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# Contents

# Foreword

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# 1 Scope

The present specification provides the stage 3 definition of the UE Policy Control Service (Npcf_UEPolicyControl) of the 5G System.

The stage 2 definition and procedures of UE Policy Control Service are contained in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [4]. The 5G System Architecture is defined in 3GPP TS 23.501 [2].

Stage 3 call flows are provided in 3GPP TS 29.513 [7].

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

The UE Policy Control Service is provided by the Policy Control Function (PCF). This service provides UE policies.

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

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

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

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

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

[12] 3GPP TS 23.402: "Architecture enhancements for non-3GPP accesses".

[13] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

[14] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[15] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[16] 3GPP TS 24.526: "UE policies for 5G System (5GS); Stage 3".

[17] 3GPP TS 29.519: "5G System; Usage of the Unified Data Repository service for Policy Data, Application Data and Structured Data for Exposure; Stage 3".

[18] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace; Trace control and configuration management".

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

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

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

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

[23] 3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G System (5GS)".

[24] 3GPP TS 24.587: "Vehicle-to-Everything (V2X) services in 5G System (5GS); Stage 3".

[25] 3GPP TS 24.588: "Vehicle-to-Everything (V2X) services in 5G System (5GS); User Equipment (UE) policies; Stage 3".

[26] 3GPP TS 29.505: "5G System; Usage of the Unified Data Repository service for Subscription Data; Stage 3".

[27] 3GPP TS 29.504:"5G System; Unified Data Repository Services; Stage 3".

# 3 Definitions and abbreviations

## 3.1 Definitions

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

## 3.2 Abbreviations

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

| | |
|---|---|
| 5G-BRG | 5G Broadband Residential Gateway |
| 5G-CRG | 5G Cable Residential Gateway |
| 5G-RG | 5G Residential Gateway |
| 5G-VN | 5G Virtual Network |
| AMF | Access and Mobility Management Function |
| ANDSP | Access Network Discovery and Selection Policy |
| API | Application Programming Interface |
| DNN | Data Network Name |
| FN-RG | Fixed Network Residential Gateway |
| FN-BRG | Fixed Network Broadband Residential Gateway |
| FN-CRG | Fixed Network Cable Residential Gateway |
| FQDN | Fully Qualified Domain Name |
| GPSI | Generic Public Subscription Identifier |
| GUAMI | Globally Unique AMF Identifier |
| HFC | Hybrid Fiber-Coaxial |
| HTTP | Hypertext Transfer Protocol |
| H-PCF | Home Policy Control Function |
| JSON | JavaScript Object Notation |
| N3AN | Non-3GPP access network |
| NID | Network Identifier |

| | |
|---|---|
| NF | Network Function |
| NRF | Network Repository Function |
| NSWO | Non-Seamless WLAN Offload |
| OS | Operating System |
| OSId | Operating System Identity |
| PCF | Policy Control Function |
| PEI | Permanent Equipment Identifier |
| PRA | Presence Reporting Area |
| PTI | Procedure Transaction Identity. |
| SNPN | Stand-alone Non-Public Network |
| SUPI | Subscription Permanent Identifier |
| UDR | Unified Data Repository |
| UPSC | UE policy section code |
| UPSI | UE policy section identifier |
| URSP | UE Route Selection Policy |
| V2X | Vehicle-to-Everything |
| V2XP | Vehicle-to-Everything Policy |
| V-PCF | Visited Policy Control Function |
| W-5GAN | Wireline 5G Access Network |
| W-5GCAN | Wireline 5G Cable Access Network |
| W-AGF | Wireline Access Gateway Function |

# 4 UE Policy Control Service

## 4.1 Service Description

### 4.1.1 Overview

The UE Policy Control 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 is used as part of the provisioning of UE policies determined by the PCF to the UE via the AMF, and used as part of provisioning of N2 PC5 policy determined by the PCF to the NG-RAN via the AMF, and offers the following functionalities:

- creation of the UE Policy Association requested by the NF service consumer (e.g. AMF);
- provisioning of the policy control request triggers to the NF service consumer (e.g. AMF);
- provisioning of the UE policy to the V-PCF by the H-PCF in the roaming case;
- provisioning of the N2 PC5 policy to the V-PCF by the H-PCF in the roaming case;
- reporting of the met policy control request trigger; and
- deletion of the the UE Policy Association requested by the NF service consumer (e.g. AMF).

### 4.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Policy and Charging related 5G architecture is also described in 3GPP TS 29.513 [7].

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

The known consumers of the Npcf_UEPolicyControl service are the Access and Mobility Management Function (AMF) and the Visited Policy Control Function (V-PCF).

The AMF accesses the UE Policy Control Service at the PCF via the N15 Reference point. In the roaming scenario, the N15 reference point is located between the V-PCF in the visited network and the AMF. The V-PCF accesses the UE Policy Control Service at the Home Policy Control Function (H-PCF) via the N24 Reference point.

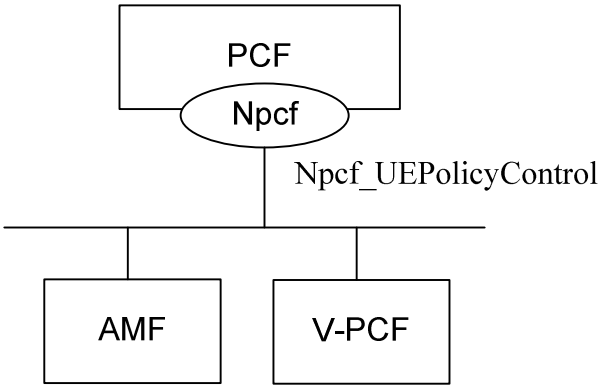


**Figure 4.1.2-1: Reference Architecture for the Npcf_UEPolicyControl Service; SBI representation**

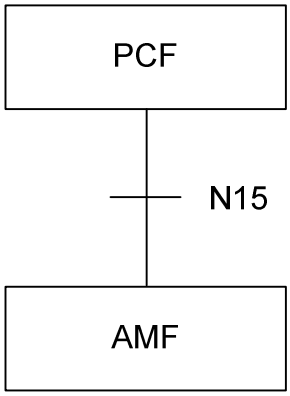


**Figure 4.1.2-2: Non-roaming Reference Architecture for the Npcf_UEPolicyControlService; reference point representation**

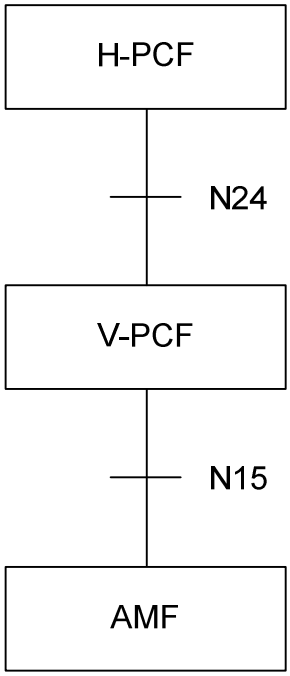


**Figure 4.1.3-2: Roaming reference Architecture for the Npcf_UEPolicyControlService; reference point representation**

## 4.1.3 Network Functions

### 4.1.3.1 Policy Control Function (PCF)

For non-roaming scenarios, the Policy Control Function (PCF):

- Supports unified policy framework to govern network behaviour; and
- Provides UE policy, including Access Network Discovery and Selection Policy (ANDSP), UE Route Selection Policy (URSP), and V2XP (Vehicle-to-Everything Policy) via the AMF transparently to the UE;
- Provides policy control request triggers to the AMF; and

NOTE 1: The PCF invokes the Namf_Communication service specified in 3GPP TS 29.518 [14] to provide the UE Policy.

- Provides N2 PC5 policy, containing the PC5 QoS parameters used by NG-RAN for V2X communication via the AMF to the NG-RAN.

NOTE 2: The PCF invokes the Namf_Communication service specified in 3GPP TS 29.518 [14] to provide the N2 PC5 Policy.

For roaming scenarios, the Visited Policy Control Function (V-PCF):

- Provides policy control request triggers to the AMF;
- Provides the ANDSP of the VPLMN via the AMF transparently to the UE;
- Forwards the ANDSP, URSP and V2XP received form the H-PCF via the AMF to the UE.

NOTE 3: The V-PCF invokes the Namf_Communication service specified in 3GPP TS 29.518 [14] to provide the UE Policy.

- Forwards the N2 PC5 policy the H-PCF via the AMF to the NG-RAN.

NOTE 4: The V-PCF invokes the Namf_Communication service specified in 3GPP TS 29.518 [14] to provide the N2 PC5 Policy.

For roaming scenarios, the Home Policy Control Function (H-PCF):

- Provides policy control request triggers to the V-PCF; and
- Provides the ANDSP, URSP and V2XP of the HPLMN to the V-PCF for forwarding to the UE via the the AMF.
- Provides the N2 PC5 policy to the V-PCF for forwarding to the NG-RAN via the the AMF

#### 4.1.3.2 NF Service Consumers

The Access and Mobility Management function (AMF) performs:

- Registration management;
- Connection management;
- Reachability management;
- Mobility Management;
- Forwarding of UE Policy towards the served UE;
- Reporting of the UE state to the (V-)PCF; and
- Forwarding of the UE policy enforcement result received from the UE to the (V-)PCF.

NOTE: The AMF invokes the Namf_Communication service specified in 3GPP TS 29.518 [14] to report the UE policy enforcement result.

- Forwarding of the N2 PC5 policy towards the NG-RAN.

The Visited Policy Control Function (V-PCF) provides the functions described in subclause 4.1.3.1 towards the visited network as NF service producer and acts as NF Service consumer toward the H-PCF, performing the following functions:

- Receiving policy control request triggers, ANDSP, URSP and V2XP from the H-PCF;
- Receiving the N2 PC5 policy from the H-PCF; and
- Reporting of the UE state and UE policy enforcement result to the H-PCF.

# 4.2 Service Operations

## 4.2.1 Introduction

**Table 4.2.1-1: Operations of the Npcf_UEPolicyControl Service**

| Service operation name | Description | Initiated by |
|---|---|---|
| Npcf_UEPolicyControl_Create | Creates a UE Policy Association. | NF consumer (AMF, V-PCF in roaming case) |
| Npcf_UEPolicyControl_Update | Updates of an UE Policy Association and provides corresponding policies to the NF consumer when the policy control request trigger is met or the AMF is relocated due to the UE mobility and the old PCF is selected. | NF consumer (AMF, V-PCF in roaming case) |
| Npcf_UEPolicyControl_UpdateNotify | Provides the updated policy control request triggers to the AMF by the (V-)PCF in the non-roaming or roaming case;<br>Provides updated UE policy and policy control request trigger to the V-PCF by the H-PCF; or initiates the UE Policy association termination towards to the NF consumer by the NF producer. | PCF (H-PCF and V-PCF in roaming case) |
| Npcf_UEPolicyControl_Delete | Provides means for the NF consumer to delete the UE Policy Association. | NF consumer (AMF, V-PCF in roaming case) |

## 4.2.2 Npcf_UEPolicyControl_Create Service Operation

### 4.2.2.1 General

The procedure in the present subclause is applicable when the NF service consumer creates a UE policy association in the following cases:

- UE initial registers to the network as defined in subclause 5.5.1.2.2 of 3GPP TS 24.501 [15];
- UE performs the mobility registration if the UE operating in the single-registration mode performs inter-system change from S1 mode to N1 mode as defined in subclause 5.5.1.3.2 of 3GPP TS 24.501 [15] and there is no existing UE Policy Association between AMF and PCF for this UE;
- the AMF is relocated (between the different AMF sets) and the new AMF selects a new PCF. The procedure for the case where the AMF is relocated and the new AMF selects the old PCF is defined in subclause 4.2.3.1.

The creation of an UE policy association only applies for normally registered UEs, i.e., it does not apply for emergency-registered UEs.

Figure 4.2.2.1-1 illustrates the creation of a policy association.

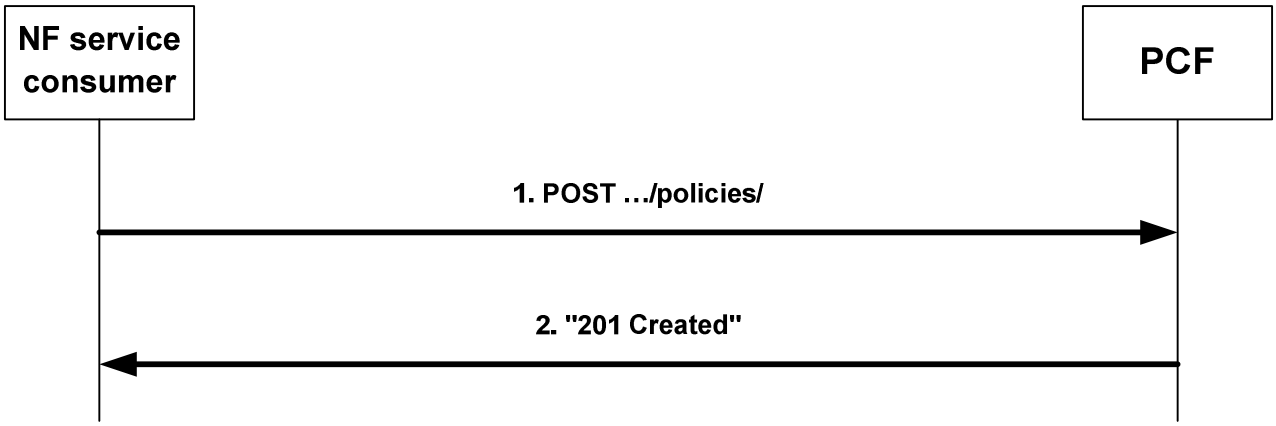


**Figure 4.2.2.1-1: Creation of a UE policy association**

NOTE 1: For the roaming case, the PCF represents the V-PCF if the NF service consumer is an AMF and the PCF represents the H-PCF if the NF service consumer is a V-PCF.

When a UE registers and a UE context is being established, if the AMF obtains from the UE an UE policy delivery protocol message as defined in Annex D of 3GPP TS 24.501 [15] the AMF shall establish a UE policy association with the (V-)PCF in case that there is no existing UE policy association for the UE; otherwise the AMF may establish UE Policy Association with the (V-)PCF based on AMF local configuration.

NOTE 2: In roaming scenario, the AMF local configuration can indicate whether UE Policy delivery is needed based on the roaming agreement with home PLMN of the UE.

To establish a UE policy association with the PCF, the NF service consumer (e.g. AMF) shall send an HTTP POST request with: "{apiRoot}/npcf-ue-policy-control/v1/policies/" as Resource URI and the PolicyAssociationRequest data structure as request body that shall include:

- Notification URI encoded as "notificationUri" attribute; and
- SUPI encoded as "supi" attribute,

and that shall include when available:

- GPSI encoded as "gpsi" attribute;
- Access type encoded as "accessType" attribute;
- Permanent Equipment Identifier (PEI) encoded as "pei" attribute;
- User Location Information encoded as "userLoc" attribute;
- UE Time Zone encoded as "timeZone" attribute;
- Serving PLMN Identifier and for SNPN the NID encoded as "servingPlmn" attribute;
- RAT type encoded as "ratType" attribute;
- the received UE policy delivery protocol message defined in Annex D of 3GPP TS 24.501 [15] or defined in subclause 7.2.1.1 of 3GPP TS 24.587 [24] encoded as "uePolReq" attribute;
- if the NF service consumer is an AMF, H-PCF ID (if the consumer is V-PCF, when receiving the H-PCF ID from AMF) encoded as "hPcfId" attribute;
- Internal Group Identifier(s) encoded as "groupIds" attribute;
- the PC5 capability for V2X encoded as "pc5Capab" attribute if the "V2X" feature defined in subclause 5.8 is suppoted;
- if the NF service consumer is an AMF, the GUAMI encoded as "guami" attribute;

- if the NF service consumer is an AMF, the name of a service produced by the AMF that expects to receive information within Npcf_UEPolicyControl_UpdateNotify service operation encoded as "serviceName" attribute;

- if the NF service consumer is an AMF, alternate or backup IPv4 Address(es) where to send Notifications encoded as "altNotifIpv4Addrs" attribute;

- if the NF service consumer is an AMF, alternate or backup IPv6 Address(es) where to send Notifications encoded as "altNotifIpv6Addrs" attribute;

- if the NF service consumer is an AMF, alternate or backup FQDN(s) where to send Notifications encoded as "altNotifFqdns" attribute; and

- if the NF service consumer is an AMF, serving AMF Id encoded in the "servingNfId" attribute.

