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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
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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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1   presented to TSG for information;

2   presented to TSG for approval;

3   or greater indicates TSG approved document under change control.

y   the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z   the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

shall   indicates a mandatory requirement to do something

shall not   indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

should   indicates a recommendation to do something

should not   indicates a recommendation not to do something

may   indicates permission to do something

need not   indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

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 Access and Mobility Policy Authorization service (Npcf_AMPolicyAuthorization) of the 5G System.

The 5G System stage 2 architecture of the Access and Mobility Policy Authorization service are contained in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14]. The 5G System Architecture is defined in 3GPP TS 23.501 [2].

Stage 3 call flows for policy and charging control use cases 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].

The Access and Mobility Policy Authorization service is provided by the Policy Control Function (PCF). This service creates access and mobility policies (e.g. service area restrictions, or access stratum time distribution information) as requested by an authorized NF service consumer (e.g. AF, NEF, or TSCTSF) for the Access and Mobility Policy Context to which the related NF service consumer's context (e.g. AF, NEF, or TSCTSF) is bound. This service also enables subscription/notifications on UE 5G ProSe Policy event(s) related to the UE context to which the NF service consumer's context (e.g. 5G DDNMF) is bound.

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 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".

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

[13]   IETF RFC 7807: "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 29.507: "5G System; Access and Mobility Policy Control Service; Stage 3".

[17]   3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

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

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

[20]   3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[21]   3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".

[22]   3GPP TS 23.304: "Proximity based Services (ProSe) in the 5G System (5GS)".

[23]   3GPP TS 24.555: "Proximity-services (ProSe) in 5G System (5GS); User Equipment (UE) policies; Stage 3".

[24]   3GPP TS 29.555: "5G System; 5G Direct Discovery Name Management Services; Stage 3".

[25]   3GPP TS 29.565: "5G System; Time Sensitive Communication and Time Synchronization Function Services; Stage 3".

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].

Application Function (AF): Element acting on behalf of applications(s) that require the control of the Access and Mobility context of a UE, which can in turn lead to e.g. Service Area Restrictions and/or RFSP changes.

AF application AM context: Information about the capabilities that an AF application requires from the access network for a registered UE. It is established by the AF before or during the use of the service that requires it.

NF service consumer AM context: Information about the capabilities that a NF service consumer requires from the access network for a registered UE.

3.2   Symbols

None.

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].

5G DDNMF	5G Direct Discovery Name Management Function
AF	Application Function
AMF	Access and Mobility Management Function
JSON	JavaScript Object Notation
NEF	Network Exposure Function
NF	Network Function
PCF	Policy Control Function
PDUID	ProSe Discovery UE ID
ProSe	Proximity Services

RFSP	RAT Frequency Selection Priority
SMF	Session Management Function
TSCTSF	Time Sensitive Communication and Time Synchronization Function

4 Npcf_AMPolicyAuthorization Service

4.1 Service Description

4.1.1 Overview

The Npcf_AMPolicyAuthorization service, as defined in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14], is provided by the Policy Control Function (PCF) and enables an authorized NF service consumer to influence access and mobility policies for a UE and to subscribe to notifications on UE 5G ProSe Policy event(s).

The Npcf_AMPolicyAuthorization service enables to authorize a NF service consumer's request and create/update the associated access and mobility policies as requested by the authorized NF service consumer for the Access and Mobility policy association to which the NF service consumer AM context (e.g. the AF application AM context) is bound.

This service also allows the NF service consumer to subscribe/unsubscribe to notifications on AM Policy event(s) (e.g. service area restrictions policy change) and to subscribe/unsubscribe to notifications on UE 5G ProSe Policy event(s) (e.g. PDUID change event).

4.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Policy and Charging control related 5G architecture is also defined in 3GPP TS 23.503 [14] and 3GPP TS 29.513 [15].

The known NF service consumers of the Npcf_AMPolicyAuthorization service are the Application Function (AF), the Network Exposure Function (NEF), the 5G Direct Discovery Name Management Function (5G DDNMF) and the Time Sensitive Communication and Time Synchronization Function (TSCTSF).

The Npcf_AMPolicyAuthorization service is provided by the PCF and consumed by the NF service consumers (e.g. AF, NEF), as shown in figure 4.1.2-1 for the SBI representation model and in figure 4.1.2-2 for the reference point representation model.
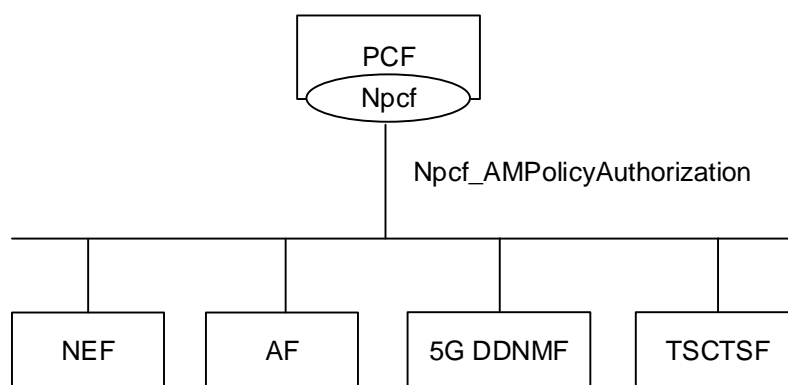
Figure 4.1.2-1: Npcf_AMPolicyAuthorization service architecture, SBI representation
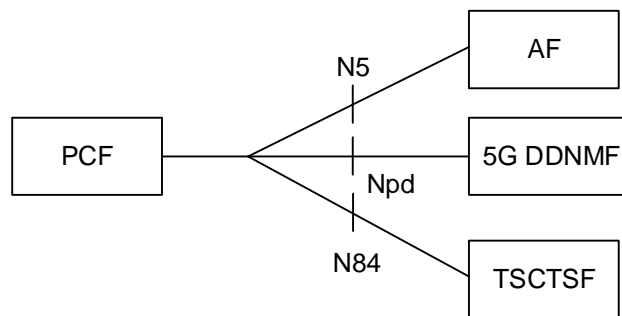
Figure 4.1.2-2: Npcf_AMPolicyAuthorization service architecture, reference point representation

The NEF can act as an AF using N5 reference point.

4.1.3 Network Functions

4.1.3.1 Policy Control Function (PCF)

The PCF (Policy Control Function) is a functional element that encompasses, among other functionalities, access and mobility policy decisions for the control of e.g. the UE Service Area Restrictions and RAT/RFSP control, and the delivery of UE Policies (e.g. UE 5G ProSe Policies) to the UE.

The PCF receives from a NF service consumer (e.g. AF, NEF) access and mobility service requirements related to a registered UE and notifies it about the outcome of the requested access and mobility policy changes, if applicable, if the NF service consumer previously subscribed, via the Npcf_AMPolicyAuthorization service.

The PCF derives access and mobility policies and provisions them to the AMF via the Npcf_AMPolicyControl as described in 3GPP TS 29.507 [16].

When the PCF that handles the AM Policy Associations (PCF for the UE) is different from the PCF that handles the SM Policy Associations (PCF for the PDU session) for a UE, the PCF subscribes to application traffic detection event(s) using the Npcf_PolicyAuthorization service as described in 3GPP TS 29.514 [17].

The PCF receives from a NF service consumer (e.g. 5G DDNMF) subscriptions to notifications on events related to the delivered UE 5G ProSe Policies for a SUPI.

4.1.3.2 NF Service Consumers

The known NF service consumers are the AF, the NEF, the 5G DDNMF, and the TSCTSF as defined in 3GPP TS 23.502 [3].

The Application Function (AF) is a network function offering, among other functionalities, control to applications for the dynamic change of access and mobility policies for a registered UE. The AF uses the Npcf_AMPolicyAuthorization service to provide to the PCF service information related to the required access and mobility context (e.g. access and mobility required policies) for the concerned service(s).

The AFs can be deployed by the same operator offering the access services or be provided by an external third-party service provider. If the AF is not allowed by the operator to directly access the PCF, the AF uses the 3GPP external network exposure framework via the NEF to interact with the PCF, as described in clause 5.20 of 3GPP TS 23.501 [2].

The Network Exposure Function (NEF) supports external exposure of the capabilities of 5GC network functions.

The 5G DDNMF is a network function that handles the network related actions required for dynamic 5G ProSe Direct Discovery, as defined in 3GPP TS 23.304 [22].

The AF trusted by the operator, or the NEF can use the TSCTSF to interface with the PCF to support the delivery of access stratum time distribution information to the AMF as defined in 3GPP TS 29.565 [25].

4.2 Service Operations

4.2.1 Introduction

Service operations defined for the Npcf_AMPolicyAuthorization service are shown in table 4.2.1-1.

Table 4.2.1-1: Npcf_AMPolicyAuthorization Service Operations

Service Operation Name	Description	Initiated by
Npcf_AMPolicyAuthorization_Create	Creates an AF application AM context in the PCF as per request from an authorized NF service consumer, and determines and installs the access and mobility policy according to the service information provided by the NF service consumer. It also allows the subscription to event notifications.	NF service consumer (e.g. AF, NEF, TSCTSF)
Npcf_AMPolicyAuthorization_Update	Updates the AF application AM context in the PCF as per request from an authorized NF service consumer, and determines and updates the access and mobility policy according to the modified service information provided by the NF service consumer. It also allows the update of the associated subscription to event notifications.	NF service consumer (e.g. AF, NEF, TSCTSF)
Npcf_AMPolicyAuthorization_Delete	Provides means to the concerned NF service consumer to delete the AF application AM context in the PCF.	NF service consumer (e.g. AF, NEF, TSCTSF)
Npcf_AMPolicyAuthorization_Subscribe	Allows NF service consumers to subscribe to event notifications.	NF service consumer (e.g. AF, NEF, 5G DDNMF)
Npcf_AMPolicyAuthorization_Unsubscribe	Allows NF service consumers to unsubscribe from event notifications.	NF service consumer (e.g. AF, NEF, 5G DDNMF)
Npcf_AMPolicyAuthorization_Notify	Notifies NF service consumers of the subscribed events.	PCF

NOTE 1: The NEF and the AF use the Npcf_AMPolicyAuthorization service in the same way.

NOTE 2: The 5G DDNMF only uses the Npcf_AMPolicyAuthorization subscribe, unsubscribe and notify service operations.

NOTE 3: The TSCTSF only uses the Npcf_AMPolicyAuthorization create, update and delete service operations.

4.2.2 Npcf_AMPolicyAuthorization_Create service operation

4.2.2.1 General

The Npcf_AMPolicyAuthorization_Create service operation authorizes the request from the NF service consumer, and optionally communicates with Npcf_AMPolicyControl service to determine and install in the AMF the access and mobility policies according to the information provided by the NF service consumer.

The Npcf_AMPolicyAuthorization_Create service operation creates a NF service consumer related AM context in the PCF.

The following procedures using the Npcf_AMPolicyAuthorization_Create service operation are supported:

- Initial provisioning of access and mobility related service information.

- Creation of the subscription to service area coverage change outcome.

4.2.2.2   Initial provisioning of access and mobility related service information

This procedure is used to set up an NF service consumer AM context (e.g. an AF application AM context) for the service as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14].

Figure 4.2.2.2-1 illustrates the initial provisioning of service information for the AM context.
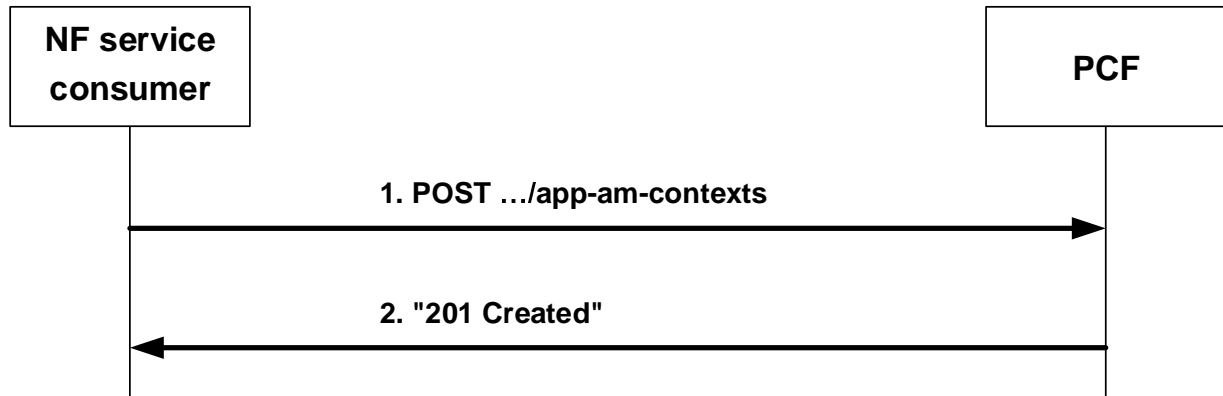
Figure 4.2.2.2-1: Initial provisioning of service information for the AM context

When a NF service consumer requires an AM context is being established in the 5GS and the related access and mobility requirements are available at the NF service consumer, the NF service consumer shall invoke the Npcf_AMPolicyAuthorization_Create service operation by sending the HTTP POST request to the resource URI representing the "Application AM contexts" collection resource of the PCF, as shown in figure 4.2.2.2-1, step 1.

