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Contents

Foreword

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1 Scope

The present document specifies the stage 3 protocol and data model for the Policy Control Event Exposure Service of the 5G System. It provides stage 3 protocol definitions, message flows and specifies the API for the Npcf Event Exposure service.

The 5G System stage 2 architecture and the procedures are specified in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [4].

The 5G System stage 3 call flows are provided in 3GPP TS 29.513 [8].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [5] and 3GPP TS 29.501 [6].

The Policy Control Event Exposure Service is provided by the Policy Control Function (PCF). This service exposes policy control events observed at the PCF.

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[4] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System; Stage 2".

[5] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[6] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

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

[8] 3GPP TS 29.513: "5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".

[9] 3GPP TS 29.512: "5G System; Session Management Policy Control Service; Stage 3".

[10] 3GPP TS 29.507: "5G System; Access and Mobility Policy Control Service; Stage 3".

[11] 3GPP TS 29.525: "5G System; UE Policy Control Service; Stage 3".

[12] 3GPP TS 29.514: "5G System;Policy Authorization Service; Stage 3".

[13] 3GPP TS 29.214: "Policy and Charging Control over Rx reference point".

[14] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[15] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".

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

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

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

[19] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

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

[21] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

3 Definitions, symbols 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].

example: text used to clarify abstract rules by applying them literally.

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
API	Application Programming Interface
GPSI	Generic Public Subscription Identifier
DNN	Data Network Name
HTTP	Hypertext Transfer Protocol
NEF	Network Exposure Function
NF	Network Function
NRF	Network Repository Function
PCF	Policy Control Function
RFSP	RAT Frequency Selection Priority
S-NSSAI	Single Network Slice Selection Assistance Information
SUPI	Subscription Permanent Identifier
URSP	UE Route Selection Policy

4 Npcf_EventExposure Service

4.1 Service Description

4.1.1 Overview

The Policy Event Exposure Service, as defined in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [4], is provided by the Policy Control Function (PCF).

This service:

- allows NF service consumers to subscribe, modify and unsubscribe for policy control events; and
- notifies NF service consumers with a corresponding subscription about observed events on the PCF.

The types of observed events include:

- PLMN identifier notification; and
- Access type change.

The target of the event reporting may include a group of UE(s) or any UE (i.e. all UEs). When the event occurs, to which the NF service consumer has subscribed to, the PCF reports the requested information to the NF service consumer based on the event reporting information definition requested by the NF service consumer (see 3GPP TS 23.502 [3], subclause 4.15.1).

4.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Policy and Charging related 5G architecture and signalling flows are also described in 3GPP TS 29.513 [8].

The Policy Event Exposure Service (Npcf_EventExposure) is part of the Npcf service-based interface exhibited by the Policy Control Function (PCF).

The only known NF service consumer of the Npcf_EventExposure service is the Network Exposure Function (NEF).

The Npcf_EventExposure service is provided by the PCF and consumed by the NEF, as shown in figure 4.1.2-1 for the SBI representation model and in figure 4.1.2-2 for reference point representation model.

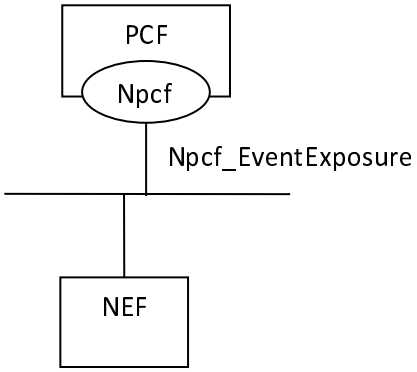

Figure 4.1.2-1: Npcf_ EventExposure service Architecture, SBI representation

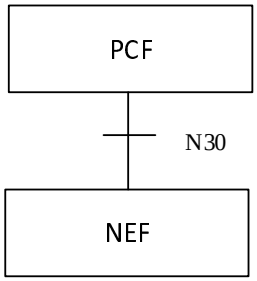

Figure 4.1.2-2: Npcf_ EventExposure service Architecture, reference point representation

4.1.3 Network Functions

4.1.3.1 Policy Control Function (PCF)

The PCF (Policy Control Function) is a functional element that encompasses policy control decision and flow based charging control functionalities as defined in 3GPP TS 29.512 [9], access and mobility policy decisions for the control of the UE Service Area Restrictions and RAT/RFSP control as defined in 3GPP TS 29.507 [10] and UE Policy decisions for the control of Access network discovery and selection policy and UE Route Selection Policy (URSP) as defined in 3GPP TS 29.525 [11].

The policy control decision and flow based charging control functionalities enable the PCF to provide network control regarding the service data flow detection, gating, QoS and flow based charging (except credit management) towards the SMF/UPF. The PCF offers these capabilities to the NF service consumers (e.g. the AF and NEF) as defined in 3GPP TS 29.514 [12] and 3GPP TS 29.214 [13].

The Policy Event Exposure Service enables the PCF to report policy control events observed in one or more PCF services to NF service consumers.

4.1.3.2 NF Service Consumers

The Network Exposure Function (NEF) is a functional element that supports the following functionalities:

- The NEF securely exposes network capabilities and events provided by 3GPP NFs to AF.
- The NEF provides a means for the AF to securely provide information to 3GPP network and can authenticate, authorize and assist in throttling the AF.
- The NEF translates the information received from the AF to the one sent to internal 3GPP NFs, and vice versa.
- The NEF supports exposing information (collected from other 3GPP NFs) to the AF.

4.2 Service Operations

4.2.1 Introduction

Service operations defined for the Npcf_EventExposure Service are shown in table 4.2.1-1.

