscriber identifier of the service user.
pei	Pei	O	0..1	When present, this IE shall contain the IMEI or IMEISV of the service user.
accessType	AccessType	O	0..1	This IE shall be present, and it shall contain the access type from which the service user accesses to network.
ueLocation	UserLocation	O	0..1	When present, this IE shall contain the UE location information (e.g. TAI and CGI).
ueTimeZone	TimeZone	O	0..1	When present, this IE shall contain the time zone of the service user.

6.1.6.2.4 Void

6.1.6.2.5 Type: SmsRecordDeliveryData

Table 6.1.6.2.5-1: Definition of type SmsRecordDeliveryData

Attribute name	Data type	P	Cardinality	Description
smsRecordId	RecordId	M	1	This IE shall be present, and it shall contain the record id uniquely identify a message carrying SMS payload.
deliveryStatus	SmsDeliveryStatus	M	1	This IE shall be present, and it shall indicate the status of SMS payload delivery attempt in the SMSF, after SMSF receiving SMS payload on Nsmsf interface.

6.1.6.3 Simple data types and enumerations

6.1.6.3.1 Introduction

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

6.1.6.3.2 Simple data types

The simple data types defined in table 6.1.6.3.2-1 shall be supported.

Table 6.1.6.3.2-1: Simple data types

Type Name	Type Definition	Description
RecordId	string	String uniquely identifying a record in the SMSF. The format of RecordId is implementation specific, e.g. using UUID format. In an OpenAPI Specification [3] schema, the format shall be designated as "RecordId".

6.1.6.3.3 Enumeration: SmsDeliveryStatus

The enumeration SmsDeliveryStatus represents the status of SMS payload delivery attempt at the SMSF. It shall comply with the provisions defined in table 6.1.5.3.3-1.

Table 6.1.6.3.3-1: Enumeration SmsDeliveryStatus

Enumeration value	Description
SMS_DELIVERY_PENDING	The SMS payload delivery at SMSF is pended.
SMS_DELIVERY_COMPLETED	The SMS payload delivery at SMSF is completed.
SMS_DELIVERY_FAILED	The SMS payload delivery at SMSF is failed due to certain reasons.

6.1.6.4 Binary data

6.1.6.4.1 Introduction

This subclause defines the binary data that shall be supported in a binary body part in an HTTP multipart message (see subclauses 6.1.2.2.2 and 6.1.2.4), to support delivery of binary content of SMS payload.

6.1.6.4.2 SMS Payload Information

SMS Payload Information shall encode a SMS payload as specified in 3GPP TS 23.040 [11] and 3GPP TS 24.011 [12], using the vnd.3gpp.sms content-type.

SMS Payload Information may encode e.g. the following content:

- CP-DATA, CP-ACK, CP-ERROR as specified in 3GPP TS 23.040 [11] and 3GPP TS 24.011 [12];

6.1.7 Error Handling

6.1.7.1 General

HTTP error handling shall be supported as specified in subclause 5.2.4 of 3GPP TS 29.500 [4].

6.1.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in subclause 5.2.7 of 3GPP TS 29.500 [4].

6.1.7.3 Application Errors

The common application errors defined in the Table 5.2.7.2-1 in 3GPP TS 29.500 [4] may also be used for the Nsmsf_SMSservice service, and the following application errors listed in Table 6.1.7.3-1 are specific for the Nsmsf_SMSservice service.

Table 6.1.7.3-1: Application errors

Application Error	HTTP status code	Description
USER_NOT_FOUND	404 Not Found	The provided subscriber identifier is invalid or the service user not found from UDM.
CONTEXT_NOT_FOUND	404 Not Found	The UE context for SMS to be operated is invalid or not found in SMSF.
SERVICE_NOT_ALLOWED	403 Forbidden	The requested service is not allowed for this service user.
SMS_PAYLOAD_MISSING	400 Bad Request	The expected SMS payload content is missing.
SMS_PAYLOAD_ERROR	400 Bad Request	Errors exist in the format of SMS payload.

