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Contents

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1 Scope

The present document specifies the protocols and the associated procedures for application layer support for Personal IoT Network (PINAPP) as specified in 3GPP TS 23.542 [2] for:

a) PIN application communication among PIN peers (over the PIN-2, PIN-3, and PIN-4 interfaces); and

b) PIN application communication between the PIN peer and the PIN server (over the PIN-6, PIN-7, and PIN-10 interfaces).

The present specification also defines the message format, message contents, error handling and system parameters applied by the protocols for PINAPP.

NOTE: PIN-5 interface is out of the scope of the present document.

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.

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[1]   3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2]   3GPP TS 23.542: "Application layer support for Personal IoT Network".

[3]   3GPP TS 22.261: "Service requirements for the 5G system".

[4]   IETF RFC 9110 :"HTTP Semantics".

[5]   void.

[6]   ITU-T Recommendation E.212: "The international identification plan for public networks and subscriptions", 2016-09-23.

[7]   3GPP TS 23.003: "Numbering, addressing and identification".

[8]   IETF RFC 791: "Internet Protocol".

[9]   IETF RFC 4291: "IP Version 6 Addressing Architecture".

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

[11]   3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[12]   W3C REC-xmlschema-2-20041028: "XML Schema Part 2: Datatypes".

[13]   IEEE 802.11-2012, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications, IEEE Std.

[14]   IETF RFC 5905: "Network Time Protocol Version 4: Protocol and Algorithms Specification".

[15]   3GPP TS 24.526: "UE policies for 5G System (5GS); Stage 3".

[16]   3GPP TS 29.222: "Common API Framework for 3GPP Northbound APIs; Stage 3".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in 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 TR 21.905 [1].

PIN application enabler server: An entity that provides the server side functionalities corresponding to the PIN application enabler layer.

PIN communication: A communication in a PIN between two PIN peers or between a PIN peer and an application server, which is supported by PGAE-C within the same PIN via a PDU session.

PIN element application enabler client: An entity that provides the client side functionalities corresponding to the PIN application enabler layer.

PIN gateway application enabler client: An entity that provides the client side functionalities corresponding to the PIN application enabler layer.

PIN management application enabler client: An entity that provides the client side functionalities corresponding to the PIN application enabler layer.

PIN peer: The appellative of the element in the PIN, which can be a PEAE-C, a PGAE-C, or a PMAE-C.

For the purposes of the present document, the following terms given in 3GPP TS 22.261 [3] apply:

> **Personal IoT Network**
> **PIN direct connection**
> **PIN Element**
> **PIN Element with Gateway Capability**
> **PIN Element with Management Capability**

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

FQDN	Fully Qualified Domain Name
GPSI	Generic Public Subscription Identifier
MIME	Multipurpose Internet Mail Extensions
PAE-S	PIN Application Enabler Server
PEMC	PIN Element with Management Capability
PEAE-C	PIN Element Application Enabler Client
PEGC	PIN Element with Gateway Capability
PGAE-C	PIN Gateway Application Enabler Client
PIN	Personal IoT Network
PINAPP	Application layer support for Personal IoT Network
PINE	PIN Element
PMAE-C	PIN Management Application Enabler Client
URI	Uniform Resource Identifier

4 Overview

4.1 General

To support the application layer support for Personal IoT Network (PINAPP), the PINE contains a PIN element application enabler client (PEAE-C), the PEGC contains a PIN gateway application enabler client (PGAE-C), the

PEMC contains a PIN management application enabler client (PMAE-C), and the PIN server contains a PIN application enabler server (PAE-S). The communication in PINAPP includes:

a)   PIN application communication among PIN peers (over the PIN-2, PIN-3, and PIN-4 interfaces); and

b)   PIN application communication between the PIN peers and the PIN server (over the PIN-6, PIN-7, and PIN-10 interfaces),

wherein:

a)   the PEAE-C communicates with PGAE-C over the PIN-2 interface;

b)   the PEAE-C communicates with PMAE-C over the PIN-3 interface;

c)   the PGAE-C communicates with PMAE-C over the PIN-4 interface;

d)   the PMAE-C communicates with PAE-S over the PIN-6 interface;

e)   the PGAE-C communicates with PAE-S over the PIN-7 interface; and

f)   the PEAE-C communicates with PAE-S over the PIN-10 interface.

The HTTP protocol interactions for the above interfaces are specified in clause 5.

The coding of all the messages is specified in clause 6.

The message format and the message contents are specified in clause 7.

5   PIN application layer procedures

5.1   General

The following procedures are defined for PIN application layer procedures:

a)   PIN server discovery as specified in clause 5.2;

b)   PIN registration management as specified in clause 5.3;

c)   PIN management as specified in clause 5.4;

d)   PIN communication as specified in clause 5.5;

e)   application server discovery in PIN as specified in clause 5.6;

f)   service switch as specified in clause 5.7;

g)   service continuity as specified in clause 5.8; and

h)   PIN authorization as specified in clause 5.9.

5.2   PIN server discovery

5.2.1   General

The purpose of PIN server discovery procedure is to receive one or more endpoint information (e.g. URI, FQDN, IP address, etc.) of PAE-S for a PEAE-C.

The following procedures are defined for PIN server discovery:

a)   static PAE-S discovery as specified in clause 5.2.2; and

b)   PAE-S discovery via PGAE-C as specified in clause 5.2.3.

5.2.2 Static PAE-S discovery

For static PAE-S discovery, a PEAE-C can discover a PAE-S by one or more of the following:

a) endpoint information that is pre-configured in PINE;

b) endpoint information that is pre-configured information in its client (i.e. PEAE-C);

c) input of the user;

d) derived from HPLMN identifier for non-roaming scenario or from VPLMN identifier for roaming scenario; and

e) DNS query for PIN server.

5.2.3 PAE-S discovery via PGAE-C

5.2.3.1 PEAE-C procedure

When the PEAE-C needs to receive one or more endpoint information of PAE-S, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 91109110 [4]. In the HTTP POST request, the PEAE-C:

a) shall set the Request-URI to the URI corresponding to the PGAE-C;

NOTE: How to obtain the URI corresponding to the PGAE-C is left to UE implementation.

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <server-discovery-request> element in the <pinapp-info> root element and within the <server-discovery-request> element:

1) shall include a <ue-id> element set to the identity of the PEAE-C (i.e. GPSI);

2) may include a <mac-address> element set to the MAC address of the PEAE-C; and

3) may include a <ue-location> element set to the location information of the PEAE-C.

The PEAE-C shall send the generated HTTP POST request towards the PGAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <server-discovery-accept> element in the <pinapp-info> root element,

the PEAE-C shall store the endpoint information of PAE-S and consider the client procedure for PAE-S discovery via PGAE-C is complete.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <server-discovery-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the endpoint information is not available neither in PMAE-C nor in PGAE-C.

5.2.3.2 PGAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <server-discovery-request> element in the <pinapp-info> root element

the PGAE-C shall:

a) if the endpoint information of PAE-S is available in the PGAE-C, the PGAE-C shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [4] and send the HTTP 200 (OK) response towards the PEAE-C. In the HTTP 200 (OK) response message, the PGAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <server-discovery-accept> element in the <pinapp-info> root element and within the <server-discovery-accept> element:

i) shall include a <endpoint-information-content> element set to the endpoint information of PAE-S; and

b) else, if the endpoint information of PAE-S is not available in PGAE-C, the PGAE-C shall send the HTTP POST request message received from PEAE-C to PMAE-C directly to request the endpoint information of PIN serve from the PMAE-C.

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <server-discovery-response> element in the <pinapp-info> root element,

the PGAE-C shall send the HTTP 200 (OK) response message received from PMAE-C to PEAE-C directly to deliver the endpoint information of PAE-S towards PEAE-C.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <server-discovery-reject> element in the <pinapp-info> root element,

the PGAE-C shall forward the HTTP 403 (Forbidden) response message to the PEAE-C.

5.2.3.3   PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <server-discovery-request> element in the <pinapp-info> root element,

the PMAE-C shall check whether the endpoint information of PAE-S is available in the PMAE-C.

If the endpoint information of PAE-S is available in the PMAE-C:

a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <server-discovery-accept> element in the <pinapp-info> root element and within the <server-discovery-accept> element:

i) shall include a <endpoint-information-content> element set to the endpoint information of PAE-S; and

b) send the HTTP 200 (OK) response towards the PGAE-C.

If the endpoint information of PAE-S is not available in the PMAE-C:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PMAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <server-discovery-reject> element in the <pinapp-info> root element and within the <server-discovery-reject> element:

      i) shall include a <cause> element to indicate the endpoint information of PAE-S is not available; and

b) send the HTTP 403 (Forbidden) response towards the PGAE-C.

The <cause> element shall set to one of the following:

   0 Protocol error, unspecified;

   1 Operation not allowed;

   2 Requested information not available;

   3 Authorization failure; and

   7 Permanently denied.

5.3   PIN Registration Management

5.3.1   General

The PIN Registration Management procedure includes the following aspects:

   a) PEAE-C registration to PAE-S;

   b) PEAE-C deregistration to PAE-S; and

   c) PEAE-C registration update to PAE-S.

The PIN Registration to PAE-S procedure is different for different PIN peers:

   a) for the PMAE-C, the PMAE-C directly registers to the PAE-S. The PAE-S allocates the PIN client ID to this PMAE-C and hence the PMAE-C receives the role of being PMAE-C in a PIN;

   b) for PGAE-C, the following procedures are supported:

      1) the PGAE-C directly registers to the PAE-S. The PAE-S allocates the PIN client ID to this PGAE-C; and

      2) the PMAE-C substitutes the PGAE-C to register to PAE-S. The PAE-S allocates the PIN client ID to this PGAE-C; and

   c) for PEAE-C, the following procedures are supported:

      1) the PEAE-C registers to the PAE-S via the PGAE-C. The PAE-S allocates the PIN client ID to this PEAE-C; and

      2) the PMAE-C substitutes the PEAE-C to register to PAE-S. The PAE-S allocates the PIN client ID to this PEAE-C.

The following procedures are defined for PIN Registration management:

   a) direct PIN registration to PAE-S as specified in clause 5.3.2;

   b) indirect PIN registration to PAE-S as specified in clause 5.3.3;

   c) direct PIN deregistration to PAE-S as specified in clause 5.3.4;

   d) indirect PIN deregistration to PAE-S as specified in clause 5.3.5; and

e) PIN registration update to PAE-S as specified in clause 5.3.6,

wherein the direct PIN registration to PAE-S is for PIN peer that is able to communicate with PIN server directly (including PMAE-C, PGAE-C, and PEAE-C), the indirect PIN registration to PAE-S is for PIN peer that is not able to communicate with PIN server directly (including PGAE-C and PEAE-C), the direct PIN deregistration to PAE-S is for PIN peer that is able to communicate with PIN server directly to deregister (including PMAE-C, PGAE-C, and PEAE-C), the indirect PIN deregistration to PAE-S is for PIN peer that is not able to communicate with PIN server directly to deregister (including PGAE-C, PEAE-C), and the PIN registration update to PAE-S is for PIN peer to update the registration status.

5.3.2 Direct PIN registration to PAE-S

5.3.2.1 Requesting entity procedure

The requesting entity can be PMAE-C, PEAE-C, or PGAE-C.

When the requesting entity needs to register to the PAE-S directly, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

a) shall set the Request-URI to the URI of PAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-request> element in the <pinapp-info> root element and within the <pine-registration-request> element:

1) shall include a <ue-id> element set to the identity of the requesting entity (i.e. GPSI or identity token);

2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for a PIN service;

3) shall include a <port-number> element set to the port number of the requesting entity;;

4) may include a <mac-address> element set to the MAC address of the requesting entity;

5) may include a <vendor-name> element set to the vendor's name of the requesting entity;

6) may include a <device-description> element set to the description of the requesting entity; and

7) may include a <pine-address> element set to the IP address of the requesting entity if available in the requesting entity;

8) may include a <pine-capabilities> element set to capabilities information that whether the requesting entity is capable to act as a PMAE-C, a PGAE-C, or both;

9) may include a <maximum-number-of-pines> element set to the maximum number of the PEAE-C that can be managed by the requesting entity simultaneously (only for PMAE-C and PGAE-C); and

10) may include a <pin-service-info> element set to the PIN service information that the requesting entity can provide.

The requesting entity shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-accept> element in the <pinapp-info> root element,

the requesting entity shall:

a) if the requesting entity is registered as a PMAE-C based on the <role-of-pemc> element in the <pine-registration-accept> element, store the assigned PIN client ID, and consider the direct PIN registration to PAE-S is complete. the requesting entity may further initiate a PIN creation procedure as specified in clause 5.4.2;

b) if the requesting entity is registered as a PGAE-C based on the <role-of-pegc> element in the <pine-registration-accept> element, store the assigned PIN client ID, and consider the direct PIN registration to PAE-S is complete. The requesting entity may initiate a PIN discovery procedure as specified in clause 5.4.4; and

c) if the requesting entity is registered as a PEAE-C (i.e. not include the <pine-capabilities> element), store the assigned PIN client ID, and consider the direct PIN registration to PAE-S is complete. The requesting entity may initiate a PIN discovery procedure as specified in clause 5.4.4.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-reject> element in the <pinapp-info> root element,

the requesting entity shall consider the direct PIN registration to PAE-S is rejected by the PAE-S.

