**3GPP TSG- WG3 Meeting #C3-230496**

**Athens, Greece, 27th February - 3rd** **March, 2023**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** | **0238** | **rev** |  | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | SA2 has agreed in CR 3740 to TS 23.502 clause 4.11.0a.2 (see S2-2301622) to support URSP provisioning in EPS, when the SMF+PGW-C receives the UE Policy Container in ePCO in Create Session Request during initial Attach procedure, it forwards transparently the UE Policy Container in ePCO to PCF for the PDU Session in the Npcf\_SMPolicyControl\_Create Request. When the PCF for Session Management receives UE Policy Container from PCF for the UE, it forwards the UE Policy Container to SMF+PGW-C in Npcf\_SMPolicyControl\_UpdateNotify Request. The PCF for the PDU Session retrieves the PCRTs for UE Policy from PCF for the UE and subscribe to the applicable PCRTs in EPC to SMF+PGW-C.  *“- To Support URSP provisioning in EPS, when the SMF+PGW-C receives the UE Policy Container in ePCO in Create Session Request during initial Attach procedure, it forwards transparently the UE Policy Container in ePCO to PCF for the PDU Session in the Npcf\_SMPolicyControl\_Create Request. When the PCF for Session Management receives UE Policy Container from PCF for the UE, it forwards the UE Policy Container to SMF+PGW-C in Npcf\_SMPolicyControl\_UpdateNotify Request. The PCF for the PDU Session retrieves the PCRTs for UE Policy from PCF for the UE and subscribe to the applicable PCRTs in EPC to SMF+PGW-C.”*  Furthermore, when URSP Provisioning is supported in EPS, the PCF for the PDU Session establishes the UE Policy Association with PCF for the UE when a UE Policy Container is received from the UE and forwards the UE Policy Container to PCF for the UE in Npcf\_UEPolicyControl\_Create Request. The PCF for the UE generates the URSP and sends it to the PCF for the PDU Session in the UE Policy Container via Npcf\_UEPolicyControl\_UpdateNotify Request. The PCF for the UE triggers the re-evaluation of applicable URSPs and determines an update of URSP is needed for the UE when an event as described in TS 23.503[20] clause 6.1.2.2.X happens in the PCF for the PDU Session.  *“When URSP Provisioning is supported in EPS, the PCF for the PDU Session establishes the UE Policy Association with PCF for the UE when a UE Policy Container is received from the UE and forwards the UE Policy Container to PCF for the UE in Npcf\_UEPolicyControl\_Create Request. The PCF for the UE generates the URSP and sends it to the PCF for the PDU Session in the UE Policy Container via Npcf\_UEPolicyControl\_UpdateNotify Request. The PCF for the UE triggers the re-evaluation of applicable URSPs and determines an update of URSP is needed for the UE when an event as described in TS 23.503[20] clause 6.1.2.2.X happens in the PCF for the PDU Session”*  Accordingly, this CR adds support for URSP provisioning in EPS | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add support for URSP provisioning in EPS | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Stage 3 not aligned with stage 2 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 4.1.1, 4.1.3.1, 4.1.3.2, 4.2.2.1, 4.2.2.2.1a (new), 4.2.3.2, 4.2.3.3, 4.2.4.1, 4.2.4.2, 5.6.3.3, 5.8 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 23.502 CR 3740 | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | This CR does not introduce any changes to the OpenAPI description. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\* \* \* First Change \* \* \* \*

# 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 Specification Version 3.0.0", <https://spec.openapis.org/oas/v3.0.0>.

[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".

[28] 3GPP TS 24.554: "Proximity based services (ProSe) in 5G system (5GS) protocol aspects; Stage 3".

[29] 3GPP TS 24.555: "Proximity based services (ProSe) in 5G system (5GS); User Equipment (UE) policies; Stage 3".

[30] 3GPP TS 29.523: "5G System; Policy Control Event Exposure Service; Stage 3".

[31] 3GPP TS 29.512: "5G System; Session Management Policy Control Service; Stage 3".

