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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 Session Management Event Exposure Service (Nsmf_EventExposure) of the 5G System.

The stage 2 definition and procedures of the Session Management Event Exposure Service are contained in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [6]. The 5G System Architecture is defined in 3GPP TS 23.501 [2].

Stage 3 call flows for policy and charging control use cases are provided in 3GPP TS 29.513 [7].

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

The Session Management Event Exposure Service is provided by the Session Management Function (SMF). This service exposes events related to PDU Sessions observed at the SMF.

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

[7] 3GPP TS 29.513: "5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".

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

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

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

[11] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces Stage 3".

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

[13] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[14] 3GPP TS 29.512: "5G System; Session Management Policy Control Service; Stage 3".

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

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

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

[19] 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].

AF	Application Function
AMBR	Aggregate Maximum Bit Rate
AMF	Access and Mobility Management Function
API	Application Programming Interface
DNAI	DN Access Identifier
DNN	Data Network Name
GUAMI	Globally Unique AMF Identifier
HTTP	Hypertext Transfer Protocol
JSON	JavaScript Object Notation
NEF	Network Exposure Function
NF	Network Function
NRF	Network Repository Function
SMF	Session Management Function
SUPI	Subscription Permanent Identifier
PCF	Policy Control Function
PRA	Presence Reporting Area
UPF	User Plane Function

4 Session Management Event Exposure Service

4.1 Service Description

4.1.1 Overview

The Session Management Event Exposure Service, as defined in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [6], is provided by the Session Management Function (SMF).

This service:

- allows consumer NFs to subscribe and unsubscribe for events on a PDU session; and
- notifies consumer NFs with a corresponding subscription about observed events on the PDU session.

The types of observed events include:

- UP path change (e,g, addition and/or removal of PDU session anchor);
- access type change;

- PLMN change;
- PDU session release; and
- UE IP address/prefix change.

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 29.513 [7].

The Session Management Event Exposure Service (Nsmf_EventExposure) is part of the Nsmf service-based interface exhibited by the Session Management Function (SMF),

Known consumer of the Nsmf_EventExposure service are:

- Network Exposure Function (NEF)
- Access and Mobility Management Function (AMF).
- Application Function (AF)

The PCF accesses the Session Management Event Exposure Service at the SMF via the N7 Reference point.

NOTE: The PCF can implicitly subscribe on behalf of the AF and NEF to the UP_PATH_CH event by including the information on AF subscription within the PCC rule.

The AMF accesses the Session Management Event Exposure Service at the SMF via the N11 Reference point.

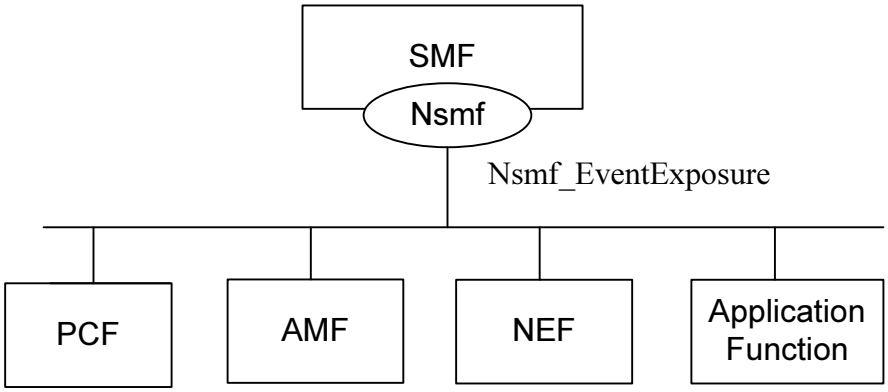

Figure 4.1.2-1: Reference Architecture for the Nsmf_EventExposure Service; SBI representation

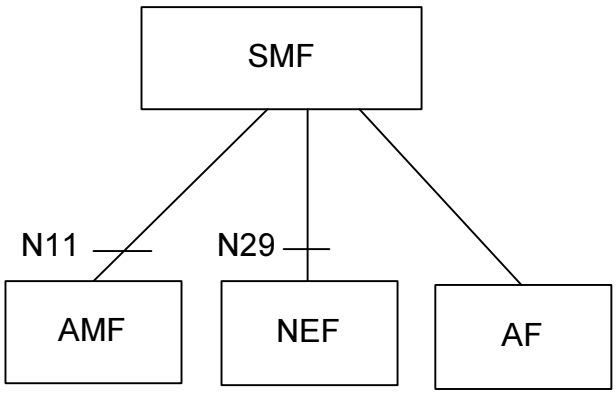

Figure 4.1.2-2: Reference Architecture for the Nsmf_EventExposure Service: reference point representation

4.1.3 Network Functions

4.1.3.1 Session Management Function (SMF)

The Session Management function (SMF) provides:

- Session Management e.g. Session establishment, modification and release;
- UE IP address allocation & management;
- Selection and control of UP function;
- Termination of interfaces towards Policy control functions; and
- Control part of policy enforcement and QoS.

4.1.3.2 NF Service Consumers

The Network Exposure Function (NEF);

- provides a means to securely expose the services and capabilities provided by 3GPP network functions for e.g. 3rd parties or internal exposure.

The Access and Mobility Management function (AMF) provides:

- Registration management;
- Connection management;
- Reachability management; and
- Mobility Management.

The Application Function (AF)

- interacts with the 3GPP Core Network to provide services.

4.2 Service Operations

4.2.1 Introduction

Table 4.2.1-1: Operations of the Nsmf_EventExposure Service

Service operation name	Description	Initiated by
Notify	Report UE PDU session related event(s) to the NF service consumer which has subscribed to the event report service.	SMF
Subscribe	This service operation is used by an NF service consumer to subscribe for event notifications on a specified PDU session, or for all PDU Sessions of one UE, a group of UE(s) or any UE, or to modify a subscription.	NF service consumer
UnSubscribe	This service operation is used by an NF service consumer to unsubscribe from event notifications.	NF service consumer

4.2.2 Nsmf_EventExposure_Notify Service Operation

4.2.2.1 General

The Nsmf_EventExposure_Notify service operation enables notification to NF service consumers that the previously subscribed event on the related PDU session occurred.

The following procedure using the Nsmf_EventExposure_Notify service operation is supported:

- notification about subscribed events.

4.2.2.2 Notification about subscribed events

Figure 4.2.2.2-1 illustrates the notification about subscribed events.

