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Contents

Foreword

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1 Scope

The present specification provides the stage 3 definition of the Background Data Transfer (BDT) Policy Control Service (Npcf_BDTPolicyControl) of the 5G System.

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The stage 2 definition and related procedures for BDT Policy Control Service are specified in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [4].

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

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [6] and 3GPP TS 29.501 [7].

The Policy Control Function (PCF) provides the BDT Policy Control Service. This service provides background data transfer policy negotiation function.

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

[6] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[7] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

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

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

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

[11] 3GPP TS 29.504: "5G System; Unified Data Repository Services; Stage 3".

[12] 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".

[13] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[14] 3GPP TS 29.122: "T8 reference point for Northbound APIs".

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

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

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

[18]   3GPP TS 33.501: "Security architecture and procedures for 5G system".

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

[20]   3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

[21]   3GPP TR 21.900: "Technical Specification Group working methods".

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].

Background data transfer: feature that enables a 3rd party service provider to keep their costs lower by favouring time windows for data transfer to specific UEs in a geographical area during non-busy hours that are less costly and able to handle larger bitrates.

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

5G System

Network Function

NF service

NF service operation

Service based interface

3.2　　Abbreviations

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

AF	Application Function
ASP	Application Service Provider
BDT	Background Data Transfer
JSON	JavaScript Object Notation
NEF	Network Exposure Function
NG-RAN	Next Generation - Radio Access Network
NRF	Network Repository Function
PCF	Policy Control Function
SBI	Service Based Interface
TAI	Tracking Area Identity
UDR	Unified Data Repository

4 Background Data Transfer Policy Control Service

4.1 Service Description

4.1.1 Overview

The BDT 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 enables the NF service consumer to negotiate policy for a future background data transfer and offers the following functionalities:

-   get background data transfer policies based on the request from the NEF; and

-   update background data transfer policies based on the selection provided by the NEF.

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 [5].

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

The only known NF service consumer of the Npcf_BDTPolicyControl service is the Network Exposure Function (NEF).

The NEF accesses the BDT Policy Control Service 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.
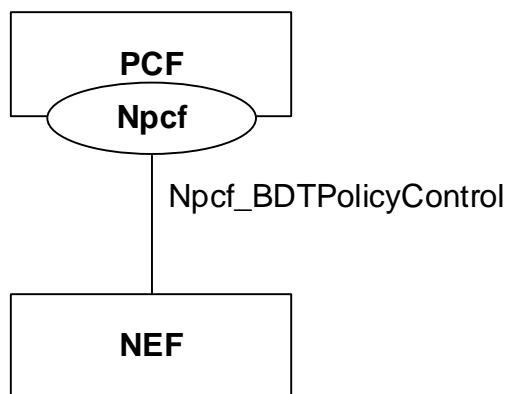
Figure 4.1.2-1: Reference Architecture for the Npcf_BDTPolicyControl Service; SBI representation
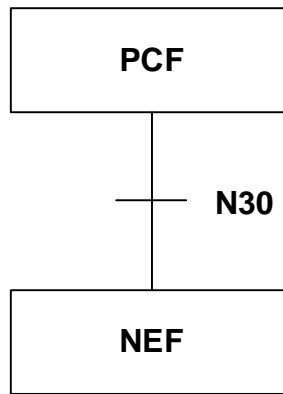
Figure 4.1.2-2: Reference Architecture for the Npcf_BDTPolicyControl Service; reference point representation

4.1.3 Network Functions

4.1.3.1 Policy Control Function (PCF)

The Policy Control Function (PCF):

- Provides background data transfer policies based on the request from the NEF. The PCF determines, based on information provided by the NEF and other available information (e.g. network policy, load status estimation for the requested time window, network area, etc.) one or more transfer policies.

- Updates background data transfer policy based on the selection provided by the NEF.

4.1.3.2 NF Service Consumers

The Network Exposure Function (NEF):

- requests the PCF to provide background data transfer policies; and

- provides the selected background data transfer policy to the PCF.

4.2 Service Operations

4.2.1 Introduction

Table 4.2.1-1: Operations of the Npcf_BDTPolicyControl Service

Service operation name	Description	Initiated by
Npcf_BDTPolicyControl_Create	Provides the requested background data transfer policies to the NF service consumer.	NF service consumer (NEF)
Npcf_BDTPolicyControl_Update	Updates the PCF with the background data transfer policy selected by the NF service consumer.	NF service consumer (NEF)

4.2.2 Npcf_BDTPolicyControl_Create service operation

4.2.2.1 General

The Npcf_BDTPolicyControl_Create service operation is used by an NF service consumer to retrieve BDT policies from the PCF.

The following procedure using the Npcf_BDTPolicyControl_Create service operation is supported:

- retrieval of BDT policies.

4.2.2.2 Retrieval of BDT policies

This procedure is used by the NEF to request BDT policies from the PCF, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [4].