\* \* \* Next Change \* \* \* \*

### 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 (e.g. ANDSP, URSP, V2XP, ProSeP) determined by the PCF to the UE via the AMF and as part of the provisioning of N2 PC5 policy for V2X communications and/or 5G ProSe determined by the PCF to the NG-RAN via the AMF. In case of URSP provisioning in EPS this service may be used as part of the provisioning of URSP determined by the PCF to the UE via a PCF for a PDU session. This service hence offers the following functionalities:

- creation of a UE Policy Association as requested by the NF service consumer (e.g. AMF);

- provisioning of policy control request trigger(s) to the NF service consumer (e.g. AMF);

- provisioning of the UE policy (e.g. ANDSP, URSP, V2XP, ProSeP) to the V-PCF by the H-PCF in the roaming case;

- provisioning of the N2 PC5 policy for V2X communications and/or 5G ProSe to the V-PCF by the H-PCF in the roaming case;

- update of a UE Policy Association as requested by the NF service consumer (e.g. AMF);

- reporting of the met policy control request trigger(s) by the NF service consumer;

- update of policy control request trigger(s) by the PCF to the NF service consumer (e.g. AMF);

- deletion of a UE Policy Association as requested by the NF service consumer (e.g. AMF);

- enable the PCF to request the termination of a UE Policy Association to the NF service consumer (e.g. AMF); and

- provisioning of the URSP to a PCF for a PDU session in case of URSP provisioning in EPS.

\* \* \* Next Change \* \* \* \*

#### 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;

- provides UE policy, including Access Network Discovery and Selection Policy (ANDSP), UE Route Selection Policy (URSP), V2XP (Vehicle-to-Everything Policy) and/or 5G ProSe Policy (ProSeP) via the AMF transparently to the UE;

- provides policy control request trigger(s) to the AMF;

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 communications and/or 5G ProSe 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 V2X communications and/or 5G ProSe.

- provides URSP via a PCF for a PDU session transparently to the UE in case of URSP provisioning in EPS; and

- provides policy control request trigger(s) to a PCF for a PDU session in case of URSP provisioning in EPS.

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

- provides policy control request trigger(s) to the AMF;

- provides the ANDSP of the VPLMN via the AMF transparently to the UE;

- forwards the ANDSP, URSP, V2XP and/or ProSeP received from the H-PCF via the AMF to the UE; and

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 for V2X communications and/or 5G ProSe received from 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 V2X communications and/or 5G ProSe.

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

- provides policy control request trigger(s) to the V-PCF;

- provides the UE policy (e.g. ANDSP, URSP, V2XP, or ProSeP) of the HPLMN to the V-PCF for forwarding to the UE via the the AMF; and

- provides the N2 PC5 policy for V2X communications and/or 5G ProSe to the V-PCF for forwarding to the NG-RAN via the AMF.

Editor's Note: It is FFS how URSP provisionng in EPS is supported in roaming scenarios.

\* \* \* Next Change \* \* \* \*

#### 4.1.3.2 NF Service Consumers

The known NF service consumers of the Npcf\_UEPolicyControl are the AMF, the V-PCF in the roaming case, and a PCF for a PDU session in case of URSP provisioning in EPS.

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;

- forwarding of the UE policy enforcement result received from the UE to the (V-)PCF; and

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 for V2X communications and/or 5G ProSe towards the NG-RAN.

The Visited Policy Control Function (V-PCF) provides the functions described in clause 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 trigger(s) and/or UE policy (e.g. ANDSP, URSP, V2XP, ProSeP) from the H-PCF;

- receiving the N2 PC5 policy for V2X communications and/or 5G ProSe from the H-PCF; and

- reporting of the UE state and UE policy enforcement result to the H-PCF.

The PCF for a PDU session in case of URSP provisioning in EPS performs:

- forwarding of URSP towards the served UE; and

- forwarding of the UE state and URSP enforcement result received from the UE to the PCF.

\* \* \* Next Change \* \* \* \*

### 4.2.2 Npcf\_UEPolicyControl\_Create Service Operation

#### 4.2.2.1 General

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

- UE performs initial registration to the network, as defined in clause 5.5.1.2.2 of 3GPP TS 24.501 [15];

- UE performs a mobility registration, if the UE operating in single-registration mode performs inter-system change from S1 mode to N1 mode, as defined in clause 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; and

- 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 clause 4.2.3.1.

The creation of a 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 procedure used for the creation of a policy association.