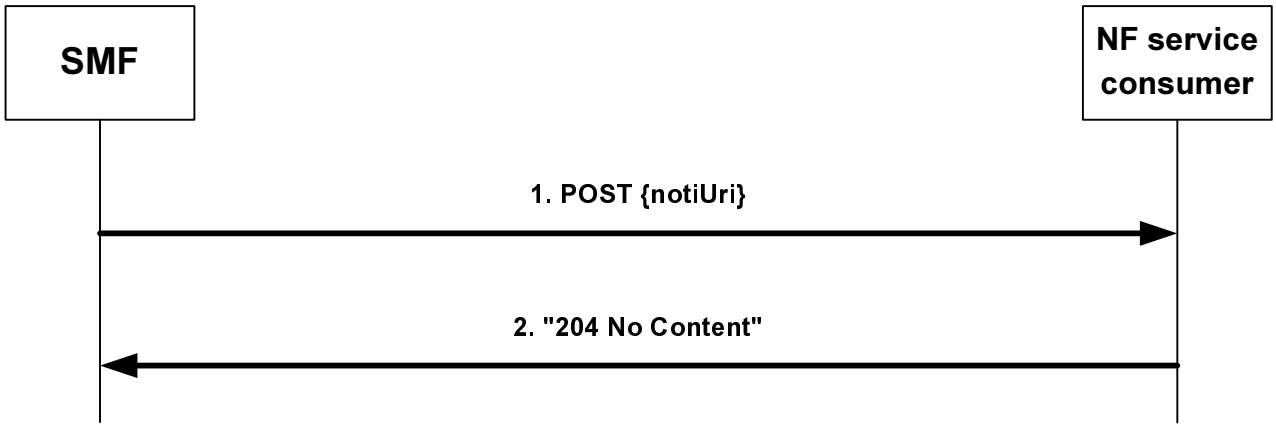

Figure 4.2.2.2-1: Notification about subscribed events

If the SMF observes PDU Session related event(s) for which an NF service consumer has subscribed to, the SMF shall send an HTTP POST request with "{notifUri}" as previously provided by the NF service consumer within the corresponding subscription as URI and NsmfEventExposureNotification data structure as request body that shall include:

- Notification correlation ID provided by the NF service consumer during the subscription, or as provided by the PCF for implicit subscription of UP path change as defined in subclause 4.2.6.2.6.2 of 3GPP TS 29.512 [14], as "notifId" attribute; and
- information about the observed event(s) within the "eventNotifs" attribute that shall contain for each observed event an "EventNotification" data structure that shall include:
    1. the Event Trigger as "event" attribute;
    2. for a UP path change notification:
        a) type of notification ("EARLY" or "LATE") as "dnaiChgType" attribute;
        b) source DNAI and/or target DNAI as "sourceDnai" attribute and "targetDnai" attribute if DNAI is changed, respectively (NOTE 3); and
        c) if the PDU Session type is IP, for the source DNAI IP address/prefix of the UE as "sourceUeIpv4Addr" attribute or "sourceUeIpv6Prefix" attribute; and
        d) if the PDU Session type is IP, for the target DNAI IP address/prefix of the UE as "targetUeIpv4Addr" attribute or "targetUeIpv6Prefix" attribute;
        e) if available (NOTE 3), for the source DNAI, N6 traffic routing information related to the UE as "sourceTraRouting" attribute;
        f) if available (NOTE 3), for the target DNAI, N6 traffic routing information related to the UE as "targetTraRouting" attribute; and
        g) if the PDU Session type is Ethernet, the MAC address of the UE in the "ueMac" attribute;

NOTE 1: UP path change notification, i.e. DNAI change notification and/or N6 traffic routing information change notification, can be the result of an implicit subscription of the PCF on behalf of the NEF/AF as part of setting PCC rule(s) via the Npcf_SMPolicyControl service (see subclause 4.2.6.2.6.2 of 3GPP TS 29.512 [14]).

NOTE 2: If the DNAI is not changed while the N6 traffic routing information change, the source DNAI and target DNAI are not provided.

NOTE 3: The change from the UP path status where no DNAI applies to a status where a DNAI applies indicates the activation of the related AF request and therefore only the target DNAI and N6 traffic routing information is provided in the event notification; the change from the UP path status where a DNAI applies to a status where no DNAI applies indicates the de-activation of the related AF request and therefore only the source DNAI and N6 traffic routing information is provided in the event notification.

3. for a UE IP address change:

   a) added new UE IP address or prefix as "adIpv4Addr" attribute or "adIpv6Prefix" attribute, respectively; and/or

   b) released UE IP address or prefix as "reIpv4Addr" attribute or "reIpv6Prefix" attribute, respectively;

4. for an access type change:

   a) new access type as "accType" attribute;

5. for a PLMN Change:

   a) new PLMN as "plmnId" attribute;

6. for a PDU Session Release:

   a) ID of the released PDU session as "pduSeId" attribute;

7. the time at which the event was observed encoded as "timeStamp" attribute;

8. the SUPI as the "supi" attribute if the subscription applies to a group of UE(s) or any UE; and

9. if available, the GPSI as the "gpsi" attribute if the subscription applies to a group of UE(s) or any UE.

Upon the reception of the HTTP POST request with "{notifUri}" as URI and an NsmfEventExposureNotification data structure as request body, the NF shall send an "204 No Content" HTTP response for a succesfull processing.

If the NF service consumer is not able to handle the Notification but knows by implementation specific means that another service consumer is able to handle the notification, it shall reply with an HTTP "307 temporary redirect" error response pointing to the new NF service consumer URI. If the NF service consumer is not able to handle the Notification but another unknown service consumer could possibly handle the notification, it shall reply with an HTTP "404 Not found" error response.

NOTE 4: An AMF as service consumer can change.

If the SMF receives a "307 temporary redirect" response, the SMF shall use this URL as Notification URL in subsequent communication and shall resend the failed Notification to that URL.

If the SMF becomes aware that a new NF service consumer is requiring notifications (e.g. via the "404 Not found" response, or via Namf_Communication service AMFStatusChange Notifications, see 3GPP TS 29.518 [13], or via link level failures or via the Nnrf_NFDiscovery Service (using the service name and GUAMI obtained during the creation of the subscription) to query the other AMFs within the AMF set) specified in 3GPP TS 29.510 [12]), and the SMF knows alternate or backup IPv4 or IPv6 Addess(es) where to send Notifications (e.g. via "altNotifIpv4Addrs" or "altNotifIpv6Addrs" attributes received when the subscription was created), the SMF shall exchange the authority part of the Notification URL with one of those addresses and shall use that URL in subsequent communication. If the SMF received a "404 Not found" response, the SMF should resend the failed notification to that URL.

4.2.3 Nsmf_EventExposure_Subscribe Service Operation

4.2.3.1 General

This service operation is used by an NF service consumer to subscribe for event notifications on a specified PDU Session, or for all PDU Sessions of one UE, group of UE(s) or any UE, or to modify an existing subscription. The following are the types of events for which a subscription can be made:

- UP path change;
- PDU Session release;
- Change of Access Type;
- PLMN change; and
- UE IP address change.