Upon the reception of the HTTP POST request,

- the (V-)(H-)PCF shall assign a UE policy association ID;

- based on operator policy the V-PCF should send as the NF service consumer towards the H-PCF a request for the Creation of a UE policy association as described in the present clause;

- the (V-)(H-)PCF shall determine the applicable UE policy as detailed in subclause 4.2.2.2, for the V-PCF taking into consideration any policy received from the H-PCF in the reply to the possible request for the Creation of a policy association;

- if the (V-)PCF determines that UE policy needs to be provisioned, it shall use the Namf_Communication service specified in 3GPP TS 29.518 [14] to provision the UE policy according to subclause 4.2.2.2 and as follows:

  (i) the V-PCF shall subscribe at the AMF to notifications of N1 messages for UE Policy Delivery Results using the Namf_Communication_N1N2MessageSubscribe service operation;

  (ii) the V-PCF shall send the determined UE policy using Namf_Communication_N1N2MessageTransfer service operation(s); and

  (iii) the V-PCF shall be prepared to receive UE Policy Delivery Results from the AMF within the Namf_Communication_N1MessageNotify service operation and for the V-PCF if the received UE Policy Delivery results relate to UE policy sections provided by the H-PCF shall use the Npcf_UEPolicyControl_Update Service Operation to send those UE Policy Delivery results to the H-PCF;

- If the UE indicates the support of V2X communications over PC5 reference point and "V2X" feature is supported, the (H-)PCF shall determine the applicable N2 PC5 policy as detailed in subclause 4.2.2.3 based on the operator's policy;

- if the (V-)PCF determines that N2 PC5 policy needs to be provisioned, it shall use the Namf_Communication service specified in 3GPP TS 29.518 [14] to provision the N2 PC5 policy according to subclause 4.2.2.3.

- for the succesfull case the (V-)(H-)PCF shall send a HTTP "201 Created" response with the URI for the created resource in the "Location" header field

NOTE 3: The assigned policy association ID is part of the URI for the created resource and is thus associated with the SUPI.

and the the PolicyAssociation data type as body including:

- optionally for the H-PCF as service producer communicating with the V-PCF, UE policy (see subclause 4.2.2.2) encoded as "uePolicy" attribute;

- optionally for the H-PCF as service producer communicating with the V-PCF, N2 PC5 policy (see subclause 4.2.2.3) encoded as "n2Pc5Pol" attribute;

- optionally one or several of the following Policy Control Request Trigger(s) encoded as "triggers" attribute (see subclause 4.2.3.2):

  a) Location change (tracking area); and

  b) Change of UE presence in PRA; and

c) Change of PLMN if the "PlmnChange" feature is supported; and

d) Change of UE connectivity state if the "ConnectivityStateChange" feature is supported; and

- if the Policy Control Request Trigger "Change of UE presence in PRA" is provided, the presence reporting areas for which reporting is required encoded as "pras" attribute; and

NOTE 4: If the PCF uses a Presence Reporting Area identifier referring to a Set of Core Network predefined Presence Reporting Areas as defined in 3GPP TS 23.501 [2], the PCF includes the identifier of this Presence Reporting Area set within the "praId" attribute.

- if errors occur when processing the HTTP POST request, the (V-)(H-)PCF shall apply error handling procedures as specified in subclause 5.7 and according to the following provisions:

  - if the user information received within the "supi" attribute is unknown, the PCF shall reject the request and include in an HTTP "400 Bad Request" response message the "cause" attribute of the ProblemDetails data structure set to "USER_UNKNOWN"; and

  - if the PCF is, due to incomplete, erroneous or missing information in the request not able to provision an UE policy decision, the PCF may reject the request and include in an HTTP "400 Bad Request" response message the "cause" attribute of the ProblemDetails data structure set to "ERROR_REQUEST_PARAMETERS".

If the (V-)PCF received an GUAMI, the (V-)PCF may subscribe to GUAMI changes using the AMFStatusChange service operation of the Namf_Communication service specified in 3GPP TS 29.518 [14], and it may use the Nnrf_NFDiscovery Service specified in 3GPP TS 29.510 [13] (using the obtained GUAMI and possibly service name) to query the other AMFs within the AMF set.

#### 4.2.2.2 UE Policy

##### 4.2.2.2.1 General

The UE policy consists of

- UE Access Network discovery and selection policies (ANDSP). It is used by the UE for selecting non-3GPP accesses network. The encoding of ANDSP is defined in 3GPP TS 24.526 [16];

- UE Route Selection Policy (URSP). This UE policy is used by the UE to determine how to route outgoing traffic. Traffic can be routed to an established PDU Session, can be offloaded to non-3GPP access outside a PDU Session, or can trigger the establishment of a new PDU Session. The encoding of URSP is defined in 3GPP TS 24.526 [16]

- UE Vehicle-to-Everything Policy (V2XP). This UE policy provides configuration parameters to the UE for V2X communication over PC5 reference point or over Uu reference point or both. The encoding of V2XP is defined in 3GPP TS 24.588 [25].

The UE Policy is transferred to the UE using the UE policy delivery protocol defined in Annex D of 3GPP TS 24.501 [15]. The (V-)(H-)PCF shall send UE policy using the "MANAGE UE POLICY COMMAND" message and will receive the "MANAGE UE POLICY COMPLETE"or the "MANAGE UE POLICY COMMAND REJECT" messages in the response. Those messages are transparently forwarded by the AMF.

The (V-)PCF shall use the Namf_Communication_N1N2MessageTransfer service operation defined in subclause 5.2.2.3.1 of 3GPP TS 29.518 [14] to send MANAGE UE POLICY COMMAND" messages to the UE and use the Namf_Communication_N1MessageNotify service operation defined in subclause 5.2.2.3.5 of 3GPP TS 29.518 [14] to receive "MANAGE UE POLICY COMPLETE" and "MANAGE UE POLICY COMMAND REJECT" messages from the UE. The (V-)PCF shall only send "MANAGE UE POLICY COMMAND" messages below a predefined size limit.

The H-PCF shall use service operations as defined in the present specification to receive "MANAGE UE POLICY COMPLETE" and "MANAGE UE POLICY COMMAND REJECT" messages from the V-PCF and to send MANAGE UE POLICY COMMAND" messages to the V-PCF. The H-PCF shall encode the "MANAGE UE POLICY COMMAND" message in an "uePolicy" attribute. The H-PCF shall only send "MANAGE UE POLICY COMMAND" messages below a predefined size limit.

The (V-)(H-)PCF may deliver the UE policy to the UE in several "MANAGE UE POLICY COMMAND" messages.

For the purpose of such fragmented delivery and subsequent partial updates of UE policies, the UE policy is divided into policy sections. Such policy sections may be predefined in the (V-)(H-)PCF, may be retrieved by the (V-)(H-)PCF from the UDR as specified in 3GPP TS 29.519 [17], or may be dynamically generated by the (V-)(H-)PCF, but shall comply to the rules below. The (V-)(H-)PCF may combine several policy sections into one "MANAGE UE POLICY COMMAND" message if the predefined size limit is observed.

The following rules apply for policy sections:

- The size shall be below the predefined size limit.
- The policy section shall only contain complete URSP rule(s), WLANSP rule(s), N3AN node configuration information, and/or complete V2XP info content, but no fractions of such rules , configuration information, or info contents.
- To ease a subsequent partial update of UE policies, policy sections should only contain a small number of policies, e.g. URSP rule(s), and/or WLANSP rule(s).
- The entire content of a policy section shall be provided by a single PLMN.

A PCF shall only determine policy sections of its own PLMN. However, a V-PCF may forward UE policy sections received from the H-PCF to the UE.

Each UE policy section is identified by a UE policy section identifier (UPSI). The UPSI is composed of two parts:

a) a PLMN ID part containing the PLMN ID for the PLMN of the PCF which provides the UE policies; and

b) a UE policy section code (UPSC) containing a unique value within the PLMN selected by the PCF.

The (V-)(H-)PCF provides an UPSI when providing a new UE policy section and may then identify that policy section using that UPSI when requesting that this UE policy section is modified or deleted, as specified in Annex D of 3GPP TS 24.501 [15].

If the (V-)(H-)PCF determines that changes are required and/or the V-PCF receives possible new or modified policy sections determined by the H-PCF in the roaming case, it shall send the determined new, updated or deleted policy sections using one or several "MANAGE UE POLICY COMMAND" messages towards the NF service consumer. In the roaming case, the V-PCF may either combine policy sections received from the H-PCF and policy sections the V-PCF selected in the same "MANAGE UE POLICY COMMAND" (as long as the predefined size limit is observed), or use separate "MANAGE UE POLICY COMMAND" messages; however, the V-PCF shall not distribute the policy sections received in one "MANAGE UE POLICY COMMAND" from the H-PCF into several "MANAGE UE POLICY COMMAND" messages as long as the predefined size limit is observed for the policy sections received from the H-PCF. The V-PCF shall allocate a new PTI for the "MANAGE UE POLICY COMMAND" sent by the V-PCF and store the mapping between the new PTI and the PTI within the "MANAGE UE POLICY COMMAND" received from the H-PCF.

After sending a "MANAGE UE POLICY COMMAND" messages, the (V-)(H-)PCF shall wait for a related confirmation in a "MANAGE UE POLICY COMPLETE" messages or failure indication in a "MANAGE UE POLICY COMMAND REJECT" message. When receiving no such message until the expiry of a supervision timer specified in Annex D of 3GPP TS 24.501 [15], or when receiving a failure indication, the PCF should re-send related instructions for the policy sections. In the roaming case, the H-PCF and the V-PCF shall each be responsible for resending those policy sections that it originally supplied. In the case that the V-PCF combined policy sections received from the H-PCF and policy sections the V-PCF selected in the same "MANAGE UE POLICY COMMAND" described below, the V-PCF shall wait for the H-PCF to resend the policy sections of HPLMN, and then resend the combined policy sections. The (V-)(H-)PCF shall always include the initially supplied policy sections when resending the UE policy.

The (V-)(H-)PCF shall determine that a received "MANAGE UE POLICY COMPLETE" message or "MANAGE UE POLICY COMMAND REJECT" message is related to the result of a "MANAGE UE POLICY COMMAND" based on the PTI within that message. In the roaming case, the V-PCF shall determine that the received message is related to the result of the UE policy provided by the H-PCF if the PTI within the message belongs to one of the stored PTI mapping.

If the V-PCF combined policy sections received from the H-PCF and policy sections the V-PCF selected in the same "MANAGE UE POLICY COMMAND", upon reception of a "MANAGE UE POLICY COMPLETE" message or "MANAGE UE POLICY COMMAND REJECT" message the V-PCF shall:

- forward the corresponding "MANAGE UE POLICY COMPLETE" message to the H-PCF;

- if a "MANAGE UE POLICY COMMAND REJECT" message with UPSI(s) of the HPLMN is received, forward the parts of the "MANAGE UE POLICY COMMAND REJECT" message that relate to the UPSI(s) of the HPLMN to the H-PCF;

- if a "MANAGE UE POLICY COMMAND REJECT" message without UPSI(s) of the HPLMN is received, send a "MANAGE UE POLICY COMPLETE" message to the H-PCF; and

- provide the stored PTI received from the HPLMN in the corresponding "MANAGE UE POLICY COMMAND" within the "MANAGE UE POLICY COMPLETE" message or "MANAGE UE POLICY COMMAND REJECT" message towards the H-PCF.

If the V-PCF sent a separate "MANAGE UE POLICY COMMAND" containing only the policy sections received from the H-PCF, the V-PCF shall forward the corresponding "MANAGE UE POLICY COMPLETE" or "MANAGE UE POLICY COMMAND REJECT" message to the H-PCF and provide the stored PTI received from the HPLMN in the corresponding "MANAGE UE POLICY COMMAND" within the "MANAGE UE POLICY COMPLETE" message or "MANAGE UE POLICY COMMAND REJECT" message towards the H-PCF.If the V-PCF distributed the policy sections received in one "MANAGE UE POLICY COMMAND" from the H-PCF into several "MANAGE UE POLICY COMMAND" messages to the UE (because the predefined size limit of the VPLMN was exceeded), the V-PCF shall aggregate all corresponding "MANAGE UE POLICY COMPLETE" or "MANAGE UE POLICY COMMAND REJECT" messages received from the UE into one "MANAGE UE POLICY COMPLETE" or "MANAGE UE POLICY COMMAND REJECT" message towards the H-PCF.

When the (V-)PCF receives an Namf_Communication_N1N2MessageTransfer failure response as defined in subclause 5.2.2.3.1.2 of 3GPP TS 29.518 [14], or an N1N2 Transfer Failure Notification as defined in subclause 5.2.2.3.2 of 3GPP TS 29.518 [14], the (V-)PCF shall stop the supervision timer specified in Annex D of 3GPP TS 24.501 [15] corresponding to the affected PTIs. For the N1N2 Transfer Failure Notification case, the (V-)PCF determines the affected PTIs allocated by the V-PCF based on the resource URI within the "n1n2MsgDataUri" attribute of the N1N2MsgTxfrFailureNotification data structure as defined in subclause 6.1.6.2.30 of 3GPP TS 29.518 [14].

NOTE: The (V-)PCF correlates the Namf_Communication_N1N2MessageTransfer request and the corresponding N1N2 Transfer Failure Notification based on the resource URI within the "Location" header included in the response HTTP status code "202 Accepted" of the Namf_Communication_N1N2MessageTransfer response and the resource URI within the "n1n2MsgDataUri" attribute of and N1N2 Transfer Failure Notification. And then the V-PCF determines the affected PTIs related with the resource URI.

For the roaming case and if the V-PCF determines that the affected UE policy is related with the UE policy delivered by the H-PCF, the V-PCF shall send the POST message as defined in subclause 4.2.3.1 to notify the H-PCF of the failure of UE policy transfer by including the "uePolTransFailNotif" attribute within the PolicyAssociationUpdateRequest data structure. Within the UePolicyTransferFailureNotification data structure, the V-PCF shall include the cause of the UE Policy Transfer Failure within the "cause" attribute and the PTI(s) allocated by the H-PCF corresponding to the PTI(s) allocated by the V-PCF within the "ptis" attribute. The H-PCF shall stop the supervision timer corresponding to the affected PTIs.

In the failure case described above, the (H-)(V-)PCF may provision the policy control request trigger "CON_STATE_CH" if not provisioned yet. Upon receiving the notification of UE connectivity state change indicating that the UE enters the CM-Connected state, the (H-)(V-)PCF may retry to deliver the UE Policy.

