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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 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".

[22] 3GPP TR 21.900: "Technical Specification Group working methods".

# 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 |
| AMF | Access and Mobility Management Function |
| API | Application Programming Interface |
| ATSSS | Access Traffic Steering, Switching and Splitting |
| DNN | Data Network Name |
| ePDG | evolved Packet Data Gateway |
| GPSI | Generic Public Subscription Identifier |
| HTTP | Hypertext Transfer Protocol |
| MA | Multi-Access |
| NEF | Network Exposure Function |
| NID | Network Identifier |
| NF | Network Function |
| NRF | Network Repository Function |
| NWDAF | Network Data Analytics Function |
| OAM | Operation And Maintenance |
| PCF | Policy Control Function |
| RFSP | RAT Frequency Selection Priority |
| S-NSSAI | Single Network Slice Selection Assistance Information |
| SMF | Session Management Function |
| SNPN | Stand-alone Non-Public Network |
| SUPI | Subscription Permanent Identifier |
| UDM | Unified Data Management |
| UDR | Unified Data Repository |
| 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 from 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 an event occurs, to which the NF service consumer has subscribed, 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 known NF service consumer of the Npcf_EventExposure service are the Network Exposure Function (NEF) and the Network Data Analytics Function (NWDAF).

The Npcf_EventExposure service is provided by the PCF and consumed by NF service consumers (e.g. NEF, NWDAF), 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.

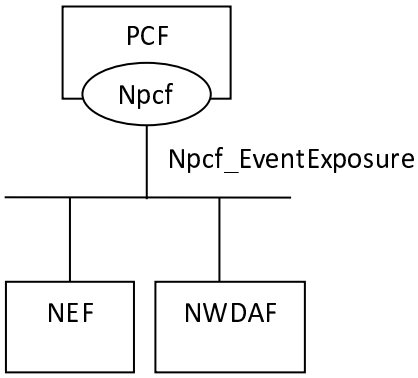

**Figure 4.1.2-1: Npcf_EventExposure service Architecture, SBI representation**

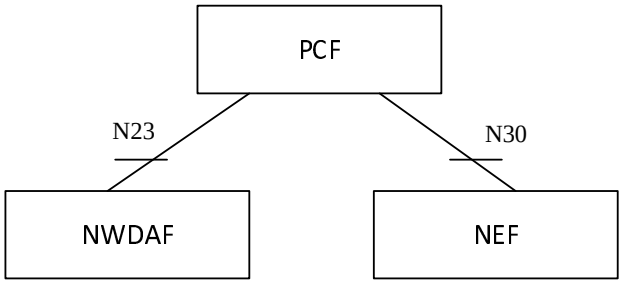


**Figure 4.1.2-2: Npcf_EventExposure service Architecture, reference point representation**

## 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

As indicated in subclause 4.1.2 above, the known NF service consumer of the Npcf_EventExposure service are the Network Exposure Function (NEF) and the Network Data Analytics Function (NWDAF).

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.

The Network Data Analytics Function (NWDAF) is a NF that provides network data analytics services to 5GC NFs and OAM. It supports for this purpose the following functionalities:

- The NWDAF performs data collection based on subscription to events provided by AMF, SMF, PCF, UDM, AF (directly or via NEF), and OAM.
- The NWDAF retrieves information from data repositories (e.g. UDR via UDM for subscriber-related information).
- The NWDAF retrieves information about NFs (e.g. from NRF for NF-related information).

- The NWDAF provides on demand network data analytics to consumers (e.g. 5GC NFs, OAM).

# 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, NWDAF) |
| Npcf_EventExposure_Unsubscribe | This service operation is used by an NF service consumer to unsubscribe from event notifications. | NF service consumer (NEF, NWDAF) |
| 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 Npcf_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.