The NF service consumer shall include in the "AppAmContextData" data type in the payload body of the HTTP POST request a partial representation of the "Individual Application AM Context" resource, that shall include:

-    the notification URI where the PCF requests to the NF service consumer the termination of the application AM context encoded as "termNotifUri" attribute;

-    the SUPI of the UE to which the AF requested policy shall apply encoded as "supi" attribute;

-    when the NF service consumer is the NEF or the AF:

     a.   the indication that high throughput policy is desired for the indicated UE encoded as "highThruInd" attribute; and/or

     b.   the service area coverage desired for the indicated UE encoded as "covReq" attribute, that contains a list of Tracking Area codes per serving network where the requested service shall be allowed;

-    when the NF service consumer is the TSCTSF:

     a.   the access stratum time distribution parameters (5G access stratum time distribution indication (enable, disable), and/or Uu time synchronization error budget) encoded as "asTimeDisParam" attribute.

In the "AppAmContextData" data type in the payload body of the HTTP POST request, the NF service consumer may include, when the NF service consumer is the NEF or the AF:

-    the GPSI of the UE encoded as "gpsi" attribute; and/or

-    the expiration time of the AF requested policy encoded as "expiry" attribute.

The NF service consumer may also include the "evSubsc" attribute of "AmEventsSubscData" data type to request the notification of access and mobility policy changes events. The NF service consumer shall include within the "evSubsc" attribute:

-    the notification URI where the NF service consumer receives the events notification encoded as "eventNotifUri" attribute; and

- the events to subscribe to in the "events" attribute. For each subscribed event in the "events" attribute, the NF service consumer shall include the event identifier within the "event" attribute and may include the description of the event reporting mode as specified in clause 4.2.5.2.

The events subscription data is provisioned in the "AM Policy Events Subscription" sub-resource.

The NF service consumer may include within the "evSubsc" attribute specific per event subscription information, if applicable, and as described in clause 4.2.2.3.

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 clause 5.7.

Otherwise, when the PCF receives the HTTP POST request from the NF service consumer, the PCF shall bind the Individual application AM context to the concerned AM policy association. The PCF identifies the AM policy association for which the HTTP POST request applies with the SUPI provided in the "supi" attribute within the body of the HTTP POST request:

If the PCF fails in executing the binding with the AM policy association, the PCF shall reject the HTTP POST request with an HTTP "500 Internal Server Error" response and may include the "cause" attribute set to "POLICY_ASSOCIATION_NOT_AVAILABLE".

The PCF shall check whether the received access and mobility related service information requires access and mobility policies to be created and provisioned in the AMF. Provisioning of access and mobility policies shall be carried out as specified at 3GPP TS 29.507 [16].

If the PCF created an "Individual Application AM Context" resource, the PCF shall send to the NF service consumer 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

- an "AppAmContextRespData" data type in the payload body.

The Location header field shall contain the URI of the created Individual application AM context resource i.e. "{apiRoot}/npcf-am-policyauthorization/<apiVersion>/app-am-contexts/{appAmContextId}".

The "AppAmContextRespData" data type payload body shall contain the representation of the created "Individual application AM context" resource within the "AppAmContextData" data type. When the request included event subscription information:

- the "AppAmContextData" data type shall also include the "AM Policy Events Subscription" sub-resource representation within the "evSubsc" attribute; and

- when the NF service consumer requested the immediate reporting and the current value is available, the "AppAmContextRespData" data type shall include the corresponding event(s) notification, encoding the event identifier within the "repEvents" attribute and the applicable event(s) information as specified within the "AmEventsNotification" data type.

The acknowledgement towards the NF service consumer should take place before or in parallel with any required access and mobility policy provisioning towards the AMF.

NOTE: The behaviour when the NF service consumer does not receive the HTTP response message, or when it arrives after the internal timer waiting for it has expired, or when it arrives with an indication different than a success indication, are outside the scope of this specification and is based on operator policy.

4.2.2.3 Creation of the subscription to service area coverage change outcome

This procedure is used by a NF service consumer to subscribe to notifications about whether the requested service area coverage provided in the access and mobility service information has been provisioned as the corresponding Service Area Restrictions to the AMF or cannot be provisioned to the AMF. This procedure also enables the subscription to notifications about subsequent changes on the service area coverage result of changes of the provisioned Service Area Restrictions (e.g. due to changes in the subscribed Service Area Restrictions).

To request to the PCF to provide a notification when a service area coverage (which may be same or different service area coverage from the service area coverage provided by the NF service consumer) has been determined (and the

related policy for Service Area Restrictions is applied) based on the request or when a service area coverage cannot be determined and, additionally, when the service area coverage subsequently changes within the AM Policy Association, the NF service consumer shall provide in the HTTP POST request message described in clause 4.2.2.2 the "evSubsc" attribute including an event entry within the "events" attribute with the "event" attribute set to "SAC_CH" and the "notifMethod" set to "ON_EVENT_DETECTION" (or omitted).

The PCF shall reply to the NF service consumer as described in clause 4.2.2.2.

When the service area coverage change event is met in the PCF, the PCF notifies to the NF service consumer as described in clause 4.2.7.4.

4.2.3 Npcf_AMPolicyAuthorization_Update service operation

4.2.3.1 General

The Npcf_AMPolicyAuthorization_Update service operation provides updated application level information from the NF service consumer and optionally communicates with the Npcf_AMPolicyControl service to determine and install the access and mobility policies according to the information provided by the NF service consumer.

The Npcf_AMPolicyAuthorization_Update service operation updates an AF application AM context in the PCF.

The following procedures using the Npcf_PolicyAuthorization_Update service operation are supported:

- Modification of AM related service information.

- Modification of the subscription to service area coverage change outcome.

4.2.3.2 Modification of AM related service information

This procedure is used to modify an existing AF application AM context as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14].

Figure 4.2.3.2-1 illustrates the modification of access and mobility service information using HTTP PATCH method.
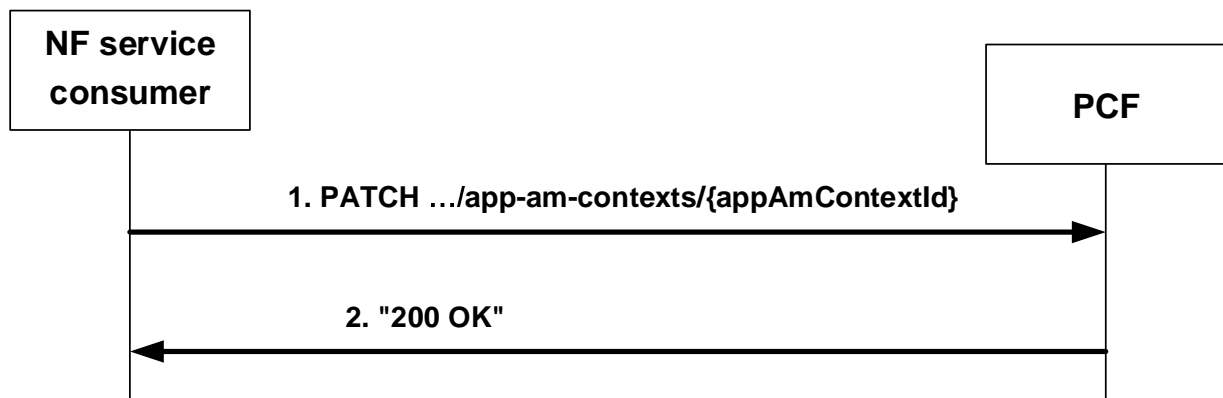
Figure 4.2.3.2-1: Modification of access and mobility service information using HTTP PATCH

The NF service consumer may modify the AF application AM context information at any time (e.g. due to an AF application AM context modification or an internal NF service consumer trigger) and invoke the Npcf_AMPolicyAuthorization_Update service operation by sending an HTTP PATCH request message to the resource URI representing the concerned "Individual application AM context" resource, as shown in figure 4.2.3.2-1, step 1, with the modifications to apply.

The JSON body within the PATCH request shall include the "AppAmContextUpdateData" data type and shall be encoded according to "JSON Merge Patch", as defined in IETF RFC 7396 [18].

The NF service consumer may create, modify or remove access and mobility service information by including updated values within the "AppAmContextUpdateData" data type as follows:

- the NF service consumer may update the "termNotifUri" attribute, to request that subsequent termination notifications are sent to a new NF service consumer;

- the NF service consumer may create or update the previously provided access and mobility service information, e.g. when the NF service consumer is the AF/NEF, expiration time, high throughput indication and/or service area coverage information, or, when the NF service consumer is the TSCTSF, 5G access stratum time distribution indication (enable, disable), and/or Uu time synchronization error budget (see clause 4.2.2.2); and

- the NF service consumer may delete the previously provided attribute(s), e.g. when the NF service consumer is the AF/NEF, expiration time, high throughput indication and/or service area coverage information, or, when the NF service consumer is the TSCTSF, Uu time synchronization error budget, by setting them to null value, to indicate that the previously provided access and mobility service information no longer applies.

The NF service consumer may also create, modify or remove events subscription information by sending an HTTP PATCH request message to the resource URI representing the concerned "Individual application AM context" resource.

The NF service consumer shall create event subscription information by including the "evSubsc" attribute of "AmEventsSubscDataRm" data type with the corresponding list of events to subscribe to within the "events" attribute, and the callback URI where to receive the event notifications within the "eventNotifUri" attribute. For each subscribed event in the "events" attribute, the NF service consumer shall include the event identifier within the "event" attribute and may include the description of the event reporting mode as specified in clause 4.2.5.2.

The NF service consumer shall update existing event subscription information by including an updated value of the "evSubsc" attribute of the "AmEventsSubscDataRm" data type as follows:

- the "eventNotifUri" attribute may include an updated value of the callback URI;

- the "events" attribute shall include the new complete list of subscribed events; and

- NOTE: When the NF service consumer requests to remove an event, this event is not included in the "events" attribute.

- the per specific event subscription information is included/removed, if applicable, and as described in clause 4.2.3.3.

The NF service consumer shall remove existing event subscription information by setting to null the "evSubsc" attribute.

If the service information provided in the body of the HTTP PATCH request is rejected because the requested policy for the AM context is invalid or insufficient for the PCF to perform the requested action because the service area coverage and/or high throughput policies present in the request result in an Individual application AM context without service area coverage and high throughput requested policies, or the request indicates the deletion of the 5G access stratum time distribution parameters resulting in an Individual application AM context without 5G access stratum time distribution and Uu time synchronization error budget requested policies, the PCF may indicate in an HTTP "400 Bad Request" response message the cause for the rejection including the "cause" attribute set to "INVALID_POLICY_REQUEST".

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 clause 5.7.

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].

If the request is accepted, the PCF shall update the AM related service information with the new information received and/or update the associated AM events subscription. Due to the updated service information and/or AM events subscription, the PCF may need to create, modify or delete the related access and mobility policies and provide the updated information towards the AMF following the corresponding procedures specified in 3GPP TS 29.507 [16].

The PCF shall reply to the NF service consumer with an HTTP "200 OK" response message and include the "AppAmContextRespData" data type payload body which shall include:

- the representation of the modified "Individual Application AM Context" resource within the "AppAmContextData" data type; and

- when the request included the creation or the update of the subscription to notification event(s):

a) the representation of the "AM Policy Events Subscription" sub-resource within the "evSubsc" attribute included in the "AppAmContextData" data type; and

b) when the NF service consumer requested the immediate reporting of the new subscribed event(s) and the current value(s) is available, "AppAmContextRespData" data type shall include the corresponding event(s) notification encoding the event identifier within "repEvents" attribute and the applicable event(s) information as specified within the "AmEventsNotification" data type.

The HTTP response message towards the NF service consumer should take place before or in parallel with any required access and mobility policy provisioning towards the SMF.

4.2.3.3   Modification of the subscription to service area coverage change outcome

This procedure is used by a NF service consumer to subscribe to notifications about whether an updated service area coverage (which may be same or different service area coverage from the service area coverage provided by the NF service consumer) determined from the requested service area coverage provided in the access and mobility service information has been applied as the corresponding Service Area Restrictions or whether an updated service area coverage cannot be provisioned. This procedure also enables to modify or remove a previous subscription to service area coverage changes.

