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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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shall not indicates an interdiction (prohibition) to do something

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should indicates a recommendation to do something

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may indicates permission to do something

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can indicates that something is possible

cannot indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document specifies the stage 3 protocol and data model for the Service Based Interface (SBI) of the Data Transfer Policy Control Services. It provides stage 3 protocol definitions and message flows, and specifies the APIs of the Data Transfer Policy Control Services offered by the Policy Control Function (PCF).

The 5G System stage 2 architecture is specified in 3GPP TS 23.501 [2]. The stage 2 definition and related procedures for Data Transfer Policy Control Services are specified in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14].

The 5G System stage 3 call flows are provided in 3GPP TS 29.513 [15].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [4] and 3GPP TS 29.501 [5].

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

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

[6] OpenAPI: "OpenAPI Specification Version 3.0.0", https://spec.openapis.org/oas/v3.0.0.

[7] 3GPP TR 21.900: "Technical Specification Group working methods".

[8] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

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

[10] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

[11] IETF RFC 9113: "HTTP/2".

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

[13] IETF RFC 9457: "Problem Details for HTTP APIs".

[14] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System; Stage 2".

[15] 3GPP TS 29.513: "5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".

[16] 3GPP TS 29.504: "5G System; Unified Data Repository Services; 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 29.520: "5G System; Network Data Analytics Services; Stage 3".

[19] IETF RFC 7396: "JSON Merge Patch".

[20] IETF RFC 3986: "Uniform Resource Identifier (URI): Generic Syntax".

[21] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[22] 3GPP TS 29.554: "5G System; Background Data Transfer Policy Control Service; Stage 3".

[23] 3GPP TS 29.122: "T8 reference point for Northbound APIs".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.501 [2], clause 3.1 apply:

5G System
Network Function
NF service
Service based interface

3.2 Symbols

No symbol is defined in this Release of the present document.

3.3 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].

5QI	5G QoS Identifier
AF	Application Function
ASP	Application Service Provider
DNN	Data Network Name
NEF	Network Exposure Function
NWDAF	Network Data Analytics Function
PCF	Policy Control Function
PDTQ	Planned Data Transfer with QoS
QoS	Quality of Service
S-NSSAI	Single Network Slice Selection Assistance Information
SBI	Service Based Interface
TAI	Tracking Area Identity
UDR	Unified Data Repository

4 Overview

The Data Transfer Policy Control Services, as defined in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14], are part of the Npcf service based interface exhibited by the Policy Control Function (PCF).

The Network Exposure Function (NEF) is the only NF service consumer of the Data Transfer Policy Control Services.

The NEF accesses the Data Transfer Policy Control Services at the PCF via the N30 Reference point. In the roaming scenario, the N30 reference point is located between the PCF and the NEF in the home network only.

Figures°4-1 and 4-2 depict the Data Transfer Policy Control Services related reference architecture of the PCF respectively in SBI representation and reference point representation.

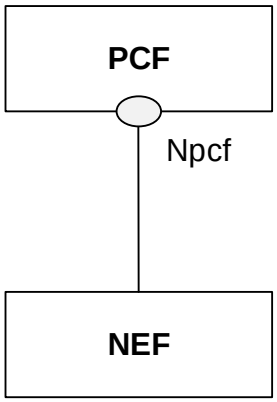

Figure 4-1: Reference Architecture for the Npcf Data Transfer Policy Control Services; SBI representation

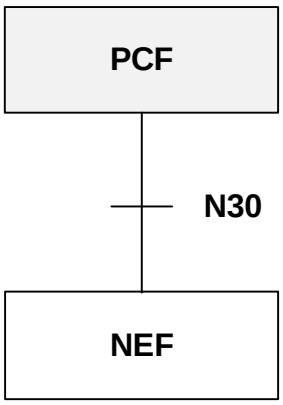

Figure 4-2: Reference Architecture for the Npcf Data Transfer Policy Control Services; reference point representation

5 Data Transfer Policy Control Services offered by the PCF

5.1 Introduction

Table 5.1-1 summarizes the corresponding APIs defined for this specification.

Table 5.1-1: API Descriptions

Service Name	Clause	Description	OpenAPI Specification File	apiName	Annex
Npcf_PDTQPolicy Control	5.2	Planned Data Transfer with QoS (PDTQ) Policy Control service	TS29543_Npcf_PDTQPolicyControl.yaml	npcf-pdtq-policy-control	A.2

5.2 Npcf_PDTQPolicyControl Service

5.2.1 Service Description

The PDTQ Policy Control service, as defined in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14], provides negotiation for planned data transfer with QoS requirements (PDTQ) policies.

The PDTQ Policy Control service offers the following functionalities:

- provide PDTQ policies based on the request from the NF service consumer;
- update an existing PDTQ data based on the request from the NF service consumer; and
- provide a PDTQ warning notification to trigger renegotiation of a PDTQ policy.

5.2.2 Service Operations

5.2.2.1 Introduction

The service operations defined for the Npcf_PDTQPolicyControl service are shown in table 5.2.2.1-1.

Table 5.2.2.1-1: Operations of the Npcf_PDTQPolicyControl service

Service operation name	Description	Initiated by
Npcf_PDTQPolicyControl_Create	Provides the requested PDTQ policies to the NF service consumer.	NF service consumer (e.g. NEF)
Npcf_PDTQPolicyControl_Update	Updates the existing PDTQ data.	NF service consumer (e.g. NEF)
Npcf_PDTQPolicyControl_Notify	Sends a PDTQ warning notification to the NF service consumer.	PCF

5.2.2.2 Npcf_PDTQPolicyControl_Create service operation

5.2.2.2.1 General

The Npcf_PDTQPolicyControl_Create service operation is used by an NF service consumer to request the PCF to create an "Individual PDTQ policy" resource.

The following procedure using the Npcf_PDTQPolicyControl_Create service operation is supported:

- retrieval of PDTQ policies.

5.2.2.2.2 Retrieval of PDTQ policies

This procedure is used by the NF service consumer to request PDTQ policies from the PCF, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14].

Figure 5.2.2.2.2-1 illustrates retrieval of PDTQ policies.