Figure 4.2.2.2-1 illustrates a retrieval of BDT policies.
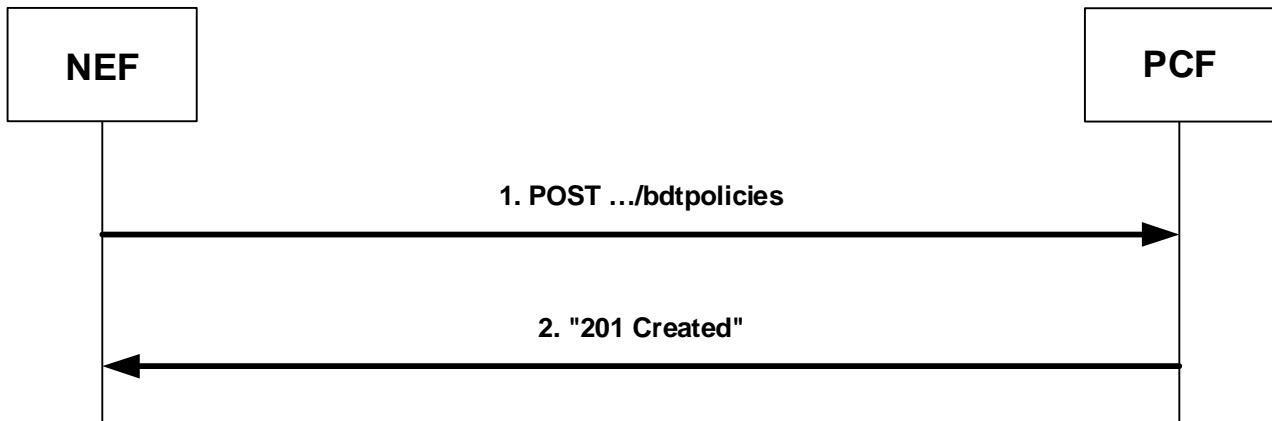
Figure 4.2.2.2-1: Retrieval of BDT policies

Upon reception of a Background Data Transfer request from the AF indicating a transfer policy request, the NEF shall invoke the Npcf_BDTPolicyControl_Create service operation by sending an HTTP POST request to the URI representing a "BDT policies" collection resource of the PCF (as shown in figure 4.2.2.2-1, step 1). The NEF shall include a "BdtReqData" data type in a payload body of the HTTP POST request. The "BdtReqData" data type shall contain:

- an ASP identifier in the "aspId" attribute;

- a volume of data per UE in the "volPerUe" attribute;

- an expected number of UEs in the "numOfUes" attribute; and

- a desired time window in the "desTimeInt" attribute,

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

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, the PCF shall send the HTTP error response as specified in subclause 5.7.

Otherwise, upon the reception of the HTTP POST request from the NEF indicating a BDT policies request, the PCF:

- may invoke the Nudr_DataRepository_Query service operation, as described in 3GPP TS 29.504 [11] and 3GPP TS 29.519 [12], to request from the UDR all stored transfer policies;

NOTE 1: In case only one PCF is deployed in the network, transfer policies can be locally stored in the PCF and the interaction with the UDR is not required.

- shall determine one or more acceptable transfer policies based on:

    a) information provided by the NEF; and

    b) other available information (e.g. the existing transfer policies, network policy, load status estimation for the desired time window); and

- shall create a BDT Reference ID.

The PCF shall send to the NEF a "201 Created" response to the HTTP POST request, as shown in figure 4.2.2.2-1, step 2. The PCF shall include in the "201 Created" response:

- a Location header field; and

- a "BdtPolicy" data type in the payload body containing the BDT Reference ID in the "bdtRefId" attribute and acceptable transfer policy/ies in the "transfPolicies" attribute.

The Location header field shall contain the URI of the created individual BDT policy resource i.e. "{apiRoot}/npcf-bdtpolicycontrol/v1/bdtpolicies/{bdtPolicyId}".

For each included transfer policy, the PCF shall provide:

- a transfer policy ID in the "transPolicyId" attribute;

- a recommended time window in the "recTimeInt" attribute; and

- a reference to charging rate for the recommended time window in the "ratingGroup" attribute,

and may provide a maximum aggregated bitrate for the uplink direction in the "maxBitRateUl" attribute and/or a maximum aggregated bitrate for the downlink direction in the "maxBitRateDl" attribute.

If the PCF included in the "BdtPolicy" data type:

- more than one transfer policy, the PCF shall wait for the transfer policy selected by the NEF as described in subclause 4.2.3; or

- only one transfer policy, the PCF may invoke the Nudr_DataRepository_Update service operation, as described in 3GPP TS 29.504 [11] and 3GPP TS 29.519 [12], to update the UDR with the selected transfer policy, the corresponding BDT Reference ID, the volume of data per UE, the expected number of UEs and if available a network area information for the provided ASP identifier.

NOTE 2: In case only one PCF is deployed in the network, transfer policies can be locally stored in the PCF and the interaction with the UDR is not required.

4.2.3 Npcf_BDTPolicyControl_Update service operation

4.2.3.1 General

The Npcf_BDTPolicyControl_Update service operation is used by an NF service consumer to update a BDT policy to the PCF.

The following procedure using the Npcf_BDTPolicyControl_Update service operation is supported:

- indication about selected transfer policy.

4.2.3.2 Indication about selected transfer policy

This procedure is used by the NEF to inform the PCF about selected transfer policy, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [4].