The NF service consumer shall include in the HTTP PATCH request message described in clause 4.2.3.2 the "evSubsc" attribute as encoded as follows:

- To create a subscription (i.e., the subscription to the "SAC_CH" event does not exist in the PCF) the NF service consumer shall include the "evSubsc" attribute encoded as specified in clause 4.2.2.3.

- To modify an existing subscription, (i.e., the subscription to the "SAC_CH" event exists in the PCF) the NF service consumer shall include within the "evSubc" attribute the "events" attribute with the updated subscription information for the "event" attribute set to "SAC_CH" as specified in clause 4.2.2.3.

- To remove an existing subscription (i.e., the subscription to the "SAC_CH" event exists in the PCF):

    a. If there are other events whose subscription the NF service consumer wants to keep, the NF service consumer shall include the "events" attribute without any event entry with the "event" attribute set to "SAC_CH".

    b. If there are no other events whose subscription the NF service consumer wants to keep, the NF service consumer shall set to null the "evSubsc" attribute.

The PCF shall reply to the NF service consumer as described in clause 4.2.3.2.

When the service area coverage change event is met in the PCF, the PCF notifies to the NF service consumer as described in clause 4.2.7.4.

NOTE: When the previously provided service area coverage requirements are completely removed by the NF service consumer, or the requested service area coverage policy expires, the NF service consumer should also unsubscribe to SAC_CH event to prevent the stale subscription information from remaining on the PCF.

4.2.4   Npcf_AMPolicyAuthorization_Delete service operation

4.2.4.1   General

The Npcf_AMPolicyAuthorization_Delete service operation provides means for the NF service consumer to delete the AF application AM context.

The following procedures using the Npcf_AMPolicyAuthorization_Delete service operation are supported:

- AF application AM context termination.

4.2.4.2   AF application AM context termination

This procedure is used to terminate an AF application AM context as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14].

Figure 4.2.4.2-1 illustrates the AF application AM context termination.
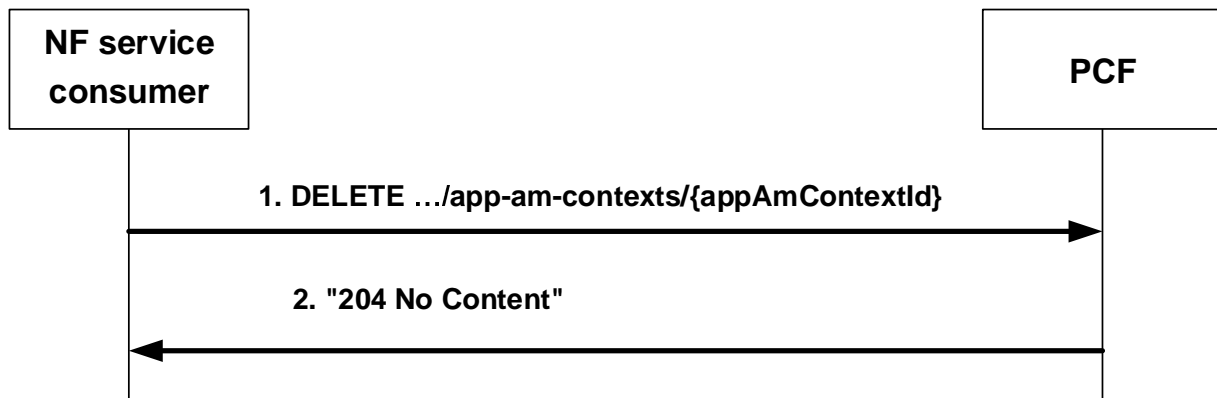
Figure 4.2.4.2-1: AF application AM context termination

When an AF session is terminated, and if the AF application AM context was created as described in clause 4.2.2, the NF service consumer shall invoke the Npcf_AMPolicyAuthorization_Delete service operation to the PCF using an HTTP DELETE request, as shown in figure 4.2.4.2-1, step 1.

The NF service consumer shall set the request URI to "{apiRoot}/npcf-am-policyauthorization/<apiVersion>/app-am-contexts/{appAmContextId}".

When the PCF receives the HTTP DELETE request from the NF service consumer, indicating the termination of the AF application AM context information, if the HTTP DELETE request from the NF service consumer is accepted, the PCF shall acknowledge that request by sending to the NF service consumer a "204 No Content".

Afterwards, the PCF shall determine whether the access and mobility policies of the concerned UE need to be updated or not. If the PCF determines that an update is needed, the PCF shall initiate the update of the access and mobility policies of the concerned UE as per the procedures specified in 3GPP TS 29.507 [16].

If the HTTP DELETE request from the NF service consumer is not accepted, the PCF shall indicate in the response to HTTP DELETE request the cause for the rejection as specified in clause 5.7.

If the PCF determines the received HTTP DELETE 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].

4.2.5 Npcf_AMPolicyAuthorization_Subscribe service operation

4.2.5.1 General

The Npcf_AMPolicyAuthorization_Subscribe service operation enables to manage subscriptions to events for an existing AF application AM context. The Npcf_AMPolicyAuthorization_Subscribe service operation also enables to manage subscriptions to events without an existing AF application AM context.

Such subscriptions to events shall be created:

- within the AF application AM context establishment procedure by invoking the Npcf_AMPolicyAuthorization_Create service operation, as described in clause 4.2.2;

- within the AF application AM context modification procedure by invoking the Npcf_AMPolicyAuthorization_Update service operation, as described in clause 4.2.3; or

- by invoking the Npcf_AMPolicyAuthorization_Subscribe service operation for the existing AF application AM context, as described in clause 4.2.5.2.

- by invoking the Npcf_AMPolicyAuthorization_Subscribe service operation when there is no existing Individual application AM context and the NF service consumer does not provide Access and Mobility related service information, as described in clause 4.2.5.3.

The following procedures using the Npcf_AMPolicyAuthorization_Subscribe service operation is supported:

- Subscription to events for an existing AF application AM context.

- Subscription to events without an existing AF application AM context.

- Subscription to PDUID changes.

4.2.5.2 Handling of subscription to events for the existing AF application AM context

This procedure is used to create a subscription to events for the existing AF application AM context or to modify an existing subscription, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14].

Figure 4.2.5.2-1 illustrates the creation of events subscription information using HTTP PUT method.

Figure 4.2.5.2-1: Creation of events subscription information using HTTP PUT

Figure 4.2.5.2-2 illustrates the modification of events subscription information using HTTP PUT method.
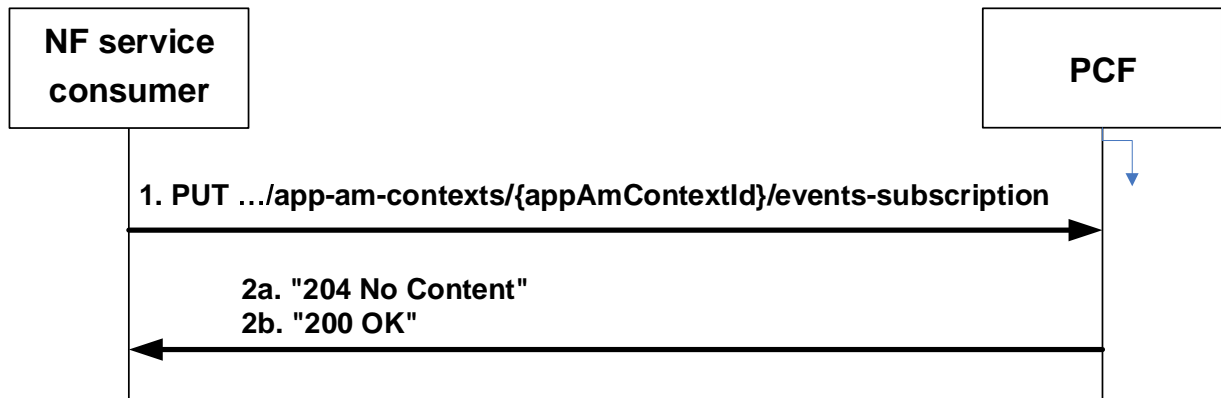
Figure 4.2.5.2-2: Modification of events subscription information using HTTP PUT

When the NF service consumer decides to create a subscription to one or more events for the existing AF application AM context or to modify an existing subscription previously created by itself at the PCF, the NF service consumer shall invoke the Npcf_AMPolicyAuthorization_Subscribe service operation by sending the HTTP PUT request to the resource URI representing the "AM Policy Events Subscription" sub-resource in the PCF, as shown in figure 4.2.5.2-1, step 1 and figure 4.2.5.2-2, step 1.

> NOTE 1: The NF service consumer builds the "AM Policy Events Subscription" sub-resource URI by adding the path segment "/events-subscription" at the end of the resource URI of the "Individual application AM context" resource, received in the Location header field of the resource creation response as specified in clause 4.2.2.2.

The NF service consumer shall provide in the "AmEventsSubscData" data type of the body of the HTTP PUT request:

- the "events" attribute with the list of events to be subscribed; and

- the "eventNotifUri" attribute, that includes the callback URI where the PCF shall send the notification of the subscribed events.

NOTE 2: The "eventNotifUri" attribute within the "AmEventsSubscData" data structure can be modified to request that subsequent notifications are sent to a new NF service consumer.

For each subscribed event included in the "events" attribute, the NF service consumer type shall include the event identifier within the "event" attribute and may include the description of the event reporting mode, as follows:

   a. immediate reporting indication as "immRep" attribute;

   b. event notification method (periodic, one time, on event detection) as "notifMethod" attribute;

   c. maximum number of reports as "maxReportNbr" attribute;

   d. monitoring Duration as "monDur" attribute; and/or

   e. repetition period for periodic reporting as "repPeriod" attribute.

The NF service consumer may provide within the "AmEventsSubscData" data type specific per event subscription information, if applicable, and as described in clause 4.2.2.3.

NOTE: The NF service consumer can use this service operation to subscribe/unsubscribe to events that matched based on the provided requested policy related to the AM context (e.g. SAC_CH event, which is matched based on the requested service area coverage). In these cases, to avoid the PCF keeping stale subscription information, the NF service consumer needs to ensure that the concerned requested policy exists together with the event subscription, i.e. the event subscription is removed when the related policy is removed.

Upon the reception of the HTTP PUT request from the NF service consumer, the PCF shall decide whether the received HTTP PUT request is accepted.

If the HTTP PUT request from the NF service consumer is not accepted, the PCF shall indicate in the response to HTTP PUT request the cause for the rejection as specified in clause 5.7.

If the PCF determines the received HTTP PUT 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].

If the PCF accepted the HTTP PUT request to create a subscription to events, the PCF shall create the "AM Policy Events Subscription" sub-resource and shall send the HTTP response message to the NF service consumer as shown in figure 4.2.5.2-1, step 2. The PCF shall include in the "201 Created" response:

- a Location header field that shall contain the URI of the created "AM Policy Events Subscription" sub-resource i.e. "{apiRoot}/npcf-am-policyauthorization/<apiVersion>/app-am-contexts/{appAmContextId}/events-subscription"; and

- a response body with the "AmEventsSubscRespData" data type, which:

   a) shall contain the created "AM Policy Events Subscription" sub-resource encoded in the attributes of the "AmEventsSubscData" data type; and

   b) if the NF service consumer requested the immediate reporting and the current value is available, may contain the corresponding event(s) notification by encoding event identifier within the "repEvents" the attribute and the applicable event(s) information as specified within the "AmEventsNotification" data type.

If the PCF accepted the HTTP PUT request to modify the events subscription, the PCF shall modify the "AM Policy Events Subscription" sub-resource and shall send to the NF service consumer:

- the HTTP "204 No Content" response (as shown in figure 4.2.5.2-2, step 2a); or

- the HTTP "200 OK" response (as shown in figure 4.2.5.2-2, step 2b) including in the "AmEventsSubscRespData" data type:

   a) the updated representation of the "AM Policy Events Subscription" sub-resource encoded within the attributes of the "AmEventsSubscData" data type; and

b) if one or more of the updated subscribed events are already met in the PCF, the notification of these events by including the event identifier within the "repEvents" attribute and the applicable event(s) information as specified within the "AmEventsNotification" data type.

When the "monDur" attribute is included in the response, it represents a server selected expiry time that is equal or less than a possible expiry time in the request.