5.3.2.2 PAE-S procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-request> element in the <pinapp-info> root element,

the PAE-S shall check whether the requesting entity identified by the <ue-id> element is authorized to be the requested role of a PIN.

If the PEAE-C identified by the <ue-id> element is authorized to be the requested role of a PIN, PAE-S shall:

a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-accept> element in the <pinapp-info> root element and within the <pine-registration-accept> element:

      i) shall include a <pin-client-id> element set to the assigned PIN client ID of the PEAE-C; and

      ii) may include a <role-of-pemc> element set to indication that the requesting entity has successfully registered to be a PMAE-C; and

      iii) may include a <role-of-pegc> element set to indication that the requesting entity has successfully registered to be a PGAE-C; and

b) send the HTTP 200 (OK) response towards the PEAE-C.

If the PEAE-C identified by the <ue-id> element is not authorized to be the requested role of a PIN, PAE-S shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PAE-S:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-reject> element in the <pinapp-info> root element and within the <pine-registration-reject> element:

      i) shall include a <cause> element set to an appropriate cause for direct PIN registration to PAE-S failure; and

b) send the HTTP 403 (Forbidden) response towards the requesting entity.

The <cause> element shall set to one of the following:

0   Protocol error, unspecified;

1   Operation not allowed;

3   Authorization failure;

4   Maximum number of PINE is reached;

6   Maximum number of service is reached; and

7   Permanently denied.

5.3.3   Indirect PIN registration to PAE-S

5.3.3.1   Requesting entity procedure

The requesting entity can be PEAE-C or PGAE-C.

When the requesting entity needs to register to the PAE-S via PMAE-C, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

a)   shall set the Request-URI to the URI of PMAE-C;

b)   shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c)   shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-request> element in the <pinapp-info> root element and within the <pine-registration-request> element:

1)   shall include a <ue-id> element set to the identity of the requesting entity (i.e. GPSI);

2)   shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for a PIN service;

3)   shall include a <port-number> element set to the port number of the requesting entity;

4)   may include a <mac-address> element set to the MAC address of the requesting entity;

5)   may include a <vendor-name> element set to the vendor's name of the requesting entity;

6)   may include a <device-description> element set to the description of the requesting entity;

7)   may include a <pine-address> element set to the IP address of the requesting entity if available in the requesting entity;

8)   may include a <pine-capabilities> element set to capabilities information that whether the requesting entity is capable to act as a PMAE-C, a PGAE-C, or both;

9)   may include a <maximum-number-of-pines> element set to the maximum number of the PEAE-C that can be managed by the requesting entity simultaneously (only for PMAE-C and PGAE-C); and

10)   may include a <pin-service-info> element set to the PIN service information that the requesting entity can provide.

The requesting entity shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a)   a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-accept> element in the <pinapp-info> root element,

the requesting entity shall:

a) if the requesting entity is registered as a PMAE-C based on the <role-of-pemc> element in the <pine-registration-accept> element, store the assigned PIN client ID, and consider the indirect PIN registration to PAE-S is complete. The requesting entity could further initiate a PIN creation procedure as specified in clause 5.4.2;

b) if the requesting entity is registered as a PGAE-C based on the <role-of-pegc> element in the <pine-registration-accept> element, store the assigned PIN client ID, and consider the indirect PIN registration to PAE-S is complete. The requesting entity may initiate a PIN discovery procedure as specified in clause 5.4.4; and

c) if the requesting entity is registered as a PEAE-C (i.e. not include the <pine-capabilities> element), store the assigned PIN client ID, and consider the indirect PIN registration to PAE-S is complete. The requesting entity may initiate a PIN discovery procedure as specified in clause 5.4.4.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-reject> element in the <pinapp-info> root element,

the requesting entity shall consider the indirect PIN registration to PAE-S is rejected by the PAE-S.

5.3.3.2 PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-request> element in the <pinapp-info> root element,

the PMAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PMAE-C:

a) shall set the Request-URI to the URI of PAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-request> element in the <pinapp-info> root element and within the <pine-registration-request> element:

1) shall include a <ue-id> element set to the identity of the PMAE-C (i.e. GPSI);

2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for a PIN service;

3) shall include a <port-number> element set to the port number of the PMAE-C;

4) shall include a <representation-indication> element set to "represented" to indicate the registration to PAE-S is represent by the PMAE-C; and

5) shall include a <registration-info> element set to a list of registration information. Each entry of the list contains the content of the <pine-registration-request> element received from one PIN peer.

NOTE: The PMAE-C is allowed to present serval PIN peers to register to PAE-S in one <pine-registration-request> element if serval <pine-registration-request> elements are received at a time. The timing for PMAE-C sending the <pine-registration-request> element to PAE-S is left to UE implementation.

The PMAE-C shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-accept> element in the <pinapp-info> root element,

the PMAE-C shall:

    a) extract the <accepted-registration-info> element and the <rejected-registration-info> element to determine the PIN peer that successfully registers to PAE-S or fails to register to PAE-S;

    b) for each PIN peer in <accepted-registration-info> element, generate an HTTP 200 (OK) response according to IETF RFC 9110 [4] and send the generated HTTP 200 (OK) response to each PIN peer in <accepted-registration-info> element. In each HTTP 200 (OK) response message, the PAE-S:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-represent-registration-accept> element in the <pinapp-info> root element and within the <pine-represent-registration-accept> element:

            i) shall include a <pin-client-id> element set to the assigned PIN client ID of the PIN peer;

            ii) shall include a <role-of-pemc> element set to indication that the requesting entity has successfully registered to be a PMAE-C, if included in <accepted-registration-info> element for this PIN peer; and

            iii) shall include a <role-of-pegc> element set to indication that the requesting entity has successfully registered to be a PGAE-C, if included in <accepted-registration-info> element for this PIN peer; and

    c) for each PIN peer in <rejected-registration-info> element, if any, generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4] and send the generated HTTP 403 (Forbidden) response to each PIN peer in <rejected-registration-info> element. In each HTTP 403 (Forbidden) response message, the PAE-S:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-represent-registration-reject> element in the <pinapp-info> root element and within the <pine-represent-registration-reject> element:

            i) shall include a <cause> element set to the PINAPP protocol cause value in <rejected-registration-info> element for this PIN peer.

Upon reception of one of the following:

    a) an HTTP 200 (OK) response message containing:

        1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-accept> element in the <pinapp-info> root element; or

    b) an HTTP 403 (Forbidden) response message containing:

        1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-reject> element in the <pinapp-info> root element,

the receiving entity shall forward the received HTTP POST response message to the requesting entity with changing the Request-URI to the URI of the requesting entity.

5.3.3.3 PAE-S procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-request> element in the <pinapp-info> root element,

the PAE-S shall check whether the <representation-indication> element is included or not.

If the <representation-indication> element is not included, the PAE-S shall treat the registration as a direct registration to PAE-S and act as specified in clause 5.3.2.2.

If the <representation-indication> element is included, the PAE-S shall check whether all the PIN peers in <registration-info> element are authorized to be the requested role of a PIN.

If all the PIN peers in <registration-info> element are not authorized to be the requested role of a PIN, the PAE-S shall:

    a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PAE-S:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-reject> element in the <pinapp-info> root element and within the <pine-registration-reject> element:

            i) shall include a <cause> element set to a list of PINAPP protocol cause values for each PIN peer. Each entry of the list contains an identity of a PIN peer and an appropriate cause for indirect PIN registration to PAE-S failure; and

    b) send the HTTP 403 (Forbidden) response towards the requesting entity.

The <cause> element shall set to one of the following:

    0   Protocol error, unspecified;

    1   Operation not allowed;

    3   Authorization failure;

    4   Maximum number of PINE is reached;

    6   Maximum number of service is reached; and

    7   Permanently denied.

If at least one PIN peers in <registration-info> element are authorized to be the requested role of a PIN, the PAE-S shall:

    a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-registration-accept> element in the <pinapp-info> root element and within the <pine-registration-accept> element:

            i) shall include a <pin-client-id> element set to the PIN client ID of PMAE-C;

           ii) shall include a <accepted-registration-info> element set to a list of accepted registration information. Each entry of the list contains the identity of the PIN peer, assigned PIN client ID, and may contain indication of being a PMAE-C, indication of being a PGAE-C, or both; and

           iii) shall include a <rejected-registration-info> element set to a list of failed registration information, if any. Each entry of the list contains an identity of a PIN peer and an appropriate cause for indirect PIN registration to PAE-S failure; and

    b) send the HTTP 200 (OK) response towards the PMAE-C.

The <cause> element shall set to one of the following:

    0   Protocol error, unspecified;

1   Operation not allowed;

3   Authorization failure;

4   Maximum number of PINE is reached;

6   Maximum number of service is reached; and

7   Permanently denied.

5.3.4   Direct PIN deregistration to PAE-S

5.3.4.1   Requesting entity procedure

The requesting entity can be PMAE-C, PEAE-C, or PGAE-C.

When the requesting entity needs to deregister to the PAE-S directly, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

   a)   shall set the Request-URI to the URI of PAE-S;

   b)   shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   c)   shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-deregistration-request> element in the <pinapp-info> root element and within the <pine-deregistration-request> element:

      1)   shall include a <ue-id> element set to the identity of the requesting entity (i.e. GPSI or identity token);

      2)   shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for a PIN service;

      3)   may include a <mac-address> element set to the MAC address of the requesting entity;

      4)   may include a <vendor-name> element set to the vendor's name of the requesting entity;

      5)   may include a <device-description> element set to the description of the requesting entity; and

      6)   may include a <ip-address> element set to the IP address of the requesting entity if available in the requesting entity.

The requesting entity shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) response message, the requesting entity shall consider the direct PIN registration to PAE-S is complete.

5.3.4.2   PAE-S procedure

Upon reception of an HTTP POST request message containing:

   a)   a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b)   an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-deregistration-request> element in the <pinapp-info> root element,

the PAE-S shall check whether the PMAE-C is authorized to deregistration from the PIN.

If the deregistration request is authorized, the PAE-S shall:

   a)   consider the requesting entity identified by the <ue-id> element is not registered as a PIN peer;

   b)   generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; and

   c)   send the HTTP 204 (No content) response towards the requesting entity.

If the deregistration request is not authorized, the PAE-S shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-deregistration-reject> element in the <pinapp-info> root element and within the <pine-deregistration-reject> element:

i) shall include a <cause> element set to an appropriate cause for deregistration failure; and

b) send the HTTP 403 (Forbidden) response towards the requesting entity.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure; and

7 Permanently denied.

5.3.5 Indirect PIN deregistration to PAE-S

5.3.5.1 Requesting entity procedure

The requesting entity can be PEAE-C or PGAE-C.

When the requesting entity needs to deregister to the PAE-S via PMAE-C or PGAE-C, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

a) shall set the Request-URI to the URI of receiving entity;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-deregistration-request> element in the <pinapp-info> root element and within the <pine-deregistration-request> element:

1) shall include a <ue-id> element set to the identity of the requesting entity (i.e. GPSI or identity token);

2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for a PIN service;

3) may include a <mac-address> element set to the MAC address of the requesting entity;

4) may include a <vendor-name> element set to the vendor's name of the requesting entity;

5) may include a <device-description> element set to the description of the requesting entity; and

6) may include a <ip-address> element set to the IP address of the requesting entity if available in the requesting entity.

The requesting entity shall send the generated HTTP POST request towards the receiving entity according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-deregistration-accept> element in the <pinapp-info> root element,

the requesting entity shall consider the direct PIN registration to PAE-S is complete.

5.3.5.2   Receiving entity procedure

The receiving entity can be PMAE-C or PGAE-C.

Upon reception of an HTTP POST request message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-deregistration-request> element in the
       <pinapp-info> root element,

the receiving entity shall forward the received HTTP POST request message to PAE-S with changing the Request-URI
to the URI of PAE-S.

Upon reception of an HTTP 200 (OK) response message containing:

   1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-deregistration-accept> element in the
       <pinapp-info> root element; or

the receiving entity shall forward the received HTTP 200 (OK) response message to the requesting entity.

5.3.5.3   PAE-S procedure

Upon reception of an HTTP POST request message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-deregistration-request> element in the
       <pinapp-info> root element,

the PAE-S shall:

   a) consider the requesting entity identified by the <ue-id> element is not registered as a PIN peer;

   b) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response
       message, the PAE-S:

       1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

       2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-deregistration-accept>
           element in the <pinapp-info> root element; and

   c) send the HTTP 200 (OK) response towards the receiving entity.

5.3.6   PIN registration update to PAE-S

5.3.6.1   Requesting entity procedure

The requesting entity can be PMAE-C, PEAE-C, or PGAE-C.