Figure 4.2.2.1-1: Creation of a UE policy association

NOTE 1: For the roaming scenario, 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 to the network and a UE context is being established, if the AMF obtains from the UE a UE policy delivery protocol message as defined in Annex D of 3GPP TS 24.501 [15] and/or the authorized PC5 capability for 5G ProSe, and/or the authorized PC5 capability for V2X communications, the AMF shall establish a UE policy association with the (V-)PCF, in case there is no existing UE policy association for the UE; otherwise, the AMF may establish a UE Policy Association with the (V-)PCF based on AMF local configuration.

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

During UE attach or the etablishment of the first PDN connection in EPS, if the "EpsUrsp" feature is supported, the PCF for a PDU session associated with the SMF+PGW-C serving the PDN connection obtains from the UE a UE policy container. Then the PCF for a PDU session shall establish a UE policy association with the PCF for the delivery of URSP only.

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, which shall include:

- the Notification URI encoded as "notificationUri" attribute;

- the SUPI encoded as "supi" attribute; and

- the features supported by the NF service consumer encoded as "suppFeat" attribute,

shall also include, when available:

- the GPSI encoded as "gpsi" attribute;

- the Access type encoded as "accessType" attribute;

NOTE 3: In this Release, for SNPN-enabled UE registered in the SNPN, direct access to the SNPN is specified for 3GPP access only.

- the Permanent Equipment Identifier (PEI) encoded as "pei" attribute;

- the User Location Information encoded as "userLoc" attribute;

- the UE Time Zone encoded as "timeZone" attribute;

- the identifier of the serving network (the PLMN Identifier or the SNPN Identifier), encoded as "servingPlmn" attribute;

NOTE 4: The SNPN Identifier consists of the PLMN Identifier and the NID.

- the RAT type encoded as "ratType" attribute;

- the received UE policy delivery protocol message defined in Annex D of 3GPP TS 24.501 [15] encoded as "uePolReq" attribute;

- for the roaming scenario, if the NF service consumer is an AMF, the H-PCF ID encoded as "hPcfId" attribute;

- the Internal Group Identifier(s) encoded as "groupIds" attribute;

- the PC5 capability for V2X encoded as "pc5Capab" attribute if the "V2X" feature defined in clause 5.8 is supported;

- the 5G ProSe capability within the "proSeCapab" attribute, if the "ProSe" feature defined in clause 5.8 is supported;

- if the NF service consumer is an AMF, the GUAMI encoded as "guami" attribute; and

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

and may include:

- if the NF service consumer is an AMF, the name of a service produced by the AMF that expects to receive information via the Npcf\_UEPolicyControl\_UpdateNotify service operation encoded as "serviceName" attribute;

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

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

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

Upon the reception of the HTTP POST request,

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

- for the roaming scenario and based on operator policy, the V-PCF (as the NF service consumer) should send to 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 clause 4.2.2.2. For the V-PCF, any policy received from the H-PCF in the reply to the possible request for the Creation of a policy association should be taken into consideration;

- 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 clause 4.2.2.2 and as follows:

(i) the (V-)PCF shall subscribe to the AMF to notifications on N1 messages for UE Policy Delivery Results using the Namf\_Communication\_N1N2MessageSubscribe service operation;

(ii) the (V-)PCF shall send the determined UE policy (e.g. ANDSP, URSP, V2XP, ProSeP) using Namf\_Communication\_N1N2MessageTransfer service operation(s); and

(iii) the (V-)PCF shall be prepared to receive UE Policy Delivery Results from the AMF and/or subsequent UE policy requests (e.g. for V2XP and/or ProSeP) within the Namf\_Communication\_N1MessageNotify service operation. For the V-PCF, if the received UE Policy Delivery results relate to UE policy sections provided by the H-PCF, the V-PCF shall use the Npcf\_UEPolicyControl\_Update Service Operation defined in clause 4.2.3 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 the "V2X" feature is supported, the (H-)PCF shall determine the applicable V2XP, as detailed in clause 4.2.2.2.1.2, and V2X N2 PC5 policy, as detailed in clause 4.2.2.3 and based on the operator's policy;

- if the UE indicates the support of 5G ProSe and the "ProSe" feature is supported, the (H-)PCF shall determine the applicable ProSeP, as detailed in clause 4.2.2.2.1.3, and 5G ProSe N2 PC5 policy, as detailed in clause 4.2.2.4 and based on the operator's policy;