4.2.5.3 Subscription to events without an existing AF application AM context

This procedure is used by an NF service consumer (e.g. 5G DDNMF) to request the creation of a subscription to event(s) in the PCF when no "Individual application AM context" exists, and the NF service consumer does not provide Access and Mobility related service information, i.e., does not create an AF application AM context.
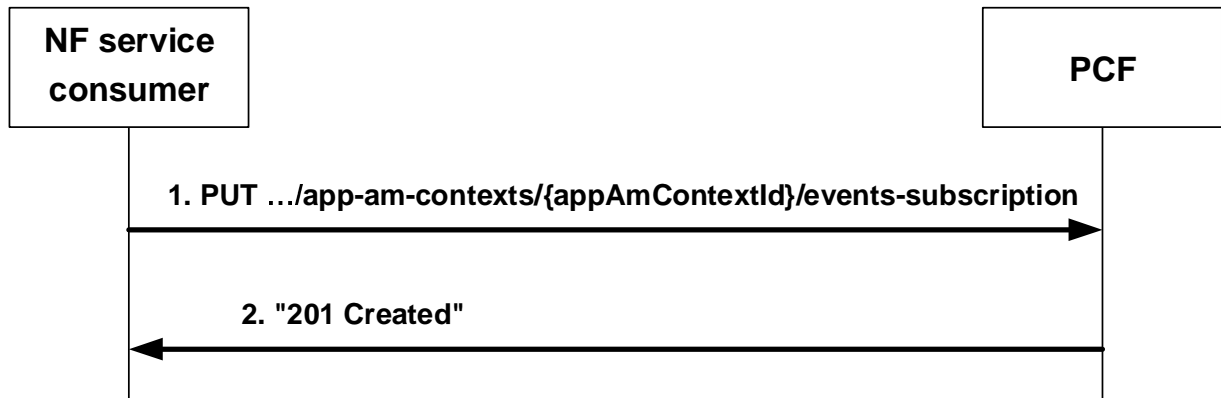
Figure 4.2.5.3-1 illustrates the subscription to event(s) without an existing AF application AM context.
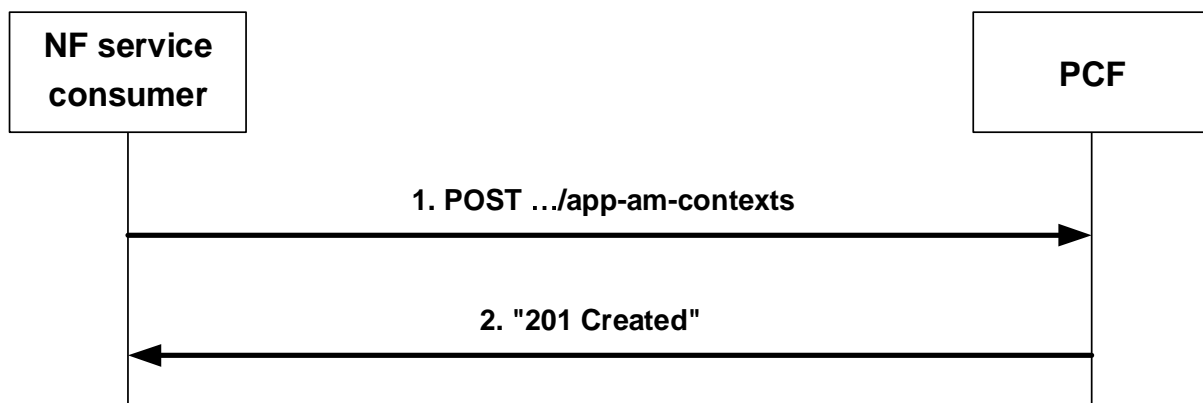
Figure 4.2.5.3-1: Subscription to events without an existing AF application AM context

When an NF service consumer (e.g. 5G DDNMF) decides to create a subscription to one or more event(s), and the NF service consumer is not providing Access and Mobility related service information and the "Individual application AM context" resource does not exist, the NF service consumer shall invoke the Npcf_AMPolicyAuthorization_Subscribe service operation to create an "Individual application AM context" resource and the corresponding "AM Policy Events Subscription" sub-resource by sending an HTTP POST request to the resource URI representing the "Application AM contexts" collection resource of the PCF, as shown in figure 4.2.5.3-1, step 1.

The NF service consumer shall include in the AppAmContextData data type in the payload body of the HTTP POST request a partial representation of the "Individual Application AM Context" resource, which shall include:

- the notification URI where the PCF shall request the termination of the application AM context to the NF service consumer, encoded as "termNotifUri" attribute;

- the SUPI encoded as "supi" attribute; and

- the "evSubsc" attribute to subscribe to notifications of access and mobility policy changes events. The NF service consumer shall include within the associated AmEventsSubscData data type:

    a. the notification URI where the NF service consumer wants to receive the event notifications, encoded as "eventNotifUri" attribute; and

    b. the event(s) to subscribe to within the "events" attribute. For each subscribed event, the AmEventSubscription data type shall include the event identifier in the "event" attribute and may include the description of the event reporting mode as specified in clause 4.2.5.2.

The event(s) subscription data is provisioned in the "AM Policy Events Subscription" sub-resource.

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 clause 5.7.

Otherwise, the PCF shall perform the association of the AF request to one and only one AM policy association or UE policy association. If the PCF fails in executing the binding with the AM policy association or UE policy association,

the PCF shall reject the HTTP POST request with an HTTP "500 Internal Server Error" response and may include the "cause" attribute set to "POLICY_ASSOCIATION_NOT_AVAILABLE".

NOTE 1: In this release of the specification whether the AF request is associated to an AM policy association or to a UE policy association is determined per specific event, e.g., a subscription to PDUID changes implies the binding to a UE policy association.

If the PCF created an "Individual Application AM Context" resource and the corresponding "AM Policy Events Subscription" sub-resource, the PCF shall send to the NF service consumer a "201 Created" response to the HTTP POST request, as shown in figure 4.2.5.3-1, step 2. The PCF shall include in the "201 Created" response:

- a Location header field; and

- an AppAmContextRespData data type in the payload body.

The Location header field shall contain the URI of the created "AM Policy Events Subscription" sub-resource, i.e., "{apiRoot}/npcf-am-policyauthorization/<apiVersion>/app-am-contexts/{appAmContextId}/events-subscription".

The AppAmContextRespData data type payload body shall contain:

- the representation of the created "Individual application AM context" resource within the AppAmContextData data type, which shall also include the "AM Policy Events Subscription" sub-resource representation within the "evSubsc" attribute; and

- when the PCF determines that the subscribed event(s) is already met and/or the NF service consumer requested immediate reporting and the current value is available, the AppAmContextRespData data type shall include the corresponding event(s) notification within the "repEvents" attribute of the AmEventsNotification data type.

NOTE 2: The created "Individual application AM context" resource does not include Access and Mobility related service information, only includes the information supplied by the NF service consumer to perform the association to the concerned AM policy association or UE policy association, i.e., the "supi" attribute, the SBI handling specific properties, i.e. the "suppFeat" attribute and the "termNotifUri" attribute, together with the "evSubsc" attribute.

4.2.5.4 Subscription to PDUID changes

This procedure is used by a NF service consumer to request the PCF to subscribe to notifications of PDUID change event.

The NF service consumer requests the subscription to notifications of PDUID change without providing (Access and Mobility or 5G ProSe) service information at initial subscription to event(s), using the HTTP POST request message as described in clause 4.2.5.3.

The NF service consumer shall include within the "events" array attribute of the "evSubsc" attribute of the AppAmContextData data type:

- an event with the "event" attribute set to "PDUID_CH"; and

- to retrieve the current value of the PCF allocated PDUID for the UE, the request for immediate reporting by setting the "immRep" attribute to true.

The PCF shall perform the association of the AF request to the UE policy association and shall retrieve the internally stored PDUID value allocated to the UE for the UE 5G ProSe Policy.

Upon success, the PCF creates an "Individual Application AM Context" resource and the corresponding "AM Policy Events Subscription" sub-resource. The PCF shall then send a "201 Created" response to the HTTP POST request received from the NF service consumer, as described in clause 4.2.5.3, including the retrieved PDUID value within the AmEventsNotification data type as described in clause 4.2.7.5.

4.2.6 Npcf_AMPolicyAuthorization_Unsubscribe service operation

4.2.6.1 General

The Npcf_AMPolicyAuthorization_Unsubscribe service operation enables an NF service consumer to remove an existing subscription to event(s) for an existing AF application AM context. The Npcf_AMPolicyAuthorization_Unsubscribe service operation also enables an NF service consumers to remove an existing subscription to event(s) without an existing AF application AM context.

Such subscription to events shall be removed:

- by invoking the Npcf_AMPolicyAuthorization_Unsubscribe service operation for an existing AF application AM context, as described in clause 4.2.6.2; or

- within the AF application AM context modification procedure by invoking the Npcf_AMPolicyAuthorization_Update service operation, as described in clause 4.2.3; or

- within the AF application AM context termination procedure by invoking the Npcf_AMPolicyAuthorization_Delete service operation, as described in clause 4.2.4.

- by invoking the Npcf_AMPolicyAuthorization_Unsubscribe service operation when there is no existing Individual application AM context, as described in clause 4.2.6.3.

The following procedures using the Npcf_AMPolicyAuthorization_Unsubscribe service operation are supported:

- Unsubscription to events, Access and Mobility related service information exists.

- Unsubscription to events, Access and Mobility related service information does not exist.

4.2.6.2 Unsubscription to events, Access and Mobility related service information exists

This procedure is used to unsubscribe to all subscribed events when the NF service consumer previously provided access and mobility related service information for the existing AF application AM context, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14]. As result of this procedure, the "AM Policy Events Subscription" sub-resource is removed but the "Individual application AM context" remains with the access and mobility related service information.

Figure 4.2.6.2-1 illustrates the procedure to unsubscribe from AM Policy Authorization event(s) using the HTTP DELETE method.
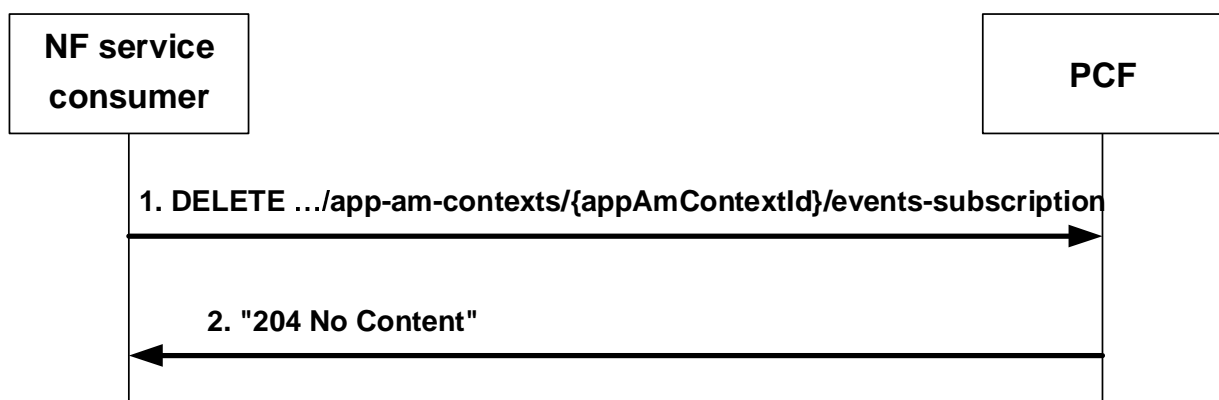
Figure 4.2.6.2-1: Removal of events subscription information using HTTP DELETE

When the NF service consumer decides to unsubscribe to all subscribed event(s) for an existing AF application AM context, and the NF service consumer previously provided access and mobility service information to the PCF, the NF service consumer shall invoke the Npcf_AMPolicyAuthorization_Unsubscribe service operation by sending an HTTP DELETE request message to the resource URI representing the concerned "AM Policy Events Subscription" sub-resource in the PCF, as shown in figure 4.2.6.2-1, step 1.

Upon the reception of the HTTP DELETE request message from the NF service consumer, the PCF shall decide whether the received HTTP request message is accepted.

If the HTTP DELETE request message from the NF service consumer is accepted, the PCF shall delete the "AM Policy Events Subscription" sub-resource and shall send to the NF service consumer a HTTP "204 No Content" response message.

If the HTTP DELETE request message from the NF service consumer is rejected, the PCF shall indicate in the HTTP response message the cause for the rejection as specified in clause 5.7.

If the PCF determines the received HTTP DELETE 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].

4.2.6.3 Unsubscription to events, Access and Mobility related service information does not exist

This procedure is used by the NF service consumer to unsubscribe to all subscribed event(s) when the AF application AM context does not contain access and mobility related service information, i.e. only contains the "supi" attribute, the SBI handling specific properties, i.e. the "suppFeat" attribute and the "termNotifUri", together with the subscription information encoded in the "evSubsc" attribute. As a result of this procedure, the "AM Policy Events Subscription" sub-resource and the parent "Individual application AM context" resource are both removed.

The procedure to unsubscribe from AM Policy Authorization events when the AF application AM context does not contain access and mobility related service information is the same as the procedure to delete the AF application AM context defined in clause 4.2.4.2.