6.1.8 Feature negotiation

The optional features in table 6.1.8-1 are defined for the Nsmsf_SMSservice API. They shall be negotiated using the extensibility mechanism defined in subclause 6.6 of 3GPP TS 29.500 [4].

Table 6.1.8-1: Supported Features

Feature number	Feature Name	Description

6.1.9 Security

As indicated in 3GPP TS 33.501 [13], the access to the Nsmsf_SMSservice API shall be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [14]), using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [15]) plays the role of the authorization server.

An NF Service Consumer, prior to consuming services offered by the Nsmsf_SMSservice API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [15], 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 Nsmsf_SMSservice service.

The Nsmsf_SMSservice API does not define any scopes for OAuth2 authorization.

Annex A (normative): OpenAPI specification

A.1 General

This subclause describes the OpenAPI file for the following service API:

- Nsmsf_SMSservice API;

A.2 Nsmsf_SMSservice API

```

openapi: 3.0.0
info:
  version: '1.PreR15.1.0'
  title: 'Nsmsf_SMSservice Service API'
  description: 'SMSF SMSservice Service API'
security:
  - oAuth2ClientCredentials: []
  - {}
paths:
  /ue-contexts/{supi}:
    put:
      summary: Activate SMS Service for a given UE
      operationId: SMSserviceActivation
      tags:
        - UEContext (Document)
      parameters:
        - name: supi
          in: path
          required: true
          description: Subscriber Permanent Identifier (SUPI)
          schema:
            type: string
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/UEsmsContextData'
            required: true
      responses:
        '201':
          description: UE Context for SMS is created in SMSF
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UEsmsContextData'
        '204':
          description: UE Context for SMS is updated in SMSF
        '400':
          description: Invalid Service Request
          content:
            application/problem+json:
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
        '403':
          description: Unable to create/update UE Context for SMS in SMSF
          content:
            application/problem+json:
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
        '404':
          description: Unable to found subscription for service user or UE Context for SMS in SMSF
          content:
            application/problem+json:
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
        '503':
          description: Service Unavailable
          content:
            application/problem+json:
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
      default:

```

```

        description: Unexpected error
        content:
          application/problem+json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
delete:
  summary: Deactivate SMS Service for a given UE
  operationId: SMSServiceDeactivation
  tags:
    - UEContext (Document)
  parameters:
    - name: supi
      in: path
      required: true
      description: Subscriber Permanent Identifier (SUPI)
      schema:
        type: string
  responses:
    '204':
      description: UE Context for SMS is deleted from SMSF
    '400':
      description: Invalid Service Request
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
    '404':
      description: Unable to found UE Context for SMS in SMSF
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
    '503':
      description: Service Unavailable
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
/ue-contexts/{supi}/sendsms:
  post:
    summary: Send SMS payload for a given UE
    operationId: SendSMS
    tags:
      - UEContext (Document)
    parameters:
      - name: supi
        in: path
        required: true
        description: Subscriber Permanent Identifier (SUPI)
        schema:
          type: string
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SmsRecordData'
      required: true
    responses:
      '200':
        description: SMS payload is received by SMSF, and is being delivered out
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SmsRecordDeliveryData'
      '400':
        description: Invalid Service Request
        content:
          application/problem+json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
      '403':
        description: Unable to deliver SMS at SMSF
        content:
          application/problem+json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
      '404':
        description: Unable to found UE Context for SMS in SMSF