The following procedures using the Nsmf_EventExposure_Subscribe service operation are supported:

- creating a new subscription;
- modifying an existing subscription.

4.2.3.2 Creating a new subscription

Figure 4.2.3.2-1 illustrates the creation of a subscription.

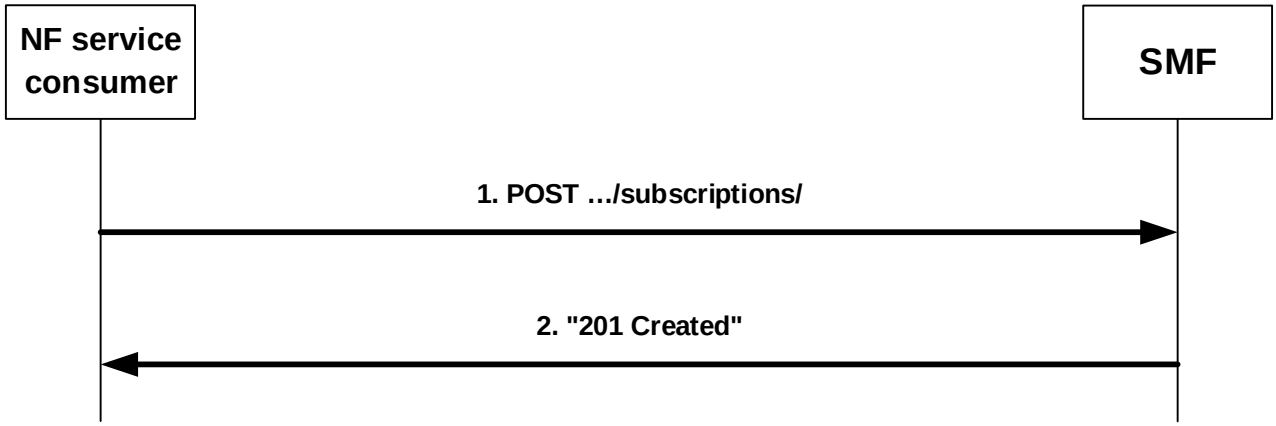

Figure 4.2.3.2-1: Creation of a subscription

To subscribe to event notifications, the NF service consumer shall send an HTTP POST request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions/" as Resource URI and the NsmfEventExposure data structure as request body that shall include:

- if the subscription applies to events related to a single PDU session, the PDU Session ID of that PDU session as "pduSeId" attribute;
- if the subscription applies to events not related to a single PDU session, identification of UEs to which the subscription applies via:
  a) identification of a single UE by SUPI as "supi" attribute;
  b) identification of a group of UE(s) via a "groupId" attribute; or
  c) identification of any UE using a specific DNN via the "dnn" attribute;

NOTE: The identification of any UE does not apply for local breakout roaming scenarios where the SMF is located in the VPLMN and the NF service consumer is located in the HPLMN.

- an URI where to receive the requested notifications as "notifURI" attribute;
- a Notification Correlation Identifier assigned by the NF service consumer for the requested notifications as "notifId" attribute; and
- if the NF service consumer is an AMF, the GUAMI encoded as "guami" attribute:
- a description of the subscribed events as "eventSubs" attribute that for each event shall include:
  a) an event identifier as "event" attribute; and

b) for event UP path change, whether the subscription is for early, late, or early and late notifications of UP path reconfiguration in the "dnaiChType" attribute;

The NsmfEventExposure data structure as request body may also include:

- Alternate or backup IPv4 Addess(es) where to send Notifications encoded as " altNotifIpv4Addrs" attribute;
- Alternate or backup IPv6 Addess(es) where to send Notifications encoded as " altNotifIpv6Addrs" attribute;
- if the NF service consumer is an AMF, the name of a service produced by the AMF that expects to receive the notification about subscribed events encoded as "serviceName" attribute;
- Immediate reporting flag as "ImmeRep" attribute;
- event notification method (periodic, one time, on event detection) as "notifMethod" attribute;
- Maximum Number of Reports as "maxReportNbr" attribute;
- Monitoring Duration as "expiry" attribute; and/or
- Repetition Period for periodic reporting as "repPeriod" attribute.

Upon the reception of an HTTP POST request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions/" as Resource URI and NsmfEventExposure data structure as request body, the SMF shall:

- create a new subscription;
- assign a subscription correlation ID;
- select an expiry time that is equal or less than a possible expiry time in the request;
- store the subscription;
- send a HTTP "201 Created" response with NsmfEventExposure data structure as response body and a Location header field containing the URI of the created individual subscription resource, i.e. {apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}; and
- if the "ImmeRep" attribute is included and set to true in the request, the SMF shall report the curret available value(s) for the subscribed event(s) as defined in subclause 4.2.3.1.

If the SMF received an GUAMI, the SMF may subscribe to GUAMI changes using the AMFStatusChange service operation of the Namf_Communication service specified in 3GPP TS 29.518 [13], and it may use the Nnrf_NFDiscovery Service specified in 3GPP TS 29.510 [12] (using the obtained GUAMI and possibly service name) to query the other AMFs within the AMF set.

4.2.3.3 Modifying an existing subscription

Figure 4.2.3.3-1 illustrates the modification of an existing subscription.

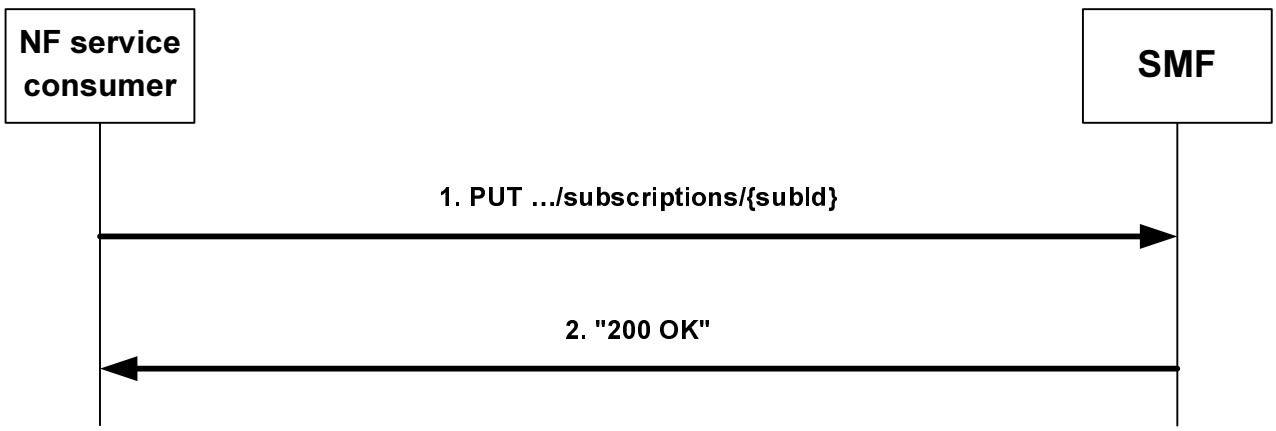

Figure 4.2.3.3-1: Modification of an existing subscription

To modify an existing subscription to event notifications, the NF service consumer shall send an HTTP PUT request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions/subId}" as Resource URI, where "{subId}" is the subscription correlation ID of the existing subscription, and NsmfEventExposure data structure as request body as described in subclause 4.2.3.2.