When the requesting entity needs to update the registration status to the PAE-S directly or indirectly, the requesting
entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP
POST request, the requesting entity:

   a) shall set the Request-URI to the URI of PAE-S;

   b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-update-registration-request>
       element in the <pinapp-info> root element and within the <pine-update-registration-request> element:

       1) shall include a <ue-id> element set to the identity of the requesting entity (i.e. GPSI or identity token);

2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for a PIN service;

3) shall include a <port-number> element set to the port number of the requesting entity;

4) may include a <mac-address> element set to the MAC address of the requesting entity;

5) may include a <vendor-name> element set to the vendor's name of the requesting entity;

6) may include a <device-description> element set to the description of the requesting entity; and

7) may include a <ip-address> element set to the IP address of the requesting entity if available in the requesting entity;

8) may include a <pine-capabilities> element set to capabilities information that whether the requesting entity is capable to act as a PMAE-C, a PGAE-C, or both;

9) may include a <maximum-number-of-pines> element set to the maximum number of the PEAE-C that can be managed by the requesting entity simultaneously if the <pine-capabilities> element is included; and

10) may include a <pin-service-info> element set to the PIN service information that the requesting entity can provide.

The requesting entity shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

NOTE: The HTTP POST request message can be routed to PAE-S with the assistance of the PGAE-C.

Upon reception of an HTTP 204 (No content) response message, the requesting entity shall consider the direct PIN registration update to PAE-S is complete.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-update-registration-reject> element in the <pinapp-info> root element,

the requesting entity shall consider the direct PIN registration update to PAE-S is rejected by the PAE-S.

5.3.6.2 PAE-S procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-update-registration-request> element in the <pinapp-info> root element,

the PAE-S shall check whether the requesting entity identified by the <ue-id> element is authorized to update the registration status.

If the requesting entity identified by the <ue-id> element is authorized to update the registration status, PAE-S shall:

a) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; and

b) send the HTTP 204 (No content) response towards the requesting entity.

If the requesting entity identified by the <ue-id> element is not authorized to update the registration status, PAE-S shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-update-registration-reject> element in the <pinapp-info> root element and within the <pine-update-registration-reject> element:

    i) shall include a <cause> element set to an appropriate cause for direct PIN registration update to PAE-S failure; and

  b) send the HTTP 403 (Forbidden) response towards the requesting entity.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  3 Authorization failure; and

  7 Permanently denied.

5.4 PIN Management

5.4.1 General

The following procedures are defined for PIN Management:

  a) PIN creation procedure as specified in clause 5.4.2;

  b) PIN deletion procedure as specified in clause 5.4.3;

  c) PIN discovery procedure as specified in clause 5.4.4;

  d) PIN modification procedure as specified in clause 5.4.5;

  e) PIN status subscription procedure as specified in clause 5.4.6;

  f) PINE management procedure as specified in clause 5.4.7;

  g) PIN profile recovery procedure as specified in clause 5.4.8;

  h) Credential provision procedure as specified in clause 5.4.9;

  i) PIN heartbeat procedure as specified in clause 5.4.10;

  j) PIN services management procedure as specified in clause 5.4.11;

  k) PIN activation management procedure as specified in clause 5.4.12; and

  l) PIN connectivity subscription.

The PIN creation procedure, the PIN deletion procedure, the PIN modification procedure, and the PIN activation management procedure can only be performed by the primary PMAE-C.

5.4.2 PIN creation procedure

5.4.2.1 PMAE-C procedure

When the PMAE-C needs to create a PIN, then the PMAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PMAE-C:

  a) shall set the Request-URI to the URI of the PAE-S;

  b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-request> element in the <pinapp-info> root element and within the <pin-creation-request> element:

    1) shall include a <ue-id> element set to the UE identity of the PMAE-C (i.e. GPSI or identity token) or the PIN client ID of PMAE-C;

2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

3) shall include a <pin-profile> element set to the PIN profile of the PIN;

4) may include a <pin-client-profile> element set to the PIN client profile(s) available in the PMAE-C;

5) may include a <ue-location> element set to the location of the PMAE-C;

6) may include a <pine-list> element set to the identifier(s) of the PEAE-C(s) intending to be added into the PIN, which have already communicated with PEMC via 3GPP access or non-3GPP access. In case of no PEAE-C is available to the PMAE-C, the <pine-list> element includes the identifier of PMAE-C itself;

7) may include a <additional-pemc> element set to the identifier(s) of PMAE-C(s) that are allowed to manage the PIN, if any; and

8) may include a <pin-service-info> element set to the PIN service information that the requesting entity can provide.

The PMAE-C shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-accept> element in the <pinapp-info> root element,

the PMAE-C:

a) shall consider the PIN creation procedure is accepted by the PAE-S;

b) shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4] towards the PGAE-C and send the generated HTTP POST request towards the PGAE-C according to IETF RFC 9110 [4] if:

1) the <access-control-info> element is received from the PAE-S; or

2) the access control info is decided by PMAE-C and available in the PMAE-C.

NOTE 1: PMAE-C is allowed to notify the PGAE-C due to other UE implementation conditions.

In the HTTP POST request, the PMAE-C:

1) shall set the Request-URI to the URI corresponding to the PGAE-C;

2) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

3) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-notification-request> element in the <pinapp-info> root element and within the <pin-creation-notification-request> element:

   i) shall include a <pin-id> element set to the assigned PIN ID of the newly created PIN;

   ii) shall include a <heartbeat-timer> element set to the heartbeat timer received from PAE-S;

   iii) shall include a <pin-member-indication> element set to indicate that the PIN element is made the member of the newly created PIN identified by the PIN ID;

   iv) may include a <pegc-address> element set to the assigned IP address or port number of the PGAE-C;

   v) may include a <pegc-id> element set to the identifier(s) of the PGAE-C(s) that are selected by the PAE-S to act as the PGAE-C(s) for the PIN; and

   vi) may include a <access-control-info> element set to the access control information for the PGAE-C; and

NOTE 2: In case of PMAE-C acts as the PGAE-C of the PIN, step b) is not needed.

c) may generate a series of HTTP POST request messages according to procedures as specified in IETF RFC 9110 [4] towards the PEAE-C(s) in the <pine-list> element accordingly and send the generated HTTP POST request towards the PEAE-C(s) accordingly as specified in IETF RFC 9110 [4]. In each HTTP POST request, the PMAE-C:

   1) shall set the Request-URI to the URI corresponding to the specific PEAE-C;

   2) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   3) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-notification-request> element in the <pinapp-info> root element and within the <pin-creation-notification-request> element:

     i) shall include a <pin-id> element set to the assigned PIN ID of the newly created PIN;

     ii) shall include a <heartbeat-timer> element set to the heartbeat timer from PAE-S;

     iii) shall include a <pin-member-indication> element set to indicate that the PIN element is made the member of the newly created PIN identified by the PIN ID;

     iv) may include a <pegc-address> element set to the assigned IP address or port number of the PGAE-C;

     v) may include a <pegc-id> element set to the identifier(s) of the PGAE-C(s) that are selected by the PAE-S to act as the PGAE-C(s) for the PIN;

     vi) may include a <access-control-info> element set to the access control information for the specific PEAE-C; and

     vii) may include a <pin-profile> element set to the PIN profile of the PIN if the target PIN peer is PGAE-C.

Upon reception of an HTTP 204 (No content) response message, the PMAE-C shall consider the PIN peer(s) that send the message are accepted to be added into the PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-notification-reject> element in the <pinapp-info> root element,

the PMAE-C shall consider the PIN peer(s) that send the message are not accepted to be added into the PIN.

The PIN is then created by the PMAE-C within the accepted PIN peer(s).

Upon reception of an HTTP 403 (Forbidden) response message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-reject> element in the <pinapp-info> root element,

the PMAE-C shall consider the PIN creation procedure is rejected by the PAE-S.

5.4.2.2 PAE-S procedure

Upon reception of an HTTP POST request message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-request> element in the <pinapp-info> root element,

the PAE-S shall check whether the PMAE-C is authorized to create a PIN and whether there is any PGAE-C available.

If the PMAE-C is authorized to be a PMAE-C of a PIN and at least one PGAE-C is available based on the <pine-capabilities> element provided by PEAE-Cs in the PAE-S (i.e. only the PEAE-C that has the capability of gateway can be selected as the PGAE-C), PAE-S shall:

a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-accept> element in the <pinapp-info> root element and within the <pin-creation-accept> element:

   i) shall include a <pin-id> element set to the assigned PIN ID of the newly created PIN;

   ii) shall include a <valid-timer> element set to the valid expiration time of the newly created PIN;

   iii) shall include a <heartbeat-timer> element set to a list of heartbeat timers for PMAE-C, PGAE-C, and PEAE-C;

   iv) shall include a <pegc-id> element set to the identifier(s) of the PGAE-C(s) that are selected by the PAE-S to act as the PGAE-C(s) for the PIN. In case of no appropriate PEAE-C to act as a PGAE-C, the <pegc-id> element set to identifier of the PMAE-C (i.e. the PAE-S indicates PMAE-C to be the PGAE-C);

   v) may include a <pegc-address> element set to the assigned IP address or port number of the PGAE-C that is selected by the PAE-S to act as the PGAE-C for the PIN;

   vi) may include a <access-control-info> element set to the access control information for the PGAE-C that is selected by the PAE-S to act as the PGAE-C for the PIN; and

   vii) may include a <pine-list> element set to the identifier(s) of the PEAE-C(s) that are added into the PIN. The list contains the identifier of PEMC and optionally the list of PIN elements which are authorized to be added into the PIN based on the <pine-list> received from PMAE-C; and

   viii) may include a <pin-profile> element set to the PIN profile of the PIN; and

b) send the HTTP 200 (OK) response towards the PEAE-C.

If the PMAE-C is not authorized to be a PMAE-C of a PIN or there is no PGAE-C available based on the <pine-capabilities> element provided by PEAE-Cs in the PAE-S (i.e. only the PEAE-C that has the capability of gateway can be selected as the PGAE-C), PAE-S shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-reject> element in the <pinapp-info> root element and within the <pin-creation-reject> element:

   i) shall include a <cause> element set to an appropriate cause for PIN creation failure; and

b) send the HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

0   Protocol error, unspecified;

1   Operation not allowed;

3   Authorization failure;

5   Resource not sufficient; and

7   Permanently denied.

5.4.2.3   PGAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-notification-request> element in the <pinapp-info> root element,

the PGAE-C:

a) shall consider the PGAE-C has been successfully added into the PIN and acts as the PGAE-C of the PIN identified by the <pin-id> element; and

b) shall perform either of the following to response to PMAE-C:

1) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; or

2) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PGAE-C:

i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-notification-reject> element in the <pinapp-info> root element and within the <pin-creation-notification-reject> element:

A) shall include a <cause> element set to an appropriate cause for PIN creation notification failure; and

c) shall send the generated HTTP 204 (No content) response or HTTP 403 (Forbidden) response towards PMAE-C.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure; and

7 Permanently denied.

5.4.2.4 PEAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-notification-request> element in the <pinapp-info> root element,

the PEAE-C:

a) shall consider the PEAE-CPEAE-C has been successfully added to the PIN;

b) shall perform either of the following to respond to PMAE-C:

1) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; or

2) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PEAE-C:

i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-creation-notification-reject> element in the <pinapp-info> root element and within the <pin-creation-notification-reject> element:

A) shall include a <cause> element set to an appropriate cause for PIN creation notification failure; and

c) shall send the generated HTTP 204 (No content) response or HTTP 403 (Forbidden) response towards PMAE-C.

The <cause> element shall set to one of the following:

0   Protocol error, unspecified;

1   Operation not allowed;

3   Authorization failure; and

7   Permanently denied.

5.4.3   PIN deletion procedure

5.4.3.1   General

The purpose of PIN deletion procedure is to delete a specific PIN. Both the PAE-S and the PMAE-C are supported to initiate the PIN deletion procedure, and the decision PIN deletion can be made by both the PAE-S and the PMAE-C (i.e. explicit PIN deletion procedure and local PIN deletion procedure). Once the PIN is successfully deleted, the PEAE-C in the PIN shall not be able to utilize the services provided by the PIN anymore and cannot access the PAE-S. The network resources allocated for this PIN shall be released.

The following procedures are defined for PIN deletion procedure:

   a) Explicit PIN deletion procedure as specified in clause 5.4.3.2; and

   b) Local PIN deletion procedure as specified in clause 5.4.3.3.

5.4.3.2   Explicit PIN deletion procedure

5.4.3.2.1   PAE-S requested PIN deletion procedure

5.4.3.2.1.1   PAE-S procedure

The PAE-S may initiate a PAE-S requested PIN deletion procedure when:

   a) the PIN continues to exist after its valid duration timer associated with the PIN; or

   b) the PAE-S decides to not provide any PIN service for this PIN.

When the PAE-S needs to delete a PIN, then the PAE-S shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PAE-S:

   a) shall set the Request-URI to the URI of the PMAE-C;

   b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element and within the <pin-deletion-notification-request> element:

        1) shall include a <pin-id> element set to the identifier of the PIN to be deleted.

The PAE-S shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) response message from the PMAE-C, the PAE-S shall consider the PIN has been considered as deleted in the PMAE-C. The PAE-S shall stop all the procedures related to the PIN and release all the network resources allocated for this PIN.

5.4.3.2.1.2   PMAE-C procedure

Upon reception of an HTTP POST request message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element,

the PMAE-C shall:

    a) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]9110; and

    b) shall generate a series of HTTP POST request messages according to procedures as specified in IETF RFC 9110 [4] towards the PIN peer(s) in the PIN and send the generated HTTP POST request towards the PIN peer(s) accordingly as specified in IETF RFC 9110 [4]. In each HTTP POST request, the PMAE-C:

        1) shall set the Request-URI to the URI corresponding to the specific PIN peer.