Figure 4.2.3.2-1 illustrates an indication about selected transfer policy.
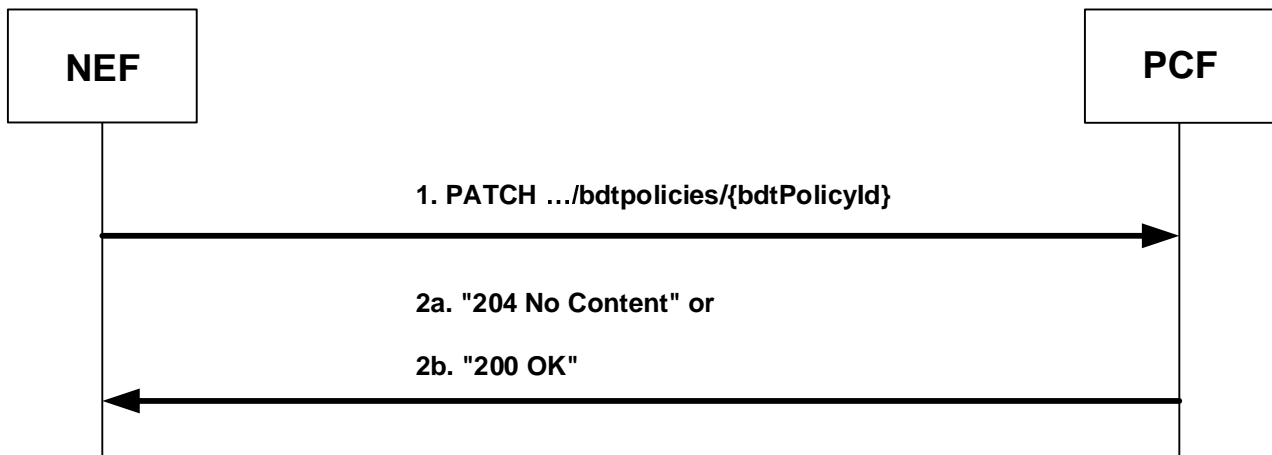
Figure 4.2.3.2-1: Indication about selected transfer policy

Upon reception of a Background Data Transfer request from the AF indicating transfer policy selection, the NEF shall invoke the Npcf_BDTPolicyControl_Update service operation by sending an HTTP PATCH request to the PCF, as shown in figure 4.2.3.2-1, step 1. The NEF shall set the request URI to "{apiRoot}/npcf-bdtpolicycontrol/v1/bdtpolicies/{bdtPolicyId}".

The NEF shall include a "BdtPolicyDataPatch" data type in a payload body of the HTTP PATCH request. The "BdtPolicyDataPatch" data type shall contain a transfer policy ID of the selected transfer policy in the "selTransPolicyId" attribute.

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, the PCF shall send the HTTP error response as specified in subclause 5.7.

Otherwise, upon the reception of the HTTP PATCH request from the NEF indicating a selected transfer policy, the PCF:

- may invoke the Nudr_DataRepository_Update service operation, as described in 3GPP TS 29.504 [11] and 3GPP TS 29.519 [12], to update the UDR with the selected transfer policy, the corresponding BDT Reference ID, the volume of data per UE, the expected number of UEs and if available a network area information for the provided ASP identifier;

NOTE: In case only one PCF is deployed in the network, transfer policies can be locally stored in the PCF and the interaction with the UDR is not required.

- shall send:

    a) a "204 No Content" response (as shown in figure 4.2.3.2-1, step 2a); or

    b) a "200 OK" response (as shown in figure 4.2.3.2-1, step 2b) with a "BdtPolicy" data type in the payload body,

    to the HTTP PATCH request to the NEF.

5 Npcf_BDTPolicyControl API

5.1 Introduction

The BDT Policy Control Service shall use the Npcf_BDTPolicyControl API.

The request URI used in each HTTP request from the NF service consumer towards the PCF shall have the structure defined in subclause 4.4.1 of 3GPP TS 29.501 [7], i.e.:

{apiRoot}/{apiName}/{apiVersion}/{apiSpecificResourceUriPart}

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [7].

- The {apiName} shall be "npcf-bdtpolicycontrol".

- The {apiVersion} shall be "v1".

- The {apiSpecificResourceUriPart} shall be set as described in subclause 5.3.

5.2 Usage of HTTP

5.2.1 General

HTTP/2, IETF RFC 7540 [8], shall be used as specified in subclause 5.2 of 3GPP TS 29.500 [6].

HTTP/2 shall be transported as specified in subclause 5.3 of 3GPP TS 29.500 [6].

The OpenAPI [10] specification of HTTP messages and content bodies for the Npcf_BDTPolicyControl is contained in Annex A.

5.2.2 HTTP standard headers

5.2.2.1 General

See subclause 5.2.2 of 3GPP TS 29.500 [6] for the usage of HTTP standard headers.

5.2.2.2 Content type

JSON, IETF RFC 8259 [9], shall be used as content type of the HTTP bodies specified in the present specification as specified in subclause 5.4 of 3GPP TS 29.500 [6]. The use of the JSON format shall be signalled by the content type "application/json".