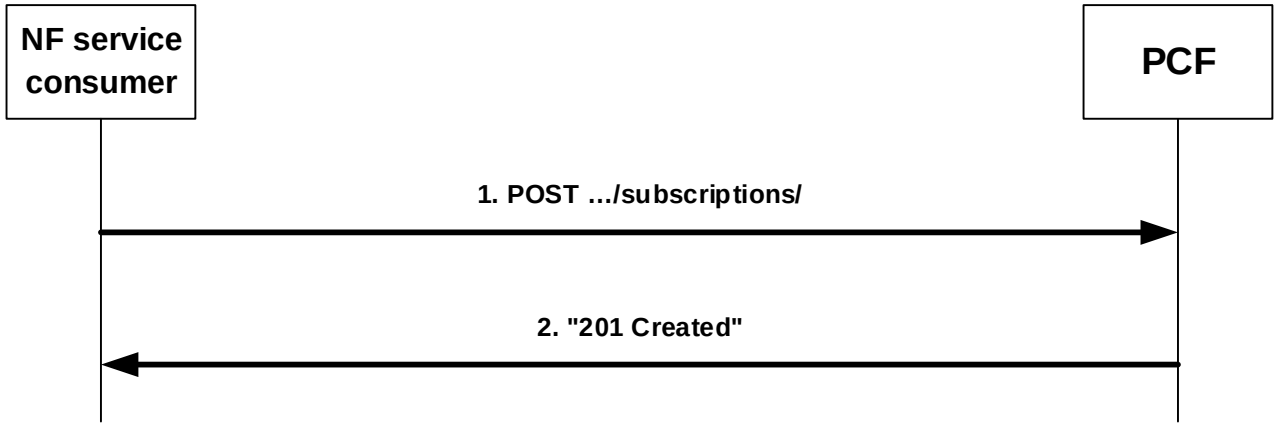


**Figure 4.2.2.2-1: Creation of a subscription**

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 also 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;
  e) immediate reporting indication as "immRep" attribute;
  f) sampling ratio as "sampRatio" attribute; and/or
  g) group reporting guard time as "grpRepTime" 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 an internal PCF error or an error in the HTTP POST request, the PCF shall send an 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, store the subscription and 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.

When the sampling ratio as the "sampRatio" attribute is included in the subscription, the PCF shall select a random subset of UEs among the target UEs according to the sampling ratio and only report the event(s) related to the selected subset of UEs.

When the group reporting guard time as the "grpRepTime" attribute is included in the subscription, the PCF shall accumulate all the event reports for the target UEs until the group reporting guard time expires. Then the PCF shall 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.

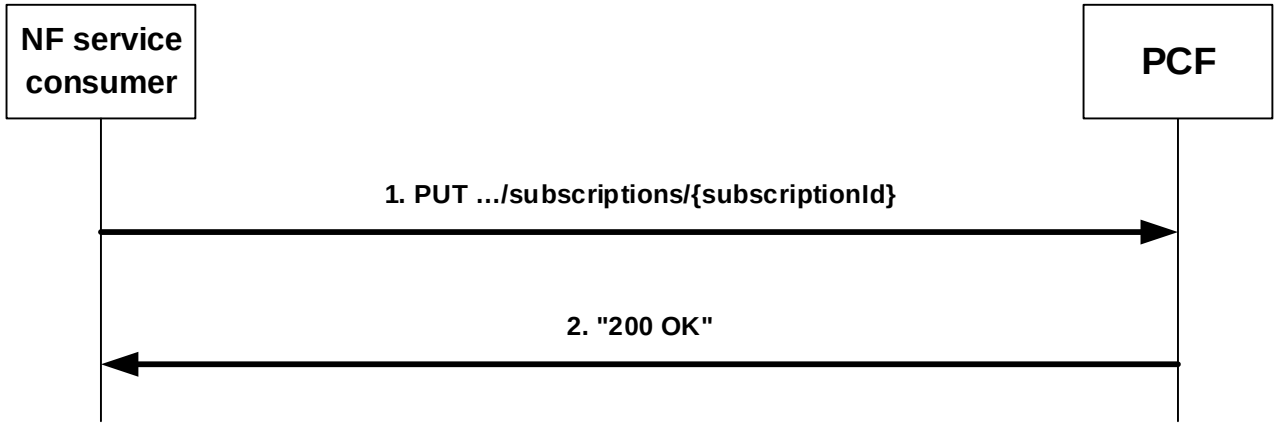


**Figure 4.2.2.3-1: Modification of an existing subscription**

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 an internal PCF error or an error in the HTTP PUT request, the PCF shall send an HTTP error response as specified in subclause 5.7.