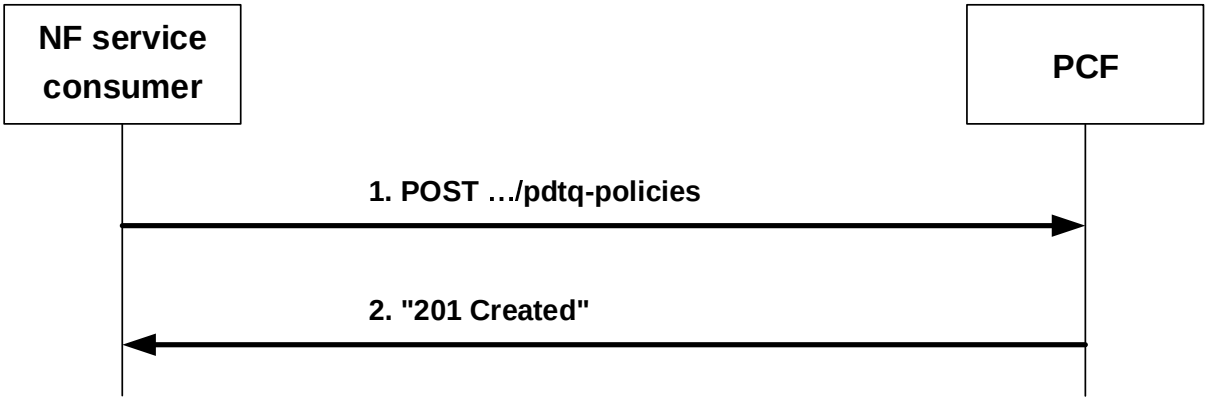

Figure 5.2.2.2.2-1: Retrieval of PDTQ policies

In order to get PDTQ policies, the NF service consumer shall invoke the Npcf_PDTQPolicyControl_Create service operation by sending an HTTP POST request to the URI representing a "PDTQ policies" collection resource of the PCF (as shown in figure 5.2.2.2.2-1, step 1). The NF service consumer shall include in a body of the HTTP POST request a PdtqPolicyData data type which shall contain:

a) an ASP identifier in the "aspId" attribute;

b) an expected number of UEs in the "numOfUes" attribute;

c) a list of desired time windows in the "desTimeInts" attribute;

d) requested QoS requirements provided as a QoS Reference in the "qosReference" attribute or as a QoS parameter set in the "qosParamSet" attribute that shall contain one or more of the following individual QoS parameters:

   1) Priority Level in the "priorLevel" attribute;

   2) Maximum Burst Size:

      A) if the Maximum Burst Size value is greater than 4095 Bytes in the "extMaxBurstSize" attribute; or

      B) if the Maximum Burst Size value is lower than or equal to 4095 Bytes in the "maxBurstSize" attribute;

   3) 5GS Delay in the "pdb" attribute;

   4) Maximum Bitrate in downlink and/or uplink directions in the "maxBitRateDl" and/or "maxBitRateUl" attributes;

   5) Guaranteed Flow Bitrate in downlink and/or uplink directions in the "gfbrDl" and/or "gfbrUl" attributes; and

   6) Packet Error Rate in the "per" attribute,

and may contain:

a) a network area information (e.g. list of TAIs and/or list of NG-RAN nodes and/or list of cells identifiers) in the "nwAreaInfo" attribute;

b) an application identifier in the "appId" attribute;

c) a DNN corresponding to the ASP identifier, in the "dnn" attribute;

d) an S-NSSAI corresponding to the ASP identifier, in the "snssai" attribute;

e) alternative service requirements provided as:

   1) one or more alternative QoS References in a prioritized order in the "altQosRefs" attribute; or

   2) one or more alternative QoS Parameter Sets in a prioritized order in the "altQosParamSets" attribute which shall contain one or more of the following individual QoS parameters:

      A) 5GS Delay in the "pdb" attribute;

B) Guaranteed Flow Bitrate in downlink and/or uplink directions in the "gfbrDl" and/or "gfbrUl" attributes; and

C) Packet Error Rate in the "per" attribute; and

f) a notification URI in the "notifUri" attribute and a request to enable a PDTQ warning notification for the planned data transfer with QoS requirements in the "warnNotifReq" attribute.

NOTE 1: The PCF can be configured to map the ASP identifier to a target DNN and S-NSSAI if the NF service consumer did not provide the DNN, S-NSSAI to the PCF.

Upon the reception of the HTTP POST request from the NF service consumer indicating a PDTQ policies request, the PCF:

a) shall invoke the Nudr_DataRepository_Query service operation, as described in 3GPP TS 29.504 [16] and 3GPP TS 29.519 [17], to request from the UDR all existing PDTQ policies;

b) may invoke the Nnwdaf_EventsSubscription_Subscribe service operation and/or the Nnwdaf_AnalyticsInfo_Request service operation as described in 3GPP TS 29.520 [18], to get from the NWDAF the Network Performance analytics or the DN Performance analytics;

NOTE 2: Whether the PCF subscribes to Network Performance analytics or DN Performance analytics is based on PCF configuration.

c) shall determine one or more acceptable PDTQ policy based on:

1) information provided by the NF service consumer; and

2) other available information (e.g. the network analytics related to "Network Performance" or "DN Performance", the existing PDTQ policies, the network policy);

d) shall create a PDTQ Reference ID;

e) shall send to the NF service consumer a "201 Created" response to the HTTP POST request, as shown in figure 5.2.2.2.2-1, step 2. The PCF shall include in the "201 Created" response a Location header field containing the URI of the created "Individual PDTQ policy" resource, and the response body with a PdtqPolicyData data type which shall contain:

1) acceptable PDTQ policy/ies in the "pdtqPolicies" attribute. For each included PDTQ policy, the PCF shall provide:

A) an identity of a PDTQ policy represented as an integer value greater than zero in the "pdtqPolicyId" attribute; and

B) recommended time window in the "recTimeInt" attribute; and

2) the PDTQ Reference ID in the "pdtqRefId" attribute; or

f) if the PCF cannot successfully fulfil the received HTTP POST request due to the internal PCF error or due to the error in the HTTP POST request, shall send the HTTP error response as specified in clause 6.1.7.

If the PCF included in the PdtqPolicyData data type:

- more than one PDTQ policy, the PCF shall wait for an indication about selected PDTQ policy from the NF service consumer as described in clause 5.2.2.3.2; or

- only one PDTQ policy, the PCF shall invoke the Nudr_DataRepository_Update service operation, as described in 3GPP TS 29.504 [16] and 3GPP TS 29.519 [17], to update the UDR with the selected PDTQ policy, the corresponding PDTQ Reference ID, the expected number of UEs, the list of desired time windows, the QoS Reference or individual QoS parameters, whether the AF accepts PDTQ policy renegotiation and, if available, the network area information and the alternative service requirements listed in a prioritized order for the provided ASP identifier.

5.2.2.3 Npcf_PDTQPolicyControl_Update service operation

5.2.2.3.1 General

The Npcf_PDTQPolicyControl_Update service operation is used by an NF service consumer to request the PCF to update an existing "Individual PDTQ policy" resource.

The following procedures using the Npcf_PDTQPolicyControl_Update service operation are supported:

- indication about selected PDTQ policy; and
- modification of a PDTQ warning notification request indication.