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 [15].

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [17].

5.2.3 HTTP custom headers

The Npcf_BDTPolicyControl API shall support HTTP custom header fields specified in subclause 5.2.3.2 of 3GPP TS 29.500 [6].

In this Release of the specification, no specific custom headers are defined for the Npcf_BDTPolicyControl API.

5.3 Resources

5.3.1 Resource Structure

{apiRoot}/npcf-bdtpolicycontrol/v1

/bdtpolicies
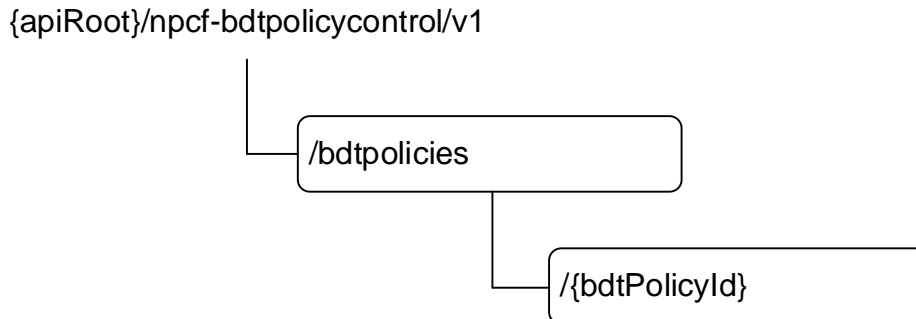
/{bdtPolicyId}

Figure 5.3.1-1: Resource URI structure of the Npcf_BDTPolicyControl API

Table 5.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 5.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
BDT policies	{apiRoot}/npcf-bdtpolicycontrol/v1/ bdtpolicies	POST	Npcf_BDTPolicyControl_Create. Creates a new Individual BDT policy resource.
Individual BDT policy	{apiRoot}/npcf-bdtpolicycontrol/v1/ bdtpolicies/{bdtPolicyId}	GET	Reads an Individual BDT policy resource.
		PATCH	Npcf_BDTPolicyControl_Update. Modifies an existing Individual BDT policy resource by selecting or reselecting a transfer policy.

5.3.2 Resource: BDT policies (Collection)

5.3.2.1 Description

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

5.3.2.2 Resource definition

Resource URI: **{apiRoot}/npcf-bdtpolicycontrol/v1/bdtpolicies**

This resource shall support the resource URI variables defined in table 5.3.2.2-1.

Table 5.3.2.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	See subclause 5.1.

5.3.2.3 Resource Standard Methods

5.3.2.3.1 POST

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

Table 5.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.3.2.3.1-2 and the response data structures and response codes specified in table 5.3.2.3.1-3.

Table 5.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

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

Table 5.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response Codes	Description
BdtPolicy	M	1	201 Created	Successful case. The creation of an Individual BDT policy resource is confirmed and a representation of that resource is returned.
n/a			303 See Other	The result of the HTTP POST request would be equivalent to the existing Individual BDT policy resource. The HTTP response shall contain a Location header field set to the URI of the existing individual BDT policy resource.
NOTE:	In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [6] for the POST method shall also apply.			

5.3.2.4 Resource Custom Operations

None.

5.3.3 Resource: Individual BDT policy (Document)

5.3.3.1 Description

The Individual BDT policy resource represents the transfer policies that exist in the BDT Policy Control service at a given PCF instance.

5.3.3.2 Resource definition

Resource URI: **{apiRoot}/npcf-bdtpolicycontrol/v1/bdtpolicies/{bdtPolicyId}**

This resource shall support the resource URI variables defined in table 5.3.3.2-1.

Table 5.3.3.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	See subclause 5.1.
bdtPolicyId	String identifying the individual BDT 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 subclause 5.1.3 of 3GPP TS 29.501 [7] and rules for a path segment defined in IETF RFC 3986 [16].

5.3.3.3 Resource Standard Methods

5.3.3.3.1 GET

This method shall support the URI query parameters specified in table 5.3.3.3.1-1.

Table 5.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.3.3.3.1-2 and the response data structures and response codes specified in table 5.3.3.3.1-3.

Table 5.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
BdtPolicy	M	1	200 OK	A representation of an Individual BDT policy resource is returned.
ProblemDetails	M	1	404 Not Found	(NOTE 2)
NOTE 1: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [6] for the GET method shall also apply.				
NOTE 2: Failure cases are described in subclause 5.7.				

5.3.3.3.2 PATCH

This method shall support the URI query parameters specified in table 5.3.3.3.2-1.

Table 5.3.3.3.2-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.3.3.3.2-2 and the response data structures and response codes specified in table 5.3.3.3.2-3.

Table 5.3.3.3.2-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
BdtPolicyDataPatch	M	1	Contains modification instructions to be performed on the BdtPolicy data structure to select a transfer policy.

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

Data type	P	Cardinality	Response Codes	Description
BdtPolicy	M	1	200 OK	Successful case. The Individual BDT Policy resource is modified and a representation of that resource is returned.
n/a			204 No Content	Successful case. The Individual BDT Policy resource is modified.
ProblemDetails	M	1	404 Not Found	(NOTE 2)
NOTE 1: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [6] for the PATCH method shall also apply.				
NOTE 2: Failure cases are described in subclause 5.7.				