#### 4.2.2.2.1.1 Provisioning of the UE Access Network discovery and selection policies and UE Route Selection Policy

When the UE registers to the network, the "UE STATE INDICATION" message as defined in subclause D.5.4.1 of 3GPP TS 24.501 [15] may be transferred transparently within the "uePolReq" attribute during the creation of a policy association, as described in subclause 4.2.2.1.

The (H-)PCF may store in the UDR and/or retrieve from the UDR, as specified in 3GPP TS 29.519 [17]:

a) UPSCs and related policy sections of the own PLMN it provided to a UE;

b) the PEI received from the AMF;

c) the OSId(s) received from the UE as described in the Annex D of 3GPP TS 24.501 [15]; and

d) the indication of UE's support for ANDSP included in the "UE STATE INDICATION" message as described in the Annex D of 3GPP TS 24.501 [15].

The (H-)PCF will use the SUPI of the UE as data key and store separate information for each UE in the UDR.

The V-PCF may retrieve UPSCs and related policy sections applicable for all UEs from a HPLMN from the UDR, using the HPLMN ID as key as specified in 3GPP TS 29.519 [17].

When receiving the "UE STATE INDICATION" message, the (V-)(H-)PCF shall determine based on the UPSIs, the ANDSP support indication and the OSId(s) indicated in that message, UPSC stored in the UDR and local policy whether any new UE policy sections need to be installed and any existing UE policy section need to be updated or deleted.

If the "EnhancedBackgroundDataTransfer" feature is supported, the (H-)PCF may retrieve the Background Data Transfer Reference ID(s) by retrieving the UE's Application Data from the UDR as defined in subclause 6.2.9 of 3GPP TS 29.519 [17]. In this case, the PCF shall retrieve the transfer policy corresponding to the Background Data Transfer Reference ID(s) as defined in subclause 5.2.8 of 3GPP TS 29.519 [17] and then may make the URSP rules including the Route Selection Validation Criteria for the UE as defined in subclause 6.6.2.1 of 3GPP TS 23.503 [4]. If the (H-)PCF provisions the URSP rules including the Route Selection Validation Criteria for the UE, it shall use the associated S-NSSAI and DNN to store in the UDR the Background Data Transfer Reference ID(s) in the UE's session management policy data as specified in 3GPP TS 29.519 [17].

If the (H-)PCF retrieves the BDT policy and corresponding related information (e.g. network area information, the volume of data to be transferred per UE, etc.) within the BdtData data type, and with the "bdtpStatus" attribute within the BdtData data type set to value "INVALID", the (H-)PCF shall not make the URSP rules based on the invalid BDT policy. When the BDT policy re-negotiation is completed the PCF may:

- if the new BDT Policy is determined, make or update the applicable URSP rules based on the new BDT policy; or

- if the invalid BDT policy is removed, remove applicable URSP rules.

#### 4.2.2.2.1.2 Provisioning of Vehicle-to-Everything Policy

When the UE registers to the network, if the AMF receives the PC5 capability for V2X in the Registration Request message from UE, the AMF further reports the PC5 capability for V2X within the "pc5Capab" attribute to the PCF as defined in subclause 4.2.2.1. The PCF may determine the V2XP over PC5 interface based on the received UE's PC5 capability for V2X, the Service specific parameter information retrieved from UE's Application Data in the UDR as defined in subclause 6.2.15 of 3GPP TS 29.519 [17] and the operator’s policy.

If the UE supports V2X communication and it does not have valid V2XP, the UE includes the "UE POLICY PROVISIONING REQUEST" message as defined in subclause 7.2.1 of 3GPP TS 24.587 [24] during registration procedure. The "UE POLICY PROVISIONING REQUEST" message is transferred transparently within the "uePolReq" attribute during the creation of a policy association as described in subclause 4.2.2.1 or during the update of the policy association as described in subclause 4.2.3.1. The PCF may reject the request by sending the "UE POLICY PROVISIONING REJECT" message as defined in subclause 7.2.2 of 3GPP TS 24.587 [24] or provision the policy as defined in subclause 4.2.2.2.1 based on the Service specific parameter information retrieved from UE's Application Data in the UDR as defined in subclause 6.2.15 of 3GPP TS 29.519 [17] and the operator’s policy.

### 4.2.2.2.2 UE Access Network discovery and selection policies

UE Access Network discovery and selection policies are used by the UE to select non-3GPP accesses and to decide how to route traffic between the selected 3GPP and non 3GPP accesses.

In this release of the specification, the Access Network Discovery & Selection policy shall contain only rules that aid the UE in selecting a WLAN access network. Rules for selecting other types of non-3GPP access networks are not specified.

The WLAN access network selected by the UE with the use of Access Network Discovery & Selection policy may be used for direct traffic offload (i.e. sending traffic to the WLAN outside of a PDU Session) and for registering to 5GC using the non-3GPP access network selection information.

The Access Network Discovery & Selection policy shall contain one or more WLAN Selection Policy (WLANSP) rules and and may contain Non-3GPP access network (N3AN) node selection information and configuration information.

N3AN node selection information and configuration information is used to control UE behaviour related to selection of either N3IWF or ePDG for accessing 5GC via non-3GPP access.

UE Access Network discovery and selection policies are encoded as defined in 3GPP TS 24.526 [16].

UE Access Network discovery and selection policies may be provided by a V-PCF and/or a H-PCF.

If the UE has indicated in the "UE STATE INDICATION" message it does not support ANDSP, i.e. the UE does not support non-3GPP access, the PCF shall not send any Access Network discovery and selection policies to the UE.

#### 4.2.2.2.3 UE Route Selection Policy(URSP)

The UE Route Selection Policy is used by the UE to determine how to route outgoing traffic.

The UE Route Selection Policy shall consist of one or several URSP rules.

URSP rules are encoded as defined in 3GPP TS 24.526 [16].

UE Route Selection Policy may only be provided by a H-PCF, but shall not be provided by a V-PCF.

The (H-)PCF shall use the UE subscription stored in UDR as specified in 3GPP TS 29.519 [17] to ensure the values included in the Route Selection Descriptor of the generated URSP rules are always supported by subscription.

For the received list of internal group Ids, the (H-)PCF retrieves the corresponding 5G VN group configuration data stored from the UDR as specified in 3GPP TS 29.504[27] and 3GPP TS 29.505 [26], if available. For each available 5G VN group, the (H-)PCF may use the retrieved 5G VN group configuration values to encode the values for the Route Selection Descriptor and the values for the Traffic Descriptor of the generated URSP rules.

The (H-)PCF may obtain the information about the UE's OS from the UE as described in the Annex D of 3GPP TS 24.501 [15] or it may derive the information about the UE's OS from the PEI provided by the AMF.

If the (H-)PCF is required to provide UE policies to the UE that includes application descriptors then:

a) If the (H-)PCF has been provided with one UE's OS Id by the UE, the (H-)PCF shall use either the traffic descriptor "OS App Id type" or the traffic descriptor "OS Id + OS App Id type" as defined in 3GPP TS 24.526 [16].

NOTE 1: The (H-)PCF uses the traffic descriptor "OS Id + OS App Id type" when the (H-)PCF does not take the received UE's OS Id into account.

b) If the (H-)PCF has been provided with more than one UE's OS Id by the UE,

- the (H-)PCF shall use the traffic descriptor "OS Id + OS App Id type" for the UE's OS Id provided by the UE as defined in 3GPP TS 24.526 [16]; and
- the (H-)PCF shall not use the traffic descriptor "OS App Id type" as defined in 3GPP TS 24.526 [16].

c) If the (H-)PCF has not been provided with the UE's OS Id by the UE,

- the (H-)PCF shall use the traffic descriptor "OS Id + OS App Id type" as defined in 3GPP TS 24.526 [16]; and
- the (H-)PCF shall not use the traffic descriptor "OS App Id type" as defined in 3GPP TS 24.526 [16].

d) If the (H-)PCF has been provided with the UE's OS Id by the UE and the (H-)PCF has derived the UE's OS Id from the PEI and if there is an inconsistency between the OS Id provided by the UE and the OS Id derived from the PEI, the (H-)PCF shall use the OS Id provided by the UE for providing UE policies to the UE that include application descriptors.

URSP rules may be used to support end to end redundant user plane paths by establishing two redundant PDU sessions.

NOTE 2: The PCF can provide two distinct URSP rules to support end to end redundant user plane paths using Dual Connectivity for the duplicated traffic of an application. Duplicated traffic from the UE application is differentiated by two distinct traffic descriptors (different DNNs, and for IP traffic, different IP descriptors or non-IP descriptors), each one defined in a different URSP rule, so that the two redundant PDU sessions are matched to the specific Route Selection Descriptors of distinct URSP rules.

#### 4.2.2.2.4 Vehicle-to-Everything Policy (V2XP)

V2XP includes the V2XP over PC5 and over Uu interfaces.

The V2XP over PC5 are defined in subclause 5.2.3 of 3GPP TS 24.587 [24] and corresponding encoding is defined 5.3.1 of 3GPP TS 24.588 [25].

The V2XP over Uu are defined in subclause 5.2.4 of 3GPP TS 24.587 [24] and corresponding encoding is defined 5.3.2 of 3GPP TS 24.588 [25].

### 4.2.2.3 N2 PC5 Policy

The N2 PC5 policy consists of PC5 QoS parameters used by the NG-RAN.

When the (H-)PCF derives the UE policy for V2X communications over PC5 reference as defined in subclause 4.2.2.2.4, the (H-)PCF shall derive the corresponding PC5 QoS parameters used by the NG-RAN.

In the roaming case, the H-PCF shall include the N2 PC5 Policy within the "n2Pc5Pol" attribute in the reponse of create or update of the policy association to the V-PCF or in the request of the policy asociation update initiated by the H-PCF.

In the roaming or non-roaming case, the (V-)PCF shall use the Namf_Communication_N1N2MessageTransfer service operation defined in subclause 5.2.2.3.1 of 3GPP TS 29.518 [14] to send N2 PC5 policy to the NG-RAN.

## 4.2.3 Npcf_UEPolicyControl_Update Service Operation

### 4.2.3.1 General

The procedure in the present subclause is applicable when the NF service consumer modifies an existing UE policy association (including the case where the AMF is relocated and the new AMF selects to maintain the policy association with the old PCF and to update the Notification URI).

Figure 4.2.3.1-1 illustrates the update of a policy association.

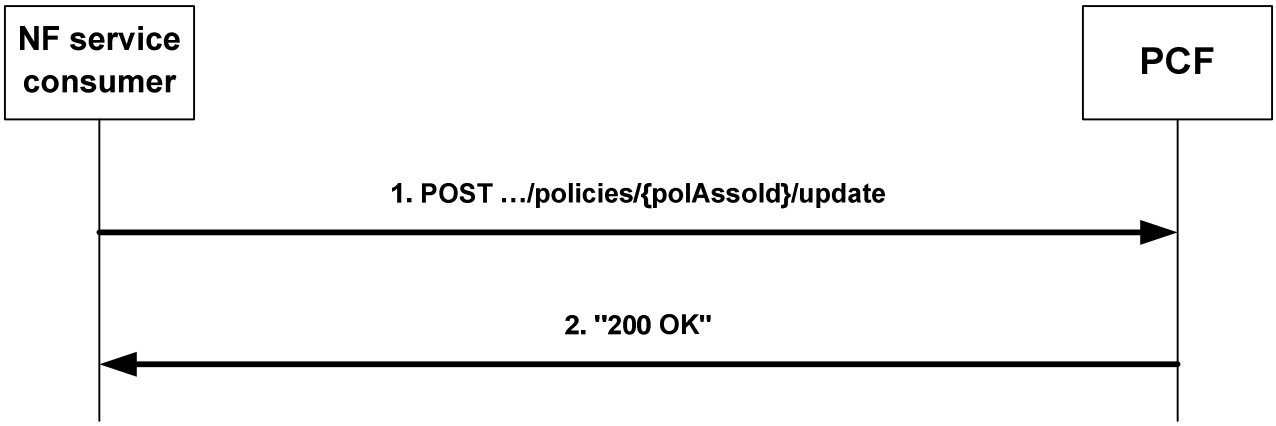


**Figure 4.2.3.1-1: Update of a UE policy association**

NOTE 1: For the roaming case, the PCF represents the V-PCF if the NF service consumer is an AMF and the PCF represents the H-PCF if the NF service consumer is a V-PCF.

The AMF as NF service consumer invokes this procedure when a subscribed policy control request trigger (see subclause 4.2.3.2) occurs: When the location change trigger, the change of UE presence in PRA trigger, the PLMN change trigger or the UE connectivity state change trigger occurs, the AMF shall only invoke the procedure if the PCF has subscribed to that event trigger.

NOTE 2: The AMF uses the Namf_Communication_N1MessageNotify service operation specified in 3GPP TS 29.518 [14] to send a "MANAGE UE POLICY COMPLETE" message or a "MANAGE UE POLICY COMMAND REJECT" message, as defined in Annex D.5 of 3GPP TS 24.501 [15], to the V-PCF.

If an AMF knows by implementation specific means that the UE context has been transferred to an AMF with another GUAMI within the AMF set, it may also invoke this procedure to update the Notification URI.

NOTE 3: Either the old or the new AMF can invoke this procedure.

During the AMF relocation, if the new AMF received the resource URI of the individual UE Policy from the old AMF and selects the old PCF, the new AMF shall also invoke this procedure to update the Notification URI. The new AMF may also update the alternate or backup IP addresses.

The V-PCF as NF service consumer invokes this procedure when a policy control request trigger (see subclause 4.2.3.2) occurs. When the "UE_POLICY", trigger occurs, the V-PCF shall always invoke the procedure. When the PLMN change trigger, the location change trigger, the change of UE presence in PRA trigger or the UE connectivity state change trigger occurs, the V-PCF shall only invoke the procedure if the H-PCF has subscribed to that event trigger.

To request policies from the PCF or to update the Notification URI, or to update the trace control configuration, or to request the termination of trace, the NF Service Consumer shall request the update of an UE Policy Association by providing relevant parameters about the UE context by sending an HTTP POST request with "{apiRoot}/npcf-ue-policy-control/v1/policies/{polAssoId}/update" as Resource URI and the PolicyAssociationUpdateRequest data structure as request body that shall include:

- at least one of the following:

  1. a new Notification URI encoded in the "notificationUri" attribute;

  2. observed Policy Control Request Trigger(s) (see subclause 4.2.3.2) encoded as "triggers" attribute;

  3. if a UE location change occurred, the UE location encoded as "userLoc" attribute;

  4. if a "MANAGE UE POLICY COMPLETE" message or a "MANAGE UE POLICY COMMAND REJECT" message of the UE policy delivery protocol defined in Annex D of 3GPP TS 24.501 [15] has been received by the V-PCF as NF service consumer, and at least parts of the contents relate to UPSIs of the HPLMN, the parts of that message that relate to UPSIs of the HPLMN encoded as "uePolDelResult" attribute;

  5. if the Policy Control Request Trigger "Change of UE presence in PRA" is provided, the current presence status of the UE for the presence reporting areas for which reporting was requested, if not previously provided, or the presence reporting areas for which reporting was requested and the status has changed encoded as "praStatuses" attribute;

NOTE 4: If the PCF included the identifer of a Core Network predefined Presence Reporting Area Set within the "praId" attribute during the subscription to changes of UE presence in PRA, the AMF only provides the presence reporting area information corresponding to the concerned individual Presence Reporting Area Identifier(s) within the Set. The "praId" attribute within each returned "PresenceInfo" data type hence includes the identifier of the concerned individual Presence Reporting Area.