5.2.2.3.2 Indication about selected PDTQ policy

This procedure is used by the NF service consumer to inform the PCF about selected PDTQ policy, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14], if the AF has selected the PDTQ policy from the received list of PDTQ policies after:

- retrieval of PDTQ policies as described in clause 5.2.2.2.2; or
- reception of a PDTQ warning notification as described in clause 5.2.2.4.2.

Figure 5.2.2.3.2-1 illustrates an indication about selected PDTQ policy.

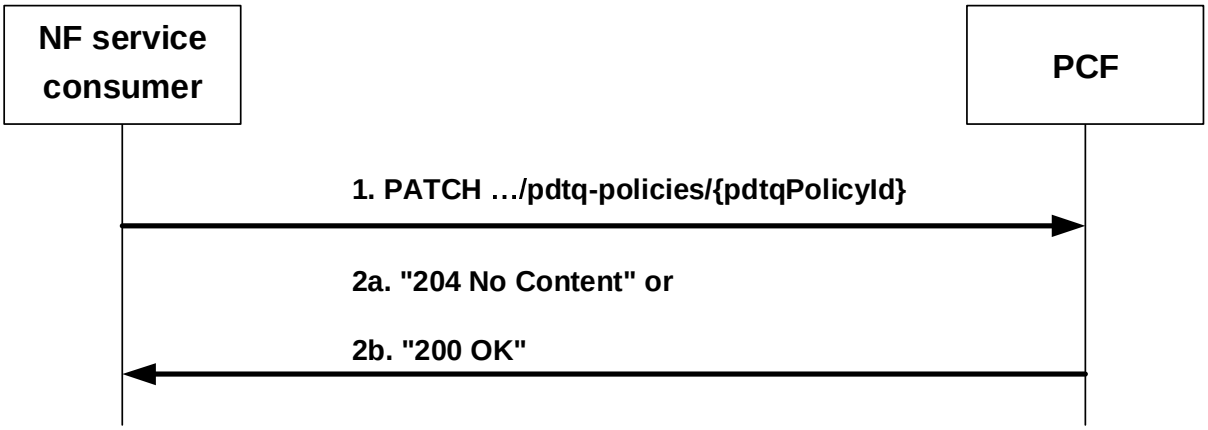

Figure 5.2.2.3.2-1: Indication about selected PDTQ policy

In order to inform the PCF about selected PDTQ policy, the NF service consumer shall invoke the Npcf_PDTQPolicyControl_Update service operation by sending an HTTP PATCH targeting the URI of the corresponding "Individual PDTQ policy" resource (as shown in figure 5.2.2.3.2-1, step 1). The NF service consumer shall include in a body of the HTTP PATCH request a PdtqPolicyPatchData data type which shall contain:

a) if the AF has selected the PDTQ policy, the identifier of the selected PDTQ policy in the "selPdtqPolicyId" attribute; or

b) in case of a PDTQ policy renegotiation and if the AF has not selected any PDTQ policy, the "selPdtqPolicyId" attribute set to value "0" to indicate no PDTQ policy is selected.

Upon the reception of the HTTP PATCH request from the NF service consumer, if the PCF determines the received HTTP PATCH request needs to be redirected, the PCF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4]. Otherwise, the PCF:

a) in case of the initial PDTQ policy negotiation, may invoke the Nudr_DataRepository_Update service operation, as described in 3GPP TS 29.504 [16] and 3GPP TS 29.519 [17], with the selected PDTQ policy, the corresponding PDTQ Reference ID, the expected number of UEs, the list of desired time windows, the QoS Reference or individual QoS parameters, whether the AF accepts PDTQ policy renegotiation and, if available, the network area information and the alternative service requirements listed in a prioritized order for the provided ASP identifier;

b) in case of the PDTQ policy renegotiation if the PDTQ policy is selected and the PCF invoked the Nudr_DataRepository_Update service operation during the initial PDTQ policy negotiation the PCF shall invoke the Nudr_DataRepository_Update service operation, as described in 3GPP TS 29.504 [16] and 3GPP TS 29.519 [17], to update the UDR with the selected PDTQ policy; and

NOTE: If the AF has not selected any of the PDTQ policies included in the candidate list, the previously negotiated PDTQ policy shall be kept.

c) shall acknowledge the received HTTP PATCH request by sending to the NF service consumer:

1) a "204 No Content" response (as shown in figure 5.2.2.3.2-1, step 2a);

2) a "200 OK" response (as shown in figure 5.2.2.3.2-1, step 2b) with a PdtqPolicyData data type in the response body; or

3) if the PCF cannot successfully fulfil the received HTTP PATCH request due to the internal PCF error or due to the error in the HTTP PATCH request, an HTTP error response as specified in clause 6.1.7.

5.2.2.3.3 Modification of PDTQ warning notification request indication

This procedure is used by the NF service consumer to inform the PCF whether the AF has enabled or disabled the PDTQ warning notification.

In order to modify a PDTQ warning notification request indication, the NF service consumer shall invoke the Npcf_PDTQPolicyControl_Update service operation by sending an HTTP PATCH request to the PCF, as described in clause 5.2.2.3.2. The NF service consumer shall include in a PdtqPolicyPatchData data type a "warnNotifReq" attribute set to value:

- "false" if the PDTQ warning notification is no longer required; or
- "true" if the PDTQ warning notification is required.

If the PDTQ warning notification is required and a notification URI was not previously provided or has been changed, the NF service consumer shall include:

- the notification URI in the "notifUri" attribute.

Upon the reception of the HTTP PATCH request from the NF service consumer indicating a modification of the PDTQ warning notification request indication, the PCF shall:

- acknowledge that request by sending an HTTP response message as described in clause 5.2.2.3.2; and
- if the PCF invoked the Nudr_DataRepository_Update service operation during the initial PDTQ policy negotiation, invoke the Nudr_DataRepository_Update service operation, as described in 3GPP TS 29.504 [16] and 3GPP TS 29.519 [17], to update the UDR with the modified PDTQ warning notification request indication.

5.2.2.4 Npcf_PDTQPolicyControl_Notify service operation

5.2.2.4.1 General

The Npcf_PDTQPolicyControl_Notify service operation is used by the PCF to send a PDTQ notification to the NF service consumer.

The following procedure using the Npcf_PDTQPolicyControl_Notify service operation is supported:

- sending a PDTQ warning notification to the NF service consumer.

5.2.2.4.2 Sending the PDTQ warning notification

This procedure is used by the PCF to provide a list of new candidate PDTQ policies to the NF service consumer due to a network performance or DN performance degradation, as defined in clause 4.16.15.2.2 of 3GPP TS 23.502 [3] and clause 6.1.2.7 of 3GPP TS 23.503 [14].