If the feature "ES3XX" is supported, and the PCF determines the received HTTP PUT request needs to be redirected, the PCF shall send an HTTP redirect response as specified in subclause 6.10.9 of 3GPP TS 29.500 [5].

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 send an HTTP "200 OK" response with the "PcEventExposureSubsc" data structure as response body, as shown in figure 4.2.2.3-1, step 2.

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.

When the sampling ratio as the "sampRatio" attribute is included in the subscription, the PCF shall select a random subset of UEs among the target UEs according to the sampling ratio and only report the event(s) related to the selected subset of UEs.

When the group reporting guard time as the "grpRepTime" attribute is included in the subscription, the PCF shall accumulate all the event reports for the target UEs until the group reporting guard time expires. Then the PCF shall 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.

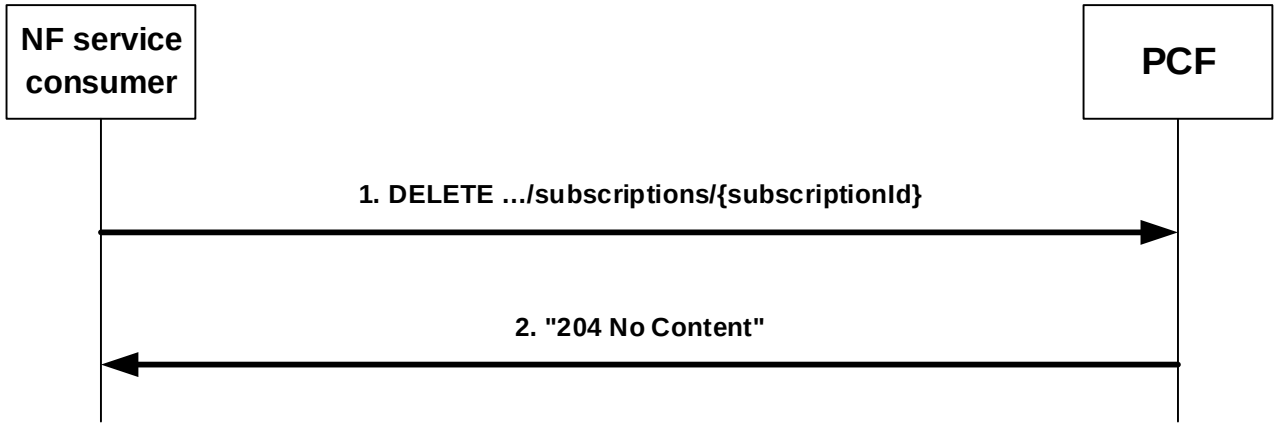


**Figure 4.2.3.2-1: Unsubscription from event notifications**

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 an internal PCF error or due to an error in the HTTP DELETE request, the PCF shall send the HTTP error response as specified in subclause 5.7.

If the feature "ES3XX" is supported, and the PCF determines the received HTTP DELETE request needs to be redirected, the PCF shall send an HTTP redirect response as specified in subclause 6.10.9 of 3GPP TS 29.500 [5].

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 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 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.