- if the PCF determines that N2 PC5 policy (e.g. for V2X communications, for 5G ProSe) needs to be provisioned, including the case of the V-PCF when receiving the N2 PC5 policy from the H-PCF, the PCF shall use the Namf\_Communication service specified in 3GPP TS 29.518 [14] to provision the N2 PC5 policy according to clause 4.2.2.3 and/or clause 4.2.2.4;

- if the UE indicates support for URSP provisionng in EPS, the "EpsUrsp" feature is supported, and the PCF determines that UE policy needs to be provisioned via a PCF for a PDU session, the PCF shall provision the UE policy according to clause 4.2.2.2 and as follows:

(i) the PCF shall send a UE policy container with the determined URSP using Npcf\_UEPolicyControl\_Create response service operation(s); and

(ii) the PCF shall be prepared to receive UE Policy Delivery Results from the PCF for a PDU session. The PCF for a PDU session shall use the Npcf\_UEPolicyControl\_Update service operation defined in clause 4.2.3 to send those UE Policy Delivery results to the PCF;

- for the successfull 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 5: The assigned policy association ID is part of the URI for the created resource and is thus associated with the SUPI.

and the PolicyAssociation data type as response body, including:

- mandatorilly, the negotiated supported features encoded as "suppFeat" attribute;

- optionally, the information provided by the NF service consumer when requesting the creation of this policy association encoded as "request" attribute;

- optionally, for the H-PCF as service producer communicating with the V-PCF, UE policy (see clause 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 clause 4.2.2.3 and/or clause 4.2.2.4) encoded as "n2Pc5Pol" attribute (for V2X communications) and/or "n2Pc5ProSePol" attribute (for 5G ProSe);

- optionally, if the UE indicates support for URSP provisionng in EPS and the "EpsUrsp" feature is supported, for the PCF as service producer communicating with the PCF for a PDU session, UE policy (see clause 4.2.2.2) encoded as "uePolicy" attribute;

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

a) Location change (tracking area);

b) Change of UE presence in PRA;

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 clause 5.7 and according to the following provisions:

- if the user information received within the "supi" attribute is unknown, the (V-)(H-)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 (V-)(H-)PCF is, due to incomplete, erroneous or missing information in the request, not able to provision a UE policy decision, the (V-)(H-)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 a 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 (service) set.

\* \* \* Next Change \* \* \* \*

###### 4.2.2.2.1.1a Provisioning of URSP in EPS

When the UE initially attaches in EPS, the "EpsUrsp" feature is supported and when the UE has one or more stored URSP sections corresponding to the serving PLMN or HPLMN, the UE includes the UE policy container IE with the "UE STATE INDICATION" message as defined in clause D.5.4.1 of 3GPP TS 24.501 [15] in the PDN CONNECTIVITY REQUEST message. The UE policy contatiner is then transferred transparently by the PCF for the PDU session within the "uePolReq" attribute during the creation of a policy association, as described in clause 4.2.2.1.

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

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

b) the PEI received from the NF service consumer, if available; and

c) the OSId(s) received from the UE within the "UE STATE INDICATION" message as described in the Annex D of 3GPP TS 24.501 [15], if available.

d) the indication of UE's support for URSP provisioning in EPS, if available.

The PCF shall retrieve from UDR the information previously stored in UDR, if not locally available, for URSP rule determination as specified in 3GPP TS 29.519 [17].

Editor's Note: It is FFS how URSP provisionng in EPS is supported in roaming scenarios.

When receiving the "UE STATE INDICATION" message, the PCF, shall determine, based on the UPSIs, the OSId(s) indicated in that message, if available, the UE Policy Sections and UPSCs stored in the UDR, if available, the policy subscription data, if available, application data, if available, and local policy, as specified in clauses 4.2.2.2.2 and 4.2.2.2.3, whether any new URSP section(s) need to be installed and whether any existing URSP section(s) need to be updated or deleted.