Figure 5.2.2.4.2-1 illustrates a PDTQ warning notification from the PCF.

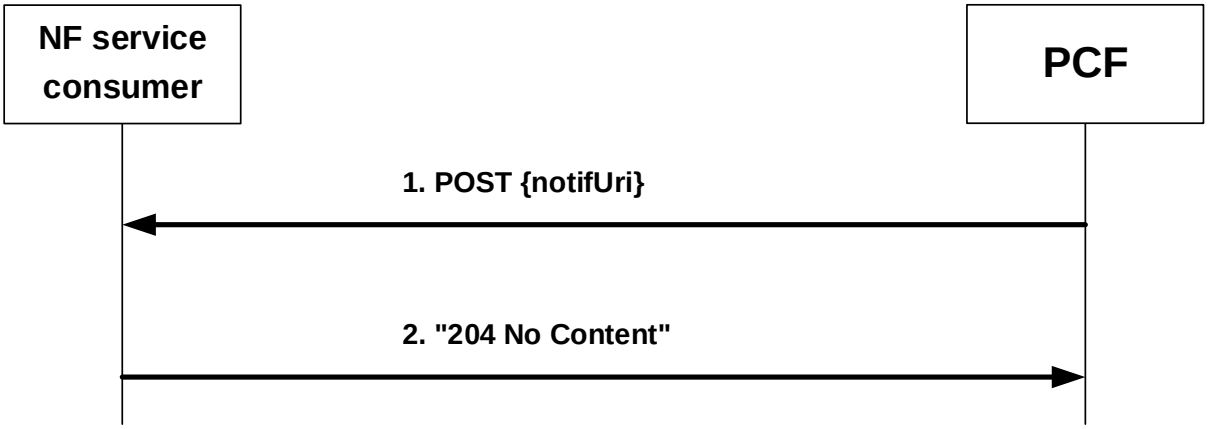

Figure 5.2.2.4.2-1: PDTQ warning notification

When the PCF gets the notification from the NWDAF, that the network performance or DN performance in the requested area of interest reaches the reporting threshold as described in 3GPP TS 29.520 [18] and if the PDTQ warning notification is enabled, the PCF may try to renegotiate the affected PDTQ policies with the affected AFs. To do this, the PCF retrieves all the PDTQ policies together with their additionally stored AF provided information for PDTQ policy decision (e.g. their corresponding list of desired time windows, the number of UEs, etc.) from the UDR, identifies the PDTQ policy(ies) that are not desirable anymore due to the degradation of the network performance or DN performance and tries to calculate one or more new candidate PDTQ policies based on the AF provided information, the PDTQ policies retrieved from the UDR and the current network performance or DN performance. If the PCF does not find any new candidate PDTQ policy, the previously negotiated PDTQ policy shall be kept and no interaction with the NF service consumer shall occur.

If one or more new candidate PDTQ policies are calculated, the PCF shall invoke the Npcf_PDTQPolicyControl_Notify service operation by sending the HTTP POST request with a PDTQ warning notification to the NF service consumer.

The PCF shall include in a body of the HTTP POST request a "Notification" data type which shall contain:

- the PDTQ Reference ID of the impacted PDTQ policy within the "pdtqRefId" attribute; and
- the list of candidate PDTQ policies in the "candPolicies" attribute.

NOTE: The AF might, or might not select a new PDTQ policy from the offered candidate list when receives the PDTQ warning notification.

Upon the reception of the HTTP POST request from the PCF, the NF service consumer shall acknowledge that request by sending an HTTP response message with the corresponding status code:

- if 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 [4];
- if the HTTP POST request from the PCF is accepted, the NF service consumer shall acknowledge the receipt of the notification with a "204 No Content" response to HTTP POST request, as shown in figure 5.2.2.4.2-1, step 2; or
- if the HTTP POST request from the PCF is not accepted, the NF service consumer shall send an HTTP error response as specified in clause 6.1.7.

6 API Definitions

6.1 Npcf_PDTQPolicyControl Service API

6.1.1 Introduction

The PDTQ Policy Control shall use the Npcf_PDTQPolicyControl API.

The API URI of the Npcf_PDTQPolicyControl API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "npcf-pdtq-policy-control".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.1.3.

6.1.2 Usage of HTTP

6.1.2.1 General

HTTP/2, IETF RFC 9113 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

The OpenAPI [6] specification of HTTP messages and content bodies for the Npcf_PDTQPolicyControl API is contained in clause A.2.

6.1.2.2 HTTP standard headers

6.1.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

6.1.2.2.2 Content type

JSON, IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. 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 9457 [13].

JSON object used in the HTTP PATCH request shall be encoded according to "JSON Merge Patch" and shall be signalled by the content type "application/merge-patch+json", as defined in IETF RFC 7396 [19].

6.1.2.3 HTTP custom headers

The mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] shall be supported, and the optional HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4] may be supported.

6.1.3 Resources

6.1.3.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 6.1.3.1-1 depicts the resource URIs structure for the Npcf_PDTQPolicyControl API.

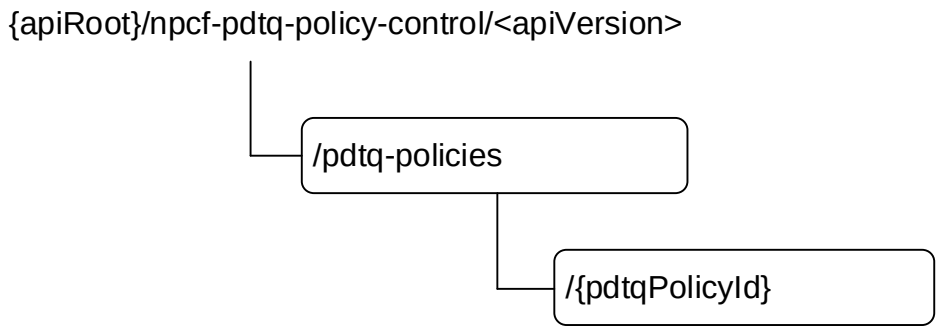

Figure 6.1.3.1-1: Resource URI structure of the Npcf_PDTQPolicyControl API

Table 6.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.1.3.1-1: Resources and methods overview

Resource purpose/name	Resource URI (relative path after API URI)	HTTP method or custom operation	Description (service operation)
PDTQ policies	/pdtq-policies	POST	Creates a new Individual PDTQ policy resource.
Individual PDTQ policy	/pdtq-policies/{pdtqPolicyId}	GET	Reads an Individual PDTQ policy resource.
		PATCH	Modifies an existing Individual PDTQ policy resource.

6.1.3.2 Resource: PDTQ policies (Collection)

6.1.3.2.1 Description

The PDTQ policies resource represents all PDTQ policies that exist in the PDTQ Policy Control service at a given PCF instance.