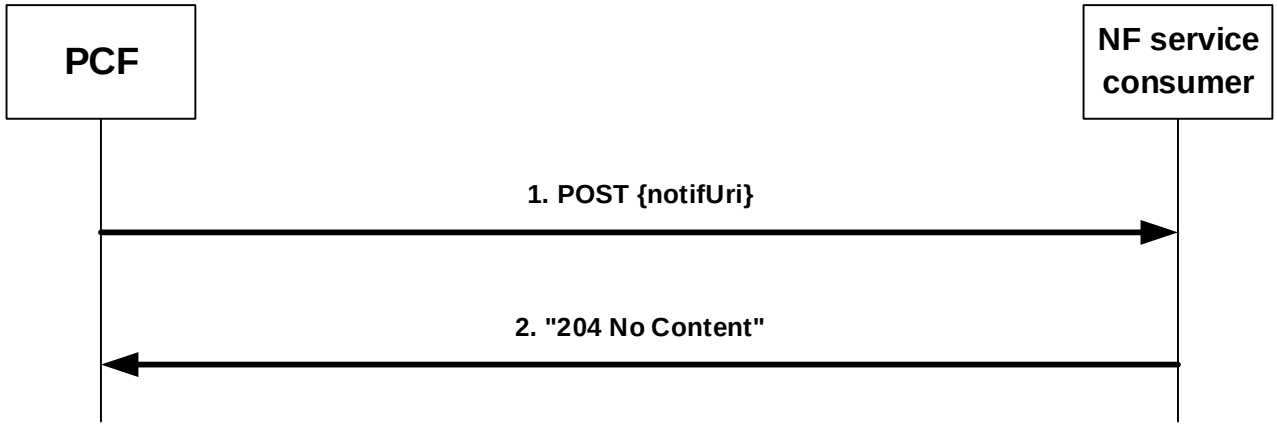


**Figure 4.2.4.2-1: Notification about subscribed events**

If the PCF observes policy control related event(s) for which an NF service consumer has subscribed, 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 containing the value previously provided by the NF service consumer within the corresponding subscription, and the "PcEventExposureNotif" data structure.

The "PcEventExposureNotif" data structure shall include:

- The 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;

     b) the new RAT type as "ratType" attribute, if applicable for the notified access type; and

     c) if the "ATSSS" feature is supported:

        i. if it is the first access type report for a PDU session, and both, 3GPP and non-3GPP access information is available, the "addAccessInfo" attribute. The "addAccessInfo" attribute contains the additional access type information, where the access type is encoded in the "accessType" attribute, and the RAT type is encoded in the "ratType" attribute when applicable for the notified access type;

        ii. if it is a subsequent access type change report:

            - if a new access type is added to the MA PDU session, the"addAccessInfo" attribute with the added access type encoded in the "accessType" attribute, and the RAT type encoded in the "ratType" attribute when applicable for the notified access type;

            - if an access type is released in the MA PDU session, the "relAccessInfo" attribute with the released access type encoded in the "accessType" attribute, and the RAT type encoded in the "ratType" attribute when applicable for the notified access type; and

NOTE: For a MA PDU session, if the "ATSSS" feature is not supported by the AF, the PCF includes the "accessType" attribute and the "ratType" attribute with a currently active combination of access type and RAT type (if applicable for the notifed access type). When both 3GPP and non-3GPP accesses are available, the PCF includes the information corresponding to the 3GPP access.

     d) for EPC inteworking scenarios, the ePDG address as "anGwAddr" attribute, if applicable for the notified access type;

  3. for a PLMN change:

a) new network identity containing the PLMN Identifier and, if available, the NID in the "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 "servEthFlows" attribute which contains an impacted Ethernet flow number within the "flowNumber" attribute in each EthernetFlowInfo data structure; or

   b) a list of IP flows in the "servIpFlows" attribute which contains an impacted IP flow number within the "flowNumber" attribute in each IpFlowInfo data structure; 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 an internal error or an error in the HTTP POST request, the NF service consumer shall send an HTTP error response as specified in subclause 5.7.

If the feature "ES3XX" is supported, and the NF service consumer determines the received HTTP POST request needs to be redirected, the NF service consumer shall send an HTTP redirect response as specified in subclause 6.10.9 of 3GPP TS 29.500 [5].