The URSP is transferred to the UE as specified in 4.2.2.2.1.0 with the following differences:

* the messages of the UE policy delivery protocol defined in Annex D of 3GPP TS 24.501 [15] are transparently forwarded to the UE by a PCF for a PDU session; and
* the PCF shall use the Npcf\_UEPolicyControl\_Create/Update response and the Npcf\_UEPolicyControl\_UpdateNotify request to send "MANAGE UE POLICY COMMAND" messages to the UE in a "uePolicy" attribute and use the Npcf\_UEPolicyControl\_Update service operation to receive "MANAGE UE POLICY COMPLETE" and "MANAGE UE POLICY COMMAND REJECT" messages from the UE via a PCF for a PDU session in a "uePolDelResult" attribute.

\* \* \* Next Change \* \* \* \*

#### 4.2.3.2 Policy Control Request Triggers

The following Policy Control Request Triggers are defined (see clause 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 this reporting 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] has been received by the V-PCF and is being forwarded to the H-PCF, or has been received by a PCF for a PDU session (in case for URSP provisioning in EPS) and is being forwarded to the PCF, or a "UE POLICY PROVISIONING REQUEST" message, as defined in clause 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 network (PLMN or SNPN) of the UE has changed;

NOTE 1: The "PLMN\_CH" trigger only applies if the "PlmnChange" feature is supported.

NOTE 2: When the UE is moving between PLMNs, the trigger reports changes of equivalent PLMNs.

NOTE 3: Mobility between non-equivalent SNPNs, and between SNPN and PLMN is not supported. When the UE is operating in SNPN access mode, the trigger reports changes of equivalent SNPNs.

- "CON\_STATE\_CH", i.e. connectivity state change: the connectivity state of the UE has changed;

NOTE 4: 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; and

NOTE 5: The "GROUP\_ID\_LIST\_CHG" trigger only applies if the "GroupIdListChange" feature is supported. This Policy Control Request Trigger does not require an explicit subscription from the PCF.

- "UE\_CAP\_CH", i.e. UE Capabilities change: the UE provided 5G ProSe capabilities have changed.

NOTE 6: The "UE\_CAP\_CH" trigger only applies if the "ProSe" feature is supported. This Policy Control Request Trigger does not require a subscription.

\* \* \* Next Change \* \* \* \*

#### 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 clause 4.2.2.2) encoded as "uePolicy" attribute, and N2 PC5 policy for V2X communications (see clause 4.2.2.3) encoded as "n2Pc5Pol" attribute and/or the N2 PC5 policy for 5G ProSe (see clause 4.2.2.4) encoded as "n2Pc5ProSePo" attribute;

- when the updated policy is supplied via PCF of a PDU session by the PCF in case of URSP provisioning in EPS, UE policy (see clause 4.2.2.2) encoded as "uePolicy" attribute;

- updated Policy Control Request Trigger(s) (see clause 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;

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.

\* \* \* Next Change \* \* \* \*

### 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, the V2X N2 PC5 policy, if the "V2X" feature is supported, and/or the 5G ProSe N2 PC5 policy, if the "ProSe" feature is supported. The PCF (H-PCF in the roaming case) may decide to request the termination of the policy association.

If the "EpsUrsp" feature is supported and the NF consumer is a PCF for a PDU session the PCF may decide to update policy control request triggers and/or to update the URSP. The PCF 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 the termination of the UE policy association.

- URSP provisioning for background Data Transfer policy.

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

- UE policy provisioning for 5G ProSe.

- N2 PC5 Policy (e.g. for V2X communications, for 5G ProSe) provisioning.

NOTE: The PCF derives the URSP and invokes the Namf\_Communication\_N1N2MessageTransfer service operation to provision it to the UE.

- URSP provisioning in EPS.

\* \* \* Next Change \* \* \* \*

#### 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, the N2 PC5 policy for V2X communications if the "V2X" feature is supported and/or the N2 PC5 policy for 5G ProSe if the "ProSe" feature is supported.

If the "EpsUrsp" feature is supported and the NF consumer is a PCF for a PDU session the PCF may decide to update policy control request triggers and/or to update the URSP.