```

```

    content:
      application/problem+json:
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
    '503':
      description: Service Unavailable
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes: {}
  schemas:
    UeSmsContextData:
      type: object
      required:
        - supi
        - amfId
        - accessType
      properties:
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        pei:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'
        amfId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
        guamis:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
        accessType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        ueLocation:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/UserLocation'
        ueTimeZone:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/TimeZone'
        traceData:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/TraceData'
        backupAmfInfo:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/BackupAmfInfo'
    SmsRecordData:
      type: object
      required:
        - smsRecordId
        - smsPayloads
      properties:
        smsRecordId:
          $ref: '#/components/schemas/RecordId'
        smsPayloads:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/RefToBinaryData'
        accessType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        ueLocation:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/UserLocation'
        ueTimeZone:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/TimeZone'
    RecordId:
      type: string
    SmsRecordDeliveryData:
      type: object
      required:
        - smsRecordId
        - deliveryStatus
      properties:

```

```
    smsRecordId:
      $ref: '#/components/schemas/RecordId'
    deliveryStatus:
      $ref: '#/components/schemas/SmsDeliveryStatus'
  SmsDeliveryStatus:
    type: string
    enum:
      - SMS_DELIVERY_PENDING
      - SMS_DELIVERY_COMPLETED
      - SMS_DELIVERY_FAILED
  externalDocs:
    description: Documentation
    url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.540/'
```

Annex B (Informative): HTTP Multipart Messages

B.1 Example of HTTP multipart message

Editor's Note: this annex will include an example of a multipart message.

B.2 OpenAPI specification of multipart body

Editor's Note: this subclause serves as a temporary placeholder until the formal OpenAPI document is specified for the SMSF SMSService API.

```
/sms-data:
  post:
    requestBody:
      content:
        multipart/related:
          schema:
            type: object
            properties:
              jsonData:
                type: object
                properties: { .... here comes the JSON part .... }
              binaryPayload:
                type: string
                format: binary
            encoding:
              jsonData:
                contentType: application/json
              binaryPayload:
                contentType: vnd.3gpp.sms
            headers:
              Content-Id:
                schema:
                  type: string
            required: true
```

The JSON part will include an attribute (e.g. contentId) encoded as a string, allowing to reference the value of the Content-ID header field of the binary body part.

Annex C (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-10	CT4#80	C4-175084				Initial Draft.	0.1.0
2017-10	CT4#80	C4-175399				Implementation of C4-175281, C4-175282, C4-175284.	0.2.0
2017-12	CT4#81	C4-176441				Implementation of C4-176092, C4-176097, C4-176346, C4-176347, C4-176349, C4-176351, C4-176353.	0.3.0
2018-03	CT4#83	C4-182439				Implementation of C4-182300, C4-182301, C4-182303, C4-182416	0.4.0
2018-04	CT4#84	C4-183520				Implementation of C4-183375, C4-183376, C4-183377, C4-183378, C4-183379.	0.5.0
2018-05	CT4#85	C4-184633				Implementation of C4-184467, C4-184605, C4-184470, C4-184473, C4-184474, C4-184634.	0.6.0
2018-06	CT#80	CP-181109				Presented for information and approval	1.0.0
2018-06	CT#80					Approved in CT#80.	15.0.0
2018-09	CT4#81	CP-182064	0002	1	F	C4-185518, Change to Common Data Type	15.1.0
2018-09	CT4#81	CP-182064	0003	1	F	C4-185328, Correct HTTP Response Code	15.1.0
2018-09	CT4#81	CP-182064	0004	1	F	C4-185326, Add Missing Parameters	15.1.0
2018-09	CT4#81	CP-182064	0005	-	F	C4-185125, Clarify the Format of SMS Record ID	15.1.0
2018-09	CT4#81	CP-182064	0006	-	F	C4-186014, Add support of 5G Trace	15.1.0
2018-09	CT4#81	CP-182064	0007	2	F	C4-186570, Backup AMF Info	15.1.0
2018-09	CT4#81	CP-182064	0008	-	F	C4-186196, Description of Structured data types	15.1.0
2018-09	CT4#81	CP-182064	0009	1	F	C4-186569, API Version Update	15.1.0

History

Document history		
V15.0.0	September 2018	Publication
V15.1.0	October 2018	Publication