5.4 Custom Operations without associated resources

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

5.5 Notifications

Notifications are not applicable for the current Release.

5.6 Data Model

5.6.1 General

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

Table 5.6.1-1 specifies the data types defined for the Npcf_BDTPolicyControl service based interface protocol.

Table 5.6.1-1: Npcf_BDTPolicyControl specific Data Types

Data type	Section defined	Description	Applicability
BdtPolicy	5.6.2.2	Represents an Individual BDT policy resource.	
BdtPolicyData	5.6.2.4	Describes an Individual BDT policy resource.	
BdtPolicyDataPatch	5.6.2.6	Contains modification instructions to be performed on the BdtPolicy data structure to select a transfer policy.	
BdtReqData	5.6.2.3	Contains information for creation a new Individual BDT policy resource.	
NetworkAreaInfo	5.6.2.8	Describes a network area information in which the NF service consumer requests the number of UEs.	
TransferPolicy	5.6.2.5	Describes a transfer policy.	

Table 5.6.1-2 specifies data types re-used by the Npcf_BDTPolicyControl 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_BDTPolicyControl service based interface.

Table 5.6.1-2: Npcf_BDTPolicyControl re-used Data Types

Data type	Reference	Comments	Applicability
BdtReferenceId	3GPP TS 29.122 [14]	Identifies transfer policy of background data transfer for provided ASP.	
BitRate	3GPP TS 29.571 [13]	Specifies bitrate in kbits per second.	
Ecgi	3GPP TS 29.571 [13]	Represents an EUTRA cell identifier.	
GlobalRanNodeId	3GPP TS 29.571 [13]	Represents an identity of the NG-RAN node.	
Ncgi	3GPP TS 29.571 [13]	Represents an NR cell identifier.	
ProblemDetails	3GPP TS 29.571 [13]	Used in error responses to provide more detailed information about an error.	
SupportedFeatures	3GPP TS 29.571 [13]	Used to negotiate the applicability of the optional features defined in table 5.8-1.	
Tai	3GPP TS 29.571 [13]	Represents a tracking area identity.	
TimeWindow	3GPP TS 29.122 [14]	Specifies a time interval.	
UsageThreshold	3GPP TS 29.122 [14]	Represents a data volume expected to be transferred per UE.	

5.6.2 Structured data types

5.6.2.1 Introduction

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

5.6.2.2 Type BdtPolicy

Table 5.6.2.2-1: Definition of type BdtPolicy

Attribute name	Data type	P	Cardinality	Description	Applicability
bdtPolData	BdtPolicyData	C	0..1	Describes the authorization data of an Individual BDT Policy created by the PCF. It shall be present in the response to the POST request that requests a creation of an Individual BDT Policy resource and in the response to GET request.	
bdtReqData	BdtReqData	C	0..1	Identifies the service requirements of an Individual BDT Policy. It shall be present in the POST request that requests a creation of an Individual BDT Policy resource and in the response to GET request.	

5.6.2.3 Type BdtReqData

Table 5.6.2.3-1: Definition of type BdtReqData

Attribute name	Data type	P	Cardinality	Description	Applicability
aspId	AspId	M	1	This IE contains an identity of an application service provider.	
desTimeInt	TimeWindow	M	1	This IE indicates a desired time window for BDT.	
nwAreaInfo	NetworkAreaInfo	O	0..1	This IE represents a network area information in which the NF service consumer requests a number of UEs. It may be present in the POST request that requests a creation of an Individual BDT Policy and in the response to GET request.	
numOfUes	integer	M	1	This IE indicates a number of UEs.	
suppFeat	SupportedFeatures	C	0..1	This IE represents a list of Supported features used as described in subclause 5.8. It shall be supplied by the NF service consumer in the POST request that request a creation of an Individual BDT Policy resource.	
volPerUe	UsageThreshold	M	1	This IE indicates a data volume expected to be transferred per UE.	

5.6.2.4 Type BdtPolicyData

Table 5.6.2.4-1: Definition of type BdtPolicyData

Attribute name	Data type	P	Cardinality	Description	Applicability
bdtRefId	BdtReferenceId	M	1	This IE indicates transfer policies of background data transfer for provided ASP.	
selTransPolicyId	integer	C	0..1	This IE contains the identity of the selected transfer policy. It shall be present in the response to the PATCH request that modifies an Individual BDT Policy resource to indicate a selected transfer policy.	
suppFeat	SupportedFeatures	C	0..1	This IE represents a list of Supported features used as described in subclause 5.8. It shall be supplied by the PCF in the response to the POST request that requests a creation of an Individual BDT Policy resource.	
transfPolicies	array(TransferPolicy)	M	1..N	This IE contains transfer policies. It shall be supplied by the PCF in the response to the POST request that requests a creation of an Individual BDT Policy resource.	