Table 4.2.1-1: Npcf_EventExposure Service Operations

Service Operation Name	Description	Initiated by
Npcf_EventExposure_Subscribe	This service operation is used by an NF service consumer to subscribe for event notifications on a specified policy control event for a group of UE(s) or any UE, or to modify a subscription.	NF service consumer (NEF)
Npcf_EventExposure_Unsubscribe	This service operation is used by an NF service consumer to unsubscribe from event notifications.	NF service consumer (NEF)
Npcf_EventExposure_Notify	This service operation is used by the PCF to report UE related policy control event(s) to the NF service consumer which has subscribed to the event report service.	PCF

4.2.2 Npcf_EventExposure_Subscribe service operation

4.2.2.1 General

This service operation is used by an NF service consumer to subscribe for policy events notifications on a specified context for a 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:

- PLMN identifier notification; and
- Change of Access Type.

The following procedures using the Nsmf_EventExposure_Subscribe service operation are supported:

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

4.2.2.2 Creating a new subscription

Figure 4.2.2.2-1 illustrates the creation of a subscription.

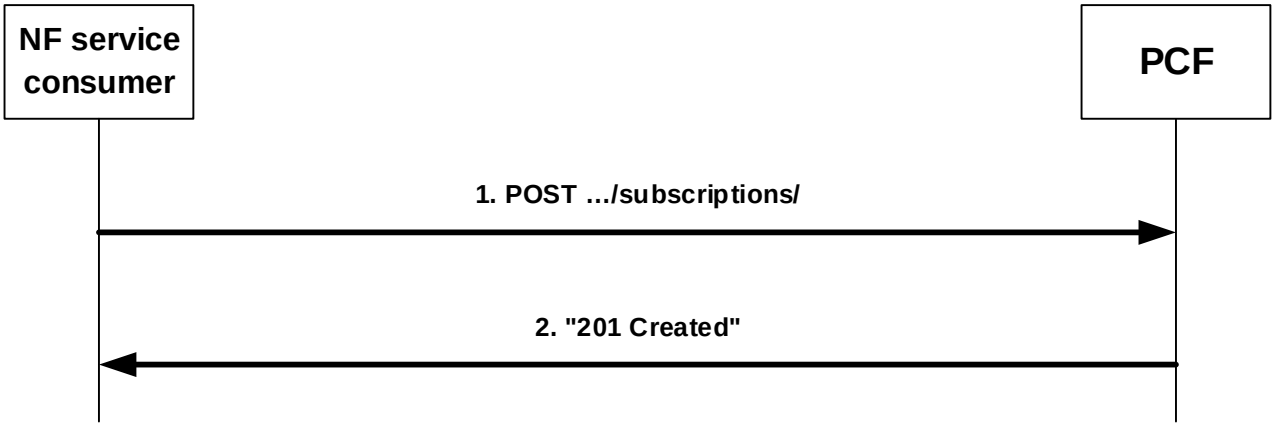

Figure 4.2.2.2-1: Creation of a subscription

To subscribe to event notifications, the NF service consumer shall send an HTTP POST request with: "{apiRoot}/npcf-eventexposure/v1/subscriptions/" as request URI as shown in figure 4.2.2.2-1, step 1, and the "PcEventExposureSubsc" data structure as request body.

The "PcEventExposureSubsc" data structure shall include:

- identification of the policy events to subscribe as "eventSubs" attribute;
- indication of the UEs to which the subscription applies via:
  a) identification of a group of UE(s) via a "groupId" attribute; or
  b) identification of any UE by ommitting the "groupId" attribute.
- a URI where to receive the requested notifications as "notifUri" attribute; and
- a Notification Correlation Identifier assigned by the NF service consumer for the requested notifications as "notifId" attribute.

The "PcEventExposureSubsc" data structure may include:

- description of the event reporting information as "eventsRepInfo", which may include:
  a) event notification method (periodic, one time, on event detection) as "notifMethod" attribute;
  b) Maximum Number of Reports as "maxReportNbr" attribute;
  c) Monitoring Duration as "monDur" attribute;
  d) repetition period for periodic reporting as "repPeriod" attribute; and/or
  e) immediate reporting indication as "immRep" attribute.
- if the supported feature "ExtendedSessionInformation" is supported, to filter the AF sessions for which the policy event report shall occur, the identification of the services one or more AF sessions may belong to as "filterServices" attribute, which may include per service identification:
  a) a list of ethernet flows in the "servEthFlows" attribute; or
  b) a list of IP flows in the "servIpFlows" attribute; and/or
  c) an AF application identifier in the "afAppId" attribute.
- to filter the DNNs for which the policy event report shall occur, the identification of the DNNs in the "filterDnns" attribute; and
- to filter the S-NSSAIs for which the policy event report shall occur, the identification of the S-NSSAIs in the "filterSnssais" attribute.

If the PCF cannot successfully fulfil the received HTTP POST request due to the internal PCF error or due to the error in the HTTP POST request, the PCF shall send the HTTP error response as specified in subclause 5.7.

Upon successful reception of the HTTP POST request with "{apiRoot}/npcf-eventexposure/v1/subscriptions/" as request URI and "PcEventExposureSubsc" data structure as request body, the PCF shall create a new "Individual Policy Events Subscription" resource, shall store the subscription and shall send a HTTP "201 Created" response as shown in figure 4.2.2.2-1, step 2. The PCF shall include in the "201 Created" response:

- a Location header field; and
- an "PcEventExposureSubsc" data type in the payload body.

The Location header field shall contain the URI of the created individual application session context resource i.e. "{apiRoot}/ npcf-eventexposure/v1/subscriptions/{subscriptionId}".

The "PcEventExposureSubsc" data type payload body shall contain the representation of the created "Individual Policy Events Subscription".

When the "monDur" attribute is included in the response, it represents a server selected expiry time that is equal or less than a possible expiry time in the request.

When the "immRep" attribute is included in the subscription and the subscribed policy control events are available, the PCF shall immediately notify the NF service consumer using the Npcf_EventExposure_Notify service operation, as described in subclause 4.2.4.2.

4.2.2.3 Modifying an existing subscription

Figure 4.2.2.3-1 illustrates the modification of an existing subscription.