  6. if the NF service consumer is an AMF, for AMF relocation scenarios, if available, alternate or backup IPv4 Address(es) where to send Notifications encoded as "altNotifIpv4Addrs" attribute;

  7. if the NF service consumer is an AMF, for AMF relocation scenarios, if available, alternate or backup IPv6 Address(es) where to send Notifications encoded as "altNotifIpv6Addrs" attribute;

  8. if the NF service consumer is an AMF, for AMF relocation scenarios, if available, alternate or backup FQDN(s) where to send Notifications encoded as "altNotifFqdns" attribute;

  9. for AMF relocation scenarios, if available, the GUAMI encoded as "guami" attribute;

NOTE 4: An alternate NF service consumer than the one that requested the generation of the subscription resource can send the request. For instance, an AMF as service consumer can change.

  10. if the NF service consumer is an AMF, for AMF relocation scenarios, the new serving AMF Id encoded in the "servingNfId" attribute;

11. if a UE PLMN change occurred, the PLMN identifier encoded as “plmnId” attribute;

12. if a "UE POLICY PROVISIONING REQUEST" message defined in subclause 7.2.1.1 of 3GPP TS 24.587 [24] has been received by the V-PCF as NF service consumer and the "V2X" feature defined in subclause 5.8 is supported, the message encoded as "uePolReq" attribute; and/or

13. if a UE Internal Group Identifier(s) change occurred and the "GroupIdListChange" feature defined in subclause 5.8 is supported, the Internal Group Identifier(s) of the served UE encoded as "groupIds" attribute.

Upon the reception of the HTTP POST request,

- if the PCF is a V-PCF and the V-PCF has an established policy association, the V-PCF shall determine based on the contents of a potentially received "uePolDelResult" attribute (see above) and requested event triggers of the H-PCF whether to send as the NF service consumer towards the H-PCF a request for the update of the policy association as described in the present clause;

- the (V-)(H-)PCF shall determine the applicable policy based on local policy and for the V-PCF any policy received from the H-PCF in the reply to the possible request for the update of a policy association;

- the (V-)(H-)PCF for the succesfull case shall send a HTTP "200 OK" response with the PolicyUpdate data type as body with possible updates for that applicable UE policy and N2 PC5 policy (for the H-PCF) and Policy Control Request Trigger(s) encoded as described in subclause 4.2.3.3;

- if the (V-)PCF determines that UE policy needs to be updated, it shall use the Namf_Communication service specified in 3GPP TS 29.518 [14] to provision the UE policy according to subclause 4.2.2.2 and as follows:

  (i) the (V-)PCF shall send the determined UE policy using Namf_Communication_N1N2MessageTransfer service operation(s); and

  (ii) the (V-)PCF shall be prepared to receive UE Policy Delivery Results from the AMF within the Namf_Communication_N1MessageNotify service operation and for the V-PCF if the received UE Policy Delivery results relate to UE policy sections provided by the H-PCF shall use the Npcf_UEPolicyControl_Update Service Operation to send those UE Policy Delivery results to the H-PCF; and

- if errors occur when processing the HTTP POST request, shall apply error handling procedures as specified in subclause 5.7 and according to the following provisions:

  - if the (V-)(H-)PCF is, due to incomplete, erroneous or missing information in the request not able to provision a UE policy decision, the PCF may reject the request and include in an HTTP "400 Bad Request" response message the "cause" attribute of the ProblemDetails data structure set to "ERROR_REQUEST_PARAMETERS".

If the PCF received a new GUAMI, the PCF may subscribe to GUAMI changes using the AMFStatusChange service operation of the Namf_Communication service specified in 3GPP TS 29.518 [14], and it may use the Nnrf_NFDiscovery Service specified in 3GPP TS 29.510 [13] (using the obtained GUAMI and possibly service name) to query the other AMFs within the AMF set.

### 4.2.3.2 Policy Control Request Triggers

The following Policy Control Request Triggers are defined (see subclause 6.1.2.5 of 3GPP TS 23.503 [4]):

- "LOC_CH", i.e. location change (tracking area): the tracking area of the UE has changed;

- "PRA_CH", i.e. change of UE presence in PRA: the UE is entering/leaving a Presence Reporting Area, this includes reporting the initial status at the time the request for reports is initiated;

- "UE_POLICY", i.e. a "MANAGE UE POLICY COMPLETE" message or a "MANAGE UE POLICY COMMAND REJECT" message, as defined in Annex D.5 of 3GPP TS 24.501 [15] or a "UE POLICY PROVISIONING REQUEST" message, as defined in subclause 7.2.1.1 of 3GPP TS 24.587 [24], has been received by the V-PCF and is being forwarded to the H-PCF ;

- "PLMN_CH", i.e. PLMN change: the serving PLMN of the UE has changed; and

NOTE 1: The "PLMN_CH" trigger only applies if the "PlmnChange" feature is supported.

- "CON_STATE_CH", i.e. connectivity state change: the connectivity state of UE has changed.

NOTE 2: The "CON_STATE_CH" trigger only applies if the "ConnectivityStateChange" feature is supported.

- "GROUP_ID_LIST_CHG", i.e. UE Internal Group Identifier(s) change: the UDM provided list of group Ids has changed.

NOTE 3: The "GROUP_ID_LIST_CHG" trigger only applies if the "GroupIdListChange" feature is supported. This Policy Control Request Trigger does not require a subscription.

#### 4.2.3.3 Encoding of updated policy

Updated policies shall be encoded within the PolicyUpdate data type that may include:

- only when the updated policy is supplied by the H-PCF in the roaming scenario, UE policy (see subclause 4.2.2.2) encoded as "uePolicy" attribute, and N2 PC5 policy (see subclause 4.2.2.3) encoded as "n2Pc5Pol" attribute;
- updated Policy Control Request Trigger(s) (see subclause 4.2.3.2) encoded as "triggers" attribute i.e.:
  1) either a new complete list of applicable Policy Control Request Trigger(s) including one or several of the following:
     a) Location change (tracking area); or
     b) Change of UE presence in PRA; or
     c) Change of PLMN if the "PlmnChange" feature is supported; or
     d) Change of UE connectivity state if the "ConnectivityStateChange" feature is supported; or
  2) a "NULL" value to request the removal of all previously installed Policy Control Request Trigger(s); and
- if the Policy Control Request Trigger "Change of UE presence in PRA" is provided or if that trigger was already set but the requested presence reporting areas need to be changed, the presence reporting areas for which reporting is required encoded as "pras" attribute encoded as follows:
  a) A new entry shall be added by supplying a new identifier as key and the corresponding PresenceInfo data type instance with complete contents as value as an entry within the map.
  b) An existing entry shall be modified by supplying the existing identifier as key and the PresenceInfo data type instance with complete contents as value as an entry within the map.
  c) An existing entry shall be deleted by supplying the existing identifier as key and "NULL" as value as an entry within the map.
  d) For an unmodified entry, no entry needs to be provided within the map.

### 4.2.4 Npcf_UEPolicyControl_UpdateNotify Service Operation

#### 4.2.4.1 General

The (V-)(H)-PCF may decide to update policy control request triggers, and in the roaming case the H-PCF may decide to update the UE Policy and N2 PC5 policy if the "V2X" feature is supported.The PCF (H-PCF in the roaming case) may decide to request the termination of the policy association. The(V-)(H-)PCF shall then use an Npcf_UEPolicyControl_UpdateNotify service operation.

The following procedures using the Npcf_UEPolicyControl_UpdateNotify service operation are supported:

- Policy update notification.
- Request for termination of the UE policy association.
- URSP provisioning for background Data Transfer policy.

- UE policy provisioning for V2X communication over PC5 and Uu reference points.

NOTE: The PCF derives the URSP and invokes the Namf_Communication_N1N2MessageTransfer service operation to provision it to the UE.

### 4.2.4.2 Policy update notification

Figure 4.2.4.2-1 illustrates the policy update notification.

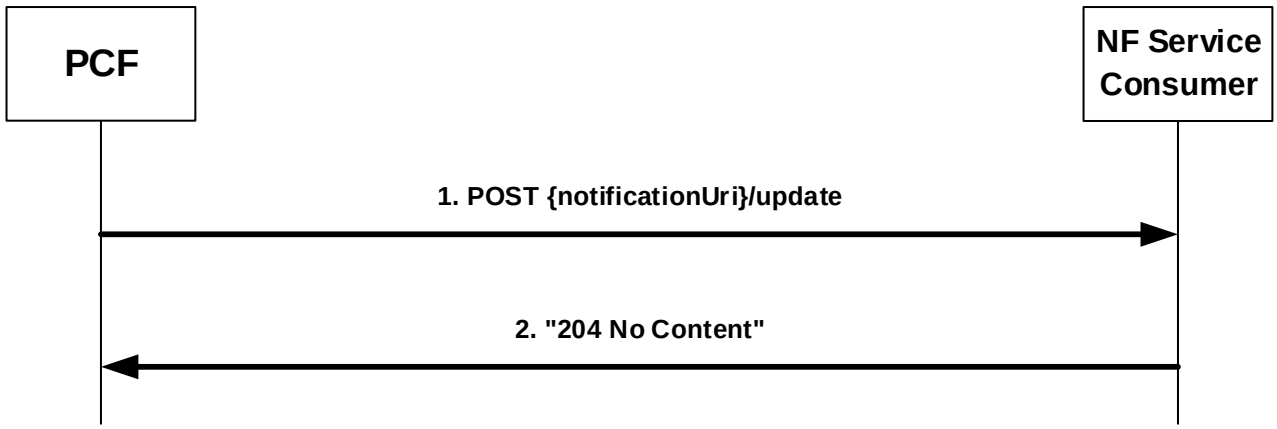


**Figure 4.2.4.2-1: policy update notification**

NOTE: For the roaming case, the PCF represents the V-PCF if the NF service consumer is an AMF and the PCF represents the H-PCF if the NF service consumer is a V-PCF.

The (V-)(H)-PCF may decide to update policy control request trigger(s) and in the roaming case, the H-PCF may also decide to update the UE Policy, N2 PC5 policy if the "V2X" feature is supported and the (V-)(H-)PCF shall then send an HTTP POST request with "{notificationUri}/update" as URI (where the Notification URI was previously supplied by the NF service consumer) to the NF service consumer and the PolicyUpdate data structure as request body encoded as described in subclause 4.2.3.3.

Upon the reception of the HTTP POST request, the NF service consumer:

- if the V-PCF is the NF service consumer, shall use the Namf_Communication Service defined in 3GPP TS 29.518 [14] to send "MANAGE UE POLICY COMMAND" message(s) with the received UE policy to the UE via the AMF and/or with the received N2 PC5 policy to the NG-RAN via the AMF;

- if the V-PCF is the NF service consumer, shall provision the received policy control requested trigger(s) to the AMF using the Npcf_UEPolicyControl_UpdateNotify service operation according to the present clause;

- if the AMF is the NF service consumer, shall enforce the received policy control request trigger(s);

- shall either send a HTTP "204 No Content" response indicating the success of the enforcement or an appropriate failure response, for the V-PCF as the NF service consumer taking into consideration a reply received from the possible Namf_Communication Service service operation and from the possible Npcf_UEPolicyControl_UpdateNotify service operation according to the previous bullets; and

- if errors occur when processing the HTTP POST request, shall apply error handling procedures as specified in subclause 5.7.

### 4.2.4.3 Request for termination of the policy association

Figure 4.2.4.3-1 illustrates the request for a termination of the policy association.

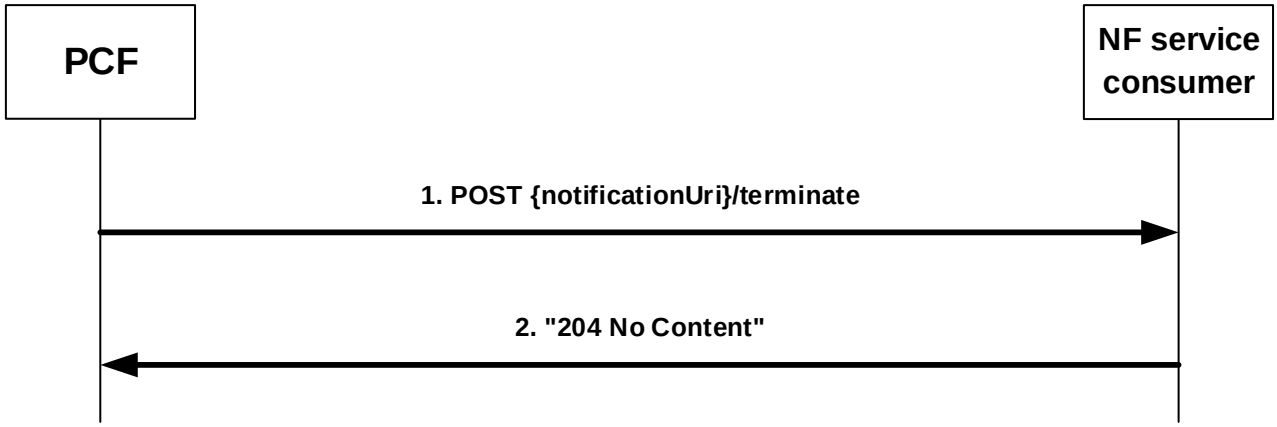


**Figure 4.2.4.3-1: request for a termination of theUE policy association**

NOTE: For the roaming case, the PCF represents the V-PCF if the NF service consumer is an AMF and the PCF represents the H-PCF if the NF service consumer is a V-PCF.

The (V-)(H-)PCF may to request the termination of the UE policy association and shall then send an HTTP POST request with "{notificationUri}/terminate" as URI (where the Notification URI was previously supplied by the NF service consumer) and the TerminationNotification data structure as request body that shall include:

- the policy association ID encoded as "polAssoId" attribute; and
- the cause why the (V-)(H-)PCF requests the termination of the policy association encoded as "cause" attribute.

Upon the reception of the HTTP POST request, the NF service consumer:

- if the V-PCF is the NF service consumer, shall send as NF service producer for the corresponding policy association (towards the AMF) a request for a termination of the policy association according to the present clause;
- shall either send a HTTP "204 No Content" response for the succesfull processing of the HTTP POST request or an appropriate failure response, for the V-PCF as the NF service consumer taking into consideration a reply received for the possible corresponding policy association termination request according to the previous bullet; and
- if errors occur when processing the HTTP POST request, shall apply error handling procedures as specified in subclause 5.7.

After the succesfull processing of the HTTP POST request, any NF service consumer except for the V-PCF shall invoke the Npcf_UEPolicyControl_Delete Service Operation defined in subclause 4.2.5 to terminate the policy association.

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

If the (V-)PCF receives a "307 temporary redirect" response, the PCF shall resend the failed request for termination of the policy association using the received URI in the Location header field as Notification URI.

If the (V-)PCF becomes aware that a new AMF is requiring notifications (e.g. via the "404 Not found" response or via Namf_Communication service AMFStatusChange Notifications, see 3GPP TS TS 29.518 [14], or via link level failures), and the (V-)PCF knows alternate or backup IPv4, IPv6 Addess(es) or FQDN(s) where to send Notifications (e.g. via "altNotifIpv4Addrs", "altNotifIpv6Addrs" or "altNotifFqdns" attributes received when the policy association was created or via AMFStatusChange Notifications, or via the Nnrf_NFDiscovery Service specified in 3GPP TS 29.510 [13] (using the service name and GUAMI obtained during the creation of the subscription) to query the other AMFs within the AMF set), the (V-)PCF shall exchange the authority part of the corresponding Notification URI with one of those addresses and shall resend the failed request for termination of the policy association to that URI.