        2) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        3) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element and within the <pin-deletion-notification-request> element:

            i) shall include a <pin-id> element set to the identifier of the PIN to be deleted.

Upon reception of either of the following:

    a) an HTTP 204 (No content) response message; or

    b) an HTTP 403 (Forbidden) response message containing:

        1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-reject> element in the <pinapp-info> root element;

the PMAE-C shall consider that the PIN has been treated as deleted in the corresponding PIN peer(s).

    NOTE: Whether PMAE-C needs to take other actions for PIN peer(s) that send <pin-deletion-notification-reject> element is left to UE implementation.

When receiving all the response(s) from the PIN peer(s), the PIN is considered as deleted in the PMAE-C from this time onward. The PMAE-C shall delete all the information related to this PIN.

5.4.3.2.1.3   PGAE-C procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element,

the PGAE-C:

    a) shall consider the PIN has been deleted;

    b) shall invalidate the access control information of the PIN in the PGAE-C;

    c) shall perform either of the following to respond to PMAE-C:

        1) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; or

        2) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PGAE-C:

            i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

            ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-reject> element in the <pinapp-info> root element and within the <pin-deletion-notification-reject> element:

                A) shall include a <cause> element set to an appropriate cause for PIN deletion notification failure; and

d) shall send the generated HTTP 204 (No content) response or HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure; and

7 Permanently denied.

5.4.3.2.1.4   PEAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element,

the PEAE-C:

a) shall consider the PIN has been deleted; and

b) shall perform either of the following to respond to PMAE-C:

1) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; or

2) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PEAE-C:

i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-reject> element in the <pinapp-info> root element and within the <pin-deletion-notification-reject> element:

A) shall include a <cause> element set to an appropriate cause for PIN deletion notification failure; and

c) shall send the generated HTTP 204 (No content) response or HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure; and

7 Permanently denied.

5.4.3.2.2   PMAE-C requested PIN deletion procedure

5.4.3.2.2.1   PMAE-C procedure

When the PMAE-C needs to delete a PIN, then the PMAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PMAE-C:

a) shall set the Request-URI to the URI of the PAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-request> element in the <pinapp-info> root element and within the <pin-deletion-request> element:

1) shall include a <pin-id> element set to the PIN ID of the PIN to be deleted; and

2) shall include a <security-credentials> element set to the security credentials of the PIN to be deleted.

The PMAE-C shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) response message, the PMAE-C:

a) shall consider the PIN deletion procedure is accepted by the PAE-S;

b) shall generate a series of HTTP POST request messages according to procedures as specified in IETF RFC 9110 [4] towards the PIN peer(s) in the PIN accordingly and send the generated HTTP POST request towards the PIN peer(s) accordingly as specified in IETF RFC 9110 [4]. In each HTTP POST request, the PMAE-C:

1) shall set the Request-URI to the URI corresponding to the specific PIN peer.

2) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

3) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element and within the <pin-deletion-notification-request> element:

i) shall include a <pin-id> element set to the identifier of the PIN to be deleted.

Upon reception of either of the following from PIN peer(s):

a) an HTTP 204 (No content) response message; or

b) an HTTP 403 (Forbidden) response message containing:

1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-reject> element in the <pinapp-info> root element;

the PMAE-C shall consider that the PIN has been treated as deleted in the corresponding PIN peer.

NOTE: Whether PMAE-C needs to take other actions for PIN peer(s) that send <pin-deletion-notification-reject> element is left to UE implementation.

When receiving all the response(s) from PIN peer(s), the PIN is considered as deleted in the PMAE-C from this time onward. The PMAE-C shall delete all the information related to this PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-reject> element in the <pinapp-info> root element,

the PMAE-C shall consider that the PMAE-C requested PIN deletion procedure is rejected by the PAE-S. The PMAE-C may initiate a local PIN deletion procedure as specified in clause 5.4.3.3 if still needed.

5.4.3.2.2.2 PAE-S procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-request> element in the <pinapp-info> root element,

the PAE-S shall verify whether the PMAE-C is authorized to delete a PIN.

If the PMAE-C is authorized to delete the PIN, the PAE-S shall generate an HTTP 204 (No content) response according to IETF RFC 9110 [4] and send the generated HTTP 204 (No content) response to the PMAE-C.9110

From this time onward, the PIN is considered as deleted in the PAE-S. The PAE-S shall stop all the procedures related to the PIN and release all the network resources allocated for this PIN.

If the PMAE-C is not authorized to delete a PIN, the PAE-S shall:

   a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PMAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-reject> element in the <pinapp-info> root element and within the <pin-deletion-reject> element:

      i) shall include a <cause> element set to an appropriate cause for PIN deletion failure; and

   b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

The <cause> element shall set to one of the following:

   0   Protocol error, unspecified;

   1   Operation not allowed;

   3   Authorization failure; and

   7   Permanently denied.

5.4.3.2.2.3   PGAE-C procedure

Upon reception of an HTTP POST request message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element,

the PGAE-C:

   a) shall consider the PIN has been deleted;

   b) shall invalidate the access control information in the PGAE-C; and

   c) shall perform either of the following to respond to PMAE-C:

   1) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; or

   2) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PGAE-C:

      i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

      ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-reject> element in the <pinapp-info> root element and within the <pin-deletion-notification-reject> element:

         A) shall include a <cause> element set to an appropriate cause for PIN deletion notification failure; and

   d) shall send the generated HTTP 204 (No content) response or HTTP 403 (Forbidden) towards the PMAE-C.

The <cause> element shall set to one of the following:

   0   Protocol error, unspecified;

   1   Operation not allowed;

3 Authorization failure; and

7 Permanently denied.

5.4.3.2.2.4 PEAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element,

the PEAE-C:

a) shall consider the PIN has been deleted;

b) shall perform either of the following to respond to PMAE-C:

1) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; or

2) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PEAE-C:

i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-reject> element in the <pinapp-info> root element and within the <pin-deletion-notification-reject> element:

A) shall include a <cause> element set to an appropriate cause for PIN deletion notification failure; and

c) shall send the generated HTTP 204 (No content) response or HTTP 403 (Forbidden) towards the PMAE-C.

5.4.3.3 Local PIN deletion procedure

5.4.3.3.1 PMAE-C procedure

The PMAE-C may initiate a local PIN deletion procedure initiation procedure when:

a) PMAE-C receives the request from the user or for any other reason which are implementation specific; or

b) the duration associated with the PIN expires.

When the PMAE-C needs to locally delete a PIN, the PMAE-C:

a) shall generate a series of HTTP POST request messages according to procedures as specified in IETF RFC 9110 [4] towards the PAE-S and the PIN peer(s) in the PIN accordingly. In each HTTP POST request, the PMAE-C:

1) shall set the Request-URI to the URI corresponding to the PAE-S or the specific PIN peer.

2) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

3) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element and within the <pin-deletion-notification-request> element:

i) shall include a <pin-id> element set to the identifier of the PIN to be deleted; and

b) shall send the generated HTTP POST request towards the PAE-S and the PIN peer(s) accordingly as specified in IETF RFC 9110 [4].

Upon reception of either of the following:

a) an HTTP 204 (No content) response message; or

b) an HTTP 403 (Forbidden) response message containing:

1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-reject> element in the <pinapp-info> root element;

the PMAE-C shall consider that the PIN has been treated as deleted in the PAE-S or the corresponding PIN peer(s).

NOTE: Whether PMAE-C needs to take other actions for PIN peer(s) that send <pin-deletion-notification-reject> element is left to UE implementation.

When receiving all the response(s) from the PAE-S and the PIN peer(s), the PIN is considered as deleted in the PMAE-C from this time onward. The PMAE-C shall delete all the information related to this PIN.

5.4.3.3.2 PGAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element,

the PGAE-C:

a) shall consider the PIN has been deleted;

b) shall invalidate the access control information of the PIN in the PGAE-C;

c) shall perform either of the following to respond to PMAE-C:

1) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; or

2) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PGAE-C:

i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-reject> element in the <pinapp-info> root element and within the <pin-deletion-notification-reject> element:

A) shall include a <cause> element set to an appropriate cause for PIN deletion notification failure; and

d) shall send the generated HTTP 204 (No content) response or HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure; and

7 Permanently denied.

5.4.3.3.3 PEAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element,

the PEAE-C:

    a)   shall consider the PIN has been deleted; and

    b)   shall perform either of the following to respond to PMAE-C:

        1)   generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; or

        2)   generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PEAE-C:

            i)   shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

            ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-reject> element in the <pinapp-info> root element and within the <pin-deletion-notification-reject> element:

                A) shall include a <cause> element set to an appropriate cause for PIN deletion notification failure; and

    c)   shall send the generated HTTP 204 (No content) response or HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

    0   Protocol error, unspecified;

    1   Operation not allowed;

    3   Authorization failure; and

    7   Permanently denied.

5.4.3.3.4 PAE-S procedure

Upon reception of an HTTP POST request message containing:

    a)   a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b)   an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-deletion-notification-request> element in the <pinapp-info> root element,

the PAE-S:

    a)   shall consider the PIN has been deleted in the PMAE-C;

    b)   shall stop all the procedures related to the PIN and release all the network resources allocated for this PIN;

    c)   shall generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; and

    d)   shall send the generated HTTP 204 (No content) response towards the PMAE-C.

5.4.4 PIN discovery procedure

5.4.4.1 General

This clause describes the procedures for PIN discovery procedure.

The purpose of PIN discovery procedure is to discover a specific PIN for a PEAE-C. The PEAE-C can discover and decide whether to join in a PIN. The PEAE-C can discover the PIN by:

    a)   if the PINE have an application layer connection with the PEMC of a PIN (e.g. via WiFi, Bluetooth, etc.), the PIN elements can receive the necessary information of a PIN from the application layer connection; or

    b)   if the PEGC can be set as open access (e.g. with no user name or password), the PIN element can communicate with PAE-S to receive the necessary information of a PIN from PAE-S via the PGAE-C.

The following procedures are defined for PIN discovery procedure:

a) PIN discovery with assistance of PMAE-C as specified in clause 5.4.4.2; and

b) PIN discovery with assistance of PAE-S via PGAE-C as specified in clause 5.4.4.3.

5.4.4.2   PIN discovery with assistance of PMAE-C

5.4.4.2.1   PEAE-C procedure

When the PEAE-C needs to discover a PIN, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PEAE-C:

a) shall set the Request-URI to the URI of the PMAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-request> element in the <pinapp-info> root element and within the <pin-discovery-request> element:

1) shall include a <ue-id> element set to the identity of the PEAE-C (i.e. GPSI or identity token);

2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

3) may include a <ue-location> element set to the location of the PEAE-C; and

4) may include a <filter-info> element set to the filter information (e.g. the interesting area, the interesting type of PIN, etc).

The PEAE-C shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-accept> element in the <pinapp-info> root element,

the PEAE-C shall consider the PIN discovery procedure with assistance of PMAE-C is accepted by the PMAE-C and decides whether to join the PIN according to the <pin-discovery-accept> element.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the PIN discovery procedure with assistance of PMAE-C is rejected by the PMAE-C.

5.4.4.2.2   PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-request> element in the <pinapp-info> root element,

the PMAE-C shall check whether the PEAE-C is allowed to discover the PIN that the PMAE-C manages.

If the PEAE-C is allowed to discover the PIN that the PMAE-C manages, PMAE-C shall:

a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-accept> element in the <pinapp-info> root element and within the <pin-discovery-accept> element:

      i) shall include a <pin-info> element set to the information of each PIN and within the <pin-info> element:

         A) shall include a <pin-id> element set to the PIN ID of the PIN;

         B) may include a <pin-description> element set to the description of the PIN (e.g., the vendor's name, location, the type of PIN, etc.);

         C) may include a <pin-service-list> element set to the list of services that the PIN can provide (e.g. PIN service provider identifier, PIN service type, PIN service feature, etc.); and

         D) may include a <pemc-info> element set to the identifier and IP address of PMAE-C; and

  b) send the HTTP 200 (OK) response towards the PEAE-C.

If the PEAE-C is not allowed to discover the PIN that the PMAE-C manages, PMAE-C shall:

  a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PMAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-reject> element in the <pinapp-info> root element and within the <pin-discovery-reject> element:

      i) shall include a <cause> element set to an appropriate cause for PIN discovery failure; and

  b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  2 Requested information not available;

  3 Authorization failure; and

  7 Permanently denied.

5.4.4.3 PIN discovery with assistance of PAE-S via PGAE-C

5.4.4.3.1 PEAE-C procedure

When the PEAE-C needs to discover a PIN, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PEAE-C:

  a) shall set the Request-URI to the URI of the PAE-S;

  b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-request> element in the <pinapp-info> root element and within the <pin-discovery-request> element:

   1) shall include a <ue-id> element set to the identity of the PEAE-C (i.e. GPSI or identity token);

   2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

   3) may include a <filter-info> element set to the filter information (e.g. the interesting area, the interesting type of PIN, etc); and

4) may include a <ue-location> element set to the location of the PEAE-C.