NOTE 1: An alternate NF service consumer than the one that requested the generation of the subscription resource can send the PUT. For instance, an AMF as service consumer can change.

NOTE 2: The "notifURI" attribute within the NsmfEventExposure data structure can be modified to request that subsequent notifications are sent to a new NF service consumer.

Upon the reception of an HTTP PUT request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}" as Resource URI and NsmfEventExposure data structure as request body, the SMF shall:

- store the subscription; and
- send a HTTP "200 OK" response with NsmfEventExposure data structure as response body.

4.2.4 Nsmf_EventExposure_UnSubscribe Service Operation

4.2.4.1 General

This service operation is used by an NF service consumer to unsubscribe from event notifications.

The following procedure using the Nsmf_EventExposure_UnSubscribe service operation is supported:

- unsubscription from event notifications.

4.2.4.2 Unsubscription from event notifications

Figure 4.2.4.2-1 illustrates the unsubscription from event notifications.

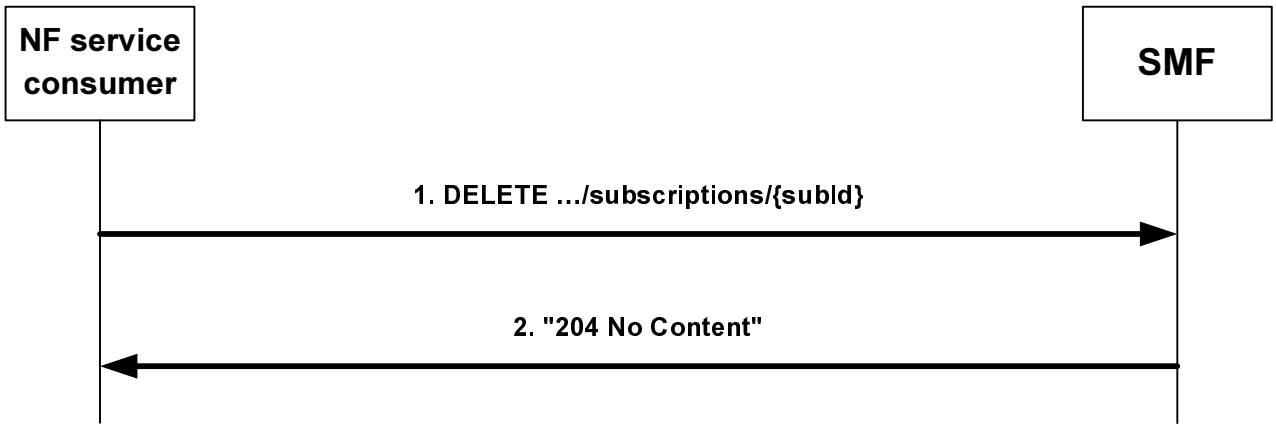

Figure 4.2.4.2-1: Unsubscription from event notifications

To unsubscribe from event notifications, the NF service consumer shall send an HTTP DELETE request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}" as Resource URI, where "{subId}" is the subscription correlation ID of the existing subscription that is to be deleted.

Upon the reception of the HTTP DELETE request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}" as Resource URI, the SMF shall:

- remove the corresponding subscription; and
- send an HTTP "204 No Content" response.

5 Nsmf_EventExposure API

5.1 Introduction

The Session Management Event Exposure Service shall use the Nsmf_EventExposure API.

The request URI used in HTTP request from the NF service consumer towards the SMF shall have the structure defined in subclause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The {apiName} shall be "nsmf-event-exposure".
- 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 [4].

HTTP/2 shall be transported as specified in subclause 5.3 of 3GPP TS 29.500 [4].

The OpenAPI [10] specification of HTTP messages and content bodies for the Nsmf_EventExposure 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 [4] for the usage of HTTP standard headers.

5.2.2.2 Content type

JSON, IETF RFC 8259 [9], shall be used as content type of the HTTP bodies specified in the present specification as specified in subclause 5.4 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [18].

5.2.3 HTTP custom headers

The mandatory HTTP custom header fields specified in subclause 5.2.3.2 of 3GPP TS 29.500 [4] shall be applicable.

5.3 Resources

5.3.1 Resource Structure

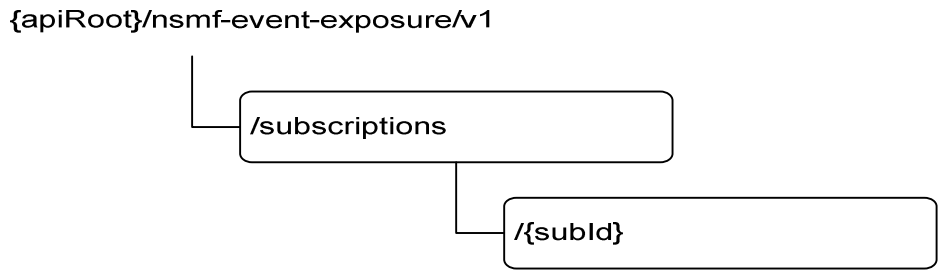

Figure 5.3.1-1: Resource URI structure of the Nsmf_EventExposure API

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
SMF Notification Subscriptions	{apiRoot}/ nsmf-event-exposure/ v1/ subscriptions	POST	Create a new Individual SMF Notification Subscription resource.
Individual SMF Notification Subscription	{apiRoot}/ nsmf-event-exposure/ v1/ subscriptions/ {subId}	GET	Read an Individual SMF Notification Subscription resource.
		PUT	Modify an existing Individual SMF Notification Subscription resource.
		DELETE	Delete an Individual SMF Notification Subscription resource and cancel the related subscription.

5.3.2 Resource: SMF Notification Subscriptions

5.3.2.1 Description

The SMF Notification Subscriptions resource represents all subscriptions to the SMF event exposure service at a given SMF.

5.3.2.2 Resource definition

Resource URI: {apiRoot}/nsmf-event-exposure/v1/subscriptions/

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
NsmfEventExposure	M	1	Create a new Individual SMF Notification Subscription resource.