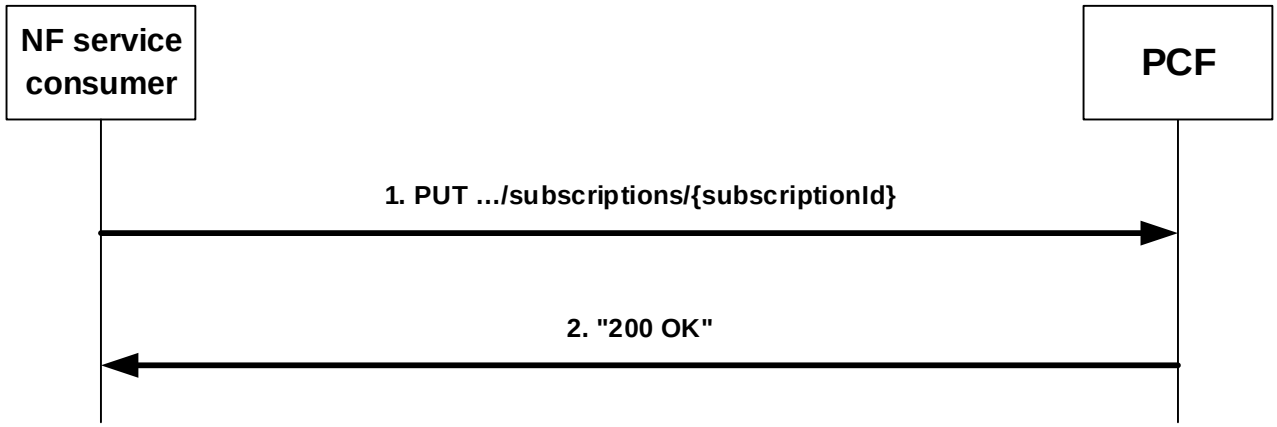

Figure 4.2.2.3-1: Modification of an existing subscription

To modify an existing subscription to event notifications, the NF service consumer shall send an HTTP PUT request with: "{apiRoot}/npcf-eventexposure/v1/subscriptions/{subscriptionId}" as request URI, as shown in figure 4.2.2.3-1, step 1, where "{subscriptionId}" is the subscription correlation ID of the existing subscription. The "PcEventExposureSubsc" data structure is included as request body as described in subclause 4.2.2.2.

NOTE 1: An alternate NF service consumer than the one that requested the generation of the subscription resource can send the PUT.

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

If the PCF cannot successfully fulfil the received HTTP PUT request due to the internal PCF error or due to the error in the HTTP PUT request, the PCF shall send the HTTP error response as specified in subclause 5.7.

Upon successful reception of an HTTP PUT request with: "{apiRoot}/npcf-eventexposure/v1/subscriptions/{subscriptionId}" as request URI and "PcEventExposureSubsc" data structure as request body, the PCF shall store the subscription and shall send a HTTP "200 OK" response as shown in figure 4.2.2.3-1, step 2, with the "PcEventExposureSubsc" data structure as response body.

The "PcEventExposureSubsc" data structure payload body shall contain the representation of the modified "Individual Policy Events Subscription".

When the "monDur" attribute is included in the response, it represents a NF service producer selected expiry time that is equal or less than a possible expiry time received in the request.

When the "immRep" attribute is included in the updated subscription and the subscribed policy control events are available, the PCF shall immediately notify the NF service consumer using the Npcf_EventExposure_Notify service operation, as described in subclause 4.2.4.2.

4.2.3 Npcf_EventExposure_UnSubscribe service operation

4.2.3.1 General

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

The following procedure using the Npcf_EventExposure_UnSubscribe service operation is supported:

- unsubscription from event notifications.

4.2.3.2 Unsubscription from event notifications

Figure 4.2.3.2-1 illustrates the unsubscription from event notifications.

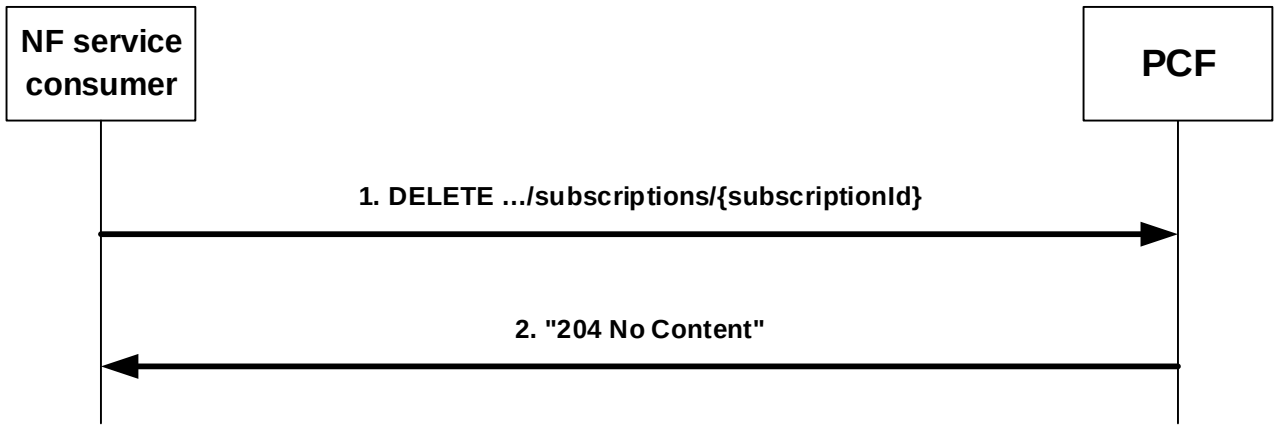

Figure 4.2.3.2-1: Unsubscription from event notifications

To unsubscribe from event notifications, the NF service consumer shall send an HTTP DELETE request with: "{apiRoot}/npcf-eventexposure/v1/subscriptions/{subscriptionId}" as request URI, as shown in figure 4.2.3.2-1, step 1, where "{subscriptionId}" is the subscription correlation identifier of the existing resource subscription that is to be deleted.