4.2.7 Npcf_AMPolicyAuthorization_Notify service operation

4.2.7.1 General

The Npcf_AMPolicyAuthorization_Notify service operation enables to notify to the NF service consumers that the previously subscribed event for the existing AF application AM context occurred or that the AF application AM context is no longer valid.

The following procedures using the Npcf_AMPolicyAuthorization_Notify service operation are supported:

- Notification about AF application AM context event.

- Notification about AF application AM context termination.

- Notification about service area coverage change outcome.

- Notification about PDUID changes.

4.2.7.2 Notification about AF application AM context event

This procedure is invoked by the PCF to notify the NF service consumer when a certain, previously subscribed, AF application AM context event occurs, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14].

Figure 4.2.7.2-1 illustrates the notification about AF application AM context event.
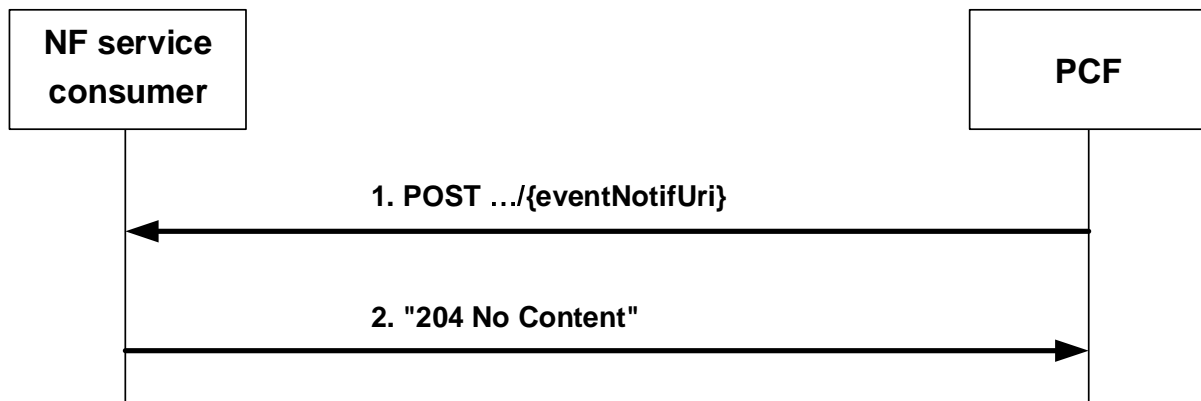
Figure 4.2.7.2-1: Notification about AF application AM context event

When the PCF determines that the event for the existing AF application AM context, to which the NF service consumer has subscribed to, occurred, the PCF shall invoke the Npcf_AMPolicyAuthorization_Notify service operation by sending the HTTP POST request (as shown in figure 4.2.7.2-1, step 1) to the NF service consumer using the callback URI received in the subscription creation (or modification), as specified in clauses 4.2.2.2, 4.2.3.2 and 4.2.5.2. The PCF shall provide in the body of the HTTP POST request the "AmEventsNotification" data type including:

- the AM Policy Events Subscription resource identifier related with the notification in the "appAmContextId" attribute; and

- the list of the reported events in the "repEvents" attribute. For each reported event, the "AmEventNotification" data type may include additional event information.

The notification of other specific events using the Npcf_AMPolicyAuthorization_Notify request is described in the related clauses.

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

If the HTTP POST request from the PCF is not accepted, the NF service consumer shall indicate in the response to HTTP POST request the cause for the rejection as specified in clause 5.7.

If the HTTP POST request from the PCF is accepted, the NF service consumer shall acknowledge the receipt of the event notification with a "204 No Content" response to HTTP POST request, as shown in figure 4.2.7.2-1, step 2.

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].

4.2.7.3 Notification about AF application AM context termination

This procedure is invoked by the PCF to notify the NF service consumer that the AF application AM context is no longer valid, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [14].

Figure 4.2.7.3-1 illustrates the notification about AF application AM context termination.
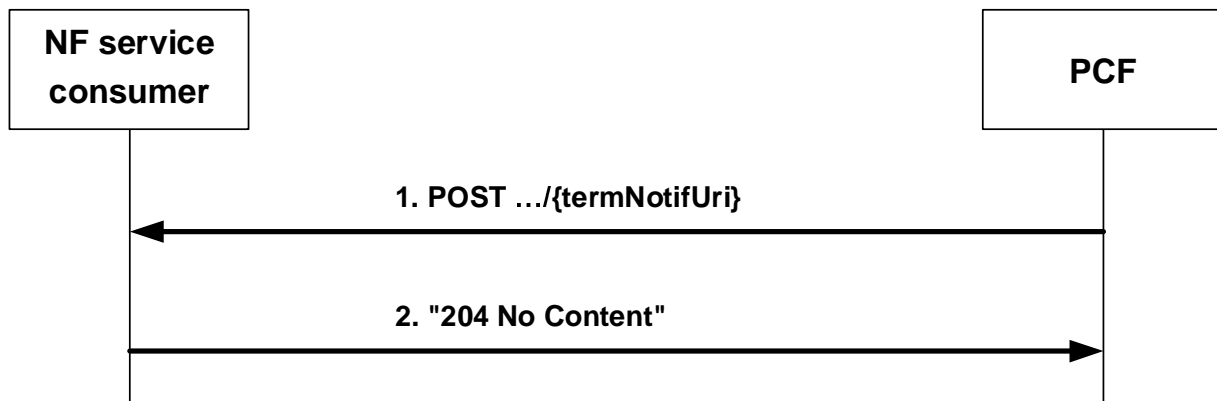
Figure 4.2.7.3-1: Notification about AF application AM context termination

When the PCF determines that the AF application AM context is no longer valid, the PCF shall invoke the Npcf_AMPolicyAuthorization_Notify service operation by sending the HTTP POST request (as shown in figure 4.2.7.3-1, step 1) using the callback URI received in the "Individual application AM context" resource creation, as specified in clause 4.2.2.2. The PCF shall provide in the body of the HTTP POST request the "AmTerminationInfo" data type including:

- the Individual application AM context resource identifier related to the termination notification within the "appAmContextId" attribute; and

- the AF application AM context termination cause within the "termCause" attribute encoded using of the "AmTerminationCause" data type, indicating the termination cause.

Upon the reception of the HTTP POST request from the PCF requesting the AF application AM context termination, the NF service consumer shall acknowledge that request by sending an HTTP response message with the corresponding status code.

If the HTTP POST request from the PCF is not accepted, the NF service consumer shall indicate in the response to HTTP POST request the cause for the rejection as specified in clause 5.7.

If the HTTP POST request from the PCF is accepted, the NF service consumer shall acknowledge the receipt of the AF application AM context termination request with a "204 No Content" response (as shown in figure 4.2.7.3-1, step 2) and shall invoke the Npcf_AMPolicyAuthorization_Delete service operation to the PCF as described in clause 4.2.4.

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].

4.2.7.4   Notification about service area coverage change outcome

When the PCF becomes aware that the request received from the NF service consumer to change the service area coverage is performed, it shall inform the NF service consumer accordingly if the NF service consumer has previously subscribed to the "SAC_CH" event as described in clauses 4.2.2.3 and 4.2.3.3.

The PCF shall notify the NF service consumer by including the AmEventsNotification data type in the body of the HTTP POST request as described in clause 4.2.7.2. The PCF shall include within an entry of the "repEvents" attribute:

- the "event" attribute set to "SAC_CH" in the "event" attribute;

- the applied service area coverage (same or different service area coverage from the service area coverage provided by the NF service consumer) in the "appliedCov" attribute.

When the result of the execution of the request of service area coverage is that the service is allowed in one or more of the requested Tracking Areas in the serving network where the UE is camping, the "appliedCov" attribute shall encode within the "tacList" attribute the list of NF consumer provided Tracking Area codes where the requested service shall be allowed and within the "servingNetwork" attribute the serving network where the UE is camping.

When the result of the execution of the request of service area coverage change is that the service is restricted in the whole NF requested service area coverage, the "appliedCov" attribute shall encode an empty array within the "tacList" attribute.

NOTE: The actual service area coverage for the UE might be larger than the one reported within "appliedCov" attribute. The "appliedCov" attribute provides to the NF consumer feedback about where the service is allowed in relation to the NF consumer provided service area coverage.

When the NF service consumer indicated that the notification method is "ON_EVENT_DETECTION" (or omitted it) during the subscription, the subscription to this event is kept in the PCF until the NF service consumer terminates the subscription as described in clause 4.2.3.2 or 4.2.6.2. The NF service consumer shall be notified of subsequent service area coverage changes (i.e., changes in the applied service area coverage, which may indicate e.g. no service area coverage is allowed) as specified in bullets above without requiring a new subscription, both, when the service area coverage change is triggered by the NF service consumer and/or triggered by other events (e.g. based on PCF internal policies and/or changes in the subscribed service area restrictions), and as long as the requested service area coverage requirements exist (e.g, they have not expired).

Upon receipt of the HTTP POST request from the PCF, the NF service consumer shall acknowledge the request by sending a "204 No Content" response as described in clause 4.2.7.2.

4.2.7.5 Notification about PDUID changes

When the PCF allocates a new PDUID (ProSe Discovery UE ID) for the UE 5G ProSe Policy of a SUPI, the PCF shall inform the NF service consumer that previously subscribed as described in clause 4.2.5.4.

The PCF shall notify the NF service consumer by including the AmEventsNotification data type in the body of the HTTP POST request as described in clause 4.2.7.2, which shall include within an entry of the "repEvents" attribute:

- the "PDUID_CH" event within the "event" attribute; and

- the "pduidInfo" attribute, with the allocated PDUID within the "pduid" attribute and its validity timer within the "expiry" attribute.

When the NF service consumer receives the notification in the HTTP POST request, it shall acknowledge the request by sending a "204 No Content" response to the PCF as specified in clause 4.2.7.2.

5 Npcf_AMPolicyAuthorization Service API

5.1 Introduction

The Npcf_AMPolicyAuthorization shall use the Npcf_AMPolicyAuthorization API.

The API URI of the Npcf_AMPolicyAuthorization 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-am-policyauthorization".

- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 5.3.

5.2 Usage of HTTP

5.2.1 General

HTTP/2, IETF RFC 7540 [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_AMPolicyAuthorization API is contained in Annex A.

5.2.2 HTTP standard headers

5.2.2.1 General

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

5.2.2.2 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 7807 [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 [18].

5.2.3 HTTP custom headers

5.2.3.1 General

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.

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

5.3 Resources

5.3.1 Overview

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

Figure 5.3.1-1 depicts the resource URIs structure for the Npcf_AMPolicyAuthorization API.

{apiRoot}/npcf-am-policyauthorization/<apiVersion>
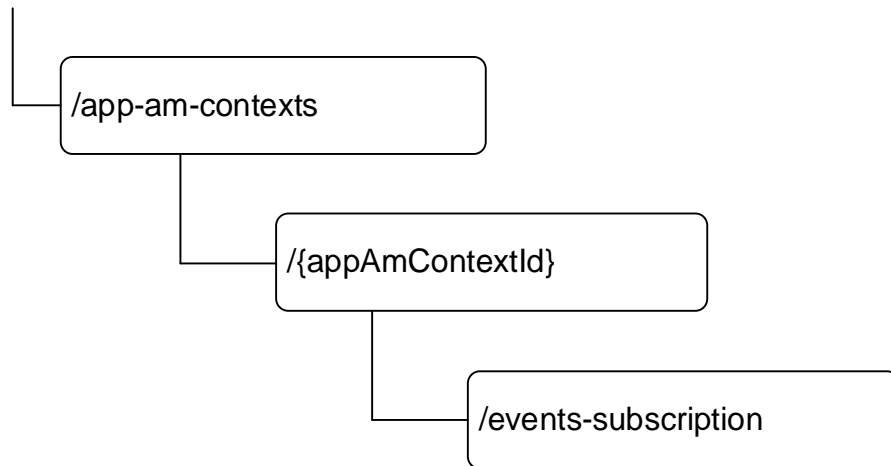
Figure 5.3.1-1: Resource URI structure of the Npcf_AMPolicyAuthorization API

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
Application AM contexts	/app-am-contexts	POST	Npcf_AMPolicyAuthorization_Create. Creates a new Individual application AM context resource and may create the child AM Policy Events Subscription sub-resource.
Individual application AM context	/app-am-contexts/ {appAmContextId}	PATCH	Npcf_AMPolicyAuthorization_Update. Updates an existing Individual application AM context resource. It can also create or update an AM Policy Events Subscription sub-resource.
		GET	Reads an existing Individual application AM context resource.
		DELETE	Npcf_AMPolicyAuthorization_Delete. Deletes an existing Individual application AM context resource and the child AM Policy Events Subscription sub-resource.
AM Policy Events Subscription	/app-am-contexts/ {appAmContextId} /events-subscription	PUT	Npcf_AMPolicyAuthorization_Subscribe. Creates a new AM Policy Events Subscription sub-resource or modifies an existing AM Policy Events Subscription sub-resource.
		DELETE	Npcf_AMPolicyAuthorization_Unsubscribe. Deletes an AM Policy Events Subscription sub-resource.