6.1.3.2.2 Resource Definition

Resource URI: **{apiRoot}/npcf-pdtq-policy-control/<apiVersion>/pdtq-policies**

This resource shall support the resource URI variables defined in table 6.1.3.2.2-1.

Table 6.1.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1

6.1.3.2.3 Resource Standard Methods

6.1.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.1.3.2.3.1-1.

Table 6.1.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.1.3.2.3.1-2 and the response data structures and response codes specified in table 6.1.3.2.3.1-3.

Table 6.1.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
PdtqPolicyData	M	1	Contains information for the creation of a new Individual PDTQ policy resource.

Table 6.1.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
PdtqPolicyData	M	1	201 Created	Successful case. An Individual PDTQ policy resource is created and a representation of that resource is returned.
NOTE: The mandatory HTTP error status code for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

Table 6.1.3.2.3.1-4: 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-pdtq-policy-control/<apiVersion>/pdtq-policies/{pdtqPolicyId}

6.1.3.2.4 Resource Custom Operations

None.

6.1.3.3 Resource: Individual PDTQ policy (Document)

6.1.3.3.1 Description

The Individual PDTQ policy resource represents the planned data transfer with QoS requirements policy that exist in the PDTQ Policy Control service at a given PCF instance.

6.1.3.3.2 Resource Definition

Resource URI: **{apiRoot}/npcf-pdtq-policy-control/<apiVersion>/pdtq-policies/{pdtqPolicyId}**

This resource shall support the resource URI variables defined in table 6.1.3.3.2-1.

Table 6.1.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1.
pdtqPolicyId	string	Identifies the individual PDTQ policy resource in the PCF. To enable the value to be used as part of a URI, the string shall only contain allowed characters according to the "lower-with-hyphen" naming convention defined in clause 5.1.3 of 3GPP TS 29.501 [5] and rules for a path segment defined in IETF RFC 3986 [20].

6.1.3.3.3 Resource Standard Methods

6.1.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.3.3.1-1.

Table 6.1.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.1.3.3.3.1-2 and the response data structures and response codes specified in table 6.1.3.3.3.1-3.

Table 6.1.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.1.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
PdtqPolicyData	M	1	200 OK	A representation of an Individual PDTQ policy resource is returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. (NOTE 2)
ProblemDetails	O	0..1	404 Not Found	(NOTE 3)
NOTE 1: The mandatory HTTP error status code for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (refer to clause 6.10.9.1 of 3GPP TS 29.500 [4]). NOTE 3: Failure cases are described in clause 6.1.7.				

Table 6.1.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative PCF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target PCF (service) instance towards which the request is redirected.

Table 6.1.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative PCF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target PCF (service) instance towards which the request is redirected.

6.1.3.3.3.2 PATCH

This method shall support the URI query parameters specified in table 6.1.3.3.3.2-1.

Table 6.1.3.3.3.2-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.1.3.3.3.2-2 and the response data structures and response codes specified in table 6.1.3.3.3.2-3.

Table 6.1.3.3.3.2-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
PdtqPolicyPatchData	M	1	Contains modifications that shall be applied on the existing Individual PDTQ policy resource.

Table 6.1.3.3.3.2-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
PdtqPolicyData	M	1	200 OK	The Individual PDTQ policy resource is modified and a representation of that resource is returned.
n/a			204 No Content	The Individual PDTQ policy resource is modified.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. (NOTE 2)
ProblemDetails	O	0..1	404 Not Found	(NOTE 3)
NOTE 1: The mandatory HTTP error status code for the PATCH method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (refer to clause 6.10.9.1 of 3GPP TS 29.500 [4]). NOTE 3: Failure cases are described in clause 6.1.7.				

Table 6.1.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative PCF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target PCF (service) instance towards which the request is redirected.

Table 6.1.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative PCF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target PCF (service) instance towards which the request is redirected.

6.1.4 Custom Operations without associated resources

No custom operation is defined in this Release of the specification.

6.1.5 Notifications

6.1.5.1 General

Notifications shall comply to clause 6.2 of 3GPP TS 29.500 [4] and clause 4.6.2.3 of 3GPP TS 29.501 [5].

Table 6.1.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
PDTQ warning notification	{notifUri}	POST	Provides a PDTQ warning notification.

6.1.5.2 PDTQ warning notification

6.1.5.2.1 Description

The PDTQ warning notification is used by the PCF to notify the NF service consumer about changed conditions for a planned data transfer with QoS requirements e.g. that a network performance or DN performance in the area of interest goes below the criteria set by the operator.

6.1.5.2.2 Target URI

The Callback URI **"{notifUri}"** shall be used with the callback URI variables defined in table 6.1.5.2.2-1.

Table 6.1.5.2.2-1: Callback URI variables

Name	Definition
notifUri	String formatted as URI with the Callback Uri

6.1.5.2.3 Standard Methods

6.1.5.2.3.1 POST

This method shall support the request data structures specified in table 6.1.5.2.3.1-1 and the response data structures and response codes specified in table 6.1.5.2.3.1-2.

Table 6.1.5.2.3.1-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
Notification	M	1	Provides a PDTQ warning notification.

Table 6.1.5.2.3.1-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The reception of a PDTQ warning notification is acknowledged.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (refer to clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 6.1.5.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI representing the end point of an alternative NF service consumer instance towards which the notification is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF service consumer instance towards which the notification request is redirected.

Table 6.1.5.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI representing the end point of an alternative NF service consumer instance towards which the notification is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF service consumer instance towards which the notification request is redirected.

6.1.6 Data Model

6.1.6.1 General

This clause specifies the application data model supported by the API.

Table 6.1.6.1-1 specifies the data types defined for the Npcf_PDTQPolicyControl service based interface protocol.

Table 6.1.6.1-1: Npcf_PDTQPolicyControl specific Data Types

Data type	Clause defined	Description	Applicability
AltQosParamSet	6.1.6.2.4	Contains the alternative QoS requirements expressed as the list of individual QoS parameter sets.	
Notification	6.1.6.2.7	Contains the PDTQ notification information.	
PdtqPolicy	6.1.6.2.5	Describes a PDTQ policy.	
PdtqPolicyData	6.1.6.2.2	Describes an Individual PDTQ policy resource.	
PdtqPolicyPatchData	6.1.6.2.6	Represents modifications of an Individual PDTQ policy resource.	
PdtqReferenceId	6.1.6.3.2	Represents a PTDQ Reference ID.	
QosParameterSet	6.1.6.2.3	Contains the QoS requirements expressed as one or more individual QoS parameters.	

Table 6.1.6.1-2 specifies data types re-used by the Npcf_PDTQPolicyControl 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_PDTQPolicyControl service based interface.