If the PCF cannot successfully fulfil the received HTTP DELETE request due to the internal PCF error or due to the error in the HTTP DELETE request, the PCF shall send the HTTP error response as specified in subclause 5.7.

Upon successful reception of the HTTP DELETE request with: "{apiRoot}/npcf-eventexposure/v1/subscriptions/{subscriptionId}" as request URI, the PCF shall remove the corresponding subscription and shall send an HTTP "204 No Content" response as shown in figure 4.2.3.2-1, step 2.

4.2.4 Npcf_EventExposure_Notify service operation

4.2.4.1 General

The Npcf_EventExposure_Notify service operation enables the PCF to notify to the NF service consumers that the previously subscribed policy control event occurred.

The following procedure using the Npcf_EventExposure_Notify service operation is supported:

- notification about subscribed events.

4.2.4.2 Notification about subscribed events

Figure 4.2.4.2-1 illustrates the notification about subscribed events.

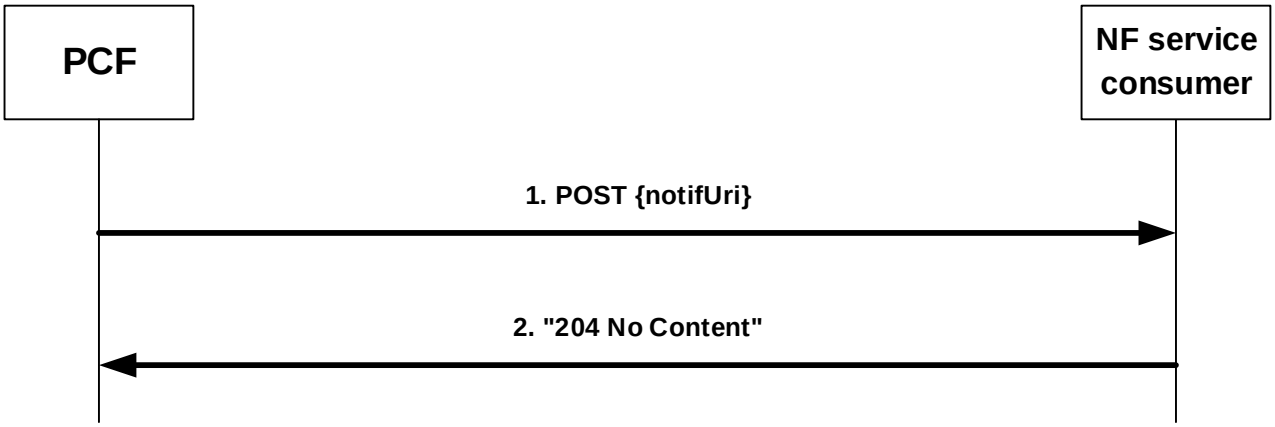

Figure 4.2.4.2-1: Notification about subscribed events

If the PCF observes policy control related event(s) for which an NF service consumer has subscribed to, the PCF shall send an HTTP POST request as shown in figure 4.2.4.2-1, step 1, with the "{notifUri}" as request URI with the value previously provided by the NF service consumer within the corresponding subscription, and the "PcEventExposureNotif" data structure.

The "PcEventExposureNotif" data structure shall include:

- Notification correlation ID provided by the NF service consumer during the subscription as "notifId" attribute; and
- information about the observed event(s) within the "eventNotifs" attribute that shall contain for each observed event an "PcEventNotification" data structure that shall include:
  1. the Policy Control event as "event" attribute;
  2. for an access type change:
     a) new access type as "accType" attribute; and
     b) the new RAT type as "ratType" attribute, if applicable for the notified access type;
  3. for a PLMN change:
     a) new PLMN as "plmnId" attribute;
  4. the identity of the affected UE in the "supi" attribute and, if available, in the "gpsi" attribute;
  5. the time at which the event was observed encoded as "timeStamp" attribute;
  6. if available, and if the feature "ExtendedSessionInformation" is supported, information about the PDU session involved in the reported event in the "pduSessInfo" attribute, that shall include:
     a) the S-NSSAI of the PDU session in the "snssai" attribute;
     b) the DNN of the PDU session in the "dnn" attribute; and
     c) the IPv4 address in the "ueIpv4" attribute and/or the IPv6 prefix in the "ueIpv6" attribute, or the Ethernet MAC address in the "ueMac" attribute; and

     if the IPv4 address is included in the "ueIpv4" attribute, may include the IP domain in the "ipDomain" attribute;
  7. if available, and if the feature "ExtendedSessionInformation" is supported, information about the services involved in the reported event in the indicated PDU session in the "repServices" attribute, which may include per identified service:

a) a list of Ethernet flows in the "ethFlowNums" attribute; or

b) a list of IP flows in the "ipFlowNums" attribute; and/or

c) an AF application identifier in the "afAppId" attribute.

If the NF service consumer cannot successfully fulfil the received HTTP POST request due to the internal error or due to the error in the HTTP POST request, the NF service consumer shall send the HTTP error response as specified in subclause 5.7.

Upon successful reception of the HTTP POST request with "{notifUri}" as request URI and a "PcEventExposureNotif" data structure as request body, the NF service consumer shall send a "204 No Content" HTTP response, as shown in figure 4.2.4.2-1, step 2, for a successful processing.

5 Npcf_EventExposure Service API

5.1 Introduction

The Npcf_EventExposure Service shall use the Npcf_EventExposure API.

The request URI used in HTTP request from the NF service consumer towards the PCF shall have the structure defined in subclause 4.4.1 of 3GPP TS 29.501 [6], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [6].
- The {apiName} shall be "npcf-eventexposure".
- 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 [16], shall be used as specified in subclause 5.2 of 3GPP TS 29.500 [5].