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 clause 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 for V2X communications and/or 5G ProSe 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);

- if the "EpsUrsp" feature is supported and a PCF for a PDU session is the NF service consumer,

1)- shall forward the "MANAGE UE POLICY COMMAND" message(s) with the received UE policy to the UE via SMF+PGW-C; and

2) shall provision the received policy control requested trigger(s) to the SMF+PGW-C using the Npcf\_SMPolicyControl\_UpdateNotify service operation according to 3GPP TS 29.512 [31];

- shall either send a successful 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. In case of a successful response:

- if the feature "ImmediateReport" is supported and the PCF provisioned the policy control request triggers related to PLMN change, PRA change, connectivity state change or location change, a "200 OK" response code and a response body with the corresponding available information in the "UeRequestedValueRep" data structure shall be returned in the response;

- otherwise, a "204 No Content" response code shall be returned in the response; and

- if errors occur when processing the HTTP POST request, shall send an HTTP error response as specified in clause 5.7; or

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

If the feature "ErrorResponse" is supported and if the AMF as NF service consumer 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 (V-)PCF shall resend the failed policy update notification request using the received URI in the Location header field as Notification URI. Subsequent policy update notifications, triggered after the failed one, shall be sent to the Notification URI provided by the NF service consumer during the corresponding policy association creation/update.

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 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 use that URI in any subsequent communication.

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

\* \* \* Next Change \* \* \* \*

#### 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. (NOTE) |  |
| 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. (NOTE) |  |
| 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] has been received by the V-PCF and is being forwarded to the H-PCF, or has been received by a PCF for a PDU session and is being forwarded to the PCF when the "EpsUrsp" feature is supported. A Namf\_Communication\_N1N2MessageTransfer failure response as defined in clause 5.2.2.3.1.2 of 3GPP TS 29.518 [14], an N1N2 Transfer Failure Notification as defined in clause 5.2.2.3.2 of 3GPP TS 29.518 [14], a UE Policy transfer failure is notifying to the H-PCF, or a UE Policy transfer failure is notifying to the PCF when the "EpsUrsp" feature is supported.  When the "ProSe" feature is supported it indicates that a "UE POLICY PROVISIONING REQUEST" message, as defined in clause 10.4 of 3GPP TS 24.554 [28] has been received by the V-PCF and is being forwarded to the H-PCF.  When the "V2X" feature is supported it indicates that a "UE POLICY PROVISIONING REQUEST" message, as defined in clause 7.2 of 3GPP TS 24.587 [24] has been received by the V-PCF and is being forwarded 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 or a PCF for a PDU session as NF service consumer and the PCF as NF service producer when the “EpsUrsp” feature is supported. |  |
| PLMN\_CH | PLMN change: the serving network (a PLMN or an SNPN) of UE has changed. (NOTE) | PlmnChange |
| CON\_STATE\_CH | Connectivity state change: the connectivity state of UE has changed. (NOTE) | 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 policy control request trigger does not require a subscription. | GroupIdListChange |
| UE\_CAP\_CH | UE Capabilities change: the UE provided 5G ProSe capabilities have changed. This policy control request trigger does not require subscription. | ProSe |
| NOTE: The report of this trigger includes reporting the current value at the time the trigger is provisioned during the update or update notification of the policy association. | | |

\* \* \* Next Change \* \* \* \*

## 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 clause 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 communications. |
| 5 | GroupIdListChange | This feature indicates the support for the notification of changes in the list of internal group identifiers. |
| 6 | ImmediateReport | This feature indicates the support of the current applicable values report corresponding to the policy control request triggers for policy update notification. |
| 7 | ErrorResponse | This feature indicates support for “404 Not Found” error response code for policy update notification between AMF and (V-)PCF. |
| 8 | ES3XX | Extended Support for 3xx redirections. This feature indicates the support of redirection for any service operation, according to Stateless NF procedures as specified in clauses 6.5.3.2 and 6.5.3.3 of 3GPP TS 29.500 [5] and according to HTTP redirection principles for indirect communication, as specified in clause 6.10.9 of 3GPP TS 29.500 [5]. |
| 9 | ProSe | This feature indicates support of UE policy and N2 information provisioning for 5G ProSe. |
| 10 | FeatureRenegotiation | This feature indicates the support of feature renegotiation during the update of a policy association triggered by UE mobility with AMF change. |
| XX | EpsUrsp | This feature indicates support of URSP provisioning in EPS and is only applicable in the case of of 5GC and EPC interworking. |

\* \* \* End Change \* \* \* \*