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
NsmfEventExposure	M	1	201 Created	The creation of an Individual SMF Notification Subscription resource is confirmed and a representation of that resource is returned.
NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

5.3.2.4 Resource Custom Operations

None.

5.3.3 Resource: Individual SMF Notification Subscription

5.3.3.1 Description

The SMF Notification Subscriptions resource represents a single subscription to the SMF event exposure service.

5.3.3.2 Resource definition

Resource URI: {apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}

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
subId	String identifying a subscription to the SMF event exposure service formatted as defined for the SubId type in table 5.6.3.2-1.

5.3.3.3 Resource Standard Methods

5.3.3.3.1 GET

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

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

Name	Data type	P	Cardinality	Description
n/a				

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

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

Data type	P	Cardinality	Description
n/a			

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

Data type	P	Cardinality	Response codes	Description
NsmfEventExposure	M	1	200 OK	A representation of the SMF Notification Subscription matching the eventSubId is returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

5.3.3.3.2 PUT

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

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

Name	Data type	P	Cardinality	Description
n/a				

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

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

Data type	P	Cardinality	Description
NsmfEventExposure	M	1	Modify the existing Individual SMF Notification Subscription resource matching the eventSubId according to the representation in the NsmfEventExposure

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

Data type	P	Cardinality	Response codes	Description
NsmfEventExposure	M	1	200 OK	Successful case: The Individual SMF Notification Subscription resource matching the eventSubId was modified and a representation is returned.
n/a			204 No Content	Successful case: The Individual SMF Notification Subscription resource matching the eventSubId was modified.
NOTE: The mandatory HTTP error status codes for the PUT method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

5.3.3.3.3 DELETE

This method shall support the URI query parameters specified in table 5.3.3.3.3-1.

Table 5.3.3.3.3-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.3.3.3.3-2 and the response data structures and response codes specified in table 5.3.3.3.3-3.

Table 5.3.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.3.3.3.3-3: 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 SMF Notification Subscription resource matching the subId was deleted.
NOTE: The manadatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

5.3.3.4 Resource Custom Operations

None.

5.4 Custom Operations without associated resources

None.

5.5 Notifications

5.5.1 General

Notifications shall comply to subclause 6.2 of 3GPP TS 29.500 [4] and subclause 4.6.2.3 of 3GPP TS 29.501 [5].

5.5.2 Event Notification

5.5.2.1 Description

The Event Notification is used by the SMF to report one or several observed Events to a NF service consumer that has subscribed to such Notifications via the Individual SMF Notification Subscription Resource.

5.5.2.2 Target URI

The Notification URI **"{notifUri}"** shall be used with the resource URI variables defined in table 5.5.2.2-1.

Table 5.5.2.2-1: Resource URI variables for this resource

Name	Definition
notifUri	String formatted as URI with the Notification Uri as assigned within the Individual SMF Notification Subscription Resource and described within the NsmfEventExposure type (see table 5.6.2.2-1).

5.5.2.3 Standard Methods

5.5.2.3.1 POST

This method shall support the URI query parameters specified in table 5.5.2.3.1-1.

Table 5.5.2.3.1-1: 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 5.5.2.3.1-2 and the response data structures and response codes specified in table 5.5.2.3.1-3.

Table 5.5.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
NsmfEventExposureNotification	M	1	Provides Information about observed events

Table 5.5.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.
n/a			307 temporary redirect	The NF service consumer shall generate a Location header field containing a URI pointing to another NF service consumer to which the notification should be send.
ProblemDetails	M	1	404 Not Found	The NF service consumer can use this response when the notification can be sent to another host.
NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

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 Nsmf_EventExposure service based interface protocol.

Table 5.6.1-1: Nsmf_EventExposure specific Data Types

Data type	Section defined	Description	Applicability
EventNotification	5.6.2.5	Describes notifications about a single event that occurred.	
EventSubscription	5.6.2.4	Represents the subscription to a single event	
NotificationMethod	5.6.3.4	Represents the notification methods that can be subscribed	
NsmfEventExposure	5.6.2.2	Represents an Individual SMF Notification Subscription resource	
NsmfEventExposureNotification	5.6.2.3	Describes Notifications about events that occurred.	
SmfEvent	5.6.3.3	Represents the types of events that can be subscribed	
SubId	5.6.3.2	Identifies an Individual SMF Notification Subscription.	

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

Table 5.6.1-2: Nsmf_EventExposure re-used Data Types

Data type	Reference	Comments	Applicability
AccessType	3GPP TS 29.571 [11]		
DateTime	3GPP TS 29.571 [11]		
Dnai	3GPP TS 29.571 [11]		
DnaiChangeType	3GPP TS 29.571 [11]	Describes the types of DNAI change.	
Dnn	3GPP TS 29.571 [11]		
DurationSec	3GPP TS 29.571 [11]		
Gpsi	3GPP TS 29.571 [11]		
GroupId	3GPP TS 29.571 [11]		
Guami	3GPP TS 29.571 [11]	Globally Unique AMF Identifier	
Ipv4Addr	3GPP TS 29.571 [11]		
Ipv6Addr	3GPP TS 29.571 [11]		
Ipv6Prefix	3GPP TS 29.571 [11]		
MacAddr48	3GPP TS 29.571 [11]	MAC Address.	
PduSessionId	3GPP TS 29.571 [11]		
PlmnId	3GPP TS 29.571 [11]		
ProblemDetails	3GPP TS 29.571 [11]		
RouteToLocation	3GPP TS 29.571 [11]	A traffic route to/from an DNAI	
Supi	3GPP TS 29.571 [11]		
SupportedFeatures	3GPP TS 29.571 [11]	Used to negotiate the applicability of the optional features defined in table 5.8-1.	
Uinteger	3GPP TS 29.571 [11]		
Uri	3GPP TS 29.571 [11]		