5.6.2.5 Type TransferPolicy

Table 5.6.2.5-1: Definition of type TransferPolicy

Attribute name	Data type	P	Cardinality	Description	Applicability
maxBitRateDl	BitRate	O	0..1	This IE indicates a maximum aggregated bitrate in the downlink direction authorized by the PCF.	
maxBitRateUl	BitRate	O	0..1	This IE indicates a maximum aggregated bitrate in the uplink direction authorized by the PCF.	
ratingGroup	integer	M	1	This IE indicates a rating group for the recommended time window.	
recTimeInt	TimeWindow	M	1	This IE indicates a recommended time window of a transfer policy.	
transPolicyId	integer	M	1	This IE contains an identity of a transfer policy.	

5.6.2.6 Type BdtPolicyDataPatch

Table 5.6.2.6-1: Definition of type BdtPolicyDataPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
selTransPolicyId	integer	M	1	This IE contains an identity (i.e. the transPolicyId value) of a selected transfer policy.	

5.6.2.7 Void

5.6.2.8 Type NetworkAreaInfo

Table 5.6.2.8-1: Definition of type NetworkAreaInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
ecgis	array(Ecgi)	O	1..N	This IE contains a list of E-UTRA cell identities.	
ncgis	array(Ncgi)	O	1..N	This IE contains a list of NR cell identities.	
gRanNodeIds	array(GlobalRanNodeId)	O	1..N	This IE contains a list of the NG-RAN nodes. The "n3IwfId" attribute within the "GlobalRanNodeId" data type shall not be supplied.	
tais	array(Tai)	O	1..N	This IE contains a list of tracking area identities.	
NOTE: The NetworkAreaInfo data type allows any combination of defined properties.					

5.6.2.9 Void

5.6.3 Simple data types and enumerations

5.6.3.1 Introduction

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

5.6.3.2 Simple data types

The simple data types defined in table 5.6.3.2-1 shall be supported.

Table 5.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
AspId	string	This IE contains an identity of an application service provider.	

5.7 Error handling

5.7.1 General

HTTP error handling shall be supported as specified in subclause 5.2.4 of 3GPP TS 29.500 [6].

For the Npcf_BDTPolicyControl API, HTTP error responses shall be supported as specified in subclause 4.8 of 3GPP TS 29.501 [7]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [6] 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 [6]. In addition, the requirements in the following subclauses shall apply.

5.7.2 Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the Npcf_BDTPolicyControl API.

5.7.3 Application Errors

The application errors defined for the Npcf_BDTPolicyControl API are listed in table 5.7.3-1. The PCF shall include in the HTTP status code a "ProblemDetails" data structure with the "cause" attribute indicating the application error as listed in table 5.7.3-1.

Table 5.7.3-1: Application errors

Application Error	HTTP status code	Description
BDT_POLICY_NOT_FOUND	404 Not Found	The HTTP request is rejected because the specified Individual BDT policy resource does not exist. (NOTE)
NOTE: This application error is included in the responses to the GET and PATCH requests.		

5.8 Feature negotiation

The optional features in table 5.8-1 are defined for the Npcf_BDTPolicyControl API. They shall be negotiated using the extensibility mechanism defined in subclause 6.6.2 of 3GPP TS 29.500 [6].

When requesting the PCF to create an Individual BDT policy resource the NF service consumer shall indicate the optional features the NF service consumer supports for the Npcf_BDTPolicyControl service by including the "suppFeat" attribute in the "BdtReqData" data type of the HTTP POST request.

The PCF shall determine the supported features for the created Individual BDT policy resource as specified in subclause 6.6.2 of 3GPP TS 29.500 [6]. The PCF shall indicate the supported features in the HTTP response confirming the creation of the Individual BDT policy resource by including the "suppFeat" attribute in the "BdtPolicyData" data type.

Table 5.8-1: Supported Features

Feature number	Feature Name	Description

5.9 Security

As indicated in 3GPP TS 33.501 [18] and 3GPP TS 29.500 [6], the access to the Npcf_BDTPolicyControl API, based on local configuration, may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [19]), using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [20]) plays the role of the authorization server.

If OAuth2 authorization is used, an NF Service Consumer, prior to consuming services offered by the Npcf_BDTPolicyControl API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [20], subclause 5.4.2.2.

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

The Npcf_BDTPolicyControl API defines a single scope "npcf-bdtpolicycontrol" for OAuth2 authorization (as specified in 3GPP TS 33.501 [18]) for the entire API, and it does not define any additional scopes at resource or operation level.

Annex A (normative):
OpenAPI specification

A.1 General

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

This Annex shall take precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API.

NOTE 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 file contained in this 3GPP Technical Specification are available on the public 3GPP file server in the following locations (see clause 5B of the 3GPP TR 21.900 [21] for further information):

- https://www.3gpp.org/ftp/Specs/archive/OpenAPI/<Release>/; and

- https://www.3gpp.org/ftp/Specs/<Plenary>/<Release>/OpenAPI/.

NOTE 2: To fetch the OpenAPI specification file after CT#83 plenary meeting for Release 15 in the above links <Plenary> must be replaced with the date the CT Plenary occurs, in the form of year-month (yyyy-mm), e.g. for CT#83 meeting <Plenary> must be replaced with value "2019-03" and <Release> must be replaced with value "Rel-15".