HTTP/2 shall be transported as specified in subclause 5.3 of 3GPP TS 29.500 [5].

The OpenAPI [7] specification of HTTP messages and content bodies for the Npcf_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 [5] for the usage of HTTP standard headers.

5.2.2.2 Content type

JSON, IETF RFC 8259 [17], 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 [5]. 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

5.2.3.1 General

The mandatory HTTP custom header fields specified in subclause 5.2.3.2 of 3GPP TS 29.500 [5] shall be applicable.

In this Release of the specification, no specific custom headers are defined for the Npcf_EventExposure API.

5.3 Resources

5.3.1 Resource Structure

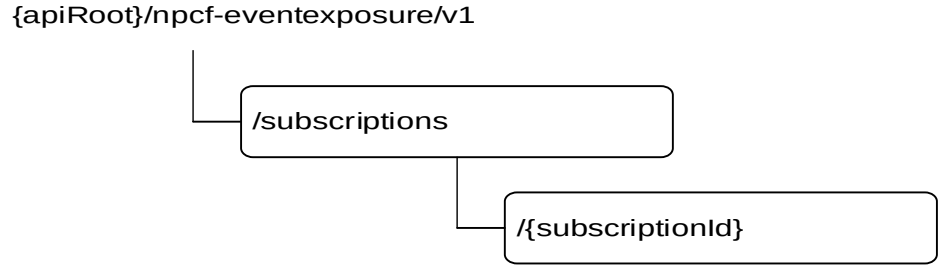

Figure 5.3.1-1: Resource URI structure of the Npcf_EventExposure API

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
Policy Control Events Subscriptions	{apiRoot}/ npcf-eventexposure/ v1/subscriptions	POST	Subscription to the notification of policy control events and creation of an Individual Policy Control Events Subscription resource.
Individual Policy Control Events Subscription	{apiRoot}/ npcf-eventexposure/ v1/subscriptions/{subscriptionId}	GET	Reads an Individual Policy Control Events Subscription resource.
		PUT	Modifies an Individual Policy Control Events Subscription.
		DELETE	Cancels an individual subscription to notifications of policy control events.

5.3.2 Resource: Policy Control Events Subscriptions (Collection)

5.3.2.1 Description

The Policy Control Events Subscriptions resource represents all subscriptions of the Npcf_EventExposure service at a given PCF.

5.3.2.2 Resource definition

Resource URI: **{apiRoot}/npcf-eventexposure/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 <method 1> 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 <method 1> Request Body on this resource

Data type	P	Cardinality	Description
PcEventExposure Subsc	M	1	Contains the information required for the creation of a new individual policy control events subscription.

Table 5.3.2.3.1-3: Data structures supported by the <method 1> Response Body on this resource

Data type	P	Cardinality	Response codes	Description
PcEventExposure Subsc	M	1	201 Created	Contains the representation of the Individual Policy Control Events Subscription resource.
NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

5.3.2.4 Resource Custom Operations

None.

5.3.3 Resource: Individual Policy Control Events Subscription (Document)

5.3.3.1 Description

The Individual Policy Control Events Subscription resource represents a single subscription of the Npcf_EventExposure service at a given PCF.

5.3.3.2 Resource definition

Resource URI: **{apiRoot}/npcf-eventexposure/v1/subscriptions/{subscriptionId}**

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
subscriptionId	String identifying a subscription to the PCF event exposure service.

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
PcEventExposureSubsc	M	1	200 OK	A representation of the Individual Policy Control Events Subscription 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 [5] 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
PcEventExposureSubsc	M	1	Modifies the existing Individual Policy Control Events Subscription resource.

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
PcEventExposureSubsc	M	1	200 OK	Successful case: The Individual Policy Control Events Subscription was modified and a representation is returned.
NOTE: The mandatory HTTP error status codes for the PUT method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] 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 Policy Control Events Subscription resource matching the subscriptionId was deleted.
NOTE: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] 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 [5] and subclause 4.6.2.3 of 3GPP TS 29.501 [6].

Table 5.5.1-1: Notifications

Custom operation URI	Mapped HTTP method	Description
{notifUri}	POST	Notification of policy control event reporting.

5.5.2 Policy Control Event Notification

5.5.2.1 Description

The Policy Control Event Notification is used by the PCF to report one or several observed policy control events to the NF service consumer that has subscribed to such notifications via the Individual Policy Control Events Subscription resource.

5.5.2.2 Target URI

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

Table 5.5.2.2-1: URI variables

Name	Definition
notifUri	String formatted as URI with the Notification Uri as assigned by the NF service consumer during the subscription service operation and described within the PcEventExposureSubsc data 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
PcEventExposureNotif	M	1	Provides Information about observed policy control 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.
NOTE: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [5] for the POST method shall 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 Npcf_EventExposure service based interface protocol.

Table 5.6.1-1: Npcf_EventExposure specific Data Types

Data type	Section defined	Description	Applicability
EthernetFlowInfo	5.6.2.6	Identification of an UL/DL ethernet flow.	ExtendedSessionInformation
IpFlowInfo	5.6.2.7	Identification of an UL/DL IP flow.	ExtendedSessionInformation
PcEvent	5.6.3.3	Policy Control Events.	
PcEventExposureSubsc	5.6.2.2	Represents an Individual Policy Events Subscription resource.	
PcEventExposureNotif	5.6.2.3	Describes notifications about Policy Control events that occurred in an Individual Policy Events Subscription resource.	
PcEventNotification	5.6.2.8	Represents the information reported for a Policy Control event.	
PduSessionInformation	5.6.2.9	Represents PDU session identification information.	ExtendedSessionInformation
ReportingInformation	5.6.2.4	Represents the type of reporting the subscription requires.	
ServiceIdentification	5.6.2.5	Identification of the service to which the subscription applies.	ExtendedSessionInformation