If the (V-)PCF received a "404 Not found" response, the (V-)PCF should resend the failed request for termination of the policy association to that URI.

#### 4.2.4.4 URSP provisioning for Background Data Transfer policy

If the "EnhancedBackgroundDataTransfer" feature is supported, after the UE policy association establishment, the (H-)PCF may receive the Background Data Transfer Reference ID(s) notified by the UDR for the change of UE's Application Data as defined in subclause 6.3.4 of 3GPP TS 29.519 [17]. In this case, the (H-)PCF shall retrieve the transfer policy corresponding to the Background Data Transfer Reference ID(s) as defined in subclause 5.2.8 of 3GPP TS 29.519 [17] and derive the URSP including the Route Selection Validation Criteria for the UE as defined in subclause 6.2.2.1 of 3GPP TS 23.503 [40]. The H-PCF shall provision the URSP to the V-PCF as defined in subclause 4.2.4.2 and then the V-PCF shall invoke the Namf_Communication_N1N2MessageTransfer service operation to provision it to the UE. The (H-)PCF shall use the associated S-NSSAI and DNN to store in the UDR the Background Data Transfer Reference ID(s) in the UE's session management policy data as specified in 3GPP TS 29.519 [17].

#### 4.2.4.5 UE policy provisioning for V2X communication over PC5 and Uu reference points

If the "V2X" feature is supported, after the UE policy association establishment, the (H-)PCF may receive the Service specific parameter information notified by the UDR for the change of UE's Application Data as defined in subclause 6.3.4 of 3GPP TS 29.519 [17]. In this case, the H-PCF shall derive the V2XP and provision them to the V-PCF as defined in subclause 4.2.4.2 for the roaming case; the PCF shall use the Namf_Communication Service defined in 3GPP TS 29.518 [14] to send "MANAGE UE POLICY COMMAND" message(s) with the policy to the UE via the AMF for the non-roaming case.

### 4.2.5 Npcf_UEPolicyControl_Delete Service Operation

Figure 4.2.5-1 illustrates the deletion of a policy association.

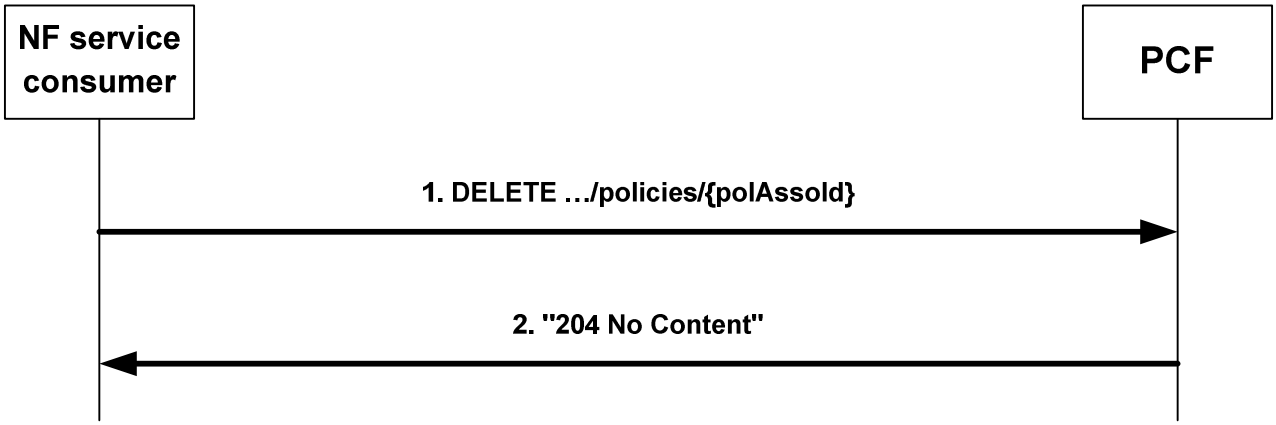


**Figure 4.2.5-1: Deletion of a policy association**

NOTE: For the roaming case, the PCF represents the V-PCF if the NF service consumer is an AMF and the PCF represents the H-PCF if the NF service consumer is a V-PCF.

The AMF as NF service consumer requests that the policy association is deleted when the corresponding UE context is terminated, e.g. during UE de-registration from the network.

During the AMF relocation, the old AMF shall invoke this procedure when:

- the resource URI of the individual UE Policy Association resource is not transferred to the new AMF; or
- the new AMF informs the old AMF that the individual UE Policy Association resource is not being reused.

To request that the UE policy association is deleted, the NF service consumer (e.g. AMF) shall send an HTTP DELETE request with "{apiRoot}/npcf-ue-policy-control/v1/policies/{polAssoId}" as Resource URI.

Upon the reception of the HTTP DELETE request,

- the (V-)(H-)PCF shall delete the policy association;

- if the PCF is a V-PCF and has an established corresponding policy association towards the H-PCF, the V-PCF shall send as the NF service consumer towards the H-PCF a request for the deletion of that policy association as described in the present clause;
- the (V-)(H-)PCF shall send either an HTTP "204 No Content" response indicating the success of the deletion or an appropriate failure response, for the V-PCF as PCF taking into consideration a reply received for the possible policy association deletion request according to the previous bullet; and
- the (V-)(H-)PCF shall if errors occur when processing the HTTP DELETE request, apply error handling procedures as specified in subclause 5.7.

# 5 Npcf_UEPolicyControl API

## 5.1 Introduction

The Access and Mobility Policy Control Service shall use the Npcf_UEPolicyControl API.

The API URI of the Npcf_UEPolicyControl 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-ue-policy-control".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in subclause 5.3.

## 5.2 Usage of HTTP

### 5.2.1 General

HTTP/2, IETF RFC 7540 [8], shall be used as specified in clause 5 of 3GPP TS 29.500 [5].

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

The OpenAPI [10] specification of HTTP messages and content bodies for the Npcf_UEPolicyControl 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 [9], shall be used as content type of the HTTP bodies specified in the present specification as specified in subclause 5.4 of 3GPP TS 29.500 [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 [21].

### 5.2.3 HTTP custom headers

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

## 5.3 Resources

### 5.3.1 Resource Structure

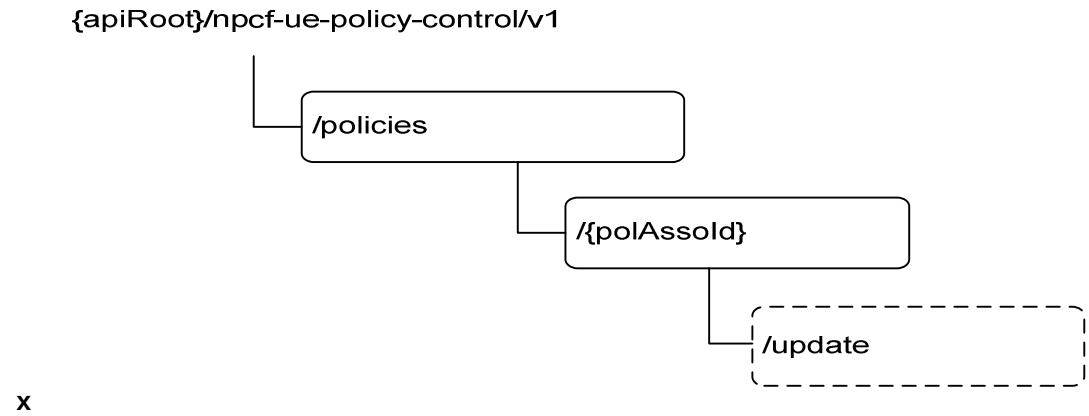


**Figure 5.3.1-1: Resource URI structure of the Npcf_UEPolicyControl API**

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 |
|---|---|---|---|
| UE Policy Associations | /policies/ | POST | Create a new Individual UE policy association resource. |
| Individual UE Policy Association | /policies/{polAssoId} | GET | Read an Individual UE Policy Association resource. |
| | | DELETE | Delete an Individual UE Policy Association resource. |
| | /policies/{polAssoId}/update | update (POST) | Report observed event trigger and obtain updated UE policies. |

### 5.3.2 Resource:UE Policy Associations

#### 5.3.2.1 Description

This resource represents a collection of UE policy associations.

#### 5.3.2.2 Resource definition

Resource URI: **{apiRoot}/npcf-ue-policy-control/v1/policies/**

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 |
|---|---|---|---|
| PolicyAssociationRequest | M | 1 | Input parameters for the creation of a policy association. |

**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 |
|---|---|---|---|---|
| PolicyAssociation | M | 1 | 201 Created | Policy association was created and policies are being provided. |
| 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-ue-policy-control/v1/policies/{polAssoId} |

## 5.3.3 Resource: Individual UE Policy Association

### 5.3.3.1 Description

This resource represents an individual UE policy association.

### 5.3.3.2 Resource definition

Resource URI: **{apiRoot}/npcf-ue-policy-control/v1/policies/{polAssoId}**

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. |
| polAssoId | string | Identifier of a policy association. |

### 5.3.3.3 Resource Standard Methods

#### 5.3.3.3.1 GET

This method shall support the URI query parameters specified in table 5.3.2.3.1-1.

**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 5.3.2.3.1-2 and the response data structures and response codes specified in table 5.3.2.3.1-3.

**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 |
|---|---|---|---|---|
| PolicyAssociation | M | 1 | 200 OK | |
| 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 DELETE

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 DELETE method on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| n/a | | | | |

This method shall support the request data structures specified in table 5.3.3.3.2-2 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 DELETE Request Body on this resource**

| Data type | P | Cardinality | Description |
|---|---|---|---|
| n/a | | | |

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

| Data type | P | Cardinality | Response codes | Description |
|---|---|---|---|---|
| n/a | | | 204 No Content | The policy association was successfully deleted. |
| NOTE: The mandatory HTTP error status codes 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

#### 5.3.3.4.1 Overview

**Table 5.3.3.4.1-1: Custom operations**

| Operation name | Custom operation URI | Mapped HTTP method | Description |
|---|---|---|---|
| Update | /policies/{polAssoId}/update | POST | Report observed event trigger and obtain updated policies. |

#### 5.3.3.4.2 Operation: Update

##### 5.3.3.4.2.1 Description

The update custom operation allows an NF service consumer to report the occurrence on a police request trigger and to obtain related updated policies.

##### 5.3.3.4.2.2 Operation Definition

This operation shall support the request data structures specified in table 5.3.3.4.2.2-1 and the response data structure and response codes specified in table 5.3.3.4.2.2-2.

**Table 5.3.3.4.2.2-1: Data structures supported by the POST Request Body on this resource**

| Data type | P | Cardinality | Description |
|---|---|---|---|
| PolicyAssociationUpdateRequest | M | 1 | Describes the observed event trigger(s). |

**Table 5.3.3.4.2.2-2: Data structures supported by the POST Response Body on this resource**

| Data type | P | Cardinality | Response codes | Description |
|---|---|---|---|---|
| PolicyUpdate | M | 1 | 200 OK | Describes updated policies. |
| 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. | | | | |

## 5.4 Custom Operations without associated resources

None.

# 5.5 Notifications

## 5.5.1 General

**Table 5.5.1-1: Notifications overview**

| Notification | Callback URI | HTTP method or custom operation | Description (service operation) |
|---|---|---|---|
| Policy Update Notification | {notificationUri}/update | update (POST) | Policy Update Notification. |
| Request for termination of the UE policy association | {notificationUri}/terminate | terminate (POST) | Request for termination of the policy association. |

## 5.5.2 Policy Update Notification

### 5.5.2.1 Description

This notification is used by the H-PCF to provide updates of UE policies to the V-PCF as NF service consumer, and used by the V-PCF to provide updates of policy control request triggers to the AMF as NF service consumer.

### 5.5.2.2 Operation Definition

This operation shall support the request data structures specified in table 5.5.2.2-1 and the response data structure and response codes specified in table 5.5.2.2-2.

**Table 5.5.2.2-1: Data structures supported by the POST Request Body on this resource**

| Data type | P | Cardinality | Description |
|---|---|---|---|
| PolicyUpdate | M | 1 | Updated policies. |

**Table 5.5.2.2-2: Data structures supported by the POST Response Body on this resource**

| Data type | P | Cardinality | Response codes | Description |
|---|---|---|---|---|
| n/a | | | 204 No Content | The policies were successfully updated. |
| 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. | | | | |

## 5.5.3 Request for termination of the UE policy association

### 5.5.3.1 Description

This notification is used by the PCF to request the termination of a UE policy association.

### 5.5.3.2 Operation Definition

This operation shall support the request data structures specified in table 5.5.3.2-1 and the response data structure and response codes specified in table 5.5.3.2-2.

**Table 5.5.3.2-1: Data structures supported by the POST Request Body on this resource**

| Data type | P | Cardinality | Description |
|---|---|---|---|
| TerminationNotification | M | 1 | Request to terminate the policy association. |

**Table 5.5.3.2-2: Data structures supported by the POST Response Body on this resource**

| Data type | P | Cardinality | Response codes | Description |
|---|---|---|---|---|
| n/a | | | 204 No Content | The request for policy association termination was received. |
| n/a | | | 307 temporary redirect | The NF service consumer shall generate a Location header field containing a different URI pointing to another NF service consumer to which the notification should be send. |
| ProblemDetails | O | 0..1 | 404 Not Found | The NF service consumer can use this response when the notification can be sent to another unknown host. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply. | | | | |

**Table 5.5.3.2-3: Headers supported by the 307 Response Code on this resource**

| Name | Data type | P | Cardinality | Description |
|---|---|---|---|---|
| Location | string | M | 1 | A URI pointing to the endpoint of another NF service consumer to which the notification should be sent |

# 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_UEPolicyControl service based interface protocol.

**Table 5.6.1-1: Npcf_UEPolicyControl specific Data Types**

| Data type | Section defined | Description | Applicability |
|---|---|---|---|
| Pc5Capability | 5.6.3.5 | Indicates the specific PC5 RAT(s) which the UE supports for V2X communication over PC5 reference point. | V2X |
| PolicyAssociation | 5.6.2.2 | Description of a policy association that is returned by the PCF when a policy Association is created, updated, or read. | |
| PolicyAssociationReleaseCause | 5.6.3.4 | The cause why the PCF requests the termination of the policy association. | |
| PolicyAssociationRequest | 5.6.2.3 | Information that NF service consumer provides when requesting the creation of a policy association. | |
| PolicyAssociationUpdateRequest | 5.6.2.4 | Information that NF service consumer provides when requesting the update of a policy association. | |
| PolicyUpdate | 5.6.2.5 | Updated policies that the PCF provides in a notification or in the reply to an Update Request. | |
| RequestTrigger | 5.6.3.3 | Enumeration of possible Request Triggers. | |
| TerminationNotification | 5.6.2.6 | Request to terminate a policy Association that the PCF provides in a notification. | |
| UePolicy | 5.6.3.2 | UE Policies | |
| UePolicyDeliveryResult | 5.6.3.2 | UE Policy delivery Result | |
| UePolicyRequest | 5.6.3.2 | Request for UE Policies | |
| UePolicyTransferFailureNotification | 5.6.2.7 | Information that the UE policy is failure to be transferred to the UE because the UE is not reachable. | |