A.2 Npcf_BDTPolicyControl API

```
openapi: 3.0.0
info:
  title: Npcf_BDTPolicyControl Service API
  version: 1.0.1
  description: |
    PCF BDT Policy Control Service.
    © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
#
externalDocs:
  description: 3GPP TS 29.554 V15.4.0; 5G System; Background Data Transfer Policy Control Service.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.554/'
#
servers:
  - url: '{apiRoot}/npcf-bdtpolicycontrol/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 4.4 of 3GPP TS 29.501.
security:
  - {}
  - oAuth2ClientCredentials:
    - npcf-bdtpolicycontrol
paths:
  /bdtpolicies:
    post:
      summary: Create a new Individual BDT policy
      operationId: CreateBDTPolicy
      tags:
        - BDT policies (Collection)
      requestBody:
        description: Contains information for the creation of a new Individual BDT policy resource.
        required: true
        content:
          application/json:
```

```
              schema:
                $ref: '#/components/schemas/BdtReqData'
      responses:
        '201':
          description: Background data transfer policies offered to an ASP.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/BdtPolicy'
          headers:
            Location:
              description: 'Contains the URI of the created individual BDT policy resource,
according to the structure: {apiRoot}/npcf-bdtpolicycontrol/v1/bdtpolicies/{bdtPolicyId}'
              required: true
              schema:
                type: string
#
# Error scenarios POST
#
        '303':
          description: See Other. The result of the POST request would be equivalent to the existing
Individual BDT policy resource. The HTTP response shall contain a Location header field set to the
URI of the existing individual BDT policy resource.
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
#
# End error scenarios POST
#
  /bdtpolicies/{bdtPolicyId}:
    get:
      summary: Read an Individual BDT policy
      operationId: GetBDTPolicy
      tags:
        - Individual BDT policy (Document)
      parameters:
        - name: bdtPolicyId
          description: String identifying the individual BDT policy resource in the PCF.
          in: path
          required: true
          schema:
            type: string
      responses:
        '200':
          description: Background data transfer policies offered to and selected by an ASP.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/BdtPolicy'
#
# Error scenarios GET
#
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
```

```
              $ref: 'TS29571_CommonData.yaml#/components/responses/404'
            '406':
              $ref: 'TS29571_CommonData.yaml#/components/responses/406'
            '429':
              $ref: 'TS29571_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29571_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29571_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29571_CommonData.yaml#/components/responses/default'
#
# End error scenarios GET
#
    patch:
      summary: Update an Individual BDT policy
      operationId: UpdateBDTPolicy
      tags:
        - Individual BDT policy (Document)
      parameters:
      - name: bdtPolicyId
        description: String identifying the individual BDT policy resource in the PCF.
        in: path
        required: true
        schema:
          type: string
      requestBody:
        description: Contains modification instruction to be performed on the BdtPolicy data
structure to select a transfer policy.
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/BdtPolicyDataPatch'
      responses:
        '200':
          description: The Individual BDT Policy resource is modified and a representation of that
resource is returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/BdtPolicy'
        '204':
          description: The Individual BDT Policy resource is modified.
#
# Error scenarios PATCH
#
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
#
# End error scenarios PATCH
#
#
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
```

```
          clientCredentials:
            tokenUrl: '{nrfApiRoot}/oauth2/token'
            scopes:
              npcf-bdtpolicycontrol: Access to the Npcf_BDTPolicyControl API
  schemas:
#
# Structured data types
#
    BdtPolicy:
      description: Represents an Individual BDT policy resource.
      type: object
      properties:
        bdtPolData:
          $ref: '#/components/schemas/BdtPolicyData'
        bdtReqData:
          $ref: '#/components/schemas/BdtReqData'
#
    BdtReqData:
      description: Contains service requirements for creation a new Individual BDT policy resource.
      type: object
      required:
      - aspId
      - desTimeInt
      - numOfUes
      - volPerUe
      properties:
        aspId:
          $ref: '#/components/schemas/AspId'
        desTimeInt:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
        nwAreaInfo:
          $ref: '#/components/schemas/NetworkAreaInfo'
        numOfUes:
          description: Indicates a number of UEs.
          type: integer
        volPerUe:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/UsageThreshold'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
#
    BdtPolicyData:
      description: Describes the authorization data of an Individual BDT policy resource.
      type: object
      required:
      - bdtRefId
      - transfPolicies
      properties:
        bdtRefId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/BdtReferenceId'
        transfPolicies:
          description: Contains transfer policies.
          type: array
          items:
            $ref: '#/components/schemas/TransferPolicy'
          minItems: 1
        selTransPolicyId:
          description: Contains an identity of the selected transfer policy.
          type: integer
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
#
    BdtPolicyDataPatch:
      description: A JSON Merge Patch body schema containing modification instruction to be
performed on the BdtPolicy data structure to select a transfer policy. Adds selTransPolicyId to
BdtPolicyData data structure.
      type: object
      required:
      - selTransPolicyId
      properties:
        selTransPolicyId:
          description: Contains an identity (i.e. transPolicyId value) of the selected transfer
policy.
          type: integer
#
    TransferPolicy:
      description: Describes a transfer policy.
      type: object
      required:
```

```
          - ratingGroup
          - recTimeInt
          - transPolicyId
        properties:
          maxBitRateDl:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
          maxBitRateUl:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
          ratingGroup:
            description: Indicates a rating group for the recommended time window.
            type: integer
          recTimeInt:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
          transPolicyId:
            description: Contains an identity of a transfer policy.
            type: integer
    NetworkAreaInfo:
        description: Describes a network area information in which the NF service consumer requests
the number of UEs.
        type: object
        properties:
          ecgis:
            description: Contains a list of E-UTRA cell identities.
            type: array
            items:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/Ecgi'
            minItems: 1
          ncgis:
            description: Contains a list of NR cell identities.
            type: array
            items:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/Ncgi'
            minItems: 1
          gRanNodeIds:
            description: Contains a list of NG RAN nodes.
            type: array
            items:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/GlobalRanNodeId'
            minItems: 1
          tais:
            description: Contains a list of tracking area identities.
            type: array
            items:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/Tai'
            minItems: 1
#
# Simple data types
#
    AspId:
        description: Contains an identity of an application service provider.
        type: string
#
#
```