5.3.2 Resource: Application AM contexts (Collection)

5.3.2.1 Description

The Application AM contexts resource represents all application AM contexts that exist in the Npcf_AMPolicyAuthorization service at a given PCF instance.

5.3.2.2 Resource Definition

Resource URI: **{apiRoot}/npcf-am-policyauthorization/<apiVersion>/app-am-contexts**

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

Table 5.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 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	Applicability
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
AppAmContextData	M	1	Contains the information for the creation of a new Individual application AM context 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
AppAmContextResp Data	M	1	201 Created	Successful case. The creation of an Individual application AM context resource is confirmed and a representation of that resource is returned, together with event subscription and event notification information, if available, as specified in clause 4.2.2.2.
ProblemDetails	O	0..1	500 Internal Server Error	(NOTE 2)
NOTE 1: 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.				
NOTE 2: Failure cases are described in clause 5.7.				

Table 5.3.2.3.1-4: Headers supported by the 201 response code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/npcf-am-policyauthorization/<apiVersion>/app-am-contexts/{appAmContextId}

5.3.2.4 Resource Custom Operations

None.

5.3.3 Resource: Individual application AM context (Document)

5.3.3.1 Description

The Individual application AM context resource represents a single application AM context that exists in the Npcf_AMPolicyAuthorization.

5.3.3.2 Resource Definition

Resource URI: **{apiRoot}/npcf-am-policyauthorization/<apiVersion>/app-am-contexts/{appAmContextId}**

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	Data type	Definition
apiRoot	string	See clause 5.1
appAmContextId	string	Identifies an application AM context formatted according to IETF RFC 3986 [19].

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	Applicability
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
AppAmContextData	M	1	200 OK	Successful case. A representation of an Individual application AM context resource is returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during an Individual application AM context retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during an Individual application AM context resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.
ProblemDetails	O	0..1	404 Not Found	(NOTE 2)
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: Failure cases are described in clause 5.7.				

Table 5.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative PCF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected.

Table 5.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative PCF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected.

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	Applicability
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
AppAmContextUpdateData	M	1	Contains the modification(s) to apply to the Individual application AM context resource.

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
AppAmContextRespData	M	1	200 OK	Successful case. A representation of an Individual application AM context resource, together with event subscription and event notification information, if available, as specified in clause 4.2.3.2.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during an Individual application AM context modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during an Individual application AM context modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.
ProblemDetails	O	0..1	400 Bad Request	(NOTE 2)
ProblemDetails	O	0..1	404 Not Found	(NOTE 2)
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: Failure cases are described in clause 5.7.				

Table 5.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative PCF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected.

Table 5.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative PCF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected.

5.3.3.3.3 DELETE

This method shall support the URI query parameters specified in table 5.3.3.3.3-1.

Table 5.3.3.3.3-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 5.3.3.3.3-2 and the response data structures and response codes specified in table 5.3.3.3.3-3.

Table 5.3.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.3.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The Individual application AM context resource is deleted.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during Individual application AM context termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during Individual application AM context termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.
ProblemDetails	O	0..1	404 Not Found	(NOTE 2)
NOTE 1: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				
NOTE 2: Failure cases are described in clause 5.7.				

Table 5.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative PCF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected.

Table 5.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative PCF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected.

5.3.3.4 Resource Custom Operations

None.

5.3.4 Resource: AM Policy Events Subscription (Document)

5.3.4.1 Description

The AM Policy Events Subscription resource represents a subscription to access and mobility policy events for an application AM context that exists in the Npcf_AMPolicyAuthorization service.

5.3.4.2 Resource definition

Resource URI: **{apiRoot}/npcf-am-policyauthorization/<apiVersion>/app-am-contexts/{appAmContextId}/events-subscription**

This resource shall support the resource URI variables defined in table 5.3.4.2-1.

Table 5.3.4.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.1
appAmContextId	string	Identifies an application AM context formatted according to IETF RFC 3986 [19].

5.3.4.3 Resource Standard Methods

5.3.4.3.1 PUT

This method shall support the URI query parameters specified in table 5.3.4.3.1-1.

Table 5.3.4.3.1-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 5.3.4.3.1-2 and the response data structures and response codes specified in table 5.3.4.3.1-3.

Table 5.3.4.3.1-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
AmEventsSubscData	M	1	Contains the information for the creation and/or modification of the AM Policy Events Subscription sub-resource.

Table 5.3.4.3.1-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AmEventsSubscResp Data	M	1	201 Created	Successful case. The AM Policy Events Subscription sub-resource was created. The representation of the AM Policy Events Subscription sub-resource is included within the properties of the AmEventsSubscData data type. The one or more matched events, if available, are included within the properties of the AmEventsNotification data type.
AmEventsSubscResp Data	M	1	200 OK	Successful case. The AM Policy Events Subscription sub-resource was modified and a representation of the sub-resource is returned. The representation of the AM Policy Events Subscription sub-resource is included within the properties of the AmEventsSubscData data type. The one or more matched events, if available, are included within the properties of the AmEventsNotification data type.
n/a			204 No Content	Successful case. The AM Policy Events Subscription sub-resource was modified.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during AM Policy Events Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during AM Policy Events Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.
ProblemDetails	O	0..1	404 Not Found	(NOTE 2)
NOTE 1: The mandatory HTTP error status code for the PUT method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				
NOTE 2: Failure cases are described in clause 5.7.				

Table 5.3.4.3.1-4: 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-am-policyauthorization/<apiVersion>/ app-am-contexts/{appAmContextId}/events-subscription

Table 5.3.4.3.1-5: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative PCF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected.

Table 5.3.4.3.1-6: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative PCF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected.

5.3.4.3.2 DELETE

This method shall support the URI query parameters specified in table 5.3.4.3.2-1.

Table 5.3.4.3.2-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 5.3.4.3.2-2 and the response data structures and response codes specified in table 5.3.4.3.2-3.

Table 5.3.4.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.3.4.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The AM Policy Events Subscription resource is deleted.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during AM Policy Events Subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during AM Policy Events Subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PCF (service) instance.
ProblemDetails	O	0..1	404 Not Found	(NOTE 2)
NOTE 1: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				
NOTE 2: Failure cases are described in clause 5.7.				

Table 5.3.4.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative PCF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected.

Table 5.3.4.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative PCF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected.

5.3.4.4 Resource Custom Operations

None.

5.4 Custom Operations without associated resources

None.

5.5 Notifications

5.5.1 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 5.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
AM Event Notification	{eventNotifUri}	POST	Notification of access and mobility policy changes event(s).
Termination Request	{termNotifUri}	POST	Request for termination of an Individual application AM context.

5.5.2 AM Event Notification

5.5.2.1 Description

The AM Event Notification is used by the NF service producer to report one or several observed Access and Mobility policy change Events to a NF service consumer that has subscribed to such Notifications via the AM Policy Events Subscription Resource.

5.5.2.2 Target URI

The Callback URI **"{eventNotifUri}"** shall be used with the callback URI variables defined in table 5.5.2.2-1.

Table 5.5.2.2-1: Callback URI variables

Name	Definition
eventNotifUri	String formatted as URI with the Callback Uri. The Callback Uri is assigned within the AM Policy Events Subscription sub-resource and described within the AmEventsSubscData type (see table 5.6.2.1-1).

5.5.2.3 Standard Methods

5.5.2.3.1 POST

This method shall support the request data structures specified in table 5.5.2.3.1-1 and the response data structures and response codes specified in table 5.5.2.3.1-2.

Table 5.5.2.3.1-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
AmEventsNotification	M	1	Provides information about the observed access and mobility policy change events.

Table 5.5.2.3.1-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No content	The receipt of the Notification is acknowledged.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during AM event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during AM event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.
NOTE: 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.				

Table 5.5.2.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

Table 5.5.2.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

5.5.3 Termination Request

5.5.3.1 Description

The Termination request is used by the NF service producer to request the NF service consumer the deletion of the Individual Application AM context Resource.

5.5.3.2 Target URI

The Callback URI **"{termNotifUri}"** shall be used with the callback URI variables defined in table 5.5.3.2-1.

Table 5.5.3.2-1: Callback URI variables

Name	Definition
termNotifUri	String formatted as URI with the Callback Uri. The Callback Uri is assigned within the Individual Application AM Context resource and described within the AppAmContextData type (see table 5.6.2.1-1).

5.5.3.3   Standard Methods

5.5.3.3.1   POST

This method shall support the request data structures specified in table 5.5.3.3.1-1 and the response data structures and response codes specified in table 5.5.3.3.1-1.

Table 5.5.3.3.1-2: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
AmTerminationInfo	M	1	Provides information about the cause of the termination request.

Table 5.5.3.3.1-3: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No content	The receipt of the Notification is acknowledged.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during AM event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during AM event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.
NOTE: 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.				

Table 5.5.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

Table 5.5.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

5.6 Data Model

5.6.1 General

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

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

Table 5.6.1-1: Npcf_AMPolicyAuthorization specific Data Types

Data type	Clause defined	Description	Applicability
AmEvent	5.6.3.3	It represents the event the PCF can notify to the NF service consumer.	
AmEventNotification	5.6.2.9	Represents the notification of an event.	
AmEventData	5.6.2.8	It contains the event identifier and the related event reporting information.	
AmEventsNotification	5.6.2.5	It describes the notification about the events occurred within an Individual application AM context resource.	
AmEventsSubscData	5.6.2.4	It represents the AM Policy Events Subscription resource and identifies the events the application subscribes to.	
AmEventsSubscDataRm	5.6.2.7	This data type is defined in the same way as the "AmEventsSubscData" data type, but with the OpenAPI "nullable: true" property.	
AmEventsSubscRespData	5.6.4.2	It represents a response to an AM Policy Events Subscription request and contains the created/updated AM Policy Events Subscription resource. It may also include the Notification of the events met at the time of subscription. It is represented as a non-exclusive list of two data types: AmEventsSubscData and AmEventsNotification.	
AmTerminationCause	5.6.3.5	It represents the cause values that the PCF should report when requesting to an NF service consumer the deletion of an "AF application AM context" resource.	
AmTerminationInfo	5.6.2.6	It includes information related to the termination of the Individual Application AM Context resource.	
AppAmContextData	5.6.2.2	It represents an Individual application AM context resource.	
AppAmContextRespData	5.6.4.1	It represents a response to a modification or creation request of an Individual application AM context resource. It is represented as a non-exclusive list of two data types AppAmContextData and AmEventsNotification.	
AppAmContextUpdateData	5.6.2.3	It describes the modifications to an Individual application AM context resource.	
PduidInformation	5.6.2.10	It contains the PDUID and its validity timer.	
ServiceAreaCoverageInfo	5.6.2.11	It represents a list of Tracking Areas within a serving network.	

Table 5.6.1-2 specifies data types re-used by the Npcf_AMPolicyAuthorization 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_AMPolicyAuthorization service based interface.

Table 5.6.1-2: Npcf_AMPolicyAuthorization re-used Data Types

Data type	Reference	Comments	Applicability
AsTimeDistribution Param	3GPP TS 29.507 [16]	Contains the 5G access stratum time distribution parameters.	
DurationSec	3GPP TS 29.571 [20]	Indicates a period of time in units of seconds.	
DurationSecRm	3GPP TS 29.571 [20]	It is defined as DurationSec but with the nullable property set to "true".	
Gpsi	3GPP TS 29.571 [20]	Identifies a GPSI.	
NotificationMethod	3GPP TS 29.508 [21]	It includes information about the notification methods that can be subscribed by the NF service consumer.	
Pduid	3GPP TS 29.555 [24]	String containing a PDUID	
RedirectResponse	3GPP TS 29.571 [20]	It contains redirection related information.	
Supi	3GPP TS 29.571 [20]	Identifies the SUPI.	
SupportedFeatures	3GPP TS 29.571 [20]	Used to negotiate the applicability of the optional features defined in table 5.8-1.	
Tac	3GPP TS 29.571 [20]	It contains a Tracking Area Code	
PlmnIdNid	3GPP TS 29.571 [20]	It contains the serving PLMN ID and, for a SNPN, the NID that together with the PLMN ID identifies the SNPN.	
Uinteger	3GPP TS 29.571 [20]	Unsigned integer.	
Uri	3GPP TS 29.571 [20]	String providing a URI.	