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

Table 5.6.1-2: Npcf_EventExposure re-used Data Types

Data type	Reference	Comments	Applicability
AccessType	3GPP TS 29.571 [14]	Access Type.	
AfAppId	3GPP TS 29.514 [12]	AF application Identifier.	ExtendedSessionInformation
DateTime	3GPP TS 29.571 [14]	Time stamp.	
Dnn	3GPP TS 29.571 [14]	Identifies a DNN.	
DurationSec	3GPP TS 29.571 [14]	Seconds of duration.	
EthFlowDescription	3GPP TS 29.514 [12]	Identifies an ethernet flow description.	ExtendedSessionInformation
FlowDescription	3GPP TS 29.514 [12]	Identifies an IP flow description.	ExtendedSessionInformation
Gpsi	GPP TS 29.571 [14]	Generic Public Subscription Identifier.	
GroupId	3GPP TS 29.571 [14]	Identifies a group of UEs.	
MacAddr48	3GPP TS 29.571 [14]	Mac Address of the UE.	ExtendedSessionInformation
NotificationMethod	3GPP TS 29.508 [15]	Represents the Notification Method.	
PlmnId	3GPP TS 29.571 [14]	PLMN Identifier.	
RatType	3GPP TS 29.571 [14]	RAT Type.	
Snssai	3GPP TS 29.571 [14]	Identifies a S-NSSA.I	
Supi	3GPP TS 29.571 [14]	Identifies the SUPI of the UE.	
SupportedFeatures	3GPP TS 29.571 [14]	Used to negotiate the applicability of the optional features defined in subclause 5.8.	
Uinteger	3GPP TS 29.571 [14]	Unsigned integer.	

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 PcEventExposureSubsc

Table 5.6.2.2-1: Definition of type PcEventExposureSubsc

Attribute name	Data type	P	Cardinality	Description	Applicability
eventSubs	array(PcEvent)	M	1..N	Subscribed Policy Control events.	
eventsRepInfo	ReportingInformation	O	1	Represents the reporting requirements of the subscription.	
groupId	GroupId	C	0..1	Represents an internal group identifier and identifies a group of UEs. It shall be present when the subscription is targeting a Group of UE(s).	
filterDnns	array(Dnn)	O	1..N	Represents the DNNs for which the policy event report shall apply. If omitted it represents any DNN.	
filterSnssais	array(Snssai)	O	1..N	Represents the S-NSSAIs for which the policy event report shall apply. If omitted it represents any S-NSSAI.	
filterServices	array(ServiceIdentification)	O	1..N	Represents the services for which the policy event report shall apply. If omitted, the policy event report shall apply for all the active services.	ExtendedSessionInformation
notifUri	Uri	M	1	Notification URI for Policy Control event reporting.	
notifId	string	M	1	Notification Correlation ID assigned by the NF service consumer.	
suppFeat	SupportedFeatures	M	1	This IE represents a list of Supported features used as described in subclause 5.8. In the HTTP POST request it represents the set of NF service consumer supported features. In the HTTP POST and GET responses it represents the set of PCF Event Exposure agreeable supported features.	

5.6.2.3 Type PcEventExposureNotif

Table 5.6.2.3-1: Definition of type PcEventExposureNotif

Attribute name	Data type	P	Cardinality	Description	Applicability
notifId	string	M	1	Notification Correlation ID assigned by the NF service consumer.	
eventNotifs	array(PcEventNotification)	M	1..N	Represents the Policy Control Events to be reported according to the subscription corresponding to the Notification Correlation ID.	

5.6.2.4 Type ReportingInformation

Table 5.6.2.4-1: Definition of type ReportingInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
immRep	boolean	O	0..1	Indication of immediate reporting. If included, when it is set to true it indicates immediate reporting of the subscribed events, if available. Otherwise, reporting will occur when the event is met.	
notifMethod	NotificationMethod	O	0..1	Represents the notification method (periodic, one time, on event detection). If "notifMethod" attribute is not supplied, the default value "ON_EVENT_DETECTION" applies.	
maxReportNbr	Uinteger	O	0..1	Represents the maximum number of reports, after which the subscription ceases to exist (i.e., the reporting ends). It may be present for the "PERIODIC" and on "ON_EVENT_DETECTION" notification methods. If omitted, there is no limit.	
monDur	DateTime	C	0..1	Represents the time at which the subscription ceases to exist (i.e the subscription becomes invalid and the reporting ends). If omitted, there is no time limit. If present in the subscription request, it shall be present in the subscription response.	
repPeriod	DurationSec	O	0..1	Indicates the time interval between successive Policy Control event notifications.It is supplied for notification method "PERIODIC".	

5.6.2.5 Type ServiceIdentification

Table 5.6.2.5-1: Definition of type ServiceIdentification

Attribute name	Data type	P	Cardinality	Description	Applicability
servEthFlows	array(EthernetFlowInfo)	C	1..N	Ethernet flows of a service.	ExtendedSessionInformation
servIpFlows	array(IpFlowInfo)	C	1..N	IP flows of a service	ExtendedSessionInformation
afAppId	AfAppId	O	0..1	Contains an AF application identifier.	ExtendedSessionInformation
NOTE: At least one of the "servEthFlows", "servIpFlows" or "afAppId" attributes shall be present. The "servEthFlows" attribute and the "servIpFlows" attribute shall not be both present at the same time.					

