

ETSI TS 129 525 V17.10.0 (2025-03)



**5G;
5G System;
UE Policy Control Service;
Stage 3
(3GPP TS 29.525 version 17.10.0 Release 17)**

[ETSI TS 129 525 V17.10.0 \(2025-03\)](https://standards.iteh.ai/catalog/standards/etsi/287de2df-40cf-409f-8f18-269604bf5a7f/etsi-ts-129-525-v17-10-0-2025-03)

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Reference

RTS/TSGC-0329525vha0

Keywords

5G

ETSI

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Contents

Intellectual Property Rights	2
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	6
1 Scope	7
2 References	7
3 Definitions and abbreviations.....	8
3.1 Definitions	8
3.2 Abbreviations	8
4 UE Policy Control Service	9
4.1 Service Description	9
4.1.1 Overview	9
4.1.2 Service Architecture	10
4.1.3 Network Functions.....	11
4.1.3.1 Policy Control Function (PCF)	11
4.1.3.2 NF Service Consumers.....	12
4.2 Service Operations	13
4.2.1 Introduction.....	13
4.2.2 Npcf_UEPolicyControl_Create Service Operation.....	13
4.2.2.1 General	13
4.2.2.2 UE Policy	16
4.2.2.2.1 Overview	16
4.2.2.2.1.1 Provisioning of the UE Access Network discovery and selection policies and UE Route Selection Policy	19
4.2.2.2.1.2 Provisioning of Vehicle-to-Everything Policy	20
4.2.2.2.1.3 Provisioning of ProSe Policy	20
4.2.2.2.2 UE Access Network discovery and selection policies (ANDSP)	20
4.2.2.2.3 UE Route Selection Policy (URSP).....	21
4.2.2.2.4 Vehicle-to-Everything Policy (V2XP)	23
4.2.2.2.5 Proximity based Services Policy (ProSeP)	23
4.2.2.3 V2X N2 PC5 Policy	23
4.2.2.4 5G ProSe N2 PC5 Policy	24
4.2.3 Npcf_UEPolicyControl_Update Service Operation	24
4.2.3.1 General	24
4.2.3.2 Policy Control Request Triggers	27
4.2.3.3 Encoding of updated policy.....	28
4.2.4 Npcf_UEPolicyControl_UpdateNotify Service Operation	28
4.2.4.1 General	28
4.2.4.2 Policy update notification	29
4.2.4.3 Request for termination of the policy association	30
4.2.4.4 URSP provisioning for Background Data Transfer policy.....	31
4.2.4.5 UE policy provisioning for V2X communication over PC5 and Uu reference points	32
4.2.4.6 UE policy provisioning for 5G ProSe	32
4.2.4.7 UE policy provisioning for AF-influenced URSP.....	32
4.2.5 Npcf_UEPolicyControl_Delete Service Operation.....	32
5 Npcf_UEPolicyControl API.....	33
5.1 Introduction	33
5.2 Usage of HTTP.....	34
5.2.1 General.....	34
5.2.2 HTTP standard headers.....	34
5.2.2.1 General	34
5.2.2.2 Content type	34
5.2.3 HTTP custom headers.....	34

5.3	Resources	34
5.3.1	Resource Structure	34
5.3.2	Resource:UE Policy Associations.....	35
5.3.2.1	Description	35
5.3.2.2	Resource definition	35
5.3.2.3	Resource Standard Methods.....	35
5.3.2.3.1	POST	35
5.3.3	Resource: Individual UE Policy Association	36
5.3.3.1	Description	36
5.3.3.2	Resource definition	36
5.3.3.3	Resource Standard Methods.....	36
5.3.3.3.1	GET	36
5.3.3.3.2	DELETE	37
5.3.3.4	Resource Custom Operations	38
5.3.3.4.1	Overview	38
5.3.3.4.2	Operation: Update	38
5.3.3.4.2.1	Description.....	38
5.3.3.4.2.2	Operation Definition	39
5.4	Custom Operations without associated resources.....	39
5.5	Notifications	40
5.5.1	General.....	40
5.5.2	Policy Update Notification	40
5.5.2.1	Description	40
5.5.2.2	Operation Definition	40
5.5.3	Request for termination of the UE policy association.....	41
5.5.3.1	Description	41
5.5.3.2	Operation Definition	41
5.6	Data Model.....	42
5.6.1	General.....	42
5.6.2	Structured data types.....	43
5.6.2.1	Introduction	43
5.6.2.2	Type PolicyAssociation	44
5.6.2.3	Type PolicyAssociationRequest	45
5.6.2.4	Type PolicyAssociationUpdateRequest	48
5.6.2.5	Type PolicyUpdate	51
5.6.2.6	Type TerminationNotification.....	51
5.6.2.7	Type UePolicyTransferFailureNotification.....	52
5.6.2.8	Type UeRequestedValueRep	52
5.6.3	Simple data types and enumerations.....	52
5.6.3.1	Introduction	52
5.6.3.2	Simple data types	52
5.6.3.3	Enumeration: RequestTrigger	53
5.6.3.4	Enumeration: PolicyAssociationReleaseCause	53
5.6.3.5	Enumeration: Pc5Capability	54
5.6.3.6	Enumeration: ProSeCapability	54
5.7	Error handling	54
5.7.1	General.....	54
5.7.2	Protocol Errors.....	54
5.7.3	Application Errors	54
5.8	Feature negotiation	55
5.9	Security	56
Annex A (normative):	OpenAPI specification.....	57
A.1	General	57
A.2	Npcf_UEPolicyControl API.....	57
Annex B (normative):	Wireless and wireline convergence access support.....	66
B.1	Scope	66
B.2	Npcf_UEPolicyControl Service	66