The PEAE-C shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

NOTE: The HTTP POST request message is routed to PAE-S with the assistance of the PGAE-C.

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-accept> element in the <pinapp-info> root element,

the PEAE-C shall consider the PIN discovery procedure with assistance of PAE-S via PGAE-C is accepted by the PAE-S and decides whether to join the PIN according to the <pin-discovery-accept> element.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the PIN discovery procedure with assistance of PAE-S via PGAE-C is rejected by the PAE-S.

5.4.4.3.2   PAE-S procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-request> element in the <pinapp-info> root element,

the PAE-S shall check whether the PEAE-C is allowed to discover the PIN that the PEAE-C is interested in.

If the PEAE-C is allowed to discover the PIN that the PEAE-C is interested in, PAE-S shall:

a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-accept> element in the <pinapp-info> root element and within the <pin-discovery-accept> element:

i) shall include a <pin-info> element set to the information of each PIN and within the <pin-info> element:

A) shall include a <pin-id> element set to the PIN ID(s) of the PIN(s), including all the candidate PIN(s) the PEAE-C is allowed to discover based on the <filter-info> element and the corresponding PIN profile;

B) may include a <pin-description> element set to the description of the PIN (e.g., the vendor's name, location, the type of PIN, etc.) for each PIN;

C) may include a <pin-service-list> element set to the list of services that the PIN can provide (e.g. PIN service provider identifier, PIN service type, PIN service feature, etc.) for each PIN; and

D) may include a <pemc-info> element set to the identifier and IP address of PMAE-C for each PIN; and

b) send the HTTP 200 (OK) response towards the PEAE-C.

NOTE: The HTTP 200 (OK) response message is routed to PEAE-C with the assistance of the PGAE-C.

If the PEAE-C is not allowed to discover the PIN that the PEAE-C is interested in, PAE-S shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-discovery-reject> element in the <pinapp-info> root element and within the <pin-discovery-reject> element:

i) shall include a <cause> element set to an appropriate cause for PIN discovery failure; and

b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

NOTE: The HTTP 403 (Forbidden) response message is routed to PEAE-C with the assistance of the PGAE-C.

The <cause> element shall set to one of the following:

0   Protocol error, unspecified;

1   Operation not allowed;

2   Requested information not available;

3   Authorization failure; and

7   Permanently denied.

5.4.5   PIN modification procedure

5.4.5.1   General

The following procedures are defined for PIN modification:

a) PMAE-C replacement without PAE-S support as specified in clause 5.4.5.2;

b) PGAE-C replacement without PAE-S support as specified in clause 5.4.5.3;

c) PMAE-C replacement with PAE-S support as specified in clause 5.4.5.4; and

d) PGAE-C replacement with PAE-S support as specified in clause 5.4.5.5.

5.4.5.2   PMAE-C replacement without PAE-S support

5.4.5.2.1   General

In this clause, the PMAE-C that initiates the PMAE-C replacement without PAE-S support procedure is called the "initiating PMAE-C", and the requested PMAE-C is called the "target PMAE-C". The "current PMAE-C" indicates the current PMAE-C if the PMAE-C replacement with PAE-S support procedure is initiated by PAE-S.

5.4.5.2.2   Initiating PMAE-C procedure

When the PMAE-C needs to request the another PMAE-C to takeover the role of primary PEMC in a PIN, the initiating PMAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the initiating PMAE-C:

a) shall set the Request-URI to the URI of the target PMAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pemc-takeover-request> element in the <pinapp-info> root element and within the <pin-pemc-takeover-request> element:

1) shall include a <pin-id> element set to the identity of the involved PIN;

2) shall include a <current-pemc-id> element set to the identity of the initiating PMAE-C; and

3) shall include a <new-pemc-id> element set to the identity of the target PMAE-C.

The initiating PMAE-C shall send the generated HTTP POST request towards the target PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pemc-takeover-accept> element in the <pinapp-info> root element,

the initiating PMAE-C shall:

a) update the PIN dynamic profile information with PEMC role change details;

b) deliver the PIN dynamic profile information to the target PMAE-C by including the event ID set to "PIN profiles update" as specified in clause 5.4.6.4; and

c) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) in the PIN as specified in clause 5.4.6.4 to notify the PIN modification.

From this time onward, the initiating PMAE-C is no longer considered as the primary PMAE-C of the PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pemc-takeover-reject> element in the <pinapp-info> root element,

the initiating PMAE-C shall consider the PMAE-C replacement without PAE-S support is rejected by the target PMAE-C. The initiating PMAE-C may select another PMAE-C in the PIN to initiate a PMAE-C replacement without PAE-S support as specified in clause 5.4.5.2.

5.4.5.2.3 Target PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pemc-takeover-request> element in the <pinapp-info> root element,

the target PMAE-C shall determine whether to takeover the role of PMAE-C for the initiating PMAE-C in the indicated PIN.

If the target PMAE-C determines to takeover the role of PMAE-C for the initiating PMAE-C in the indicated PIN, the target PMAE-C shall:

a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the target PMAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pemc-takeover-accept> element in the <pinapp-info> root element and within the <pin-pemc-takeover-accept> element:

i) shall include a <pin-id> element set to the PIN ID of the PIN; and

b) send the HTTP 200 (OK) response towards the initiating PMAE-C.

If the target PMAE-C determines not to takeover the role of PMAE-C for the initiating PMAE-C in the indicated PIN, the target-PMAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the target PMAE-C:

    1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pemc-takeover-reject> element in the <pinapp-info> root element and within the <pin-pemc-takeover-reject> element:

      i) shall include a <pin-id> element set to the identifier of the PIN; and

      ii) shall include a <cause> element set to an appropriate cause for PMAE-C replacement without PAE-S support failure; and

  b) send the HTTP 403 (Forbidden) response towards the target PMAE-C.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  3 Authorization failure; and

  7 Permanently denied.

5.4.5.3 PGAE-C replacement without PAE-S support

5.4.5.3.1 PMAE-C procedure

When the PMAE-C needs to request the another PGAE-C to takeover the role of current PGAE-C in a PIN (e.g. detect the unavailable of current PGAE-C), the PMAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PMAE-C:

  a) shall set the Request-URI to the URI of the target PGAE-C;

  b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pegc-takeover-request> element in the <pinapp-info> root element and within the <pin-pegc-takeover-request> element:

    1) shall include a <pin-id> element set to the identity of the involved PIN;

    2) shall include a <current-pegc-id> element set to the identity of the current PGAE-C; and

    3) shall include a <new-pegc-id> element set to the identity of the target PGAE-C.

The PMAE-C shall send the generated HTTP POST request towards the target PGAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

  a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pegc-takeover-accept> element in the <pinapp-info> root element,

the initiating PMAE-C shall:

  a) update the PIN dynamic profile information with PEGC role change details;

  b) deliver the PIN dynamic profile information to the target PGAE-C by including the event ID set to "PIN profiles update" as specified in clause 5.4.6.4; and

  c) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) (not including the target PGAE-C) in the PIN as specified in clause 5.4.6.4 to notify the PIN modification.

From this time onward, the target PGAE-C is considered as the new PGAE-C of the PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

  a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pegc-takeover-reject> element in the
      <pinapp-info> root element,

the initiating PMAE-C shall consider the PGAE-C replacement without PAE-S support is rejected by the target PGAE-
C. The initiating PMAE-C may select another PGAE-C in the PIN to initiate a PGAE-C replacement without PAE-S
support as specified in clause 5.4.5.4.

5.4.5.3.2   PGAE-C procedure

Upon reception of an HTTP POST request message containing:

  a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pegc-takeover-request> element in the
      <pinapp-info> root element,

the target PGAE-C shall determine whether to takeover the role of PGAE-C for the current PGAE-C in the indicated
PIN.

If the target PGAE-C determines to takeover the role of PGAE-C for the current PGAE-C in the indicated PIN, the
target PGAE-C shall:

  a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response
      message, the PGAE-C:

      1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

      2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pegc-takeover-accept>
          element in the <pinapp-info> root element and within the <pin-pegc-takeover-request> element:

          i)   shall include a <pin-id> element set to the PIN ID of the PIN; and

  b) send the HTTP 200 (OK) response towards the initiating PMAE-C.

If the target PGAE-C determines not to takeover the role of PGAE-C for the current PGAE-C in the indicated PIN, the
target PGAE-C shall:

  a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden)
      response message, the PGAE-C:

      1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

      2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-pegc-takeover-reject>
          element in the <pinapp-info> root element and within the <pin-pegc-takeover-reject> element:

          i)   shall include a <pin-id> element set to the PIN ID of the PIN; and

          ii) shall include a <cause> element set to an appropriate cause for PGAE-C replacement without PAE-S
               support failure; and

  b) send the HTTP 403 (Forbidden) response towards the target PMAE-C.

The <cause> element shall set to one of the following:

  0   Protocol error, unspecified;

  1   Operation not allowed;

  3   Authorization failure;

  5   Resource not sufficient; and

  7   Permanently denied.

5.4.5.4 PMAE-C replacement with PAE-S support

5.4.5.2.1 General

In this clause, the PMAE-C that initiates the PMAE-C replacement with PAE-S support procedure is called the "initiating PMAE-C", and the requested PMAE-C is called the "target PMAE-C".

5.4.5.4.2 Initiating PMAE-C procedure

When the PMAE-C needs to request another PMAE-C (i.e. target PMAE-C) to takeover the role of PMAE-C in a PIN with PAE-S support, the PMAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the initiating PMAE-C:

   a) shall set the Request-URI to the URI of the PAE-S;

   b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-request> element in the <pinapp-info> root element and within the <pin-configuration-request> element:

      1) shall include a <pin-id> element set to the identity of the involved PIN;

      2) shall include a <requestor-pemc-id> element set to the identity of the initiating PMAE-C;

      3) shall include a <authorization-type> element set to "PMAE-C role change";

      4) shall include a <failure-pemc-id> element set to the identity of the failure PMAE-C;

      5) may include a <new-pemc-id> element set to the identity of the target PMAE-C; and

      6) may include a <additional-pemc-ids> element set to a list of additional PMAE-Cs that are requested to manage the PIN.

The initiating PMAE-C shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-accept> element in the <pinapp-info> root element,

the initiating PMAE-C shall initiate a PIN status notify procedure as specified in clause 5.4.6.4 to PIN peers to notify the change of PMAE-C with the following consideration:

   a) the event ID shall include "PIN modification", and:

      1) shall include the <pemc-id> element set to the identifier(s) of the PMAE-C(s) in the PIN; and

      2) shall include the <pemc-address> element set to the IP address or port number for each PMAE-C respectively; and

   b) the event ID shall include "PIN profiles update" if it is for PGAE-C, and:

      1) shall include the <pin-profile> element set to the PIN profile of the PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-reject> element in the <pinapp-info> root element,

the initiating PMAE-C shall consider the PMAE-C replacement with PAE-S support fails due to the reason indicated by the cause value.

5.4.5.4.3   PAE-S procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-notify> element in the <pinapp-info> root element,

the PAE-S shall:

a) consider the PMAE-C identified by the <pin-client-identifier> element is not available and determine a new PMAE-C (i.e. the target PMAE-C) for the PIN;

b) generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PAE-S:

1) shall set the Request-URI to the URI of the target PMAE-C;

2) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

3) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-request> element in the <pinapp-info> root element and within the <pin-management-request> element:

i)   shall include a <requestor-id> element set to the identifier of the PAE-S;

ii) shall include a <modification-type> element set to "PEMC assignment"; and

iii) shall include a <pin-profile> element set to the PIN profile information of the PIN; and

c) send the generated HTTP POST request towards the target PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-request> element in the <pinapp-info> root element,

the PAE-S shall determine whether the initiating PMAE-C is allowed to modify the PIN and determine whether the target PMAE-C identified by the <new-pemc-id> element (if provided) is allowed to be a PMAE-C of the PIN.

If:

a) the initiating PMAE-C is allowed to modify the PIN; and

b) the target PMAE-C is included and is allowed to be a PMAE-C of the PIN, or

if:

a) the initiating PMAE-C is allowed to modify the PIN; and

b) the target PMAE-C is not included,

NOTE: In case of the target PMAE-C is not included, PAE-S can select a target PMAE-C based on implementation (e.g. based on PIN profile).

the PAE-S shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the initiating PAE-S

a) shall set the Request-URI to the URI of the target PMAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-request> element in the <pinapp-info> root element and within the <pin-management-request> element:

1) shall include a <requestor-id> element set to the identifier of the PAE-S;

2) shall include a <modification-type> element set to "PEMC assignment"; and

3) shall include a <pin-profile> element set to the PIN profile information of the PIN.

The PAE-S shall send the generated HTTP POST request towards the target PMAE-C according to IETF RFC 9110 [4].