5.6.2 Structured data types

5.6.2.1 Introduction

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

5.6.2.2 Type NsmfEventExposure

Table 5.6.2.2-1: Definition of type NsmfEventExposure

Attribute name	Data type	P	Cardinality	Description	Applicability
supi	Supi	C	0..1	Subscription Permanent Identifier (NOTE)	
gpsi	Gpsi	C	0..1	Generic Public Subscription Identifier (NOTE)	
anyUeInd	boolean	C	0..1	This IE shall be present if the event subscription is applicable to any UE. Default value "FALSE" is used, if not present (NOTE)	
groupId	GroupId	C	0..1	Identifies a group of UEs. (NOTE)	
pduSeId	PduSessionId	C	0..1	PDU session ID (NOTE)	
subId	SubId	C	0..1	Subscription ID. This parameter shall be supplied by the SMF in HTTP responses that include an object of NsmfEventExposure type.	
notifId	string	M	1	Notification Correlation ID assigned by the NF service consumer.	
notifUri	Uri	M	1	Identifies the recipient of Notifications sent by the SMF.	
altNotifIpv4Addrs	array(Ipv4Addr)	O	1..N	Alternate or backup IPv4 Addess(es) where to send Notifications.	
altNotifIpv6Addrs	array(Ipv6Addr)	O	1..N	Alternate or backup IPv6 Addess(es) where to send Notifications.	
eventSubs	array(EventSubscription)	M	1..N	Subscribed events	
ImmeRep	boolean	O	0..1	It is included and set to true if the immediate reporting of the current status of the subscribed event, if available is required.	
notifMethod	NotificationMethod	O	0..1	If "notifMethod" is not supplied, the default value "ON_EVENT_DETECTION" applies.	
maxReportNbr	Uinteger	O	0..1	If omitted, there is no limit.	
expiry	DateTime	C	0..1	This attribute indicates the expiry time of the subscription, after which the SMF shall not send any event notifications and the subscription becomes invalid. It may be included in an event subscription request and may be included in an event subscription response based on operator policies. If an expiry time was included in the request, then the expiry time returned in the response should be less than or equal to that value. If the expiry time is not included in the response, the NF Service Consumer shall not associate an expiry time for the subscription.	
repPeriod	DurationSec	C	0..1	Is supplied for notification Method "periodic".	
guami	Guami	C	0..1	The Globally Unique AMF Identifier (GUAMI) shall be provided by an AMF as service consumer.	
serviceName	string	O	0..1	If the NF service consumer is an AMF, it should provide the name of a service produced by the AMF that makes use of the notification about subscribed events.	

supportedFeatures	SupportedFeatures	C	0..1	List of Supported features used as described in subclause 5.8. This parameter shall be supplied by NF service consumer and SMF in the POST request that request the creation of an SMF Notification Subscriptions resource and the related reply, respectively.	
NOTE: One of the PDU session of a single UE (pduSeId, and gpsi/supi), or a group of UEs (groupId), or anyUeInd set to TRUE shall be included.					

5.6.2.3 Type NsmfEventExposureNotification

Table 5.6.2.3-1: Definition of type NsmfEventExposureNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
notifId	string	M	1	Notification correlation ID used to identify the subscription which the notification is corresponding to. It shall be set to the same value as the “notifId" attribute of NsmfEventExposure data type or the value of "notifiCorreId" within the UpPathChgEvent data type defined in 3GPP TS 29.512 [14].	
eventNotifs	array(EventNotification)	M	1..N	Notifications about Individual Events	

5.6.2.4 Type EventSubscription

Table 5.6.2.4-1: Definition of type EventSubscription

Attribute name	Data type	P	Cardinality	Description	Applicability
event	SmfEvent	M	1	Subscribed events	
dnaiChType	DnaiChangeType	C	0..1	For event UP path change, whether the subscription is for early, late, or early and late DNAI change notification shall be supplied.	

5.6.2.5 Type EventNotification

Table 5.6.2.5-1: Definition of type EventNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
event	SmfEvent	M	1	Event that is notified.	
timeStamp	DateTime	M	1	Time at which the event is observed.	
supi	Supi	C	0..1	Subscription Permanent Identifier. It is included when the subscription applies to a group of UE(s) or any UE.	
gpsi	Gpsi	C	0..1	Identifies a GPSI. It shall contain an MSISDN. It is included when it is available and the subscription applies to a group of UE(s) or any UE.	
sourceDnai	Dnai	C	0..1	Source DN Access Identifier. Shall be included for event "UP_PATH_CH" if the DNAI changed (NOTE 1, NOTE 2).	
targetDnai	Dnai	C	0..1	Target DN Access Identifier. Shall be included for event "UP_PATH_CH" if the DNAI changed (NOTE 1, NOTE 2).	
dnaiChgType	DnaiChangeType	C	0..1	DNAI Change Type. Shall be included for event "UP_PATH_CH".	
sourceUeIpv4Addr	Ipv4Addr	O	0..1	The IPv4 Address of the served UE for the source DNAI. May be included for event "UP_PATH_CH".	
sourceUeIpv6Prefix	Ipv6Prefix	O	0..1	The Ipv6 Address Prefix of the served UE for the source DNAI. May be included for event "UP_PATH_CH".	
targetUeIpv4Addr	Ipv4Addr	O	0..1	The IPv4 Address of the served UE for the target DNAI. May be included for event "UP_PATH_CH".	
targetUeIpv6Prefix	Ipv6Prefix	O	0..1	The Ipv6 Address Prefix of the served UE for the target DNAI. May be included for event "UP_PATH_CH".	
sourceTraRouting	RouteToLocation	C	0..1	N6 traffic routing information for the source DNAI. Shall be included for event "UP_PATH_CH" if available (NOTE 2).	
targetTraRouting	RouteToLocation	C	0..1	N6 traffic routing information for the target DNAI. Shall be included for event "UP_PATH_CH" if available (NOTE 2).	
ueMac	MacAddr48	O	0..1	UE MAC address. May be included for event "UP_PATH_CH".	
adIpv4Addr	Ipv4Addr	O	0..1	Added IPv4 Address(es). May be included for event "UE_IP_CH".	
adIpv6Prefix	Ipv6Prefix	O	0..1	Added Ipv6 Address Prefix(es). May be included for event "UE_IP_CH".	
reIpv4Addr	Ipv4Addr	O	0..1	Removed IPv4 Address(es). May be included for event "UE_IP_CH".	
reIpv6Prefix	Ipv6Prefix	O	0..1	Removed Ipv6 Address Prefix(es). May be included for event "UE_IP_CH".	
plmnId	PlmnId	C	0..1	New PLMN ID. Shall be included for event "PLMN_CH".	
accType	AccessType	C	0..1	New Access Type. Shall be included for event "AC_TY_CH".	
pduSeId	PduSessionId	C	0..1	PDU session ID. Shall be included for event "PDU_SES_REL".	

NOTE 1: If the DNAI is not changed while the N6 traffic routing information is changed, the "sourceDnai" attribute and "targetDnai" attribute shall not be provided.
NOTE 2: The change from the UP path status where no DNAI applies to a status where a DNAI applies indicates the activation of the related AF request and therefore only the target DNAI and N6 traffic routing information is provided in the event notification; the change from the UP path status where a DNAI applies to a status where no DNAI applies indicates the de-activation of the related AF request and therefore only the source DNAI and N6 traffic routing information is provided in the event notification.

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
SubId	string	Identifies an Individual SMF Notification Subscription. 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 [5]. In an OpenAPI [10] schema, the format shall be designated as "SubId".	