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 API URI of the Npcf_EventExposure API shall be:

**{apiRoot}/<apiName>/<apiVersion>/**

The request URIs used in HTTP requests from the NF service consumer towards the PCF shall have the Resource URI 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

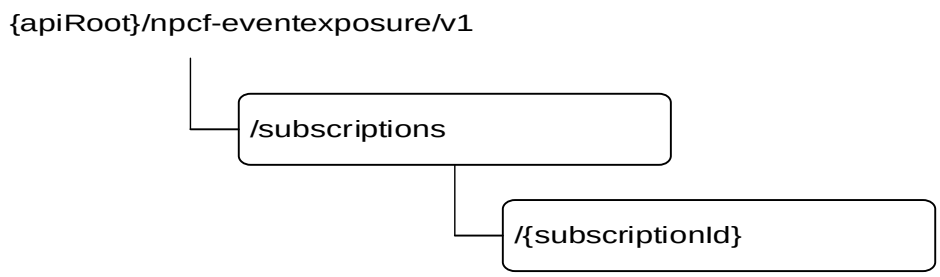


**Figure 5.3.1-1: Resource URI structure of the Npcf_EventExposure API**

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 | /subscriptions | POST | Subscription to notifications of policy control events and creation of an Individual Policy Control Events Subscription resource. |
| Individual Policy Control Events Subscription | /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 | Data type | Definition |
|---|---|---|
| apiRoot | string | 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 |
|---|---|---|---|
| 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 POST Response Body on this resource**

| Data type | P | Cardinality | Response codes | Description |
|---|---|---|---|---|
| PcEventExposureSubsc | 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. | | | | |

**Table 5.3.2.3.1-4: Headers supported by the 201 Response Code on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| Location | string | M | 1 | Contains the URI of the newly created resource, according to the structure: {apiRoot}/npcf-eventexposure/v1/subscriptions/{subscriptionId} |

### 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 | Data type | Definition |
|---|---|---|
| apiRoot | string | See subclause 5.1 |
| subscriptionId | string | Identif 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. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.<br>Applicable if the feature "ES3XX" is supported. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.<br>Applicable if the feature "ES3XX" is supported. |
| 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. | | | | |

**Table 5.3.3.3.1-4: Headers supported by the 307 Response Code on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PCF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

**Table 5.3.3.3.1-5: Headers supported by the 308 Response Code on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PCF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

### 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. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance. Applicable if the feature "ES3XX" is supported. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance. Applicable if the feature "ES3XX" is supported. |
| 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. | | | | |

**Table 5.3.3.3.2-4: Headers supported by the 307 Response Code on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PCF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

**Table 5.3.3.3.2-5: Headers supported by the 308 Response Code on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PCF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

### 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. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.<br>Applicable if the feature "ES3XX" is supported. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.<br>Applicable if the feature "ES3XX" is supported. |
| 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. | | | | |

**Table 5.3.3.3.3-4: Headers supported by the 307 Response Code on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PCF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

**Table 5.3.3.3.3-5: Headers supported by the 308 Response Code on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PCF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

### 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 with 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 overview**

| Notification | Callback URI | HTTP method or custom operation | Description (service operation) |
|---|---|---|---|
| Policy Control Event Notification | {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 Callback URI **"{notifUri}"** shall be used with the callback URI variables defined in table 5.5.2.2-1.

**Table 5.5.2.2-1: Callback URI variables**

| Name | Data type | Definition |
|---|---|---|
| notifUri | Uri | 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. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.<br>Applicable if the feature "ES3XX" is supported. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.<br>Applicable if the feature "ES3XX" is supported. |
| 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. | | | | |

**Table 5.5.2.3.1-4: Headers supported by the 307 Response Code on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

**Table 5.5.2.3.1-5: Headers supported by the 308 Response Code on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

# 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. | |
| AdditionalAccessInfo | 3GPP TS 29.512 [9] | Indicates the combination of additional Access Type and RAT Type for MA PDU session | ATSSS |
| AfAppId | 3GPP TS 29.514 [12] | AF application Identifier. | ExtendedSessionInformation |
| AnGwAddress | 3GPP TS 29.514 [12] | Carries the control plane address of the EPC untrusted non-3GPP access network gateway. (NOTE 1) | |
| 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. (NOTE 2) | ExtendedSessionInformation |
| FlowDescription | 3GPP TS 29.514 [12] | Identifies an IP flow description. | ExtendedSessionInformation |
| Gpsi | 3GPP 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. | |
| PlmnIdNid | 3GPP TS 29.571 [14] | Identifies the network: the PLMN Identifier and, for an SNPN, also the NID. | |
| RatType | 3GPP TS 29.571 [14] | RAT Type. | |
| RedirectResponse | 3GPP TS 29.571 [14] | Contains redirection related information. | ES3XX |
| SamplingRatio | 3GPP TS 29.571 [14] | Sampling Ratio. | |
| Snssai | 3GPP TS 29.571 [14] | Identifies a S-NSSAI | |
| 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. | |