Table 6.1.6.1-2: Npcf_PDTQPolicyControl re-used Data Types

Data type	Reference	Comments	Applicability
5QiPriorityLevel	3GPP TS 29.571 [21]	Represents the 5QI Priority Level (see clauses 5.7.3.3 and 5.7.4 of 3GPP TS 23.501 [2]) within the range 1 to 127.	
ApplicationId	3GPP TS 29.571 [21]	Contains the application identifier.	
BitRate	3GPP TS 29.571 [21]	Represents the bitrate in kbits per second.	
Dnn	3GPP TS 29.571 [21]	Identifies a Data Network Name.	
ExtMaxDataBurstVol	3GPP TS 29.571 [21]	Represents the Maximum Data Burst Volume (see clauses 5.7.3.7 and 5.7.4 of 3GPP TS 23.501 [2]), expressed in Bytes. Minimum = 4096. Maximum = 2000000.	
MaxDataBurstVol	3GPP TS 29.571 [21]	Represents the Maximum Data Burst Volume (see clauses 5.7.3.7 and 5.7.4 of 3GPP TS 23.501 [2]), expressed in Bytes. Minimum = 1. Maximum = 4095.	
NetworkAreaInfo	3GPP TS 29.554 [22]	Describes a network area information in which the NF service consumer requests the number of UEs.	
PacketDelBudget	3GPP TS 29.571 [21]	Represents the Packet Delay Budget (see clauses 5.7.3.4 and 5.7.4 of 3GPP TS 23.501 [2]), expressed in milliseconds.	
PacketErrRate	3GPP TS 29.571 [21]	Represents the Packet Error Rate (see clause 5.7.3.5 and 5.7.4 of 3GPP TS 23.501 [2]), expressed as a "scalar x 10-k" where the scalar and the exponent k are each encoded as one decimal digit.	
ProblemDetails	3GPP TS 29.571 [21]	Used in error responses to provide more detailed information about an error.	
RedirectResponse	3GPP TS 29.571 [21]	Contains redirection related information.	
Snssai	3GPP TS 29.571 [21]	Identifies a Single Network Slice Selection Assistance Information.	
SupportedFeatures	3GPP TS 29.571 [21]	Used to negotiate the applicability of the optional features defined in table 6.1.8-1.	
TimeWindow	3GPP TS 29.122 [23]	Specifies a time interval.	
Uri	3GPP TS 29.571 [21]	String providing an URI.	

6.1.6.2 Structured data types

6.1.6.2.1 Introduction

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

6.1.6.2.2 Type: PdtqPolicyData

Table 6.1.6.2.2-1: Definition of type PdtqPolicyData

Attribute name	Data type	P	Cardinality	Description	Applicability
altQosParamSets	array(AltQosParamSet)	O	1..N	This IE contains the alternative QoS requirements expressed as the list of individual QoS parameter sets in a prioritized order. The lower the index of the array for a given entry, the higher the priority. (NOTE 4)	
altQosRefs	array(string)	O	1..N	This IE contains the alternative QoS requirements expressed as the list of QoS References in a prioritized order. The lower the index of the array for a given entry, the higher the priority. (NOTE 3)	
appId	ApplicationId	O	0..1	This IE contains an application identifier.	
aspId	string	M	1	This IE contains an identity of an application service provider.	
desTimeInts	array(TimeWindow)	M	1..N	This IE contains a list of desired time windows for PDTQ.	
dnn	Dnn	O	0..1	This IE identifies a DNN. A full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. (NOTE 1)	
notifUri	Uri	O	0..1	This IE contains an URI of the recipient of the PDTQ notification.	
nwAreaInfo	NetworkAreaInfo	O	0..1	This IE represents a network area information in which the NF service consumer requests a number of UEs.	
numOfUes	integer	M	1	This IE indicates a number of UEs.	
pdtqPolicies	array(PdtqPolicy)	O	1..N	This IE contains PDTQ policies.	
pdtqRefId	PdtqReferenceId	O	0..1	This IE identifies PDTQ policies of planned data transfer with QoS requirements for provided ASP.	
qosParamSet	QosParameterSet	C	0..1	This IE contains the requested QoS requirements expressed as one or more individual QoS parameters. (NOTE 2)	
qosReference	string	C	0..1	This IE contains the requested QoS requirements expressed as the QoS Reference which represents a pre-defined QoS information. (NOTE 2)	
selPdtqPolicyId	integer	O	0..1	This IE contains the identity of the selected PDTQ policy. (NOTE 5)	
snssai	Snssai	O	0..1	This IE identifies a slice.	
suppFeat	SupportedFeatures	O	0..1	This IE represents a list of Supported features used as described in clause 6.1.8.	
warnNotifReq	boolean	O	0..1	This IE indicates whether the PDTQ warning notification is enabled or disabled. true: enabled; false: disabled (default).	

NOTE 1: The PCF uses the DNN as received from the NF service consumer without applying any transformation. To successfully perform DNN matching, in a specific deployment a DNN shall always be encoded either with the full DNN (e.g., because there are multiple Operator Identifiers for a Network Identifier) or the DNN Network Identifier only. The NF service consumer may include the DNN Operator Identifier based on local configuration.
NOTE 2: Either the "qosReference" attribute or the "qosParamSet" attribute shall be included.
NOTE 3: The "altQosRefs" attribute may be included only if the ""qosReference" attribute is included.
NOTE 4: The "altQosParamSets" attribute may be included only if the "qosParamSet" attribute is included.
NOTE 5: The value "0" indicates that no PDTQ policy is selected.

6.1.6.2.3 Type: QosParameterSet

Table 6.1.6.2.3-1: Definition of type QosParameterSet

Attribute name	Data type	P	Cardinality	Description	Applicability
extMaxBurstSize	ExtMaxDataBurstVol	O	0..1	This IE represents the Maximum Burst Size value greater than 4095 Bytes. (NOTE 1)	
gfbrDl	BitRate	O	0..1	This IE represents the Guaranteed Flow Bitrate in downlink direction.	
gfbrUl	BitRate	O	0..1	This IE represents the Guaranteed Flow Bitrate in uplink direction.	
maxBitRateDl	BitRate	O	0..1	This IE represents the Maximum Bitrate in downlink direction.	
maxBitRateUl	BitRate	O	0..1	This IE represents the Maximum Bitrate in uplink direction.	
maxBurstSize	MaxDataBurstVol	O	0..1	This IE represents the Maximum Burst Size value lower than or equal to 4095 Bytes. (NOTE 1)	
pdb	PacketDelBudget	O	0..1	This IE represents the 5GS Packet Delay Budget.	
per	PacketErrRate	O	0..1	This IE represents the Packet Error Rate.	
priorLevel	5QiPriorityLevel	O	0..1	This represents the Priority Level.	
NOTE 1: The attributes "extMaxBurstSize" and "maxBurstSize" are mutually exclusive. NOTE 2: At least one of the attributes shall be present.					