If:

a) the initiating PMAE-C is not allowed to modify the PIN; or

if:

a) the initiating PMAE-C is allowed to modify the PIN; and

b) the target PMAE-C is included and is not allowed to be a PMAE-C of the PIN,

the PAE-S:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-reject> element in the <pinapp-info> root element and within the <pin-configuration-reject> element:

i) shall include a <cause> element set to an appropriate cause for PIN configuration failure; and

b) send the HTTP 403 (Forbidden) response towards the initiating PMAE-C.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure;

5 Resource not sufficient; and

7 Permanently denied.

Upon reception of an HTTP 204 (No content) response message, if the PMAE-C replacement with PAE-S support is initiated by the initiating PMAE-C, the PAE-S shall:

a) consider the target PMAE-C accepts to be the new PMAE-C of the PIN;

b) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-accept> element in the <pinapp-info> root element and within the <pin-configuration-accept> element:

i) shall include a <pin-profile> element set to the updated PIN profile information of the PIN; and

c) send the HTTP 200 (OK) response towards the initiating PMAE-C.

Upon reception of an HTTP 204 (No content) response message, if the PMAE-C replacement with PAE-S support is initiated by the PAE-S, the PAE-S shall:

a) consider the target PMAE-C accepts to be the new PMAE-C of the PIN;

b) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-command> element in the <pinapp-info> root element and within the <pin-configuration-command> element:

 i) shall include a <pin-profile> element set to the updated PIN profile information of the PIN; and

c) send the HTTP 200 (OK) response towards the current PMAE-C.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-reject> element in the <pinapp-info> root element,

the PAE-S shall:

a) consider the target PMAE-C is not accepted to act as a PMAE-C of the PIN;

b) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PAE-S:

 1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

 2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-reject> element in the <pinapp-info> root element and within the <pin-configuration-reject> element:

 i) shall include a <cause> element set to an appropriate cause for PIN configuration failure; and

c) send the HTTP 403 (Forbidden) response towards the initiating PMAE-C.

The <cause> element shall set to one of the following:

 0 Protocol error, unspecified;

 1 Operation not allowed;

 3 Authorization failure;

 5 Resource not sufficient; and

 7 Permanently denied.

5.4.5.4.4 Target PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-request> element in the <pinapp-info> root element,

the target PMAE-C shall determine whether to accept to act as the PMAE-C in the PIN.

If the target PMAE-C determine to accept to act as the PMAE-C in the PIN, the target PMAE-C shall:

a) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4] and send the HTTP 204 (No content) response towards the PAE-S; and

b) initiate a PIN status notify procedure as specified in clause 5.4.6.4 to PIN peers to notify the change of PMAE-C with the following consideration:

 1) the event ID shall include "PIN modification", and:

 i) shall include the <pemc-id> element set to the identifier(s) of the PMAE-C(s) in the PIN; and

 ii) shall include the <pemc-address> element set to the IP address or port number for each PMAE-C respectively; and

2) the event ID shall include "PIN profiles update" if it is for PGAE-C, and:

    i) shall include the <pin-profile> element set to the PIN profile of the PIN.

If the target PMAE-C determine to reject to act as the PMAE-C in the PIN, the target PMAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the target PMAE-C:

    1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-reject> element in the <pinapp-info> root element and within the <pin-management-reject> element:

       i) shall include a <cause> element set to an appropriate cause for PIN management failure; and

b) send the HTTP 403 (Forbidden) response towards the PAE-S.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  3 Authorization failure;

  5 Resource not sufficient; and

  7 Permanently denied.

5.4.5.5 PGAE-C replacement with PAE-S support

5.4.5.5.1 PMAE-C procedure

When the PMAE-C needs to request another PGAE-C (i.e. target PGAE-C) to takeover the role of PGAE-C in a PIN with PAE-S support, the PMAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PMAE-C:

a) shall set the Request-URI to the URI of the PAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-request> element in the <pinapp-info> root element and within the <pin-configuration-request> element:

    1) shall include a <pin-id> element set to the identity of the involved PIN;

    2) shall include a <requestor-pemc-id> element set to the identity of the PMAE-C;

    3) shall include a <authorization-type> element set to "PGAE-C role change";

    4) shall include a <failure-pegc-id> element set to the identity of the failure PGAE-C; and

    5) may include a <new-pegc-id> element set to the identity of the target PGAE-C.

The initiating PMAE-C shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-accept> element in the <pinapp-info> root element,

the PMAE-C shall initiate a PIN status notify procedure as specified in clause 5.4.6.4 to PIN peers to notify the change of PMAE-C with the following consideration:

    a) the event ID shall include "PIN modification", and:

        1) shall include the <pegc-id> element set to the identifier(s) of the PGAE-C(s) in the PIN; and

        2) shall include the <pegc-address> element set to the IP address or port number for each PGAE-C respectively; and

    b) the event ID shall include "PIN profiles update" if it is for PGAE-C, and:

        1) shall include the <dynamic-pin-profile> element set to the dynamic PIN profile of the PIN; and

        2) shall include the <pin-profile> element set to the PIN profile of the PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-reject> element in the <pinapp-info> root element,

the PMAE-C shall consider the PGAE-C replacement with PAE-S support fails due to the reason indicated by the cause value.

5.4.5.5.2 PAE-S procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-request> element in the <pinapp-info> root element,

the PAE-S shall determine whether the initiating PMAE-C is allowed to modify the PIN and determine whether the target PGAE-C identified by the <new-pegc-id> element (if provided) is allowed to be a PGAE-C of the PIN.

If:

    a) the initiating PMAE-C is allowed to modify the PIN; and

    b) the target PGAE-C is included and is allowed to be a PGAE-C of the PIN, or

if:

    a) the initiating PMAE-C is allowed to modify the PIN; and

    b) the target PGAE-C is not included,

    NOTE: In case of the target PGAE-C is not included, PAE-S can select a target PGAE-C based on implementation (e.g. based on PIN profile).

the PAE-S shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the initiating PMAE-C:

    a) shall set the Request-URI to the URI of the target PGAE-C;

    b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-request> element in the <pinapp-info> root element and within the <pin-management-request> element:

        1) shall include a <requestor-id> element set to the identifier of the PAE-S;

        2) shall include a <modification-type> element set to "PEGC assignment"; and

        3) shall include a <dynamic-pin-profile> element set to the dynamic PIN profile information of the PIN.

The PAE-S shall send the generated HTTP POST request towards the target PGAE-C according to IETF RFC 9110 [4].

If:

    a) the initiating PMAE-C is not allowed to modify the PIN; or

if:

    a) the initiating PMAE-C is allowed to modify the PIN; and

    b) the target PGAE-C is included and is not allowed to be a PGAE-C of the PIN,

the PAE-S:

    a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PAE-S:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-reject> element in the <pinapp-info> root element and within the <pin-configuration-reject> element:

            i) shall include a <cause> element set to an appropriate cause for PIN configuration failure; and

    b) send the HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

    0 Protocol error, unspecified;

    1 Operation not allowed;

    3 Authorization failure;

    5 Resource not sufficient; and

    7 Permanently denied.

Upon reception of an HTTP 204 (No content) response message, the PAE-S shall:

    a) consider the target PGAE-C accepts to be the new PGAE-C of the PIN;

    b) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-accept> element in the <pinapp-info> root element and within the <pin-configuration-accept> element:

            i) shall include a <pin-profile> element set to the PIN profile of the PIN; and

           ii) shall include a <dynamic-pin-profile> element set to the dynamic PIN profile of the PIN; and

    c) send the HTTP 200 (OK) response towards the PMAE-C.

Upon reception of an HTTP 403 (Forbidden) response message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-reject> element in the <pinapp-info> root element,

the PAE-S shall:

    a) consider the target PGAE-C is not accepted to act as a PGAE-C of the PIN;

    b) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-reject> element in the <pinapp-info> root element and within the <pin-configuration-reject> element:

i) shall include a <cause> element set to an appropriate cause for PIN configuration failure; and

c) send the HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure;

5 Resource not sufficient; and

7 Permanently denied.

5.4.5.5.3   Target PGAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-request> element in the <pinapp-info> root element,

the target PGAE-C shall determine whether to accept to act as the PGAE-C in the PIN.

If the target PGAE-C determine to accept to act as the PGAE-C in the PIN, the target PGAE-C shall:

a) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; and

b) send the HTTP 204 (No content) response towards the PEAE-C.

If the target PGAE-C determine to reject to act as the PGAE-C in the PIN, the target PGAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the target PGAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-reject> element in the <pinapp-info> root element and within the <pin-management-reject> element:

i) shall include a <cause> element set to an appropriate cause for PIN management failure; and

b) send the HTTP 403 (Forbidden) response towards the PAE-S.

5.4.6   PIN status management procedure

5.4.6.1   General

The following procedures are defined for PIN status management:

a) PIN status subscribe as specified in clause 5.4.6.2;

b) PIN status update as specified in clause 5.4.6.3;

c) PIN status notify as specified in clause 5.4.6.4; and

d) PIN status unsubscribe as specified in clause 5.4.6.5.

5.4.6.2 PIN status subscribe

5.4.6.2.1 Requesting entity procedure

The requesting entity can be a PEAE-C, PGAE-C, or PAE-S.

To subscribe the PIN status from the PMAE-C, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

    a) shall set the Request-URI to the URI of the PMAE-C;

    b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-subscribe-request> element in the <pinapp-info> root element and within the <pin-status-subscribe-request> element:

        1) shall include a <ue-id> element set to the identity of the requesting entity;

        2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

        3) shall include a <pin-id> element set to the identity of the PIN to be subscribed;

        4) shall include a <subscribed-event> element set to the event ID(s) for which the subscriber is notified. More than one event ID can be included;

        5) may include a <notification-target-address> element set to the target address (e.g. URL, IP address) where the notification should be sent to; and

        6) may include a <expected-subscription-time> element set to the expected expiration time for the subscription.

The requesting entity shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-subscribe-accept> element in the <pinapp-info> root element,

the requesting entity shall:

    a) consider it has successfully subscribed the PIN status event identified by the <accepted-subscription-id> element; and

    b) start a subscription timer if the <authorized-subscription-time> element is included. The value of the subscription timer shall be equal to the value in the <authorized-subscription-time> element. The requesting entity shall consider the subscription is valid within the subscription timer.

Upon reception of an HTTP 403 (Forbidden) response message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-subscribe-reject> element in the <pinapp-info> root element,

the requesting entity shall consider the PIN status subscribe is rejected by the PMAE-C for all requested event IDs.

5.4.6.2.2 PMAE-C procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-subscribe-request> element in the <pinapp-info> root element,

the PMAE-C shall check whether the requesting entity is authorized to subscribe the requested event ID(s) or not.

If the requesting entity is authorized to subscribe at least one requested event ID(s), the PMAE-C shall:

a) create and store the subscription for the requesting entity for the PIN;

b) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-subscribe-accept> element in the <pinapp-info> root element and within the <pin-status-subscribe-accept> element:

     i) shall include a <accepted-subscription-id> element set to the identity of the authorized subscription by the PMAE-C. More than one identity can be indicated;

     ii) may include a <authorized-subscription-time> element set to the authorized expiration time for the subscription; and

     iii) may include a <rejected-subscription-id> element set to the identity of the rejected subscription by the PMAE-C. More than one identity can be indicated;

c) send the HTTP 200 (OK) response towards the requesting entity; and

d) start a subscription timer for the requesting entity if the <authorized-subscription-time> element is included. The value of the subscription timer shall be equal to the value in the <authorized-subscription-time> element. The PMAE-C shall treat the requesting entity as implicitly unsubscribed the PIN status event(s) if the requesting entity does not update the PIN status subscription within the subscription timer.

If the requesting entity is not authorized to subscribe all the event IDs, the PMAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PMAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-subscribe-reject> element in the <pinapp-info> root element and within the <pin-status-subscribe-reject> element:

     i) shall include a <cause> element set to an appropriate cause for PIN status subscribe failure; and

b) send the HTTP 403 (Forbidden) response towards the requesting entity.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  3 Authorization failure;

  4 Maximum number of PINE is reached;

  5 Resource not sufficient; and

  7 Permanently denied.

5.4.6.3 PIN status update

5.4.6.3.1 Requesting entity procedure

The requesting entity can be a PEAE-C, PGAE-C, or PAE-S.

To maintain the subscribed PIN status event(s) from the PEMC within the subscription timer as specified in clause 5.4.6.2.1, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

    a) shall set the Request-URI to the URI of the PMAE-C;

    b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-update-request> element in the <pinapp-info> root element and within the <pin-status-update-request> element:

        1) shall include a <ue-id> element set to the identity of the requesting entity;

        2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

        3) shall include a <subscribed-event> element set to the event ID(s) for which the subscriber is notified. More than one event ID can be included;

        4) shall include a <pin-id> element set to the identity of the PIN;

        5) may include a <notification-target-address> element set to the target address (e.g. URL, IP address) where the notification should be sent to; and

        6) may include a <expected-subscription-time> element set to the expected expiration time for the subscription.

The requesting entity shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-update-accept> element in the <pinapp-info> root element,

the requesting entity shall:

    a) consider it has successfully updated the subscription information for all the requested event IDs; and

    b) start a subscription timer if the <authorized-subscription-time> element is included. The value of the subscription timer shall be equal to the value in the <authorized-subscription-time> element. The requesting entity shall consider the subscription is valid within the subscription timer.

Upon reception of an HTTP 403 (Forbidden) response message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-update-reject> element in the <pinapp-info> root element,

the requesting entity shall consider the PIN status update is rejected by the PMAE-C and invalidate all the subscription towards the PMAE-C when the subscription timer expires.