NOTE 1: "AnGwAddress" data structure is only used to encode the ePDG address and is only applicable to the 5GS and EPC/E-UTRAN interworking scenario as defined in 3GPP TS 29.512 [9], Annex B.
NOTE 2: In order to support a set of MAC addresses with a specific range in the traffic filter, feature MacAddressRange as specified in clause 5.8 shall be supported.

## 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 | 0..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. Each DNN is a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. 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 | C | 0..1 | This IE represents a list of Supported features used as described in subclause 5.8. Shall be present in the HTTP POST request/response. (NOTE) | |
| NOTE: In the HTTP request, it represents the set of features supported by the NF service consumer. In the HTTP response, it represents the set of features supported by both the NF service consumer and the PCF. | | | | | |

### 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 event notifications.It is supplied for notification method "PERIODIC". | |
| sampRatio | SamplingRatio | O | 0..1 | Indicates the ratio of the random subset to target UEs, event reports only relates to the subset. | |
| grpRepTime | DurationSec | O | 0..1 | Indicates the time during which the the event reports detected for the concerned UEs are aggregated in a group, in order to be reported together to the NF service consumer. | |

### 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". | |
| addAccessInfo | AdditionalAccessInfo | O | 0..1 | Indicates the additional combination of Access Type and RAT Type available for MA PDU session. It may be present when the notified event is "AC_TY_CH" and the PDU session is a Multi-Access PDU session. | ATSSS |
| relAccessInfo | AdditionalAccessInfo | O | 0..1 | Indicates the release of a combination of Access Type and RAT Type available for MA PDU session. It may be present when the notified event is "AC_TY_CH" and the PDU session is a Multi-Access PDU session. | ATSSS |
| anGwAddr | AnGwAddress | O | 0..1 | ePDG address. It shall be included if applicable 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 | PlmnIdNid | C | 0..1 | PLMN Identifier and, for an SNPN, also the NID. 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, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. | ExtendedSessionInformation |
| ueIpv4 | Ipv4Addr | C | 0..1 | The IPv4 address of the served UE.<br>(NOTE 1) | ExtendedSessionInformation |
| ueIpv6 | Ipv6Prefix | C | 0..1 | The IPv6 prefix of the served UE.<br>(NOTE 1) | ExtendedSessionInformation |
| ipDomain | string | O | 0..1 | Identifies the IP domain.<br>(NOTE 2) | ExtendedSessionInformation |
| ueMac | MacAddr48 | C | 0..1 | UE MAC address.<br>(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.<br>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. |
| 2 | MacAddressRange | Indicates the support of a set of MAC addresses with a specific range in the traffic filter. |
| 3 | ATSSS | Indicates the support of the report of the multiple access types of a MA PDU session. |
| 4 | ES3XX | Extended Support for 3xx redirections. This feature indicates the support of redirection for any service operation, according to Stateless NF procedures as specified in subclauses 6.5.3.2 and 6.5.3.3 of 3GPP TS 29.500 [5] and according to HTTP redirection principles for indirect communication, as specified in subclause 6.10.9 of 3GPP TS 29.500 [5]. |

## 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.

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: 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 a Git-based repository that uses the GitLab software version control system (see clause 5B of the 3GPP TR 21.900 [22] and subclause 5.3.1 of the 3GPP TS 29.501 [6] for further information).