5.6.2.6 Type EthernetFlowInfo

Table 5.6.2.6-1: Definition of type EthernetFlowInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
ethFlows	array(EthFlowDescription)	C	1..2	Contains the flow description for the Uplink and/or Downlink Ethernet flows. It shall be present in the subscription request.	ExtendedSessionInformation
flowNumber	integer	M	1	Identifies the ordinal number of the Ethernet flow.	ExtendedSessionInformation

5.6.2.7 Type IpFlowInfo

Table 5.6.2.7-1: Definition of type IpFlowInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
ipFlows	array(FlowDescription)	C	1..2	Contains the flow description for the Uplink and/or Downlink IP flows. It shall be present in the subscription request	ExtendedSessionInformation
flowNumber	integer	M	1	Identifies the ordinal number of the IP flow.	ExtendedSessionInformation

5.6.2.8 Type PcEventNotification

Table 5.6.2.8-1: Definition of type PcEventNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
event	PcEvent	M	1..N	Reported Policy Control event.	
accType	AccessType	C	0..1	Access Type. It shall be included when the reported PcEvent is "AC_TY_CH".	
ratType	RatType	O	0..1	RAT Type. It shall be included if applicable when the reported PcEvent is "AC_TY_CH".	
plmnId	PlmnId	C	0..1	PLMN Identifier. It shall be included when the reported PcEvent is "PLMN_CH".	
supi	Supi	C	0..1	SUPI of the UE. It shall be present if available.	
gpsi	Gpsi	O	0..1	Gpsi shall contain either an External Id or an MSISDN.	
timeStamp	DateTime	M	1	Time at which the event is observed.	
pduSessInfo	PduSessionInformation	O	0..1	Represents PDU session information related to the observed event.	ExtendedSessionInformation
repServices	ServiceIdentification	O	0..1	Represents service information related to the observed event.	ExtendedSessionInformation

5.6.2.9 Type PduSessionInformation

Table 5.6.2.9-1: Definition of type PduSessionInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
snssai	Snssai	M	1	S-NSSAI of the PDU session.	ExtendedSessionInformation
dnn	Dnn	M	1..N	Dnn of the PDU session.	ExtendedSessionInformation
ueIpv4	Ipv4Addr	C	0..1	The IPv4 address of the served UE. (NOTE 1)	ExtendedSessionInformation
ueIpv6	Ipv6Prefix	C	0..1	The IPv6 prefix of the served UE. (NOTE 1)	ExtendedSessionInformation
ipDomain	string	O	0..1	Identifies the IP domain. (NOTE 2)	ExtendedSessionInformation
ueMac	MacAddr48	C	0..1	UE MAC address. (NOTE 1)	ExtendedSessionInformation
NOTE 1: Either the served UE IP address (an Ipv4Addr or Ipv6Prefix or both if available) or UE MAC address shall be present. NOTE 2: An "ipDomain" attribute, may be provided in combination with a "ueIpv4" attribute.					

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

5.6.3.3 Enumeration: PcEvent

The enumeration PcEvent represents the policy control events that can be subscribed. It shall comply with the provisions defined in table 5.6.3.3-1.

Table 5.6.3.3-1: Enumeration PcEvent

Enumeration value	Description	Applicability
AC_TY_CH	Access Type Change	
PLMN_CH	PLMN Change	

5.7 Error handling

5.7.1 General

HTTP error handling shall be supported as specified in subclause 5.2.4 of 3GPP TS 29.500 [5].

For the Npcf_EventExposure API, HTTP error responses shall be supported as specified in subclause 4.8 of 3GPP TS 29.501 [6]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [5] 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 [5].

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

5.7.2 Protocol Errors

In this Release of the specification, there are no service specific protocol errors applicable for the Npcf_EventExposure API.

5.7.3 Application Errors

The application errors defined for the Npcf_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 Npcf_EventExposure API. They shall be negotiated using the extensibility mechanism defined in subclause 6.6 of 3GPP TS 29.500 [5].

Table 5.8-1: Supported Features

Feature number	Feature Name	Description
1	ExtendedSessionInformation	Indicates the support of additional session information in the subscription and report of policy control event.

5.9 Security

As indicated in 3GPP TS 33.501 [19] and 3GPP TS 29.500 [5], the access to the Npcf_EventExposure API, based on local configuration, may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [20]), using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [21]) plays the role of the authorization server.

If OAuth2 authorization is used, an NF Service Consumer, prior to consuming services offered by the Nnrf_NFManagement API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [21], subclause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF where the NF Service Consumer invoked the discovery of the Npcf_EventExposure service.

The Npcf_EventExposure API defines a single scope "npcf-eventexposure" 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 [7] specification of HTTP messages and content bodies used by the Npcf_EventExposure API.

In case of conflicts between the main body of the present document and the present Annex, the information in the main body shall be applicable.