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

**Table 5.6.1-2: Npcf_UEPolicyControl re-used Data Types**

| Data type | Reference | Comments | Applicability |
|---|---|---|---|
| AccessType | 3GPP TS 29.571 [11] | | |
| CmState | 3GPP TS 29.518 [14] | Connectivity state of UE | ConnectivityStateChange |
| Fqdn | 3GPP TS 29.510 [13] | FQDN | |
| Gpsi | 3GPP TS 29.571 [11] | Generic Public Subscription Identifier | |
| GroupId | 3GPP TS 29.571 [11] | | |
| Guami | 3GPP TS 29.571 [11] | Globally Unique AMF Identifier | |
| Ipv4Addr | 3GPP TS 29.571 [11] | | |
| Ipv6Addr | 3GPP TS 29.571 [11] | | |
| N1N2MessageTransferCause | 3GPP TS 29.518 [14] | | |
| N2InfoContent | 3GPP TS 29.518 [14] | Represents a transparent N2 information content to be relayed by AMF. | V2X |
| NfInstanceId | 3GPP TS 29.571 [11] | | |
| Pei | 3GPP TS 29.571 [11] | Permanent Equipment Identifier | |
| PlmnId | 3GPP TS 29.571 [11] | | |
| PlmnIdNid | 3GPP TS 29.571 [11] | PLMN Identifier, and for SNPN NID | |
| PresenceInfo | 3GPP TS 29.571 [11] | Presence reporting area information | |
| ProblemDetails | 3GPP TS 29.571 [11] | | |
| Uri | 3GPP TS 29.571 [11] | | |
| UserLocation | 3GPP TS 29.571 [11] | | |
| RatType | 3GPP TS 29.571 [11] | | |
| ServiceName | 3GPP TS 29.510 [13] | Name of the service instance. | |
| Supi | 3GPP TS 29.571 [11] | Subscription Permanent Identifier | |
| SupportedFeatures | 3GPP TS 29.571 [11] | Used to negotiate the applicability of the optional features defined in table 5.8-1. | |
| TimeZone | 3GPP TS 29.571 [11] | | |
| Uinteger | 3GPP TS 29.571 [11] | | |

## 5.6.2 Structured data types

### 5.6.2.1 Introduction

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

### 5.6.2.2 Type PolicyAssociation

**Table 5.6.2.2-1: Definition of type PolicyAssociation**

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|---|---|---|---|---|
| request | PolicyAssociationRequest | O | 0..1 | The information provided by the NF service consumer when requesting the creation of a policy association | |
| uePolicy | UePolicy | O | 0..1 | The UE policy as determined by the PCF. | |
| n2Pc5Pol | N2InfoContent | O | 0..1 | The N2 PC5 policy as determined by the PCF. | V2X |
| triggers | array(RequestTrigger) | O | 1..N | Request Triggers that the PCF subscribes. Only values "LOC_CH", "PRA_CH", "PLMN_CH" and "CON_STATE_CH" are permitted. | (NOTE) |
| pras | map(PresenceInfo) | C | 1..N | If the Trigger "PRA_CH" is provided, the presence reporting area(s) for which reporting is requested shall be provided. The "praId" attribute within the PresenceInfo data type shall also be the key of the map. The "presenceState" and the "additionalPraId" attributes within the PresenceInfo data type shall not be supplied. The "praId" attribute within the PresenceInfo data type shall include the identifier of either a presence reporting area or a presence reporting area set. | |
| suppFeat | SupportedFeatures | M | 1 | Indicates the negotiated supported features. | |
| NOTE: The "PLMN_CH" and "CON_STATE_CH" values in the "triggers" attribute apply under feature control as described in subsclause 4.2.3.2. | | | | | |

### 5.6.2.3 Type PolicyAssociationRequest

**Table 5.6.2.3-1: Definition of type PolicyAssociationRequest**

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|---|---|---|---|---|
| notificationUri | Uri | M | 1 | Identifies the recipient of Notifications sent by the PCF. | |
| altNotifIpv4Addrs | array(Ipv4Addr) | O | 1..N | Alternate or backup IPv4 Addess(es) where to send Notifications. | |
| altNotifIpv6Addrs | array(Ipv6Addr) | O | 1..N | Alternate or backup IPv6 Addess(es) where to send Notifications. | |
| altNotifFqdns | array(Fqdn) | O | 1..N | Alternate or backup FQDN(s) where to send Notifications. | |
| supi | Supi | M | 1 | Subscription Permanent Identifier. | |
| gpsi | Gpsi | C | 0..1 | Generic Public Subscription Identifier. Shall be provided when available. | |
| accessType | AccessType | C | 0..1 | The Access Type where the served UE is camping. Shall be provided when available. | |
| pei | Pei | C | 0..1 | The Permanent Equipment Identifier of the served UE. Shall be provided when available. | |
| userLoc | UserLocation | C | 0..1 | The location of the served UE. Shall be provided when available. | |
| timeZone | TimeZone | C | 0..1 | The time zone where the served UE is camping. Shall be provided when available. | |
| servingPlmn | PlmnIdNid | C | 0..1 | The serving PLMN where the served UE is camping. For an SNPN the NID together with the PLMN ID identifies the SNPN. Shall be provided when available. | |
| ratType | RatType | C | 0..1 | The RAT Type where the served UE is camping. Shall be provided when available. | |
| groupIds | array(GroupId) | C | 1..N | Internal Group Identifier(s) of the served UE. Shall be provided when available. | |
| hPcfId | NfInstanceId | C | 0..1 | H-PCF Identifier. Shall be provided when available. | |
| uePolReq | UePolicyRequest | C | 0..1 | A request for UE Policies. Shall be provided when the AMF receives an "UE STATE INDICATION" message, as defined in Annex D.5.4 of 3GPP TS 24.501 [15] or when the AMF receives an "UE POLICY PROVISIONING REQUEST" message, as defined in subclause 7.2.1.1 of 3GPP TS 24.587 [24] if the "V2X" feature is supported. | |
| guami | Guami | C | 0..1 | The Globally Unique AMF Identifier (GUAMI) shall be provided by an AMF as service consumer. | |
| serviceName | ServiceName | O | 0..1 | If the NF service consumer is an AMF, it should provide the name of a service produced by the AMF that makes use of information received within the Npcf_UEPolicyControl_UpdateNotify service operation. | |
| servingNfId | NfInstanceId | C | 0..1 | If the NF service consumer is an AMF, it shall contain the identifier of the serving AMF. | |
| pc5Capab | Pc5Capability | O | 0..1 | Indicates the PC5 Capability supported by the UE. | V2X |
| | | | | | |
| suppFeat | SupportedFeatures | M | 1 | Indicates the features supported by the service consumer. | |

### 5.6.2.4 Type PolicyAssociationUpdateRequest

**Table 5.6.2.4-1: Definition of type PolicyAssociationUpdateRequest**

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|---|---|---|---|---|
| notificationUri | Uri | O | 0..1 | Identifies the recipient of Notifications sent by the PCF. | |
| altNotifIpv4Addrs | array(Ipv4Addr) | O | 1..N | Alternate or backup IPv4 Address(es) where to send Notifications. | |
| altNotifIpv6Addrs | array(Ipv6Addr) | O | 1..N | Alternate or backup IPv6 Address(es) where to send Notifications. | |
| altNotifFqdns | array(Fqdn) | O | 1..N | Alternate or backup FQDN(s) where to send Notifications. | |
| triggers | array(RequestTrigger) | C | 1..N | Request Triggers that the NF service consumer observes. | |
| praStatuses | map(PresenceInfo) | C | 1..N | If the Trigger "PRA_CH" is reported, the UE presence status for tracking area for which changes of the UE presence occurred shall be provided. The "praId" attribute within the PresenceInfo data type shall also be the key of the map. The "presenceState" attribute within the PresenceInfo data type shall be supplied. The "additionalPraId" attribute within the PresenceInfo data type shall not be supplied. The "praId" attribute within the PresenceInfo data type shall include the identifier of an individual presence reporting area. | |
| userLoc | UserLocation | C | 0..1 | The location of the served UE shall be provided for trigger "LOC_CH". | |
| uePolDelResult | UePolicyDeliveryResult | C | 0..1 | UE Policy Delivery Result. Shall be provided together with trigger "UE_POLICY" when a "MANAGE UE POLICY COMPLETE" message or a "MANAGE UE POLICY COMMAND REJECT" message, as defined in Annex D.5 of 3GPP TS 24.501 [15], has been received by the V-PCF and is being forwarded to the H-PCF. | |
| uePolTransFailNotif | UePolicyTransferFailureNotification | C | 0..1 | The UE policy transfer failure notification. Shall be the provided together with trigger "UE_POLICY" when a response with HTTP status code 4xx or 5xx as defined in subclause 5.2.2.3.1.2 of 3GPP TS 29.518 [14] or a N1N2 Transfer Failure Notification as defined in subclause 5.2.2.3.2 of 3GPP TS 29.518 [14] is received after the V-PCF provisioned the UE policy by invoking the Namf_Communication_N1N2MessageTransfer service operation to the AMF and is notifying the H-PCF. | |
| uePolReq | UePolicyRequest | C | 0..1 | A request for UE Policies. Shall be provided when the AMF receives an "UE POLICY PROVISIONING REQUEST" message, as defined in subclause 7.2.1.1 of 3GPP TS 24.587 [24] if the "V2X" feature is supported. | V2X |
| guami | Guami | O | 0..1 | The Globally Unique AMF Identifier (GUAMI) shall be provided by an AMF as service consumer. | |
| servingNfId | NfInstanceId | C | 0..1 | It shall contain the identifier of the new AMF during the AMF relocation. | |
| plmnId | PlmnId | C | 0..1 | The PLMN of the served UE shall be provided for trigger "PLMN_CH". | PlmnChange |

| | | | | | |
|---|---|---|---|---|---|
| connectState | CmState | C | 0..1 | The connectivity state of the served UE shall be provided for trigger "CON_STATE_CH". | ConnectivityStateChange |
| groupIds | array(GroupId) | C | 1..N | Internal Group Identifier(s) of the served UE. Shall be provided for trigger "GROUP_ID_LIST_CHG". | GroupIdListChange |

### 5.6.2.5 Type PolicyUpdate

**Table 5.6.2.5-1: Definition of type PolicyUpdate**

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|---|---|---|---|---|
| resourceUri | Uri | M | 1 | The resource URI of the individual UE policy association related to the notification. | |
| uePolicy | UePolicy | O | 0..1 | The UE policy as determined by the PCF. | |
| n2Pc5Pol | N2InfoContent | O | 0..1 | The N2 PC5 policy as determined by the PCF. | V2X |
| triggers | array(RequestTrigger) | O | 1..N | Request Triggers that the PCF subscribes. Only values "LOC_CH", "PRA_CH", "PLMN_CH" and "CON_STATE_CH" are permitted. | (NOTE) |
| pras | map(PresenceInfo) | C | 1..N | If the Trigger "PRA_CH" is provided or if that trigger was already set but the requested presence reporting areas need to be changed, the presence reporting area(s) for which reporting is requested shall be provided. The "praId" attribute within the PresenceInfo data type shall also be the key of the map. The "presenceState" attribute within the PresenceInfo data type shall not be supplied. The "praId" attribute within the PresenceInfo data type shall include the identifier of either a presence reporting area or a presence reporting area set. | |
| NOTE: The "PLMN_CH" and "CON_STATE_CH" values in the "triggers" attribute apply under feature control as described in subsclause 4.2.3.2. | | | | | |

### 5.6.2.6 Type TerminationNotification

**Table 5.6.2.6-1: Definition of type TerminationNotification**

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|---|---|---|---|---|
| resourceUri | Uri | M | 1 | The resource URI of the individual UE policy association related to the notification. | |
| cause | PolicyAssociationReleaseCause | M | 1 | The cause why the PCF requests the termination of the policy association. | |

### 5.6.2.7 Type UePolicyTransferFailureNotification

**Table 5.6.2.7-1: UEPolicyTransferFailureNotification**

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|---|---|---|---|---|
| cause | N1N2MessageTransferCause | M | 1 | Indicates the reason why the UE policy could not be transferred by the AMF. | |
| ptis | array(Uinteger) | M | 1..N | Contains a list of PTI assigned by the H-PCF corresponding to the UE policy(s) which could not be transferred by the AMF. | |

## 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 |
|---|---|---|---|
| UePolicy | Bytes | "MANAGE UE POLICY COMMAND" message content, as defined in Table D.5.1.1.1 of 3GPP TS 24.501 [15] | |
| UePolicyDeliveryResult | Bytes | "MANAGE UE POLICY COMPLETE" message content, as defined in Table D.5.2.1.1 of 3GPP TS 24.501 [15], or "MANAGE UE POLICY COMMAND REJECT" message content, as defined in Table D.5.3.1.1 of 3GPP TS 24.501 [15] | |
| UePolicyRequest | Bytes | "UE STATE INDICATION" message content, as defined in Table D.5.4.1.1 of 3GPP TS 24.501 [15] or "UE POLICY PROVISIONING REQUEST" message content, as defined in subclause 7.2.1.1 of 3GPP TS 24.587 [24]. | |

### 5.6.3.3 Enumeration: RequestTrigger

The enumeration RequestTrigger represents the possible Policy Control Request Triggers.. It shall comply with the provisions defined in table 5.6.3.3-1.

**Table 5.6.3.3-1: Enumeration RequestTrigger**

| Enumeration value | Description | Applicability |
|---|---|---|
| LOC_CH | Location change (tracking area): the tracking area of the UE has changed. | |
| PRA_CH | Change of UE presence in PRA: the AMF reports the current presence status of the UE in a Presence Reporting Area, and notifies that the UE enters/leaves the Presence Reporting Area. | |
| UE_POLICY | A "MANAGE UE POLICY COMPLETE" message, a "MANAGE UE POLICY COMMAND REJECT" message, as defined in Annex D.5 of 3GPP TS 24.501 [15] or a "UE POLICY PROVISIONING REQUEST" message, as defined in subclause 7.2.1.1 of 3GPP TS 24.587 [24], has been received by the V-PCF and is being forwarded to the H-PCF. A Namf_Communication_N1N2MessageTransfer failure response as defined in subclause 5.2.2.3.1.2 of 3GPP TS 29.518 [14], or an N1N2 Transfer Failure Notification as defined in subclause 5.2.2.3.2 of 3GPP TS 29.518 [14], a UE Policy transfer failure is notifying to the H-PCF. This event does not require a subscription and is only applicable for the V-PCF as NF service consumer and the H-PCF as NF service producer. | |
| PLMN_CH | PLMN change: the serving PLMN of UE has changed. | PlmnChange |
| CON_STATE_CH | Connectivity state change: the connectivity state of UE has changed. | ConnectivityStateChange |
| GROUP_ID_LIST_CHG | UE Internal Group Identifier(s) has changed: the AMF reports that UDM provided list of group Ids has changed. This event does not require a subscription. | GroupIdListChange |

### 5.6.3.4 Enumeration: PolicyAssociationReleaseCause

The enumeration PolicyAssociationReleaseCause represents the cause why the PCF requests the termination of the policy association. It shall comply with the provisions defined in table 5.6.3.4-1.

**Table 5.6.3.4-1: Enumeration PolicyAssociationReleaseCause**

| Enumeration value | Description | Applicability |
|---|---|---|
| UNSPECIFIED | This value is used for unspecified reasons. | |
| UE_SUBSCRIPTION | This value is used to indicate that the policy association needs to be terminated because the subscription of UE has changed (e.g. was removed). | |
| INSUFFICIENT_RES | This value is used to indicate that the server is overloaded and needs to abort the policy association. | |

### 5.6.3.5 Enumeration: Pc5Capability

The enumeration Pc5Capability indicates the specific PC5 RAT(s) which the UE supports for V2X communication over PC5 reference point. It shall comply with the provisions defined in table 5.6.3.5-1.