## A.2 Npcf_EventExposure API

```
openapi: 3.0.0
info:
  version: 1.1.2
  title: Npcf_EventExposure
  description: |
    PCF Event Exposure Service.
    © 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.523 V16.5.0; 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
                '307':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/307'
                '308':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/308'
                '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'
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '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
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '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
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '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'
        sampRatio:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SamplingRatio'
        grpRepTime:
          $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'
      addAccessInfo:
        $ref: 'TS29512_Npcf_SMPolicyControl.yaml#/components/schemas/AdditionalAccessInfo'
      relAccessInfo:
        $ref: 'TS29512_Npcf_SMPolicyControl.yaml#/components/schemas/AdditionalAccessInfo'
      anGwAddr:
        $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/AnGwAddress'
      ratType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
      plmnId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnIdNid'
      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 |
| 2019-06 | CT#84 | CP-191081 | 0007 | 1 | F | Report ePDG address | 15.2.0 |
| 2019-06 | CT#84 | CP-191081 | 0008 | | F | Storage of OpenAPI specification file | 15.2.0 |
| 2019-06 | CT#84 | CP-191081 | 0009 | 2 | F | Correction to the notification procedure | 15.2.0 |
| 2019-06 | CT#84 | CP-191081 | 0010 | | F | Correction on PCF event exposure service | 15.2.0 |
| 2019-06 | CT#84 | CP-191081 | 0011 | 2 | F | Precedence of OpenAPI file | 15.2.0 |
| 2019-06 | CT#84 | CP-191182 | 0012 | 2 | F | Copyright note in YAML file | 15.2.0 |
| 2019-06 | CT#84 | CP-191081 | 0013 | 1 | F | OpenAPI Version number update | 15.2.0 |
| 2019-09 | CT#85 | CP-192156 | 0014 | 1 | B | Support of a set of MAC addresses in traffic filter | 16.0.0 |
| 2019-09 | CT#85 | CP-192157 | 0015 | 1 | B | Enhancement of event reporting information | 16.0.0 |
| 2019-09 | CT#85 | CP-192173 | 0016 | | F | OpenAPI version update | 16.0.0 |
| 2020-03 | CT#87e | CP-200207 | 0018 | | B | DNN Clarification | 16.1.0 |
| 2020-06 | CT#88e | CP-201252 | 0019 | | B | Adding support of NID | 16.2.0 |
| 2020-06 | CT#88e | CP-201229 | 0020 | 3 | B | Access Type Report for a MA PDU session | 16.2.0 |
| 2020-06 | CT#88e | CP-201244 | 0021 | 1 | F | Storage of YAML files in ETSI Forge | 16.2.0 |
| 2020-06 | CT#88e | CP-201256 | 0022 | 1 | F | URI of the Npcf_EventExposure service | 16.2.0 |
| 2020-06 | CT#88e | CP-201223 | 0024 | 1 | A | suppFeat within PcEventExposureSubsc | 16.2.0 |
| 2020-06 | CT#88e | CP-201244 | 0025 | 1 | F | Supported headers, Resource Data type | 16.2.0 |
| 2020-06 | CT#88e | CP-201255 | 0027 | | F | Update of OpenAPI version and TS version in externalDocs Field | 16.2.0 |
| 2020-09 | CT#89e | CP-202055 | 0031 | 1 | A | Resource URI for individual subscription | 16.3.0 |
| 2020-12 | CT#90e | CP-203075 | 0032 | 2 | F | Essential corrections and alignments | 16.4.0 |
| 2020-12 | CT#90e | CP-203139 | 0034 | 1 | F | Storage of YAML files in ETSI Forge | 16.4.0 |
| 2020-12 | CT#90e | CP-203110 | 0038 | 1 | F | Correction to support Stateless NFs | 16.4.0 |
| 2020-12 | CT#90e | CP-203152 | 0040 | - | F | Update of OpenAPI version and TS version in externalDocs field | 16.4.0 |
| 2021-06 | CT#92e | CP-211200 | 0050 | 1 | F | Redirect responses with "application/json" media type | 16.5.0 |
| 2021-06 | CT#92e | CP-211264 | 0054 | - | F | Update of OpenAPI version and TS version in externalDocs field | 16.5.0 |

# History

| Document history | | |
|---|---|---|
| V16.2.0 | August 2020 | Publication |
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