A.2 Npcf_EventExposure API

```
openapi: 3.0.0
info:
  description: Policy Control Event Exposure Service API
  version: "1.0.1"
  title: Npcf_EventExposure
externalDocs:
  description: 3GPP TS 29.523 V15.1.0; 5G System; Policy Control Event Exposure Service; Stage 3.
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.523/

servers:
  - url: '{apiRoot}/npcf-eventexposure/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 4.4 of 3GPP TS 29.501

security:
  - {}
  - oAuth2ClientCredentials:
    - npcf-eventexposure

paths:
  /subscriptions:
    post:
      summary: Creates a new Individual Policy Control Events Subscription resource
      operationId: PostPcEventExposureSubsc
      tags:
        - Policy Control Events Subscription (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/PcEventExposureSubsc'
      responses:
        '201':
          description: Success
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PcEventExposureSubsc'
          headers:
            Location:
              description: 'Contains the URI of the created individual policy control events
subscription resource, according to the structure: {apiRoot}/npcf-
eventexposure/v1/subscriptions/{subscriptionId}'
              required: true
              schema:
                type: string
        '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:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    callbacks:
      PcEventNotification:
        '{$request.body#/notifUri}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/PcEventExposureNotif'
            responses:
              '204':
                description: No Content, Notification was succesfull
              '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/{subscriptionId}:
    get:
      summary: "Reads an existing Individual Policy Control Events Subscription"
      operationId: GetPcEventExposureSubsc
      tags:
        - Individual Policy Control Events Subscription (Document)
      parameters:
        - name: subscriptionId
          in: path
          description: Policy Control Event Subscription ID
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PcEventExposureSubsc'
        '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:
    summary: "Modifies an existing Individual Policy Control Events Subscription "
    operationId: PutPcEventExposureSubsc
    tags:
      - Individual Policy Control Events Subscription (Document)
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/PcEventExposureSubsc'
    parameters:
      - name: subscriptionId
        in: path
        description: Policy Control 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/PcEventExposureSubsc'
      '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:
    summary: "Cancels an existing Individual Policy Control Events Subscription "
    operationId: DeletePcEventExposureSubsc
    tags:
      - Individual Policy Control Events Subscription (Document)
    parameters:
      - name: subscriptionId
        in: path
        description: Policy Control 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:
            npcf-eventexposure: Access to the Npcf_EventExposure API.

  schemas:

    PcEventExposureNotif:
      type: object
      properties:
        notifId:
          type: string
        eventNotifs:
          type: array
          items:
            $ref: '#/components/schemas/PcEventNotification'
          minItems: 1
      required:
        - notifId
        - eventNotifs


    PcEventExposureSubsc:
      type: object
      properties:
        eventSubs:
          type: array
          items:
            $ref: '#/components/schemas/PcEvent'
          minItems: 1
        eventsRepInfo:
          $ref: '#/components/schemas/ReportingInformation'
        groupId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
        filterDnns:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
          minItems: 1
        filterSnssais:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
          minItems: 1
        filterServices:
          type: array
          items:
            $ref: '#/components/schemas/ServiceIdentification'
          minItems: 1
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        notifId:
          type: string
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - eventSubs
        - notifId
        - notifUri

    ReportingInformation:
```

```
      type: object
      properties:
        immRep:
          type: boolean
        notifMethod:
          $ref: 'TS29508_Nsmf_EventExposure.yaml#/components/schemas/NotificationMethod'
        maxReportNbr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        monDur:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        repPeriod:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'

    ServiceIdentification:
      type: object
      properties:
        servEthFlows:
          type: array
          items:
            $ref: '#/components/schemas/EthernetFlowInfo'
          minItems: 1
        servIpFlows:
          type: array
          items:
            $ref: '#/components/schemas/IpFlowInfo'
          minItems: 1
        afAppId:
          $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/AfAppId'
      # All conditions in allOf must be met
      allOf:
        # First condition is that servEthFlows and servIpFlows are mutually exclusive
        - not:
            required: [servEthFlows, servIpFlows]
        # Second condition is that at least one the servEthFlows, servIpFlows and afAppId shall be
present
        - anyOf:
          - required: [servEthFlows]
          - required: [servIpFlows]
          - required: [afAppId]

    EthernetFlowInfo:
      type: object
      properties:
        ethFlows:
          type: array
          items:
            $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
          minItems: 1
          maxItems: 2
        flowNumber:
          type: integer
      required:
        - flowNumber

    IpFlowInfo:
      type: object
      properties:
        ipFlows:
          type: array
          items:
            $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/FlowDescription'
          minItems: 1
          maxItems: 2
        flowNumber:
          type: integer
      required:
        - flowNumber

    PcEventNotification:
      type: object
      properties:
        event:
          $ref: '#/components/schemas/PcEvent'
        accType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
        ratType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
        plmnId:
```

```
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        timeStamp:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        pduSessionInfo:
          $ref: '#/components/schemas/PduSessionInformation'
        repServices:
          $ref: '#/components/schemas/ServiceIdentification'
      required:
        - event
        - timeStamp

    PduSessionInformation:
      type: object
      properties:
        snssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        ueIpv4:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        ueIpv6:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
        ipDomain:
          type: string
        ueMac:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
      required:
        - snssai
        - dnn
      oneOf:
        - required: [ueMac]
        - anyOf:
          - required: [ueIpv4]
          - required: [ueIpv6]

# Simple data types and Enumerations

    PcEvent:
      anyOf:
      - type: string
        enum:
          - AC_TY_CH
          - PLMN_CH
      - type: string
```

Annex B (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2018-11						TS skeleton of Policy Event Exposure Service specification	0.0.0
2018-11	CT3#99	C3-187718				API Introduction and Usage of HTTP for new PCF TS	1.0.0
2018-11	CT3#99	C3-187416				Npcf_EventExposure Resources Definition and Error handling	1.0.0
2018-11	CT3#99	C3-187419				Npcf_EventExposure, Policy Control Event Notification	1.0.0
2018-11	CT3#99	C3-187675				Npcf_EventExposure Service Description	1.0.0
2018-11	CT3#99	C3-187717				Npcf_EventExposure Service Operations and Data Structures	1.0.0
2018-11	CT3#99	C3-187734				Npcf_EventExposure, OpenAPI	1.0.0
2018-11	CT3#99	C3-187677				Npcf_EventExposure, Security	1.0.0
2018-12	CT#82	CP-183131				TS sent to plenary for information and approval	1.0.0
2018-12	CT#82	CP-183166				Npcf_EventExposure, OpenAPI	1.1.0
2018-12	CT#82	CP-183251				TS number assigned in the plenary for approval	1.1.0
2018-12	CT#82	CP-183253				TS approved by plenary	15.0.0
2019-03	CP#83	CP-190112	0001	1	F	Handling of IPdomain and UE addresses in Npcf_EventExposure service	15.1.0
2019-03	CT#83	CP-190160	0002	3	F	Correction on Presence conditions for ServiceIdentification data type	15.1.0
2019-03	CT#83	CP-190112	0003	1	F	Handling of UE identities in Npcf_EventExposure service	15.1.0
2019-03	CP#83	CP-190112	0004	-	F	Correction on the handling of access type change	15.1.0
2019-03	CT#83	CP-190112	0005	-	F	Correction of OpenAPI errors	15.1.0
2019-03	CP#83	CP-190161	0006	1	F	OpenAPI Version number updates	15.1.0

History

Document history		
V15.0.0	April 2019	Publication
V15.1.0	April 2019	Publication