5.6.2 Structured data types

5.6.2.1 Introduction

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

5.6.2.2 Type: AppAmContextData

Table 5.6.2.2-1: Definition of type AppAmContextData

Attribute name	Data type	P	Cardinality	Description	Applicability
evSubc	AmEventsSubscData	O	0..1	Represents the subscription to one or more AM policy events.	
supi	Supi	M	1	Identifies the SUPI.	
gpsi	Gpsi	O	0..1	Identifies the GPSI.	
suppFeat	SupportedFeatures	C	0..1	This IE represents a list of Supported features used as described in clause 5.8. It shall be supplied by the NF service consumer in the POST request that requests a creation of an Individual application AM context resource. It shall be supplied by the PCF in the response to the POST request that requests a creation of an Individual application AM context resource.	
termNotifUri	Uri	M	1	Identifies the callback URI where the PCF notifies termination requests.	
expiry	DurationSec	O	0..1	Indicates the time duration that the requested policy shall last. If omitted, it indicates that the requested policy lasts till the Individual Application AM context resource is deleted.	
highThruInd	boolean	C	0..1	Indicates whether high throughput is desired for the indicated UE traffic. Set to "true" if high throughput is desired; otherwise set to "false". Default value is "false" if omitted. (NOTE)	
covReq	array(ServiceAreaCoverageInfo)	C	1..N	Identifies a list of Tracking Areas per serving network where the service is allowed. (NOTE)	
asTimeDisParam	AsTimeDistributionParam	C	0..1	Contains the 5G access stratum time distribution parameters. (NOTE)	
NOTE: When the "asTimeDisParam" attribute is not included, the "highThruInd" attribute, the "covReq" attribute or both of them shall be included. When both, the "highThruInd" attribute and the "covReq" attribute are not included, the "asTimeDisParam" attribute shall be included.					

5.6.2.3   Type: AppAmContextUpdateData

Table 5.6.2.3-1: Definition of type AppAmContextUpdateData

Attribute name	Data type	P	Cardinality	Description	Applicability
evSubsc	AmEventsSubscDataRm	O	0..1	Represents the subscription to one or more AM policy events.	
termNotifUri	Uri	O	0..1	Identifies the callback URI where the PCF notifies termination requests.	
expiry	DurationSecRm	O	0..1	The expiration time of the AM related policy. If removed (i.e. set to "NULL"), it indicates that the requested policy lasts till the Individual Application AM context resource is deleted.	
highThruInd	boolean	O	0..1	Indicates whether high throughput is desired for the indicated UE traffic. Set to "true" if high throughput is desired; otherwise set to "false".	
covReq	array(ServiceAreaCoverageInfo)	O	1..N	Identifies a list of Tracking Areas per serving network where the service is allowed.	
asTimeDisParam	AsTimeDistributionParam	O	0..1	Contains the 5G access stratum time distribution parameters.	

5.6.2.4   Type: AmEventsSubscData

Table 5.6.2.4-1: Definition of type AmEventsSubscData

Attribute name	Data type	P	Cardinality	Description	Applicability
eventNotifUri	Uri	M	1	Indicates the callback URI where the PCF sends the access and mobility changes events met.	
events	array(AmEventData)	O	1..N	Indicates the one or more access and mobility related events.	

5.6.2.5   Type: AmEventsNotification

Table 5.6.2.5-1: Definition of type AmEventsNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
repEvents	array(AmEventNotification)	M	1..N	The list of the reported events.	
appAmContextId	string	C	0..1	Contains the AM Policy Events Subscription resource identifier related to the event notification. It shall be included in the notification requests. It may be omitted in the resource creation/update replies.	

5.6.2.6 Type: AmTerminationInfo

Table 5.6.2.6-1: Definition of type AmTerminationInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
appAmContextId	string	M	1	Contains the Individual application AM context resource identifier related to the termination notification.	
termCause	AmTermination Cause	M	1	Indicates the cause for requesting the termination of the Individual application AM context resource	

5.6.2.7 Type AmEventsSubscDataRm

This data type is defined as the AmEventsSubscData type, but:

- with the OpenAPI "nullable: true" property; and

- the attributes are defined as optional.

Table 5.6.2.7-1: Definition of type AmEventsSubscDataRm

Attribute name	Data type	P	Cardinality	Description	Applicability
eventNotifUri	Uri	O	1..N	Indicates the callback URI where the PCF sends the access and mobility changes events met.	
events	array(AmEvent Data)	O	1..N	Indicates the one or more access and mobility related events.	

5.6.2.8 Type AmEventData

Table 5.6.2.8-1: Definition of type AmEventData

Attribute name	Data type	P	Cardinality	Description	Applicability
event	AmEvent	M	1	Subscribed Event.	
immRep	boolean	O	0..1	Indication of immediate reporting: - true: requires the immediate reporting of the current value of the subscribed event, if available. - false (default): event report occurs when the event is met.	
notifMethod	NotificationMethod	O	0..1	Represents the notification method (periodic, one time, on event detection). If "notifMethod" attribute is not supplied, the default value "ON_EVENT_DETECTION" applies.	
maxReportNbr	Uinteger	O	0..1	Represents the maximum number of reports, after which the subscription ceases to exist (i.e., the reporting ends). It may be present for the "PERIODIC" and on "ON_EVENT_DETECTION" notification methods. If omitted, there is no limit.	
monDur	DateTime	C	0..1	Represents the time at which the subscription ceases to exist (i.e the subscription becomes invalid and the reporting ends). If omitted, there is no time limit. If present in the subscription request, it shall be present in the subscription response.	
repPeriod	DurationSec	O	0..1	Indicates the time interval between successive event notifications.It is supplied for notification method "PERIODIC".	

5.6.2.9 Type: AmEventNotification

Table 5.6.2.9-1: Definition of type AmEventNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
event	AmEvent	M	1	Notified event.	
appliedCov	ServiceAreaCoverageInfo	C	0..1	The list of applied Tracking Areas for the serving network where the UE is camping. It shall be present when the notified event is "SAC_CH".	
pduidInfo	PduidInformation	C	0..1	Contains the PDUID and its validity timer. It shall be included when the "PDUID_CH" event is reported.	

5.6.2.10   Type: PduidInformation

Table 5.6.2.10-1: Definition of type PduidInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
expiry	DateTime	M	1	Contains the expiration time of validity of UE policies for 5G Prose direct discovery.	
pduid	Pduid	M	1	Contains the PDUID as defined in Table 5.3.1.1 of 3GPP TS 24.555 [23].	

5.6.2.11   Type: ServiceAreaCoverageInfo

Table 5.6.2.11-1: Definition of type ServiceAreaCoverageInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
tacList	array(Tac)	M	0..N	It contains a list of the Tracking Area codes where the requested service shall be allowed. An empty array may be included within the AmEventNotification data type and indicates the service is restricted in the serving network.	
servingNetwork	PlmnIdNid	O	0..1	It contains the serving PLMN ID and, for a SNPN, the NID that together with the PLMN ID identifies the SNPN. It may be omitted when serving network is the UE H-PLMN.	

5.6.3   Simple data types and enumerations

5.6.3.1   Introduction

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

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
	<one simple data type, i.e. boolean, integer, number, or string>		

5.6.3.3   Enumeration: AmEvent

The enumeration "AmEvent" represents the events the PCF can notify to the NF service consumer.

Table 5.6.3.3-1: Enumeration AmEvent

Enumeration value	Description	Applicability
SAC_CH	This trigger indicates a service area coverage change for a UE.	
PDUID_CH	The PDUID assigned to a UE for the UE ProSe Policies has changed. (NOTE)	
NOTE:	This event can only be subscribed using the Npcf_AMPolicyAuthorization_Subscribe service operation.	

5.6.3.4   Enumeration: AmTerminationCause

The enumeration "AmTerminationCause" represents the cause values that the PCF should report when requesting to the NF service consumer the deletion of the "AF application AM context" resource. It shall comply with the provisions of table 5.6.3.4-1.

Table 5.6.3.4-1: Enumeration AmTerminationCause

Enumeration value	Description	Applicability
UE_DEREGISTERED	UE initiates the deregistration procedure.	
UNSPECIFIED	This value is used for unspecified reasons.	
INSUFFICIENT_RESOURCES	Indicates that the server is overloaded and needs to release the AF application AM context resource.	

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

5.6.4.1   Type: AppAmContextRespData

Table 5.6.4.1-1: Definition of type AppAmContextRespData as a list of non-exclusive alternatives

Data type	Cardinality	Description	Applicability
AmEventsNotification	0..1	It represents the notification of a match event during the creation or modification of the Individual application AM context data.	
AppAmContextData	1	It represents the Individual application AM context resource.	

5.6.4.2   Type: AmEventsSubscRespData

Table 5.6.4.2-1: Definition of type AmEventsSubscRespData as a list of non-exclusive alternatives

Data type	Cardinality	Description	Applicability
AmEventsSubscData	1	It represents the AM Policy Events subscription resource.	
AmEventsNotification	0..1	It represents the notification of a match event during the creation or modification of the AM Policy Events Subscription resource.	

5.6.5   Binary data

5.6.5.1   Binary Data Types

None.

5.7 Error Handling

5.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [5].

For the Npcf_AMPolicyAuthorization 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_AMPolicyAuthorization API.

5.7.2 Protocol Errors

No specific procedures for the Npcf_AMPolicyAuthorization service are specified.

5.7.3 Application Errors

The application errors defined for the Npcf_AMPolicyAuthorization service are listed in Table 5.7.3-1.

Table 5.7.3-1: Application errors

Application Error	HTTP status code	Description
INVALID_POLICY_REQUEST	400 Bad Request	The HTTP request is rejected because the service information for the AM context is invalid or insufficient for the PCF to perform the requested action. (NOTE 1)
APPLICATION_AM_CONTEXT_NOT _FOUND	404 Not Found	The HTTP request is rejected because the specified Individual Application AM Context does not exist. (NOTE 3)
POLICY_ASSOCIATION_NOT_AVAIL ABLE	500 Internal Server Error	The PCF failed in executing binding with the UE/AM Policy Context. (NOTE 2)
NOTE 1: This application error is included in the response to the PATCH request (see clauses 4.2.3.2).		
NOTE 2: This application error is included in the response to the POST request (see clauses 4.2.2.2 and 4.2.5.3).		
NOTE 3: This application error is included in the responses to the GET, PATCH and DELETE requests to the Individual Application AM Context resource, and to the PUT and DELETE requests to the AM Policy Events Subscription resource.		

5.8 Feature negotiation

The optional features in table 5.8-1 are defined for the Npcf_AMPolicyAuthorization API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 5.8-1: Supported Features

Feature number	Feature Name	Description

5.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Npcf_AMPolicyAuthorization 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_AMPolicyAuthorization 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_AMPolicyAuthorization service.

The Npcf_AMPolicyAuthorization API defines a single scope " npcf-am-policyauthorization " 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 3GPP TS 29.501 [5] clause 5.3.1 and 3GPP TR 21.900 [7] clause 5B).