Annex B (informative):
Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Cat	Subject/Comment	New version
2018-01						TS skeleton	0.0.0
2018-01	CT3#94	C3-180369				Inclusion of C3-180188 agreed in CT3#94.	0.1.0
2018-03	CT3#95	C3-181376				Inclusion of documents agreed in CT3#95: C3-181055, C3-181091, C3-181268, C3-181269, C3-181270.	0.2.0
2018-04	CT3#96	C3-182524				Inclusion of documents agreed in CT3#96: C3-182048, C3-182428, C3-182427, C3-182051, C3-182052, C3-182053, C3-182429, C3-182454, C3-182430, C3-182232.	0.3.0
2018-06	CT3#97	C3-183915				Inclusion of documents agreed in CT3#97: C3-183241, C3-183280, C3-183289, C3-183291, C3-183292, C3-183297, C3-183298, C3-183562, C3-183563, C3-183564, C3-183565, C3-183714, C3-183869.	0.4.0
2018-06	CT#80	CP-181028				TS sent to plenary for approval	1.0.0
2018-06	CT#80	CP-181028				TS approved by plenary	15.0.0
2018-09	CT#81	CP-182015	0001	1	B	Format of bdtPolicyId	15.1.0
2018-09	CT#81	CP-182015	0002	4	B	Network area information	15.1.0
2018-09	CT#81	CP-182015	0003	1	F	Description of Structured data types	15.1.0
2018-09	CT#81	CP-182015	0004	1	F	Resource structure presentation	15.1.0
2018-09	CT#81	CP-182015	0005	1	F	Removal of externalDoc field	15.1.0
2018-09	CT#81	CP-182015	0006		F	Corrections related to Feature negotiation	15.1.0
2018-09	CT#81	CP-182015	0007		F	"404 Not found" response in OpenAPI	15.1.0
2018-12	CT#82	CP-183205	0008	1	F	Correction of apiName	15.2.0
2018-12	CT#82	CP-183205	0010		F	Supported content types	15.2.0
2018-12	CT#82	CP-183205	0011		F	Definition of BdtPolicyData structure	15.2.0
2018-12	CT#82	CP-183205	0012		F	Non-empty arrays in OpenAPI file	15.2.0
2018-12	CT#82	CP-183205	0013	1	F	Adding the externalDocs field in the OpenAPI	15.2.0
2018-12	CT#82	CP-183205	0014		F	Adding HTTP status code "200 OK"	15.2.0
2018-12	CT#82	CP-183205	0015	1	F	Error indicating "Unspecified resource URI structure"	15.2.0
2018-12	CT#82	CP-183205	0016	3	F	Npcf_BDTPolicyControl API Authorization based on OAuth2	15.2.0
2018-12	CT#82	CP-183205	0017	1	F	API version update	15.2.0
2018-12	CT#82	CP-183205	0018		F	Default value for apiRoot	15.2.0
2018-12	CT#82	CP-183205	0019	1	F	OpenAPI: HTTP status codes alignment	15.2.0
2018-12	CT#82	CP-183205	0020	1	F	NgRanNodeId definition in OpenAPI	15.2.0
2018-12	CT#82	CP-183205	0021		F	OpenAPI: usage of the "tags" keyword	15.2.0
2018-12	CT#82	CP-183205	0022		F	Location header field in OpenAPI	15.2.0
2018-12	CT#82	CP-183205	0023	1	F	Data structure used in PATCH request	15.2.0
2019-03	CT#83	CP-190112	0024		F	Alignment of the BDT procedures	15.3.0
2019-06	CT#84	CP-191084	0025	1	F	Storage and precedence of OpenAPI specification file	15.4.0
2019-06	CT#84	CP-191084	0028	1	F	Copyright Note in YAML file	15.4.0
2019-06	CT#84	CP-191084	0030		F	OpenAPI version number update	15.4.0

History

Document history		
V15.0.0	July 2018	Publication
V15.1.0	October 2018	Publication
V15.2.0	April 2019	Publication
V15.3.0	April 2019	Publication
V15.4.0	October 2019	Publication