5.4.6.3.2 PMAE-C procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-update-request> element in the <pinapp-info> root element,

the PMAE-C shall check whether the requesting entity is authorized to update the subscription information of the requested event ID(s) or not.

If the requesting entity is authorized to update the subscription information for all the requested event IDs, the PMAE-C shall:

    a) update the subscription for the requesting entity for the PIN;

    b) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

       1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

       2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-update-accept> element in the <pinapp-info> root element and within the <pin-status-update-accept> element:

          i) may include a <authorized-subscription-time> element set to the authorized expiration time for the subscription;

    c) send the HTTP 200 (OK) response towards the requesting entity; and

    d) start a subscription timer for the requesting entity if the <authorized-subscription-time> element is included. The value of the subscription timer shall be equal to the value in the <authorized-subscription-time> element. The PMAE-C shall treat the requesting entity as implicitly unsubscribed the PIN status event(s) if the requesting entity does not update the PIN status subscription within the subscription timer.

If the requesting entity is not authorized to update the subscription information for at least one requested event ID, the PMAE-C shall:

    a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PMAE-C:

       1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

       2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-update-reject> element in the <pinapp-info> root element and within the <pin-status-update-reject> element:

          i) shall include a <cause> element set to an appropriate cause for PIN status update failure; and

    b) send the HTTP 403 (Forbidden) response towards the requesting entity.

The <cause> element shall set to one of the following:

    0 Protocol error, unspecified;

    1 Operation not allowed;

    3 Authorization failure;

    5 Resource not sufficient; and

    7 Permanently denied.

5.4.6.4 PIN status notify

5.4.6.4.1 PMAE-C procedure

The receiving entity can be a PEAE-C, PGAE-C, or PAE-S.

When an event occurs at the PMAE-C that satisfies trigger conditions for notifying a receiving entity (e.g. to provide updated PIN status when a PINE joins into the PIN). To notify the updated PIN status, the PMAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PMAE-C:

    a) shall set the Request-URI to the URI of the receiving entity;

    b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-notify> element in the <pinapp-info> root element and within the <pin-status-notify> element:

      1) shall include a <event-id> element set to the event ID needs to be notified. More than one event ID can be indicated;

      2) shall include a <pin-id> element set to the identifier of the PIN;

      3) if the event ID includes "PINE management":

         i) shall include a <pine-management-type> element set to "PINE joins into a PIN", "PINE leaves a PIN", or "PINE is removed from a PIN" according to the corresponding event;

         ii) shall include a <pine-id> element set to the identity of the corresponding PEAE-C. More than one identity can be included within a same <pine-management-type> element; and

         iii) may include a <pin-client-profile> element set to the PIN client profile of the PEAE-C if <pine-management-type> element is set to "PINE joins into a PIN". More than one PIN client profile can be included;

      4) if the event ID includes "PIN modification":

         i) may include a <pegc-id> element set to the identifier(s) of the PGAE-C(s) in the PIN;

         ii) may include a <pegc-address> element set to the IP address or port number for each PGAE-C respectively if <pegc-id> element is included;

         iii) may include a <access-control-info> element set to the access control information for each PGAE-C respectively if <pegc-id> element is included;

         iv) may include a <pemc-id> element set to the identifier(s) of the PMAE-C(s) in the PIN; and

         v) may include a <pemc-address> element set to the IP address or port number for each PMAE-C respectively if <pemc-id> element is included;

      5) if the event ID includes "PIN profiles update":

         i) may include a <pin-profile> element set to the PIN profile of the PIN; or

         ii) may include a <dynamic-pin-profile> element set to the dynamic PIN profile of the PIN; and

      6) if the event ID includes "PIN status update":

         i) shall include a <pin-status-type> element set to "PIN activation" or "PIN deactivation".

The PMAE-C shall send the generated HTTP POST request towards the receiving entity according to IETF RFC 9110 [4].

5.4.6.4.2 Receiving entity procedure

The receiving entity can be a PEAE-C, PGAE-C, or PAE-S.

Upon reception of an HTTP POST request message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-notify> element in the <pinapp-info> root element,

the receiving entity shall store, update, or remove the corresponding information in the receiving entity according to the <pin-status-notify> element. Additionally:

   a) if the receiving entity is a PGAE-C, and:

      1) the <pin-status-event-type> element includes "PINE management" and the <pine-management-type> element is set to "PINE joins into a PIN", the PGAE-C shall determine whether to enable the PEAE-C(s) to access the network (i.e. enable the access control information for the PEAE-C(s)); or

2) the <pin-status-event-type> element includes "PINE management" and the <pine-management-type> element is set to "PINE leaves a PIN" or "PINE is removed from a PIN", the PGAE-C shall disable the access control information for the PEAE-C(s); and

b) if the receiving entity is a PEAE-C, and:

1) the <event-id> element includes "PINE management" and the <pine-management-type> element is set to "PINE is removed from a PIN", the PGAE-C shall consider it has been removed from the PIN. Whether to delete all the stored information of this PIN is up to UE implementation.

5.4.6.5   PIN status unsubscribe

5.4.6.5.1   Requesting entity procedure

The requesting entity can be a PEAE-C, PGAE-C, or PAE-S.

To unsubscribe the PIN status from the PMAE-C, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

a) shall set the Request-URI to the URI of the PMAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-unsubscribe-request> element in the <pinapp-info> root element and within the <pin-status-unsubscribe-request> element:

1) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service; and

2) shall include a <unsubscription-id> element set to the identity of the subscription to be unsubscribed. More than one identity can be indicated.

The requesting entity shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) response message, the requesting entity shall consider it has successfully unsubscribed the PIN status event identified by the <unsubscription-id> element.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-unsubscribe-reject> element in the <pinapp-info> root element,

the requesting entity shall consider the PIN status unsubscribe is rejected by the PMAE-C.

5.4.6.5.2   PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-unsubscribe-request> element in the <pinapp-info> root element,

the PMAE-C shall check whether the requesting entity is authorized to unsubscribe the subscription information or not.

If the requesting entity is authorized to unsubscribe all the requested subscription information, the PMAE-C shall:

a) update the subscription information for the requesting entity for the PIN;

b) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; and

c) send the HTTP 204 (No content) response towards the requesting entity.

If the requesting entity is authorized to unsubscribe at least one requested subscription information, the PMAE-C shall:

    a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PMAE-C:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-status-unsubscribe-reject> element in the <pinapp-info> root element and within the <pin-status-unsubscribe-reject>:

            i) shall include a <cause> element set to an appropriate cause for PIN status unsubscribe failure; and

    b) send the HTTP 403 (Forbidden) response towards the requesting entity.

The <cause> element shall set to one of the following:

    0 Protocol error, unspecified;

    1 Operation not allowed;

    3 Authorization failure; and

    7 Permanently denied.

5.4.7 PINE management procedure

5.4.7.1 General

The purpose of PINE management procedure is to add or remove a PINE from a PIN for a PMAE-C, or join or leave a PIN for a PEAE-C.

The following procedures are defined for PIN Registration to PAE-S:

    a) PEAE-C requested joining into a PIN via PMAE-C as specified in clause 5.4.7.2;

    b) PEAE-C requested joining into a PIN via PGAE-C as specified in clause 5.4.7.3;

    c) PEAE-C requested leaving a PIN via PMAE-C as specified in clause 5.4.7.4;

    d) PEAE-C requested leaving a PIN via PGAE-C as specified in clause 5.4.7.5; and

    e) PMAE-C requested removing a PEAE-C from a PIN as specified in clause 5.4.7.6.

5.4.7.2 PEAE-C requested joining into a PIN via PMAE-C

5.4.7.2.1 PEAE-C procedure

When the PEAE-C needs to join into a PIN via the PMAE-C, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PEAE-C:

    NOTE: PEAE-C can obtain the IP address of PMAE-C and the PIN profile of the PIN by the implementation-specific ways.

    a) shall set the Request-URI to the URI of PMAE-C;

    b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-request> element in the <pinapp-info> root element and within the <pin-management-pine-join-request> element:

        1) shall include a <pin-id> element set to the identity of the PIN to be joined into;

        2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for a PIN service;

   3) shall include a <ue-id> element set to the identity of the PEAE-C;

   4) shall include a <target-pemc-id> element set to the identity of the target PMAE-C;

   5) may include a <pin-client-profile> element set to the PIN client profile(s) of the PEAE-C;

   6) may include a <endpoint-information-content> element set to the endpoint information of PAE-S;

   7) may include a <ue-location> element set to the location of the PEAE-C; and

   8) may include a <pin-service-info> element set to the PIN service information that the requesting entity can provide.

The PEAE-C shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-accept> element in the <pinapp-info> root element,

the PEAE-C shall store the information of the PIN and consider the PEAE-C has successfully joined into the PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the PEAE-C requested joining into a PIN is rejected by the PMAE-C.

5.4.7.2.2 PMAE-C procedure

Upon reception of an HTTP POST request message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-request> element in the <pinapp-info> root element,

the PMAE-C shall verify whether the PEAE-C is authorized to join into the PIN or not.

If the PEAE-C is authorized to join into the PIN and the HTTP POST request message is received from PEAE-C, the PMAE-C shall:

   a) generate an HTTP 200 (OK) response and send the HTTP 200 (OK) response towards the PEAE-C according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

      1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

      2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-accept> element in the <pinapp-info> root element and within the <pin-management-pine-join-accept> element:

         i) shall include a <heartbeat-timer> element set to the heartbeat timer value assigned to PEAE-C;

         ii) shall include a <valid-timer> element set to the valid expiration time of the PIN;

         iii) may include a <pin-client-profile> element set to the PIN client profile information updated by the PMAE-C;

         iv) may include a <pegc-id> element set to the identifier(s) of the PGAE-C(s) of the PIN;

         v) may include a <pegc-address> element set to the assigned IP address or port number of the PGAE-C of the PIN for each PGAE-C; and

     vi) may include a <access-control-info> element set to the access control information of the PIN for each PGAE-C; and

  b) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) in the PIN as specified in clause 5.4.6.4 to notify the PEAE-C joining into the PIN.

If the PEAE-C is not authorized to join into the PIN, the PMAE-C shall:

  a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PMAE-C:

    1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-reject> element in the <pinapp-info> root element and within the <pin-management-pine-join-reject> element:

      i) shall include a <cause> element set to an appropriate cause for PEAE-C requested joining into a PIN failure; and

  b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  3 Authorization failure;

  4 Maximum number of PINE is reached; and

  7 Permanently denied.

5.4.7.3 PEAE-C requested joining into a PIN via PGAE-C

5.4.7.3.1 PEAE-C procedure

When the PEAE-C needs to join into a PIN via the PGAE-C, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PEAE-C:

  a) shall set the Request-URI to the URI of PGAE-C;

  b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-request> element in the <pinapp-info> root element and within the <pin-management-pine-join-request> element:

    1) shall include a <pin-id> element set to the identity of the PIN to be joined into;

    2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for a PIN service;

    3) shall include a <ue-id> element set to the identity of the PEAE-C;

    4) shall include a <target-pemc-id> element set to the identity of the target PMAE-C;

    5) may include a <pin-client-profile> element set to the PIN client profile(s) of the PEAE-C;

    6) may include a <endpoint-information-content> element set to the endpoint information of PAE-S;

    7) may include a <ue-location> element set to the location of the PEAE-C; and

    8) may include a <pin-service-info> element set to the PIN service information that the requesting entity can provide.

The PEAE-C shall send the generated HTTP POST request towards the PGAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-accept> element in the <pinapp-info> root element,

the PEAE-C shall store the information of the PIN and consider the PEAE-C has successfully joined into the PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the PEAE-C requested joining into a PIN is rejected by the PMAE-C.

5.4.7.3.2 PGAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-request> element in the <pinapp-info> root element,

the PGAE-S shall verify whether the PEAE-C is authorized to join into the PIN or not.

If the PEAE-C is authorized to join into the PIN, the PGAE-C shall perform one of the following in decreasing order:

a) if the PIN direct connection between PMAE-C and PGAE-C is available, the PGAE-C shall forward the received HTTP POST request message with changing the Request-URI to the URI of the PMAE-C;

b) if:

1) the PIN direct connection between PMAE-C and PGAE-C is not available; and

2) the PIN communication with the PMAE-C is available,

the PGAE-C shall forward the received HTTP POST request message with changing the Request-URI to the URI of the PMAE-C; and

c) if:

1) the PIN direct connection between PMAE-C and PGAE-C is not available; and

2) the PIN communication with the PMAE-C is not available,

the PGAE-C shall forward the received HTTP POST request message with changing the Request-URI to the URI of the PAE-S.

If the PEAE-C is not authorized to join into the PIN, the PGAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PGAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-reject> element in the <pinapp-info> root element and within the <pin-management-pine-join-reject> element:

i) shall include a <cause> element set to an appropriate cause for PEAE-C requested joining into a PIN failure; and

b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

The <cause> element shall set to one of the following:

    0   Protocol error, unspecified;

    1   Operation not allowed;

    3   Authorization failure;

    4   Maximum number of PINE is reached; and

    7   Permanently denied.

Upon reception of either of the following:

    a) an HTTP 200 (OK) response message containing:

        1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-accept> element in the <pinapp-info> root element, or

    b) an HTTP 403 (Forbidden) response message containing:

        1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-reject> element in the <pinapp-info> root element,

the PGAE-C shall forward the received HTTP 200 (OK) response or the received HTTP 403 (Forbidden) response message to the PEAE-C.