A.2 Npcf_AMPolicyAuthorization API

```
openapi: 3.0.0
info:
  title: Npcf_AMPolicyAuthorization Service API
  version: 1.0.0
  description: |
    PCF Access and Mobility Policy Authorization Service.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: >
    3GPP TS 29.534 V17.1.0;
    5G System; Access and Mobility Policy Authorization Service; Stage 3.
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.534/'
#
servers:
  - url: '{apiRoot}/npcf-am-policyauthorization/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501
#
security:
  - {}
  - oAuth2ClientCredentials:
    - npcf-am-policyauthorization
paths:
  /app-am-contexts:
    post:
      summary: Creates a new Individual Application AM Context resource
      operationId: PostAppAmContexts
      tags:
        - Application AM contexts (Collection)
      requestBody:
        description: Contains the information for the creation the resource.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AppAmContextData'
      responses:
        '201':
          description: Successful creation of the resource.
          content:
            application/json:
              schema:
```

```yaml
                    $ref: '#/components/schemas/AppAmContextRespData'
              headers:
                Location:
                  description: >
                    Contains the URI of the created individual application AM context resource,
                    according to the structure
                    {apiRoot}/npcf-am-policyauthorization/<apiVersion>/app-am-contexts/{appAmContextId}
                    or the URI of the created AM Policy events subscription subresource,
                    according to the structure
                    {apiRoot}/npcf-am-policyauthorization/<apiVersion>/app-am-
contexts/{appAmContextId}/events-subscription}
                  required: true
                  schema:
                    type: string
            '400':
              $ref: 'TS29571_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29571_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29571_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29571_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29571_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29571_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29571_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29571_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29571_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29571_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      callbacks:
        terminationRequest:
          '{$request.body#/termNotifUri}':
            post:
              requestBody:
                description: Request of the termination of the Individual Application AM Context.
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/AmTerminationInfo'
              responses:
                '204':
                  description: The receipt of the 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'
                '503':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
        amEventNotification:
          '{$request.body#/evSubsc/eventNotifUri}':
```

```
      post:
        requestBody:
          description: Notification of an event occurrence in the PCF.
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AmEventsNotification'
        responses:
          '204':
            description: The receipt of the 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'
          '503':
            $ref: 'TS29571_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29571_CommonData.yaml#/components/responses/default'
#
  /app-am-contexts/{appAmContextId}:
    get:
      summary: "Reads an existing Individual Application AM Context"
      operationId: GetAppAmContext
      tags:
        - Individual Application AM Context (Document)
      parameters:
        - name: appAmContextId
          description: String identifying the resource.
          in: path
          required: true
          schema:
            type: string
      responses:
        '200':
          description: A representation of the resource is returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AppAmContextData'
        '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'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
```

```
              default:
                $ref: 'TS29571_CommonData.yaml#/components/responses/default'
#
    patch:
      summary: "Modifies an existing Individual Application AM Context"
      operationId: ModAppAmContext
      tags:
        - Individual Application AM Context (Document)
      parameters:
        - name: appAmContextId
          description: String identifying the resource.
          in: path
          required: true
          schema:
            type: string
      requestBody:
        description: Modification of the resource.
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/AppAmContextUpdateData'
      responses:
        '200':
          description: >
            Successful modification of the resource and a representation of that resource is
            returned. If a subscribed event is matched, the event notification is also included
            in the response.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AppAmContextRespData'
        '204':
          description: The successful modification.
        '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'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      callbacks:
        amEventNotification:
          '{$request.body#/evSubsc/eventNotifUri}':
            post:
              requestBody:
                description: Notification of an event occurrence in the PCF.
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/AmEventsNotification'
              responses:
                '204':
                  description: The receipt of the 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'
                   '503':
                     $ref: 'TS29571_CommonData.yaml#/components/responses/503'
                  default:
                     $ref: 'TS29571_CommonData.yaml#/components/responses/default'
#
    delete:
      summary: Deletes an existing Individual Application AM Context
      operationId: DeleteAppAmContext
      tags:
        - Individual Application AM Context (Document)
      parameters:
        - name: appAmContextId
          description: String identifying the Individual Application AM Context resource.
          in: path
          required: true
          schema:
            type: string
      responses:
        '204':
          description: The deletion is confirmed without returning additional data.
        '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'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
       default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
#
  /app-am-contexts/{appAmContextId}/events-subscription:
    put:
      summary: creates or modifies an AM Policy Events Subscription subresource.
      operationId: updateAmEventsSubsc
      tags:
        - AM Policy Events Subscription (Document)
      parameters:
        - name: appAmContextId
          description: String identifying the AM Policy Events Subscription subresource.
          in: path
          required: true
          schema:
            type: string
```

```
      requestBody:
        description: Creation or modification of an AM Policy Events Subscription subresource.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AmEventsSubscData'
      responses:
        '201':
          description: >
            The creation of the AM Policy Events Subscription subresource is confirmed and its
            representation is returned. If an AM Event is matched, the response also includes the
            notification.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AmEventsSubscRespData'
          headers:
            Location:
              description: >
                Contains the URI of the created AM Policy Events Subscription subresource,
                according to the structure
                {apiRoot}/npcf-am-policyauthorization/<apiVersion>/app-am-
contexts/{appAmContextId}/events-subscription}
              required: true
              schema:
                type: string
        '200':
          description: The modification of the AM Policy Events Subscription subresource is
confirmed and its representation is returned. If an AM Event is matched, the response also includes
the notification.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AmEventsSubscRespData'
        '204':
          description: The modification of the AM Policy Events Subscription subresource is
confirmed without returning additional data.
        '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'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      callbacks:
        amEventNotification:
          '{$request.body#/evSubsc/eventNotifUri}':
            post:
              requestBody:
                description: Contains the information for the notification of an event occurrence in
the PCF.
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/AmEventsNotification'
              responses:
                '204':
```

```
                    description: The receipt of the 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'
                  '503':
                    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
                  default:
                    $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    delete:
      summary: deletes the AM Policy Events Subscription subresource
      operationId: DeleteAmEventsSubsc
      tags:
        - AM Policy Events Subscription (Document)
      parameters:
        - name: appAmContextId
          description: String identifying the Individual Application AM Context resource.
          in: path
          required: true
          schema:
            type: string
      responses:
        '204':
          description: The deletion of the of the AM Policy Events Subscription subresource is
confirmed without returning additional data.
        '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'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
#
#
components:
#
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            npcf-am-policyauthorization: Access to the Npcf_AMPolicyAuthorization API
#
  schemas:
#
```

```
    AppAmContextData:
      description: Represents an Individual Application AM Context resource.
      type: object
      required:
        - supi
        - termNotifUri
      properties:
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        termNotifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        evSubsc:
          $ref: '#/components/schemas/AmEventsSubscData'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        expiry:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
        highThruInd:
          type: boolean
          description: Indicates whether high throughput is desired for the indicated UE traffic.
        covReq:
          type: array
          description: Identifies a list of Tracking Areas per serving network where service is
allowed.
          items:
            $ref: '#/components/schemas/ServiceAreaCoverageInfo'
          minItems: 1
        asTimeDisParam:
          $ref: 'TS29507_Npcf_AMPolicyControl.yaml#/components/schemas/AsTimeDistributionParam'
      anyOf:
       - anyOf:
          - required: [highThruInd]
          - required: [covReq]
       - required: [asTimeDisParam]
#
#
    AppAmContextUpdateData:
      description: Describes the modifications to an Individual Application AM resource.
      type: object
      properties:
        termNotifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        evSubsc:
          $ref: '#/components/schemas/AmEventsSubscDataRm'
        expiry:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSecRm'
        highThruInd:
          description: Indicates whether high throughput is desired for the indicated UE traffic.
          type: boolean
          nullable: true
        covReq:
          type: array
          description: Identifies a list of Tracking Areas per serving network where service is
allowed.
          items:
            $ref: '#/components/schemas/ServiceAreaCoverageInfo'
          minItems: 1
          nullable: true
        asTimeDisParam:
          $ref: 'TS29507_Npcf_AMPolicyControl.yaml#/components/schemas/AsTimeDistributionParam'
#
    AmEventsSubscData:
      description: It represents the AM Policy Events Subscription subresource and identifies the
events the application subscribes to.
      type: object
      required:
        - eventNotifUri
      properties:
        eventNotifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        events:
          type: array
          items:
            $ref: '#/components/schemas/AmEventData'
          minItems: 1
#
```

```
    AmEventsNotification:
      description: Describes the notification about the events occurred within an Individual
Application AM Context resource.
      type: object
      required:
        - repEvents
      properties:
        appAmContextId:
          type: string
          description: Contains the AM Policy Events Subscription resource identifier related to the
event notification.
        repEvents:
          type: array
          items:
            $ref: '#/components/schemas/AmEventNotification'
          minItems: 1
#
    AmTerminationInfo:
      description: Includes information related to the termination of the Individual Application AM
Context resource.
      type: object
      required:
        - appAmContextId
        - termCause
      properties:
        appAmContextId:
          type: string
          description: Contains the Individual application AM context resource identifier related to
the termination notification.
        termCause:
          $ref: '#/components/schemas/AmTerminationCause'
#
    AmEventsSubscDataRm:
      description: This data type is defined in the same way as the AmEventsSubscData but with the
OpenAPI nullable property set to true.
      type: object
      properties:
        eventNotifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        events:
          type: array
          items:
            $ref: '#/components/schemas/AmEventData'
          minItems: 1
      nullable: true
#
    AmEventData:
      description: This data type contains the event identifier and the related event reporting
information.
      type: object
      required:
        - event
      properties:
        event:
          $ref: '#/components/schemas/AmEvent'
        immRep:
          type: boolean
        notifMethod:
          $ref: 'TS29508_Nsmf_EventExposure.yaml#/components/schemas/NotificationMethod'
        maxReportNbr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        monDur:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        repPeriod:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
#
    AmEventNotification:
      description: Describes the notification of a subscription.
      type: object
      required:
        - event
      properties:
        event:
          $ref: '#/components/schemas/AmEvent'
        appliedCov:
          $ref: '#/components/schemas/ServiceAreaCoverageInfo'
        pduidInfo:
          $ref: '#/components/schemas/PduidInformation'
```

```yaml
#
    PduidInformation:
      description: Contains the ProSe Discovery UE ID and its validity timer.
      type: object
      required:
        - expiry
        - pduid
      properties:
        expiry:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        pduid:
          $ref: 'TS29555_N5g-ddnmf_Discovery.yaml#/components/schemas/Pduid'
#
    ServiceAreaCoverageInfo:
      description: It represents a list of Tracking Areas within a serving network.
      type: object
      required:
        - tacList
      properties:
        tacList:
          type: array
          description: Indicates a list of Tracking Areas where the service is allowed.
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Tac'
        servingNetwork:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnIdNid'
#
# ENUMERATIONS DATA TYPES
#
    AmTerminationCause:
      description: It represents the cause values that the PCF should report when requesting to an
NF service consumer the deletion of an "AF application AM context" resource.
      anyOf:
        - type: string
          enum:
            - UE_DEREGISTERED
            - UNSPECIFIED
            - INSUFFICIENT_RESOURCES
        - type: string
#
    AmEvent:
      anyOf:
        - type: string
          enum:
            - SAC_CH
            - PDUID_CH
        - type: string
      description: |
        Possible values are:
        - SAC_CH: Service Area Coverage Change
        - PDUID_CH: The PDUID assigned to a UE for the UE ProSe Policies changed
#
#
    AppAmContextRespData:
      description: It represents a response to a modification or creation request of an Individual
Application AM resource. It may contain the notification of the already met events.
      anyOf:
        - $ref: '#/components/schemas/AppAmContextData'
        - $ref: '#/components/schemas/AmEventsNotification'
#
    AmEventsSubscRespData:
      description: Identifies the events the application subscribes to within an AM Policy Events
Subscription subresource data. It may contain the notification of the already met events.
      anyOf:
        - $ref: '#/components/schemas/AmEventsSubscData'
        - $ref: '#/components/schemas/AmEventsNotification'
#
```

Annex B (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2021-04						TS skeleton	0.0.0
2021-04	CT3#115e	C3-212565				Inclusion of documents agreed in CT3#115e: C3-212111, C3-212411, C3-212515, C3-212516, C3-212517, C3-212303, C3-212412, C3-212306, C3-212518, C3-212308, C3-212413, C3-212555, C3-212556, C3-212557, C3-212558, C3-212559, C3-212560, C3-212561, C3-212562.	0.1.0
2021-06	CT3#116e	C3-213498				Inclusion of documents agreed in CT3#116e: C3-213358.	0.2.0
2021-09	CT3#117e	C3-214574				Inclusion of documents agreed in CT3#117e: C3-214427, C3-214428, C3-214429, C3-214431, C3-214618, C3-214430, C3-214134, C3-214305, C3-214493, C3-214494, C3-214495, C3-214496	0.3.0
2021-10	CT3#118e	C3-215472				Inclusion of documents agreed in CT3#118e: C3-215306, C3-215396	0.4.0
2021-12	CT3#119e	C3-216516				Inclusion of documents agreed in CT3#119e: C3-216187, C3-216404, C3-216405, C3-216380, C3-216206, C3-216406, C3-216409, C3-216407	0.5.0
2021-12	CT#94e	CP-213253				Presentation for information	1.0.0
2022-01	CT3#119bis-e	C3-220448				Inclusion of documents agreed in CT3#119bis-e: C3-220230, C3-220247, C3-220395, C3-220469, C3-220448	1.1.0
2022-02	CT3#120e	C3-221511				Inclusion of documents agreed in CT3#120e: C3-221704, C3-221479	1.2.0
2022-03	CT#95e	CP-220155				Presentation to TSG CT for approval	2.0.0
2022-03	CT#95e	CP-220155				Approved by TSG CT	17.0.0
2022-06	CT#96	CP-221159	0002		F	Correction to required properties in the OpenAPI file	17.1.0
2022-06	CT#96	CP-221159	0003		F	Data type in PATCH request body	17.1.0
2022-06	CT#96	CP-221144	0004	1	B	Support of AS Time Distribution, general clauses	17.1.0
2022-06	CT#96	CP-221144	0005	1	B	Support of AS Time Distribution, service procedures	17.1.0
2022-06	CT#96	CP-221095	0006	1	F	Alignment with the SBI template	17.1.0
2022-06	CT#96	CP-221151	0007		F	Update of info and externalDocs fields	17.1.0

History

Document history		
V17.0.0	May 2022	Publication
V17.1.0	July 2022	Publication