B.2.1	Service Description	66
B.2.1.1	Overview	66
B.2.1.2	Service Architecture	66
B.2.1.3	Network Functions.....	66
B.2.1.3.1	Policy Control Function (PCF)	66
B.2.1.3.2	NF Service Consumers.....	66
B.3	Service Operations	67
B.3.1	Introduction	67
B.3.2	Npcf_UEPolicyControl_Create Service Operation	67
B.3.2.1	General.....	67
B.3.3	Npcf_UEPolicyControl_Update Service Operation	67
B.3.3.1	General.....	67
B.3.4	Npcf_UEPolicyControl_UpdateNotify Service.....	68
B.3.4.1	General.....	68
B.3.5	Npcf_UEPolicyControl_Delete Service Operation	68
B.3.5.1	General.....	68
Annex C (informative):	Withdrawn API versions.....	69
Annex D (informative):	Change history	70
History		74

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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 and N2 PC5 policy.

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".

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
ProSeP	5G ProSe Policy
PTI	Procedure Transaction Identity.
RSN	Redundancy Sequence Number
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 (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. 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); and

- enable the PCF to request the termination of a UE Policy Association to 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 NF service 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.

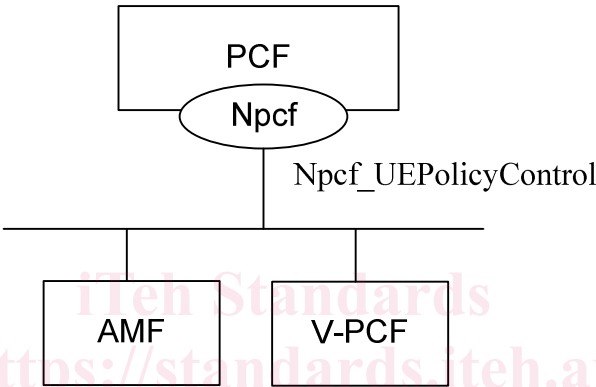


Figure 4.1.2-1: Reference Architecture for the Npcf_UEPolicyControl Service; SBI representation

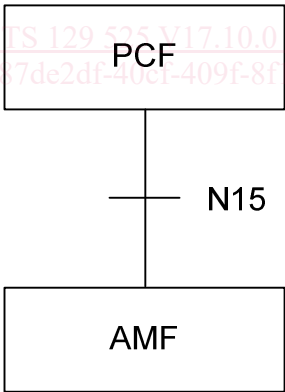


Figure 4.1.2-2: Non-roaming Reference Architecture for the Npcf_UEPolicyControlService; reference point representation

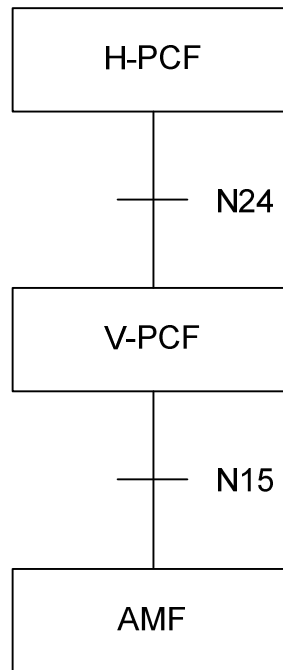


Figure 4.1.3-2: Roaming reference Architecture for the Npcf_UEPolicyControlService; reference point representation

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;
- 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; 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 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.

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.

4.1.3.2 NF Service Consumers

The known NF service consumers of the Npcf_UEPolicyControl are the AMF, and in the roaming case, the V-PCF.

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.

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 service consumer (e.g. AMF, V-PCF in roaming case)
Npcf_UEPolicyControl_Update	Updates a UE Policy Association and provides the corresponding policies to the NF service consumer when policy control request trigger(s) is/are met or the AMF is relocated due to the UE mobility and the old PCF is selected.	NF service consumer (e.g. AMF, V-PCF in roaming case)
Npcf_UEPolicyControl_UpdateNotify	- Provides the updated policy control request trigger(s) to the AMF by the (V-)PCF in the non-roaming or roaming case; - Provides the updated UE policy and/or policy control request trigger(s) to the V-PCF by the H-PCF; or - Initiates the UE Policy association termination towards the NF service consumer by the NF service producer.	PCF (H-PCF and V-PCF in roaming case)
Npcf_UEPolicyControl_Delete	Provides means for the NF service consumer to delete a UE Policy Association.	NF service consumer (e.g. AMF, V-PCF in roaming case)

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.