5.6.3.3 Enumeration: SmfEvent

Table 5.6.3.3-1: Enumeration SmfEvent

Enumeration value	Description	Applicability
AC_TY_CH	Access Type Change	
UP_PATH_CH	UP Path Change	
PDU_SES_REL	PDU Session Release	
PLMN_CH	PLMN Change	
UE_IP_CH	UE IP address change	

5.6.3.4 Enumeration: NotificationMethod

The enumeration NotificationMethod represents the notification methods that can be subscribed. It shall comply with the provisions defined in table 5.6.3.4-1.

Table 5.6.3.4-1: Enumeration NotificationMethod

Enumeration value	Description	Applicability
PERIODIC	The notification is periodically sent.	
ONE_TIME	The notification is only sent one time.	
ON_EVENT_DETECTION	The notification is sent each time the event is detected.	

5.7 Error handling

5.7.1 General

For the Nsmf_EventExposure API, HTTP error responses shall be supported as specified in subclause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] 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 [4].

In addition, the requirements in the following subclauses are applicable for the Nsmf_EventExposure API.

5.7.2 Protocol Errors

No specific procedures for the Nsmf_EventExposure service are specified.

5.7.3 Application Errors

The application errors defined for the Nsmf_EventExposure service are listed in Table 5.7.3-1.

Table 5.7.3-1: Application errors

Application Error	HTTP status code	Description

5.8 Feature negotiation

The optional features in table 5.8-1 are defined for the Nsmf_EventExposure API. They shall be negotiated using the extensibility mechanism defined in subclause 6.6 of 3GPP TS 29.500 [4].

Table 5.8-1: Supported Features

Feature number	Feature Name	Description

5.9 Security

As indicated in 3GPP TS 33.501 [15] and 3GPP TS 29.500 [4], the access to the Nsmf_EventExposure API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [16]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [12]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nsmf_EventExposure API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [12], subclause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Nsmf_EventExposure service.

The Nsmf_EventExposure API defines a single scope "nsmf-event-exposure" for the entire service, and it does not define any additional scopes at resource or operation level.

Annex A (normative): OpenAPI specification

A.1 General

The present Annex contains an OpenAPI [10] specification of HTTP messages and content bodies used by the Nsmf_EventExposure API.

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

NOTE 1: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification file contained in this 3GPP Technical Specification are available on the public 3GPP file server in the following locations (see clause 5B of the 3GPP TR 21.900 [19] for further information):

- https://www.3gpp.org/ftp/Specs/archive/OpenAPI/<Release>/, and
- https://www.3gpp.org/ftp/Specs/<Plenary>/<Release>/OpenAPI/.

NOTE 2: To fetch the OpenAPI specification file after CT#83 plenary meeting for Release 15 in the above links <Plenary> must be replaced with the date the CT Plenary occurs, in the form of year-month (yyyy-mm), e.g. for CT#83 meeting <Plenary> must be replaced with value "2019-03" and <Release> must be replaced with value "Rel-15".

A.2 Nsmf_EventExposure API

```
openapi: 3.0.0
info:
  version: 1.0.2
  title: Nsmf_EventExposure
  description: |
    Session Management Event Exposure Service.
    © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.508 V15.4.0; 5G System; Session Management Event Exposure Service.
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.508/
servers:
  - url: '{apiRoot}/nsmf-event-exposure/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 4.4 of 3GPP TS 29.501
security:
  - {}
  - oAuth2ClientCredentials:
    - nsmf-event-exposure
paths:
  /subscriptions:
    post:
      operationId: CreateIndividualSubcription
      summary: Create an individual subscription for event notifications from the SMF
      tags:
        - Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NsmfEventExposure'
      responses:
```

```
        '201':
          description: Success
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}'
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NsmfEventExposure'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      callbacks:
        myNotification:
          '{$request.body#/notifUri}':
            post:
              requestBody:
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/NsmfEventExposureNotification'
              responses:
                '204':
                  description: No Content, Notification was succesfull
                '307':
                  description: temporary redirect
                '400':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  /subscriptions/{subId}:
    get:
      operationId: GetIndividualSubcription
      summary: Read an individual subscription for event notifications from the SMF
      tags:
        - IndividualSubscription (Document)
```

```
    parameters:
      - name: subId
        in: path
        description: Event Subscription ID
        required: true
        schema:
          type: string
    responses:
      '200':
        description: OK. Resource representation is returned
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NsmfEventExposure'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29571_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  put:
    operationId: ReplaceIndividualSubcription
    summary: Replace an individual subscription for event notifications from the SMF
    tags:
      - IndividualSubscription (Document)
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/NsmfEventExposure'
    parameters:
      - name: subId
        in: path
        description: Event Subscription ID
        required: true
        schema:
          type: string
    responses:
      '200':
        description: OK. Resource was succesfully modified and representation is returned
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NsmfEventExposure'
      '204':
        description: No Content. Resource was succesfully modified
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    delete:
      operationId: DeleteIndividualSubcription
      summary: Delete an individual subscription for event notifications from the SMF
      tags:
        - IndividualSubscription (Document)
      parameters:
        - name: subId
          in: path
          description: Event Subscription ID
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content. Resource was succesfully deleted
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nsmf-event-exposure: Access to the Nsmf_EventExposure API
  schemas:
    NsmfEventExposure:
      type: object
      properties:
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        anyUeInd:
          type: boolean
          description: Any UE indication. This IE shall be present if the event subscription is
applicable to any UE. Default value "FALSE" is used, if not present.
        groupId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
        pduSeId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
        subId:
          $ref: '#/components/schemas/SubId'
        notifId:
          type: string
          description: Notification Correlation ID assigned by the NF service consumer.
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        altNotifIpv4Addrs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
          description: Alternate or backup IPv4 Addess(es) where to send Notifications.
          minItems: 1
        altNotifIpv6Addrs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
          description: Alternate or backup IPv6 Addess(es) where to send Notifications.
          minItems: 1
```

```
        eventSubs:
          type: array
          items:
            $ref: '#/components/schemas/EventSubscription'
          minItems: 1
          description: Subscribed events
        ImmeRep:
          type: boolean
        notifMethod:
          $ref: '#/components/schemas/NotificationMethod'
        maxReportNbr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        expiry:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        repPeriod:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
        guami:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
        serviveName:
          type: string
          description: If the NF service consumer is an AMF, it should provide the name of a service
produced by the AMF that makes use of notifications about subscribed events.
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - notifId
        - notifUri
        - eventSubs
    NsmfEventExposureNotification:
      type: object
      properties:
        notifId:
          type: string
          description: Notification correlation ID
        eventNotifs:
          type: array
          items:
            $ref: '#/components/schemas/EventNotification'
          minItems: 1
          description: Notifications about Individual Events
      required:
        - notifId
        - eventNotifs
    EventSubscription:
      type: object
      properties:
        event:
          $ref: '#/components/schemas/SmfEvent'
        dnaiChgType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DnaiChangeType'
      required:
        - event
    EventNotification:
      type: object
      properties:
        event:
          $ref: '#/components/schemas/SmfEvent'
        timeStamp:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        sourceDnai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnai'
        targetDnai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnai'
        dnaiChgType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DnaiChangeType'
        sourceUeIpv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        sourceUeIpv6Prefix:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
        targetUeIpv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        targetUeIpv6Prefix:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
        sourceTraRouting:
```

```
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RouteToLocation'
      targetTraRouting:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RouteToLocation'
      ueMac:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
      adIpv4Addr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
      adIpv6Prefix:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
      reIpv4Addr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
      reIpv6Prefix:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
      plmnId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
      accType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
      pduSeId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
    required:
      - event
      - timeStamp
  SubId:
    type: string
    format: SubId
    description: Identifies an Individual SMF Notification Subscription. 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]. In an OpenAPI [10] schema, the format
shall be designated as "SubId".
  SmfEvent:
    anyOf:
    - type: string
      enum:
        - AC_TY_CH
        - UP_PATH_CH
        - PDU_SES_REL
        - PLMN_CH
        - UE_IP_CH
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
    description: >
      Possible values are
      - AC_TY_CH: Access Type Change
      - UP_PATH_CH: UP Path Change
      - PDU_SES_REL: PDU Session Release
      - PLMN_CH: PLMN Change
      - UE_IP_CH: UE IP address change
  NotificationMethod:
    anyOf:
    - type: string
      enum:
        - PERIODIC
        - ONE_TIME
        - ON_EVENT_DETECTION
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
    description: >
      Possible values are
      - PERIODIC
      - ONE_TIME
      - ON_EVENT_DETECTION
```