6.1.6.2.4 Type: AltQosParamSet

Table 6.1.6.2.4-1: Definition of type AltQosParamSet

Attribute name	Data type	P	Cardinality	Description	Applicability
gfbrDl	BitRate	O	0..1	This IE represents the Guaranteed Flow Bitrate in downlink direction.	
gfbrUl	BitRate	O	0..1	This IE represents the Guaranteed Flow Bitrate in uplink direction.	
pdb	PacketDelBudget	O	0..1	This IE represents the 5GS Packet Delay Budget.	
per	PacketErrRate	O	0..1	This IE represents the Packet Error Rate.	
NOTE: At least one of the attributes shall be present.					

6.1.6.2.5 Type: PdtqPolicy

Table 6.1.6.2.5-1: Definition of type PdtqPolicy

Attribute name	Data type	P	Cardinality	Description	Applicability
pdtqPolicyId	integer	M	1	This IE contains an identity of a PDTQ policy. (NOTE)	
recTimeInt	TimeWindow	M	1	This IE contains a recommended time window of a PDTQ policy.	
NOTE: The identity of a PDTQ policy shall be greater than zero.					

6.1.6.2.6 Type PdtqPolicyPatchData

Table 6.1.6.2.6-1: Definition of type PdtqPolicyPatchData

Attribute name	Data type	P	Cardinality	Description	Applicability
notifUri	Uri	O	0..1	This IE contains an URI of the recipient of the PDTQ notification.	
selPdtqPolicyId	integer	O	0..1	This IE contains an identity (i.e. the pdtqPolicyId value) of a selected PDTQ policy. (NOTE 2)	
warnNotifReq	boolean	O	0..1	This IE indicates whether the PDTQ warning notification is enabled or disabled. true: enabled; false: disabled.	
NOTE 1: At least one of the attributes shall be included. NOTE 2: The value "0" indicates that no PDTQ policy is selected.					

6.1.6.2.7 Type Notification

Table 6.1.6.2.7-1: Definition of type Notification

Attribute name	Data type	P	Cardinality	Description	Applicability
pdtqRefId	PdtqReferenceId	M	1	This IE identifies the PDTQ policy to which the notification corresponds.	
candPolicies	array(PdtqPolicy)	M	1..N	This IE contains a list of the candidate PDTQ policies from which the AF may select a new PDTQ policy.	

6.1.6.3 Simple data types and enumerations

6.1.6.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

6.1.6.3.2 Simple data types

The simple data types defined in table 6.1.6.3.2-1 shall be supported.

Table 6.1.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
PdtqReferenceId	string	Represents a PTDQ Reference ID.	

6.1.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combinations of data types defined for this API in this Release of the present document.

6.1.6.5 Binary data

6.1.6.5.1 Binary Data Types

Table 6.1.6.5.1-1: Binary Data Types

Name	Clause defined	Content type

6.1.7 Error Handling

6.1.7.1 General

For the Npcf_PDTQPolicyControl API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] 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 [4].

In addition, the requirements in the following clauses are applicable for the Npcf_PDTQPolicyControl API.

6.1.7.2 Protocol Errors

No specific procedures for the Npcf_PDTQPolicyControl service are specified.

6.1.7.3 Application Errors

The application errors defined for the Npcf_PDTQPolicyControl service are listed in table 6.1.7.3-1.

Table 6.1.7.3-1: Application errors

Application Error	HTTP status code	Description
PDTQ_POLICY_NOT_FOUND	404 Not Found	The HTTP request is rejected because the specified Individual PDTQ policy resource does not exist.
NOTE: Including a "ProblemDetails" data structure with the "cause" attribute in the HTTP response is optional unless explicitly mandated in the service operation clauses.		

6.1.8 Feature negotiation

The optional features in table 6.1.8-1 are defined for the Npcf_PDTQPolicyControl API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 6.1.8-1: Supported Features

Feature number	Feature Name	Description

6.1.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Npcf_PDTQPolicyControl API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If OAuth2 is used, an NF service consumer, prior to consuming services offered by the Npcf_PDTQPolicyControl API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 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_PDTQPolicyControl service.

The Npcf_PDTQPolicyControl API defines a single scope "npcf-pdtq-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

This Annex specifies the formal definition of the API(s) defined in the present specification. It consists of OpenAPI specifications in YAML format.

This Annex takes precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API(s).

NOTE 1: 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 files contained in this 3GPP Technical Specification are available on a Git-based repository that uses the GitLab software version control system (see clause 5.3.1 of 3GPP TS 29.501 [5] and clause 5B of 3GPP TR 21.900 [7]).