**Table 5.6.3.5-1: Enumeration Pc5Capability**

| Enumeration value | Description | Applicability |
|---|---|---|
| LTE_PC5 | This value is used to indicate that UE supports PC5 LTE RAT for V2X communication over PC5 reference point. | |
| NR_PC5 | This value is used to indicate that UE supports PC5 NR RAT for V2X communication over PC5 reference point. | |
| LTE_NR_PC5 | This value is used to indicate that UE supports both PC5 LTE and NR RAT for V2X communication over PC5 reference point. | |

# 5.7 Error handling

## 5.7.1 General

For the Npcf_UEPolicyControl 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_UEPolicyControl API.

## 5.7.2 Protocol Errors

No specific protocol errorsfor the Npcf_UEPolicyControl API are specified.

## 5.7.3 Application Errors

The application errors defined for the Npcf_UEPolicyControl service are listed in Table 5.7.3-1 and Table 5.7.3-2. The PCF may include in the HTTP status code a "ProblemDetails" data structure with the "cause" attribute indicating the application error as listed in table 5.7.3-1 when PCF acts as a server. The AMF shall include in the HTTP status code a "ProblemDetails" data structure with the "cause" attribute indicating the application error as listed in table 5.7.3-2 when AMF acts as a server.

**Table 5.7.3-1: Application errors when PCF acts as a server**

| Application Error | HTTP status code | Description |
|---|---|---|
| USER_UNKNOWN | 400 Bad Request | The HTTP request is rejected because the end user specified in the request is unknown to the PCF. |
| ERROR_REQUEST_PARAMETERS | 400 Bad Request | The HTTP request is rejected because the set of information needed by the PCF for UE Policy selection is incomplete or erroneous or not available for the decision to be made. |
| PENDING_TRANSACTION | 400 Bad Request | This error shall be used when the PendingTransaction feature is supported and the PCF receives an incoming request on a policy association while it has an ongoing transaction on the same policy association and cannot handle the request as described in clause x.2 of 3GPP TS 29.513 [7]. |

**Table 5.7.3-2: Application errors when AMF acts as a server to receive a notification**

| Application Error | HTTP status code | Description |
|---|---|---|
| PENDING_TRANSACTION | 400 Bad Request | This error shall be used when the PendingTransaction feature is supported and the AMF receives an incoming request on a policy association while it has an ongoing transaction on the same policy association and cannot handle the request as described in clause x.2 of 3GPP TS 29.513 [7]. |

# 5.8 Feature negotiation

The optional features in table 5.8-1 are defined for the Npcf_UEPolicyControl 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 | PendingTransaction | This feature indicates support for the race condition handling as defined in 3GPP TS 29.513 [7]. |
| 2 | PlmnChange | This feature indicates support for the change of PLMN trigger handling. |
| 3 | ConnectivityStateChange | This feature indicates support for the UE connectivity state change trigger handling. |
| 4 | V2X | This feature indicates support for the UE policy provisioning and N2 information provisioning for V2X communication. |
| 5 | GroupIdListChange | This feature indicates the support for the notification of changes in the list of internal group identifiers. |

## 5.9 Security

As indicated in 3GPP TS 33.501 [19] and 3GPP TS 29.500 [5], the access to the Npcf_UEPolicyControl API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [20]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [13]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Npcf_UEPolicyControl API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [13], subclause 5.4.2.2.

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

The Npcf_UEPolicyControl API defines a single scope "npcf-ue-policy-control" for the entire service, and it does not define any additional scopes at resource or operation level.

# Annex A (normative): OpenAPI specification

## A.1 General

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

```
openapi: 3.0.0
info:
  version: 1.1.2
  title: Npcf_UEPolicyControl
  description: |
    UE Policy Control Service.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.525 V16.6.0; 5G System; UE Policy Control Service.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.525/'
servers:
  - url: '{apiRoot}/npcf-ue-policy-control/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 4.4 of 3GPP TS 29.501
security:
  - {}
  - oAuth2ClientCredentials:
    - npcf-ue-policy-control
paths:
  /policies:
    post:
      operationId: CreateIndividualUEPolicyAssociation
      summary: Create individual UE policy association.
      tags:
        - UE Policy Associations (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/PolicyAssociationRequest'
      responses:
        '201':
          description: Created
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PolicyAssociation'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/npcf-ue-policy-control/v1/policies/{polAssoId}'
              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:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  callbacks:
    policyUpdateNotification:
      '{$request.body#/notificationUri}/update':
        post:
          requestBody:
            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/PolicyUpdate'
          responses:
            '204':
              description: No Content, Notification was successful
            '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:
              $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    policyAssocitionTerminationRequestNotification:
      '{$request.body#/notificationUri}/terminate':
        post:
          requestBody:
            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/TerminationNotification'
          responses:
            '204':
              description: No Content, Notification was successful
            '307':
              description: temporary redirect
              headers:
                Location:
                  description: 'A URI pointing to the endpoint of another NF service consumer to
which the notification should be sent.'
                  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'
  /policies/{polAssoId}:
    get:
      operationId: ReadIndividualUEPolicyAssociation
      summary: Read individual UE policy association.
      tags:
        - Individual UE Policy Association (Document)
      parameters:
        - name: polAssoId
          in: path
          description: Identifier of a policy association
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PolicyAssociation'
        '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'
    delete:
      operationId: DeleteIndividualUEPolicyAssociation
      summary: Delete individual UE policy association.
      tags:
        - Individual UE Policy Association (Document)
      parameters:
        - name: polAssoId
          in: path
          description: Identifier of a policy association
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content. Resource was successfully 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'
  /policies/{polAssoId}/update:
    post:
      operationId: ReportObservedEventTriggersForIndividualUEPolicyAssociation
      summary: Report observed event triggers and possibly obtain updated policies for an individual
UE policy association.
      tags:
        - Individual UE Policy Association (Document)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/PolicyAssociationUpdateRequest'
      parameters:
        - name: polAssoId
          in: path
          description: Identifier of a policy association
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Updated policies are returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PolicyUpdate'
        '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'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            npcf-ue-policy-control: Access to the Npcf_UEPolicyControl API
  schemas:
    PolicyAssociation:
      type: object
      properties:
        request:
```

```
          $ref: '#/components/schemas/PolicyAssociationRequest'
        uePolicy:
          $ref: '#/components/schemas/UePolicy'
        n2Pc5Pol:
          $ref: 'TS29518_Namf_Communication.yaml#/components/schemas/N2InfoContent'
        triggers:
          type: array
          items:
            $ref: '#/components/schemas/RequestTrigger'
          minItems: 1
          description: Request Triggers that the PCF subscribes. Only values "LOC_CH" and "PRA_CH"
are permitted.
        pras:
          type: object
          additionalProperties:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/PresenceInfo'
          minProperties: 1
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - suppFeat
    PolicyAssociationRequest:
      type: object
      properties:
        notificationUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        altNotifIpv4Addrs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
          minItems: 1
          description: Alternate or backup IPv4 Address(es) where to send Notifications.
        altNotifIpv6Addrs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
          minItems: 1
          description: Alternate or backup IPv6 Address(es) where to send Notifications.
        altNotifFqdns:
          type: array
          items:
            $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/Fqdn'
          minItems: 1
          description: Alternate or backup FQDN(s) where to send Notifications.
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        accessType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
        pei:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'
        userLoc:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/UserLocation'
        timeZone:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/TimeZone'
        servingPlmn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnIdNid'
        ratType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
        groupIds:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
          minItems: 1
        hPcfId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
        uePolReq:
          $ref: '#/components/schemas/UePolicyRequest'
        guami:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
        serviceName:
          $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/ServiceName'
        servingNfId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
        pc5Capab:
          $ref: '#/components/schemas/Pc5Capability'
        suppFeat:
```

```
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - notificationUri
        - suppFeat
        - supi
    PolicyAssociationUpdateRequest:
      type: object
      properties:
        notificationUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        altNotifIpv4Addrs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
          minItems: 1
          description: Alternate or backup IPv4 Address(es) where to send Notifications.
        altNotifIpv6Addrs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
          minItems: 1
          description: Alternate or backup IPv6 Address(es) where to send Notifications.
        altNotifFqdns:
          type: array
          items:
            $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/Fqdn'
          minItems: 1
          description: Alternate or backup FQDN(s) where to send Notifications.
        triggers:
          type: array
          items:
            $ref: '#/components/schemas/RequestTrigger'
          minItems: 1
          description: Request Triggers that the NF service consumer observes.
        praStatuses:
          type: object
          additionalProperties:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/PresenceInfo'
          description: Map of PRA status information.
          minProperties: 1
        userLoc:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/UserLocation'
        uePolDelResult:
          $ref: '#/components/schemas/UePolicyDeliveryResult'
        uePolTransFailNotif:
          $ref: '#/components/schemas/UePolicyTransferFailureNotification'
        uePolReq:
          $ref: '#/components/schemas/UePolicyRequest'
        guami:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
        servingNfId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
        plmnId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
        connectState:
          $ref: 'TS29518_Namf_EventExposure.yaml#/components/schemas/CmState'
        groupIds:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
          minItems: 1
    PolicyUpdate:
      type: object
      properties:
        resourceUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        uePolicy:
          $ref: '#/components/schemas/UePolicy'
        n2Pc5Pol:
          $ref: 'TS29518_Namf_Communication.yaml#/components/schemas/N2InfoContent'
        triggers:
          type: array
          items:
            $ref: '#/components/schemas/RequestTrigger'
          minItems: 1
          nullable: true
          description: Request Triggers that the PCF subscribes. Only values "LOC_CH" and "PRA_CH"
are permitted.
```

```
        pras:
          type: object
          additionalProperties:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/PresenceInfo'
          description: Map of PRA information.
          minProperties: 1
          nullable: true
      required:
        - resourceUri
    TerminationNotification:
      type: object
      properties:
        resourceUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        cause:
          $ref: '#/components/schemas/PolicyAssociationReleaseCause'
      required:
        - resourceUri
        - cause
    UePolicyTransferFailureNotification:
      type: object
      properties:
        cause:
          $ref: 'TS29518_Namf_Communication.yaml#/components/schemas/N1N2MessageTransferCause'
        ptis:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
          minItems: 1
      required:
        - cause
        - ptis
    UePolicy:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Bytes'
    UePolicyDeliveryResult:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Bytes'
    UePolicyRequest:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Bytes'
    RequestTrigger:
      anyOf:
      - type: string
        enum:
          - LOC_CH
          - PRA_CH
          - UE_POLICY
          - PLMN_CH
          - CON_STATE_CH
          - GROUP_ID_LIST_CHG
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      description: >
        Possible values are
        - LOC_CH: Location change (tracking area). The tracking area of the UE has changed.
        - PRA_CH: Change of UE presence in PRA. The AMF reports the current presence status of the
UE in a Presence Reporting Area, and notifies that the UE enters/leaves the Presence Reporting Area.
        - UE_POLICY: A MANAGE UE POLICY COMPLETE message or a MANAGE UE POLICY COMMAND REJECT
message, as defined in Annex D.5 of 3GPP TS 24.501 or a "UE POLICY PROVISIONING REQUEST" message, as
defined in subclause 7.2.1.1 of 3GPP TS 24.587 , has been received by the AMF and is being
forwarded.
        - PLMN_CH: PLMN change. the serving PLMN of UE has changed.
        - CON_STATE_CH: Connectivity state change: the connectivity state of UE has changed.
        - GROUP_ID_LIST_CHG: UE Internal Group Identifier(s) has changed. This event does not
require a subscription
    PolicyAssociationReleaseCause:
      anyOf:
      - type: string
        enum:
          - UNSPECIFIED
          - UE_SUBSCRIPTION
          - INSUFFICIENT_RES
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
```

```
      description: >
        Possible values are
        - UNSPECIFIED: This value is used for unspecified reasons.
        - UE_SUBSCRIPTION: This value is used to indicate that the policy association needs to be
terminated because the subscription of UE has changed (e.g. was removed).
        - INSUFFICIENT_RES: This value is used to indicate that the server is overloaded and needs
to abort the policy association.
    Pc5Capability:
      anyOf:
      - type: string
        enum:
          - LTE_PC5
          - NR_PC5
          - LTE_NR_PC5
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      description: >
        Possible values are
        - LTE_PC5: This value is used to indicate that UE supports PC5 LTE RAT for V2X communication
over PC5 reference point.
        - NR_PC5: This value is used to indicate that UE supports PC5 NR RAT for V2X communication
over PC5 reference point.
        - LTE_NR_PC5: This value is used to indicate that UE supports both PC5 LTE and NR RAT for
V2X communication over PC5 reference point..
```

# Annex B (normative): Wireless and wireline convergence access support

## B.1 Scope

This annex provides the stage 3 definition of the UE Policy Control Service for wireless and wireline convergence access support for 5GS.

The stage 2 definition and procedures of the UE Policy Control Service for wireless and wireline convergence access support for 5GS are contained in 3GPP TS 23.316 [23].

## B.2 Npcf_UEPolicyControl Service

### B.2.1 Service Description

#### B.2.1.1 Overview

Subclause 4.1.1 applies with the modification that the 5G-RG and FN-RG replace the UE.

NOTE: The URSPs related to the FN-RG are delivered to the W-AGF, which is acting as a UE towards the 5GC on behalf of the FN-RG.

#### B.2.1.2 Service Architecture

Subclause 4.1.1 applies with the exception that roaming functionality (V-PCF and H-PCF specific functionality) shall not apply in this Release of the specification for UE policy control for 5G-RG connecting via W-5GAN and FN-RG. Roaming architecture is only applicable to a 5G-RG connecting to the 5GC via NG RAN.

#### B.2.1.3 Network Functions

##### B.2.1.3.1 Policy Control Function (PCF)

The PCF functionality defined in subclause 4.1.3.1 shall apply with the following differences:

- The PCF should not provide Access Network Discovery and Selection Policy (ANDSP) for a 5G-RG connected via wireline access.
- The Visited Policy Control Function (V-PCF) shall not apply for 5G-RG connecting via wireline access and FN-RG.
- The PCF provides the UE access selection and PDU session selection policy control as described in this Annex.

##### B.2.1.3.2 NF Service Consumers

The AMF functionality shall apply as defined in subclause 4.1.3.2 with the differences described in this Annex.

## B.3 Service Operations

### B.3.1 Introduction

Subclause 4.2.1 is applied with the following differences:

- UE is replaced by the 5G-RG or or FN-RG.
- Update of an UE Policy Association for the case that the AMF is relocated due to the UE mobility and the old PCF is selected is not applicable when the 5G-RG or FN-RG connects the 5GC via wireline access.
- Roaming scenario is not applicable when the 5G-RG or FN-RG connects the 5GC via wireline access in this release of specification.

## B.3.2 Npcf_UEPolicyControl_Create Service Operation

### B.3.2.1 General

Subclause 4.2.2.1 is applied with the following differences:

- UE is replaced by the 5G-RG or FN-RG.
- The PEI that may be included within the "pei" attribute shall have one of the following representations:
  i. If the 5G-BRG supports only wireline access, the PEI shall be the 5G-BRG MAC address.
  ii. If the 5G-CRG supports only wireline access, the PEI shall be the cable modem MAC address.
  iii. If the 5G-RG supports at least one 3GPP access technology, the PEI shall be the allocated IMEI or IMEISV.
  iv. For the FN-BRG and FN-CRG, the PEI shall be the FN-RG MAC address.

NOTE: When the PEI includes an indication that the MAC address cannot be used as Equipment identifier of the of the FN-RG, the PEI cannot be trusted for regulatory purposes and cannot be used for equipment based policy evaluation.