Annex B (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New**
2017-10						TS skeleton of Session Management Event Exposure Service specification	0.0.0
2017-10	CT3#92					C3-175326,C3-175327 and C3-175281	0.1.0
2017-12	CT3#93					C3-176071, C3-176240, C3-176316, C3-176242, C3-176243, C3-176244, C3-176317 and C3-176318	0.2.0
2018-01	CT3#94					C3-180034, C3-180196 and C3-180197	0.3.0
2018-03	CT3#95	C3-181366				Inclusion of P-CRs agreed in CT3#95: C3-181214, C3-181215, C3-181216, C3-181217, C3-181354, C3-181353.	0.4.0
2018-04	CT3#96					C3-182315, C3-182316, C3-182144, C3-182317	0.5.0
2018-05	CT3#97					C3-183452, C3-183451, C3-183829, C3-183453, C3-183454, C3-183283 and C3-183455.	0.6.0
2018-06	CT#80	CP-181039				TS sent to plenary for approval	1.0.0
2018-06	CT#80	CP-181039				TS approved by plenary	15.0.0
2018-09	CT#81	CP-182015	0001	2	F	DNAI change notification type	15.1.0
2018-09	CT#81	CP-182015	0002	4	F	Completion of Error Codes in OpenAPI file	15.1.0
2018-09	CT#81	CP-182015	0003	-	F	Definition of DNAI	15.1.0
2018-09	CT#81	CP-182015	0004	2	F	Stateless AMF support updates	15.1.0
2018-09	CT#81	CP-182015	0007	1	F	Encoding of the "N6 traffic routing information"	15.1.0
2018-09	CT#81	CP-182033	0008	2	F	Addition of Time Stamp	15.1.0
2018-09	CT#81	CP-182015	0009	1	F	Update of resource figure	15.1.0
2018-09	CT#81	CP-182015	0010	-	F	Update of resource figure	15.1.0
2018-12	CT#82	CP-183205	0011	6	F	Correction to the event subscription	15.2.0
2018-12	CT#82	CP-183205	0012	4	F	Correction to the AF influence traffic steering control	15.2.0
2018-12	CT#82	CP-183137	0013	5	F	Immediate reporting flag	15.2.0
2018-12	CT#82	CP-183205	0014	2	F	UE ID in the notification	15.2.0
2018-12	CT#82	CP-183205	0015	1	F	Correction to the overview	15.2.0
2018-12	CT#82	CP-183205	0016	2	F	Correction to the NF consumer	15.2.0
2018-12	CT#82	CP-183205	0017	1	F	Location Header	15.2.0
2018-12	CT#82	CP-183205	0018	.	F	Data for notification	15.2.0
2018-12	CT#82	CP-183205	0019	1	F	NotificationMethod	15.2.0
2018-12	CT#82	CP-183205	0020	1	F	Correction of apiName	15.2.0
2018-12	CT#82	CP-183205	0021	-	F	Default value for apiRoot	15.2.0
2018-12	CT#82	CP-183205	0023	-	F	API version	15.2.0
2018-12	CT#82	CP-183205	0024	1	F	ExternalDocs OpenAPI field	15.2.0
2018-12	CT#82	CP-183205	0025	-	F	Location header field in OpenAPI	15.2.0
2018-12	CT#82	CP-183205	0026	1	F	Security	15.2.0
2018-12	CT#82	CP-183205	0027	-	F	supported content types	15.2.0
2018-12	CT#82	CP-183205	0028	2	F	HTTP Error responses	15.2.0
2018-12	CT#82	CP-183205	0029	1	F	Monitoring identities	15.2.0
2018-12	CT#82	CP-183205	0030	-	F	Correction to the names of data types	15.2.0
2018-12	CT#82	CP-183205	0031	-	F	Report of Ethernet UE address	15.2.0
2019-03	CT#83	CP-190117	0032	1	F	Correction of name of security scope	15.3.0
2019-03	CT#83	CP-190117	0033	2	F	API version update for Rel-15	15.3.0
2019-03	CT#83	CP-190117	0034	1	F	Correction of URIs in resource structure table and figure	15.3.0
2019-06	CT#84	CP-191074	0037	3	F	Correct condition for DNAI in UP path change	15.4.0
2019-06	CT#84	CP-191074	0038	1	F	Precedence of OpenAPI file	15.4.0
2019-06	CT#84	CP-191074	0041	1	F	Correction of Misplaced Location header in OpenAPI file	15.4.0
2019-06	CT#84	CP-191074	0043	2	F	API version Update	15.4.0
2019-06	CT#84	CP-191074	0044	1	F	Copyright Note in YAML file	15.4.0
2019-09	CT#85	CP-192141	0052	1	F	Correct SMF event exposure service name	15.5.0

History

Document history		
V15.0.0	June 2018	Publication
V15.1.0	October 2018	Publication
V15.2.0	April 2019	Publication
V15.3.0	April 2019	Publication
V15.4.0	July 2019	Publication
V15.5.0	October 2019	Publication