A.2 Npcf_PDTQPolicyControl API

```
openapi: 3.0.0

info:
  title: Npcf_PDTQPolicyControl API
  version: 1.0.0-alpha.6
  description: |
    PCF PDTQ Policy Control service.
    © <2024>, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.543 V18.0.0; 5G System; Data Transfer Policy Control Services; Stage 3.
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.543/'

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

security:
  - {}
  - oAuth2ClientCredentials:
    - npcf-pdtq-policy-control

paths:

  /pdtq-policies:
    post:
      summary: Creates a new Individual PDTQ policy resource.
      operationId: CreatePDTQPolicy
      tags:
        - PDTQ policies (Collection)
      requestBody:
        description: >
          Contains information for the creation of a new Individual PDTQ policy resource.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/PdtqPolicyData'
      responses:
        '201':
          description: >
            Created, an Individual PDTQ policy resource is created and a representation of that
```

```
        resource is returned.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/PdtqPolicyData'
      headers:
        Location:
          description: >
            Contains the URI of the created Individual PDTQ policy resource,
            according to the structure
            {apiRoot}/npcf-pdtq-policy-control/v1/pdtq-policies/{pdtqPolicyId}
          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'
    '502':
      $ref: 'TS29571_CommonData.yaml#/components/responses/502'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
    default:
      $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  callbacks:
    PDTQNotification:
      '{$request.body#/notifUri}':
        post:
          requestBody:
            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/Notification'
          responses:
            '204':
              description: >
                No Content, the reception of a PDTQ warning notification is acknowledged.
            '307':
              $ref: 'TS29571_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29571_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29571_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29571_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29571_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29571_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29571_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29571_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29571_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29571_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29571_CommonData.yaml#/components/responses/500'
            '502':
              $ref: 'TS29571_CommonData.yaml#/components/responses/502'
            '503':
              $ref: 'TS29571_CommonData.yaml#/components/responses/503'
```

```
              default:
                $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  /pdtq-policies/{pdtqPolicyId}:

    get:
      summary: Reads an Individual PDTQ policy resource.
      operationId: GetIndPDTQPolicy
      tags:
        - Individual PDTQ policy (Document)
      parameters:
        - name: pdtqPolicyId
          description: String identifying the individual PDTQ policy resource in the PCF.
          in: path
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK, a representation of an Individual PDTQ policy resource is returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PdtqPolicyData'
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29571_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

    patch:
      summary: Modifies an existing Individual PDTQ policy resource.
      operationId: ModifyIndPDTQPolicy
      tags:
        - Individual PDTQ policy (Document)
      parameters:
        - name: pdtqPolicyId
          description: String identifying the individual PDTQ policy resource in the PCF.
          in: path
          required: true
          schema:
            type: string
      requestBody:
        description: >
          Contains modifications that shall be applied on the existing Individual PDTQ
          policy resource.
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/PdtqPolicyPatchData'
      responses:
        '200':
          description: >
            OK, the Individual PDTQ policy resource is modified and a representation of
            that resource is returned.
          content:
            application/json:
              schema:
```

```
              $ref: '#/components/schemas/PdtqPolicyData'
        '204':
          description: No Content, the Individual PDTQ policy resource is modified.
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '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-pdtq-policy-control: Access to the Npcf_PDTQPolicyControl API

  schemas:

# Structured data types

    PdtqPolicyData:
      description: Describes an Individual PDTQ policy resource.
      type: object
      required:
        - aspId
        - desTimeInts
        - numOfUes
      oneOf:
        - required: [qosReference]
        - required: [qosParamSet]
      properties:
        altQosParamSets:
          description: >
            Contains the alternative QoS requirements expressed as the list of individual
            QoS parameter sets in a prioritized order. The lower the index of the array for
            a given entry, the higher the priority.
          type: array
          items:
            $ref: '#/components/schemas/AltQosParamSet'
          minItems: 1
        altQosRefs:
          description: >
            Contains the alternative QoS requirements expressed as the list of QoS References
            in a prioritized order. The lower the index of the array for a given entry, the
            higher the priority.
          type: array
          items:
            type: string
          minItems: 1
        appId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
```

```
      aspId:
        description: Contains an identity of an application service provider.
        type: string
      desTimeInts:
        description: Contains a list of desired time windows for PDTQ.
        type: array
        items:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
        minItems: 1
      dnn:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
      notifUri:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      nwAreaInfo:
        $ref: 'TS29554_Npcf_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'
      numOfUes:
        description: Indicates a number of UEs.
        type: integer
      pdtqPolicies:
        description: Contains PDTQ policies.
        type: array
        items:
          $ref: '#/components/schemas/PdtqPolicy'
        minItems: 1
      pdtqRefId:
        $ref: '#/components/schemas/PdtqReferenceId'
      qosParamSet:
        $ref: '#/components/schemas/QosParameterSet'
      qosReference:
        description: >
          Contains the requested QoS requirements expressed as the QoS Reference which
          represents a pre-defined QoS information.
        type: string
      selPdtqPolicyId:
        description: Contains the identity of the selected PDTQ policy.
        type: integer
      snssai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      suppFeat:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      warnNotifReq:
        description: >
          Indicates whether the PDTQ warning notification is enabled (true) or
          disabled (false). Default value is false.
        type: boolean
        default: false

  QosParameterSet:
    description: >
      Contains the QoS requirements expressed as one or more individual QoS parameters.
    type: object
    properties:
      extMaxBurstSize:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ExtMaxDataBurstVol'
      gfbrDl:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
      gfbrUl:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
      maxBitRateDl:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
      maxBitRateUl:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
      maxBurstSize:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/MaxDataBurstVol'
      pdb:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PacketDelBudget'
      per:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PacketErrRate'
      priorLevel:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/5QiPriorityLevel'

  AltQosParamSet:
    description: >
      Contains the alternative QoS requirements expressed as the list of individual QoS
      parameter sets.
    type: object
    properties:
      gfbrDl:
```

```
          $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
        gfbrUl:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
        pdb:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PacketDelBudget'
        per:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PacketErrRate'

    PdtqPolicy:
      description: Describes a PDTQ policy.
      type: object
      required:
      - pdtqPolicyId
      - recTimeInt
      properties:
        pdtqPolicyId:
          description: Contains an identity of a PDTQ policy.
          type: integer
        recTimeInt:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'

    PdtqPolicyPatchData:
      description: Represents modifications of an Individual PDTQ policy resource.
      type: object
      properties:
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        selPdtqPolicyId:
          description: Contains the identity of the selected PDTQ policy.
          type: integer
        warnNotifReq:
          description: >
            Indicates whether the PDTQ warning notification is enabled (true) or
            disabled (false).
          type: boolean

    Notification:
      description: Contains the PDTQ notification information.
      type: object
      required:
      - pdtqRefId
      - candPolicies
      properties:
        pdtqRefId:
          $ref: '#/components/schemas/PdtqReferenceId'
        candPolicies:
          description: >
            Contains a list of the candidate PDTQ policies from which the AF may select a new
            PDTQ policy.
          type: array
          items:
            $ref: '#/components/schemas/PdtqPolicy'
          minItems: 1

# Simple data types

    PdtqReferenceId:
      description: Represents a PTDQ Reference ID.
      type: string
```

Annex B (informative): Withdrawn API versions

B.1 General

This Annex lists withdrawn API versions of the APIs defined in the present specification. 3GPP TS 29.501 [5] clause 4.3.1.6 describes the withdrawal of API versions.

B.2 Npcf_PDTQPolicyControl API

The API versions listed in table B.2-1 are withdrawn for the Npcf_PDTQPolicyControl API.

Table B.2-1: Withdrawn API versions of the Npcf_PDTQPolicyControl service

API version number	Remarks

Annex C (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2023-03						TS template for 5G System; Data Transfer Policy Control Services	0.0.0
2023-04	CT3#127e	C3-231510				Inclusion of: C3-231477, C3-231478, C3-231479 and C3-231480.	0.1.0
2023-06	CT3#128	C3-232460				Inclusion of: C3-232059 and C3-232435.	0.2.0
2023-09	CT3#129	C3-233738				Inclusion of: C3-233070 and C3-233533.	0.3.0
2023-10	CT3#130	C3-234661				Inclusion of: C3-234444.	0.4.0
2023-11	CT3#131	C3-235464				Inclusion of: C3-235220 and C3-235477.	0.5.0
2023-12	CT#102	CP-233290				Presentation to TSG CT for information.	1.0.0
2024-03	CT#103	CP-240215				Presentation to TSG CT for approval.	2.0.0
2024-03	CT#103	CP-240215				Approved by TSG CT.	18.0.0

History

Document history		
V18.0.0	May 2024	Publication