- The HFC Node Identifier is encoded in the "hfcNodeId" attribute of the "n3gaLocation" attribute included in the "userLoc" attribute within the PolicyAssociationRequest data structure when the 5G-CRG or FN-CRG connects to the 5GC via W-5GCAN.
- Roaming scenario is not applicable when the 5G-RG or FN-RG connects the 5GC via wireline access in this release of specification.
- The PCF should neither include NSWO indication nor any ANDSP policies in the UE Policy.

## B.3.3 Npcf_UEPolicyControl_Update Service Operation

### B.3.3.1 General

Subclause 4.2.3.1 is applied with the following differences:

- UE is replaced by the 5G-RG or FN-RG.
- Roaming scenario is not applicable when the 5G-RG or FN-RG connects the 5GC via wireline access in this release of specification.
- The PCF should neither include NSWO indication nor any ANDSP policies in the UE Policy.

## B.3.4 Npcf_UEPolicyControl_UpdateNotify Service

### B.3.4.1 General

Subclause 4.2.4.1 is applied with the following differences:

- UE is replaced by the 5G-RG or FN-RG.

- Roaming scenario is not applicable when the 5G-RG or FN-RG connects the 5GC via wireline access in this release of specification.

- The PCF should neither include NSWO indication nor any ANDSP policies in the UE Policy.

## B.3.5 Npcf_UEPolicyControl_Delete Service Operation

### B.3.5.1 General

Subclause 4.2.5.1 is applied with the following differences:

- UE is replaced by the 5G-RG or FN-RG.

- Roaming scenario is not applicable when the 5G-RG or FN-RG connects the 5GC via wireline access in this release of specification.

# Annex C (informative): Withdrawn API versions

This Annex list withdrawn API versions of the Npcf_UEPolicyControl API defined in the present specification. 3GPP TS 3GPP TS 29.501 [6] subclause 4.3.1.6 describes the withdrawal of API versions.

The API versions listed in table B-1 are withdrawn for the Npcf_UEPolicyControl API.

**Table B-1: Withdrawn API versions of the Npcf_UEPolicyControl service**

| API version number | Remarks |
|---|---|
| 1.0.0 | Deficits in:<br>- SUPI not mandatory (Unnecessary support of Emergency registration).<br>- Missing AMF instance id in Policy Association request |

# Annex D (informative): Change history

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | TSG # | TSG Doc. | CR | Rev | Cat | Subject/Comment | New |
| 2018-10 | CT3#98-Bis | C3-186282 | | | | First TS version created based on suitable parts of TS 29.507v15.1.0 | 0.1.0 |
| 2018-12 | CT3#99 | C3-187094 | | | | API Version | 0.2.0 |
| 2018-12 | CT3#99 | C3-187532 | | | | ExternalDocs OpenAPI field | 0.2.0 |
| 2018-12 | CT3#99 | C3-187096 | | | | Location header field in OpenAPI | 0.2.0 |
| 2018-12 | CT3#99 | C3-187533 | | | | Security | 0.2.0 |
| 2018-12 | CT3#99 | C3-187098 | | | | supported content types | 0.2.0 |
| 2018-12 | CT3#99 | C3-187534 | | | | HTTP Error responses | 0.2.0 |
| 2018-12 | CT3#99 | C3-187673 | | | | Alternate IP address in Npcf_UEPolicyControl_Update | 0.2.0 |
| 2018-12 | CT3#99 | C3-187673 | | | | Corrections on Protocol and Application errors | 0.2.0 |
| 2018-12 | CP#82 | CP-183130 | | | | TS sent to plenary for information and approval | 1.0.0 |
| 2018-12 | CP#82 | CP-183175 | | | | PCR 29.xyz Corrections of Cardinality in OpenAPI | 1.1.0 |
| 2018-12 | CP#82 | CP-183250 | | | | TS number assigned for approval at plenary | 1.1.0 |
| 2018-12 | CP#82 | CP-183252 | | | | TS approved by plenary | 15.0.0 |
| 2019-03 | CP#83 | CP-190114 | 0001 | 1 | F | Usage of the Namf_Communication Service by V-PCF | 15.1.0 |
| 2019-03 | CP#83 | CP-190114 | 0002 | 1 | F | Allignment with TS 24.501 changes on UE STATE INDICATION message | 15.1.0 |
| 2019-03 | CP#83 | CP-190114 | 0005 | - | F | OpenAPI version Update | 15.1.0 |
| 2019-03 | CP#83 | CP-190114 | 0006 | - | F | Correction to the overview | 15.1.0 |
| 2019-03 | CP#83 | CP-190114 | 0007 | - | F | Correction to the descriptions of network functions | 15.1.0 |
| 2019-03 | CP#83 | CP-190114 | 0008 | 1 | F | Correction to the service operation introduction | 15.1.0 |
| 2019-03 | CP#83 | CP-190114 | 0001 1 | 3 | F | Correction to the Npcf_UEPolicyControl_UpdateNotify operation | 15.1.0 |
| 2019-03 | CP#83 | CP-190114 | 0001 2 | - | F | Correction to the PresenceInfo data type | 15.1.0 |
| 2019-03 | CP#83 | CP-190114 | 0001 3 | - | F | UE Policy Control support for Emergency Registration | 15.1.0 |
| 2019-03 | CP#83 | CP-190114 | 0001 4 | - | F | Correction to the group identifier | 15.1.0 |
| 2019-03 | CP#83 | CP-190114 | 0001 7 | 1 | F | Adding AMF instance id in Policy Association request | 15.1.0 |
| 2019-03 | CP#83 | CP-190114 | 0001 8 | 3 | F | V-PCF Interworking procedures for UE policy delivery service | 15.1.0 |
| 2019-03 | CP#83 | CP-190214 | 0001 9 | 3 | F | Correction on the handling of URSP and ANDSP policies | 15.1.0 |
| 2019-06 | CT#84 | CP-191082 | 0021 | 1 | F | ANDSP correction | 15.2.0 |
| 2019-06 | CT#84 | CP-191082 | 0022 | 2 | F | Correction to PolicyAssociationReleaseCause data type | 15.2.0 |
| 2019-06 | CT#84 | CP-191082 | 0023 | 1 | F | Resending the UE policy | 15.2.0 |
| 2019-06 | CT#84 | CP-191082 | 0024 | 2 | F | Correction to the service operation procedure | 15.2.0 |
| 2019-06 | CT#84 | CP-191082 | 0028 | 2 | F | Withdrawing API version | 15.2.0 |
| 2019-06 | CT#84 | CP-191082 | 0029 | 1 | F | Precedence of OpenAPI file | 15.2.0 |
| 2019-06 | CT#84 | CP-191082 | 0030 | 1 | F | API version Update | 15.2.0 |
| 2019-06 | CT#84 | CP-191082 | 0031 | - | F | Correction to the serviceName attribute | 15.2.0 |
| 2019-06 | CT#84 | CP-191160 | 0034 | 2 | F | Copyright Note in YAML file | 15.2.0 |
| 2019-06 | CP#84 | CP-191089 | 0027 | 1 | F | Correction on Policy Association Termination | 16.0.0 |
| 2019-06 | CP#84 | CP-191089 | 0032 | 1 | B | Race condition handling | 16.0.0 |
| 2019-06 | CP#84 | CP-191101 | 0035 | 1 | F | API version Update | 16.0.0 |
| 2019-09 | CP#85 | CP-192178 | 0036 | - | B | Adding NID as input for policy decisions | 16.1.0 |
| 2019-09 | CP#85 | CP-192148 | 0038 | - | A | UE policy correction in AMF | 16.1.0 |
| 2019-09 | CP#85 | CP-192152 | 0040 | 1 | B | Support of wireline and wireless access convergence, Annex Skeleton | 16.1.0 |
| 2019-09 | CP#85 | CP-192176 | 0041 | 1 | B | Support of wireline and wireless access convergence, NFs | 16.1.0 |
| 2019-09 | CP#85 | CP-192224 | 0043 | 3 | A | Message transfer failure notification | 16.1.0 |
| 2019-09 | CP#85 | CP-192171 | 0044 | 3 | B | URSP rule provisioning for supporting xBDT | 16.1.0 |
| 2019-09 | CP#85 | CP-192148 | 0046 | 1 | A | GUAMI included in the Update operation | 16.1.0 |
| 2019-09 | CP#85 | CP-192160 | 0047 | 1 | B | PLMN change for V2X | 16.1.0 |
| 2019-09 | CP#85 | CP-192173 | 0048 | - | F | OpenAPI version update for TS 29.525 Rel-16 | 16.1.0 |
| 2019-12 | CP#86 | CP-193197 | 0050 | 1 | F | Data type of the "serviceName" attribute | 16.2.0 |
| 2019-12 | CP#86 | CP-193223 | 0051 | - | F | Correcting references related to xBDT support | 16.2.0 |
| 2019-12 | CP#86 | CP-193189 | 0053 | 1 | A | Correction to the trigger of UE policy association establishment | 16.2.0 |
| 2019-12 | CP#86 | CP-193223 | 0054 | 3 | B | URSP provisioning for xBDT | 16.2.0 |
| 2019-12 | CP#86 | CP-193197 | 0055 | 1 | B | Format of hPcfId attribute | 16.2.0 |
| 2019-12 | CP#86 | CP-193197 | 0057 | 1 | B | Subscription to UE Connectivity state changes | 16.2.0 |
| 2019-12 | CP#86 | CP-193197 | 0058 | - | F | Removal of TABs from OpenAPI file | 16.2.0 |
| 2019-12 | CP#86 | CP-193202 | 0059 | 1 | F | correction to PLMN change trigger | 16.2.0 |
| 2019-12 | CP#86 | CP-193223 | 0060 | 1 | B | store BDT reference ID in SMPolicyData | 16.2.0 |
| 2019-12 | CP#86 | CP-193189 | 0064 | - | A | Correction to PolicyUpdate | 16.2.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2019-12 | CP#86 | CP-193189 | 0066 | 1 | A | Correction on 307 error | 16.2.0 |
| 2019-12 | CP#86 | CP-193191 | 0067 | 1 | B | Clarification of PEI format, TS 29.525 | 16.2.0 |
| 2019-12 | CP#86 | CP-193227 | 0068 | 2 | B | Wireline Location information | 16.2.0 |
| 2019-12 | CP#86 | CP-193212 | 0069 | - | F | Update of API version and TS version in OpenAPI file | 16.2.0 |
| 2020-03 | CT#87e | CP-200223 | 0071 | - | B | Correction on UE Policy Association Establishment | 16.3.0 |
| 2020-03 | CT#87e | CP-200212 | 0072 | 1 | B | Network function enhancement for V2X communication | 16.3.0 |
| 2020-03 | CT#87e | CP-200212 | 0073 | 1 | B | UE Policy for V2XARC | 16.3.0 |
| 2020-03 | CT#87e | CP-200262 | 0074 | 2 | B | N2 PC5 Policy for V2XARC | 16.3.0 |
| 2020-03 | CT#87e | CP-200203 | 0075 | 1 | B | Complete the procedure for WWC | 16.3.0 |
| 2020-03 | CT#87e | CP-200207 | 0076 | - | B | Completing the description of “PLMN_CH” and “CON_STATE_CH” triggers. | 16.3.0 |
| 2020-03 | CT#87e | CP-200216 | 0078 | 1 | B | Update of OpenAPI version and TS version in externalDocs field | 16.3.0 |
| 2020-06 | CT#88e | CP-201224 | 0080 | 1 | A | Location Header of 307 status code | 16.4.0 |
| 2020-06 | CT#88e | CP-201224 | 0082 | 1 | A | Notification URI | 16.4.0 |
| 2020-06 | CT#88e | CP-201233 | 0083 | - | B | FQDN of alternative AMF | 16.4.0 |
| 2020-06 | CT#88e | CP-201224 | 0085 | - | A | Description of scopes field and presenceStatus attribute | 16.4.0 |
| 2020-06 | CT#88e | CP-201228 | 0086 | - | F | Removal of MAC address | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0087 | - | F | Removal of unbreakable spaces | 16.4.0 |
| 2020-06 | CT#88e | CP-201228 | 0088 | 2 | B | Untrusted FN-RG PEI | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0089 | 1 | F | Storage of YAML files in ETSI Forge | 16.4.0 |
| 2020-06 | CT#88e | CP-201238 | 0090 | 1 | B | Correction to the UE policy definition | 16.4.0 |
| 2020-06 | CT#88e | CP-201238 | 0091 | 1 | B | Correction to the V2X Policy provisioning | 16.4.0 |
| 2020-06 | CT#88e | CP-201238 | 0093 | 1 | B | Remove editor’s node | 16.4.0 |
| 2020-06 | CT#88e | CP-201256 | 0094 | 1 | F | URI of the Npcf_UEPolicyControl service | 16.4.0 |
| 2020-06 | CT#88e | CP-201238 | 0095 | - | F | AF-based service parameter provisioning | 16.4.0 |
| 2020-06 | CT#88e | CP-201238 | 0096 | - | F | Complete service description for V2X | 16.4.0 |
| 2020-06 | CT#88e | CP-201238 | 0097 | - | F | Corrections on N2 PC5 policy | 16.4.0 |
| 2020-06 | CT#88e | CP-201238 | 0098 | - | F | Include V2XP info contents into policy section | 16.4.0 |
| 2020-06 | CT#88e | CP-201213 | 0099 | 1 | B | Support of Dual Connectivity end to end Redundant User Plane Paths | 16.4.0 |
| 2020-06 | CT#88e | CP-201238 | 0100 | - | F | Correction to 4.2.4.1 | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0101 | - | F | Optionality of ProblemDetails | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0102 | 1 | F | Supported headers, Resource Data type, Operation Name | 16.4.0 |
| 2020-06 | CT#88e | CP-201255 | 0105 | - | F | Update of OpenAPI version and TS version in externalDocs field | 16.4.0 |
| 2020-09 | CT#89e | CP-202069 | 0106 | - | F | Include N2 PC5 policy in update response | 16.5.0 |
| 2020-09 | CT#89e | CP-202069 | 0107 | - | F | Remove the dependency of subscription data in UDR for V2X | 16.5.0 |
| 2020-09 | CT#89e | CP-202084 | 0113 | - | F | Update of OpenAPI version and TS version in externalDocs field | 16.5.0 |
| 2020-12 | CT#90e | CP-203139 | 0114 | 1 | F | Essential corrections and alignments | 16.6.0 |
| 2020-12 | CT#90e | CP-203139 | 0116 | 1 | F | Storage of YAML files in 3GPP Forge | 16.6.0 |
| 2020-12 | CT#90e | CP-203143 | 0118 | 1 | F | Correction to PRA | 16.6.0 |
| 2020-12 | CT#90e | CP-203129 | 0120 | 1 | F | Correction to the BDT policy re-negotiation | 16.6.0 |
| 2020-12 | CT#90e | CP-203119 | 0125 | 1 | A | Correction to Policy Update Notification | 16.6.0 |
| 2020-12 | CT#90e | CP-203150 | 0131 | 1 | F | Correction to URSP rules, support of 5G VN services | 16.6.0 |
| 2020-12 | CT#90e | CP-203119 | 0134 | - | A | report initial presence status for PRA | 16.6.0 |
| 2020-12 | CT#90e | CP-203152 | 0135 | - | F | Update of OpenAPI version and TS version in externalDocs field | 16.6.0 |

# History

| Document history | | |
|---|---|---|
| V16.4.0 | August 2020 | Publication |
| V16.5.0 | November 2020 | Publication |
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