5.4.7.3.3   PAE-S procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-request> element in the <pinapp-info> root element,

the PAE-S shall forward the received HTTP POST request message with changing the Request-URI to the URI of the PMAE-C.

Upon reception of either of the following:

    a) an HTTP 200 (OK) response message containing:

        1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-accept> element in the <pinapp-info> root element, or

    b) an HTTP 403 (Forbidden) response message containing:

        1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-reject> element in the <pinapp-info> root element,

the PAE-S shall forward the received HTTP 200 (OK) response or the received HTTP 403 (Forbidden) response message to the PGAE-C.

5.4.7.3.4   PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-request> element in the <pinapp-info> root element,

the PMAE-C shall verify whether the PEAE-C is authorized to join into the PIN or not. The PMAE-C may receive multiple HTTP POST request messages containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-request> element in the <pinapp-info> root element,

at the same time for the same PEAE-C, the PMAE-C should progress all the HTTP POST request messages.

If the PEAE-C is authorized to join into the PIN and the HTTP POST request message is received from PGAE-C, the PMAE-C shall:

a) generate an HTTP 200 (OK) response and send the HTTP 200 (OK) response towards the PGAE-C according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-accept> element in the <pinapp-info> root element and within the <pin-management-pine-join-accept> element:

      i) shall include a <heartbeat-timer> element set to the heartbeat timer value assigned to PEAE-C;

      ii) shall include a <valid-timer> element set to the valid expiration time of the PIN;

      iii) may include a <pin-client-profile> element set to the PIN client profile information updated by the PMAE-C (e.g., default and backup PEGCs assigned to PINE);

      iv) may include a <pegc-id> element set to the identifier(s) of the PGAE-C(s) of the PIN;

      v) may include a <pegc-address> element set to the assigned IP address or port number of the PGAE-C(s) of the PIN; and

      vi) may include a <access-control-info> element set to the access control information of the PIN; and

b) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) in the PIN as specified in clause 5.4.6.4 to notify the PINE joining into the PIN.

NOTE 1: In case of multiple HTTP POST request messages are received for the same PEAE-C, the PMAE-C initiates the PIN status notify procedure only once.

If the PEAE-C is authorized to join into the PIN and the HTTP POST request message is received from PAE-S, the PMAE-C shall:

a) generate an HTTP 200 (OK) response and send the HTTP 200 (OK) response towards the PAE-S according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-accept> element in the <pinapp-info> root element and within the <pin-management-pine-join-accept> element:

      i) shall include a <heartbeat-timer> element set to the heartbeat timer value assigned to PEAE-C;

      ii) shall include a <valid-timer> element set to the valid expiration time of the PIN;

      iii) may include a <pin-client-profile> element set to the PIN client profile information updated by the PMAE-C (e.g., default and backup PEGCs assigned to PINE);

      iv) may include a <pegc-id> element set to the identifier(s) of the PGAE-C(s) of the PIN;

      v) may include a <pegc-address> element set to the assigned IP address or port number of the PGAE-C(s) of the PIN; and

      vi) may include a <access-control-info> element set to the access control information of the PIN; and

  b) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) in the PIN as specified in clause 5.4.6.4 to notify the PINE joining into the PIN.

NOTE 2: In case of multiple HTTP POST request messages are received for the same PEAE-C, the PMAE-C initiates the PIN status notify procedure only once.

If the PEAE-C is not authorized to join into the PIN and the HTTP POST request message is received from PGAE-C, the PMAE-C shall:

  a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PMAE-C:

      1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

      2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-reject> element in the <pinapp-info> root element and within the <pin-management-pine-join-reject> element:

        i) shall include a <cause> element set to an appropriate cause for PEAE-C requested joining into a PIN failure; and

  b) send the HTTP 403 (Forbidden) response towards the PGAE-C.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  3 Authorization failure;

  4 Maximum number of PINE is reached; and

  7 Permanently denied.

If the PEAE-C is not authorized to join into the PIN and the HTTP POST request message is received from PAE-S, the PMAE-C shall:

  a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PMAE-C:

      1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

      2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-join-reject> element in the <pinapp-info> root element and within the <pin-management-pine-join-reject> element:

        i) shall include a <cause> element set to an appropriate cause for PEAE-C requested joining into a PIN failure; and

  b) send the HTTP 403 (Forbidden) response towards the PAE-S.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  3 Authorization failure;

  4 Maximum number of PINE is reached; and

7 Permanently denied.

5.4.7.4 PEAE-C requested leaving a PIN via PMAE-C

5.4.7.4.1 PEAE-C procedure

When the PEAE-C needs to leave a PIN via the PMAE-C, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PEAE-C:

    a) shall set the Request-URI to the URI of PMAE-C;

    b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a \<pin-management-pine-leave-request\> element in the \<pinapp-info\> root element and within the \<pin-management-pine-leave-request\> element:

        1) shall include a \<pin-id\> element set to the identity of the PIN to leave;

        2) shall include a \<security-credentials\> element set to the security credentials resulting from a successful authorization for a PIN service;

        3) shall include a \<ue-id\> element set to the identity of the PEAE-C; and

        4) shall include a \<target-pemc-id\> element set to the identity of the target PMAE-C.

Upon reception of an HTTP 204 (No content) response message, the PEAE-C shall consider that it has successfully left the PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a \<pin-management-pine-leave-reject\> element in the \<pinapp-info\> root element,

the PEAE-C shall consider the request of leaving the PIN is rejected by the PMAE-C.

5.4.7.4.2 PMAE-C procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a \<pin-management-pine-leave-request\> element in the \<pinapp-info\> root element,

the PMAE-C shall verify whether the PEAE-C is authorized to leave the PIN or not.

If the PEAE-C is authorized to leave the PIN and the HTTP POST request message is received from PEAE-C, the PMAE-C shall:

    a) generate an HTTP 204 (No content) response and send the HTTP 204 (No content) response towards the PEAE-C according to IETF RFC 9110 [4]; and

    b) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) in the PIN as specified in clause 5.4.6.4 to notify the PINE leaving the PIN.

If the PEAE-C is not authorized to leave the PIN, the PMAE-C shall:

    a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PMAE-C:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-leave-reject> element in the <pinapp-info> root element and within the <pin-management-pine-leave-reject> element:

      i) shall include a <cause> element set to an appropriate cause for PEAE-C requested leaving a PIN failure; and

  b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  3 Authorization failure; and

  7 Permanently denied.

5.4.7.5 PEAE-C requested leaving a PIN via PGAE-C

5.4.7.5.1 PEAE-C procedure

When the PEAE-C needs to leave a PIN via the PGAE-C, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PEAE-C:

  a) shall set the Request-URI to the URI of PGAE-C;

  b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-leave-request> element in the <pinapp-info> root element and within the <pin-management-pine-leave-request> element:

    1) shall include a <pin-id> element set to the identity of the PIN to leave;

    2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for a PIN service;

    3) shall include a <ue-id> element set to the identity of the PEAE-C; and

    4) shall include a <target-pemc-id> element set to the identity of the target PMAE-C.

Upon reception of an HTTP 204 (No content) response message, the PEAE-C shall consider that it has successfully left the PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

  a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-leave-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the request of leaving the PIN is rejected by the PMAE-C.

5.4.7.5.2 PGAE-C procedure

Upon reception of an HTTP POST request message containing:

  a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-leave-request> element in the <pinapp-info> root element,

the PGAE-S shall verify whether the PEAE-C is authorized to leave the PIN or not.

If the PEAE-C is authorized to leave into the PIN, the PGAE-C shall perform one of the following in decreasing order:

a) if the PIN direct connection between PMAE-C and PGAE-C is available, the PGAE-C shall forward the received HTTP POST request message with changing the Request-URI to the URI of the PMAE-C;

b) if:

1) the PIN direct connection between PMAE-C and PGAE-C is not available; and

2) the PIN communication with the PMAE-C is available,

the PGAE-C shall forward the received HTTP POST request message with changing the Request-URI to the URI of the PMAE-C; and

c) if:

1) the PIN direct connection between PMAE-C and PGAE-C is not available; and

2) the PIN communication with the PMAE-C is not available,

the PGAE-C shall forward the received HTTP POST request message with changing the Request-URI to the URI of the PAE-S.

If the PEAE-C is not authorized to leave the PIN, the PGAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PGAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-leave-reject> element in the <pinapp-info> root element and within the <pin-management-pine-leave-reject> element:

i) shall include a <cause> element set to an appropriate cause for PEAE-C requested leaving a PIN failure; and

b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

Upon reception of either of the following:

a) an HTTP 204 (No content) response message; or

b) an HTTP 403 (Forbidden) response message containing:

1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-leave-reject> element in the <pinapp-info> root element,

the PGAE-C shall forward the received HTTP 204 (No content) response or the received HTTP 403 (Forbidden) response message to the PEAE-C.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure; and

7 Permanently denied.

5.4.7.5.3 PAE-S procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-leave-request> element in the <pinapp-info> root element,

the PAE-S shall forward the received HTTP POST request message towards the PMAE-C with changing the Request-URI to the URI of the PMAE-C.

Upon reception of either of the following:

a) an HTTP 204 (No content) response message; or

b) an HTTP 403 (Forbidden) response message containing:

    1) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    2) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-leave-reject> element in the <pinapp-info> root element,

the PAE-S shall forward the received HTTP 204 (No content) response or the received HTTP 403 (Forbidden) response message to the PGAE-C.

5.4.7.5.4   PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-leave-request> element in the <pinapp-info> root element,

the PMAE-C shall verify whether the PEAE-C is authorized to leave the PIN or not.

If the PEAE-C is authorized to leave the PIN and the HTTP POST request message is received from PGAE-C, the PMAE-C shall:

a) generate an HTTP 204 (No content) response and send the HTTP 204 (No content) response towards the PGAE-C according to IETF RFC 9110 [4]; and

b) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) in the PIN as specified in clause 5.4.6.4 to notify the PINE leaving the PIN.

If the PEAE-C is authorized to leave the PIN and the HTTP POST request message is received from PAE-S, the PMAE-C shall:

a) generate an HTTP 204 (No content) response and send the HTTP 204 (No content) response towards the PAE-S according to IETF RFC 9110 [4]; and

b) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) in the PIN as specified in clause 5.4.6.4 to notify the PINE leaving the PIN.

If the PEAE-C is not authorized to leave the PIN and the HTTP POST request message is received from PGAE-C, the PMAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PMAE-C:

    1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-leave-reject> element in the <pinapp-info> root element and within the <pin-management-pine-leave-reject> element:

        i) shall include a <cause> element set to an appropriate cause for PEAE-C requested leaving a PIN failure; and

b) send the HTTP 403 (Forbidden) response towards the PGAE-C.

The <cause> element shall set to one of the following:

   0   Protocol error, unspecified;

   1   Operation not allowed;

   3   Authorization failure; and

   7   Permanently denied.

If the PEAE-C is not authorized to leave the PIN and the HTTP POST request message is received from PAE-S, the PMAE-C shall:

   a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PMAE-C:

      1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

      2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pine-leave-reject> element in the <pinapp-info> root element and within the <pin-management-pine-leave-reject> element:

         i) shall include a <cause> element set to an appropriate cause for PEAE-C requested leaving a PIN failure; and

   b) send the HTTP 403 (Forbidden) response towards the PAE-S.

The <cause> element shall set to one of the following:

   0   Protocol error, unspecified;

   1   Operation not allowed;

   3   Authorization failure; and

   7   Permanently denied.

5.4.7.6　PMAE-C requested removing a PEAE-C from a PIN

5.4.7.6.1　PMAE-C procedure

When the PMAE-C needs to remove one or more PEAE-C, the PMAE-C shall:

   a) initiate a PIN status notify procedure towards the PEAE-C(s) to be removed as specified in clause 5.4.6.4 with the following considerations:

      1) the event ID shall include "PINE management" and:

         i) the <pine-management-type> element set to "PINE is removed from a PIN"; and

         ii) the <pine-id> element set to the identity(ies) of the removed PEAE-C(s); and

   b) initiate a PIN status notify procedure towards all PIN peers and the PAE-S in the PIN as specified in clause 5.4.6.4 with the following considerations:

      1) the event ID shall include "PINE management" and:

         i) the <pine-management-type> element set to "PINE is removed from a PIN"; and

         ii) the <pine-id> element set to the identity(ies) of the removed PEAE-C(s); and

      2) the event ID shall include "PIN profiles update" and:

         i) shall include a <dynamic-pin-profile> element set to the dynamic PIN profile of the PIN.

5.4.7.6.2 PEAE-C procedure

The PEAE-C shall act as specified in clause 5.4.6.4.2.

5.4.7.6.3 PIN peer procedure

The PIN peer shall act as specified in clause 5.4.6.4.2.

5.4.7.6.4 PAE-S procedure

The PIN peer shall act as specified in clause 5.4.6.4.2.

5.4.8 PIN profile recovery procedure

5.4.8.1 PMAE-C procedure

When the PMAE-C needs to retrieve a PIN profile of a PIN from PAE-S, the PMAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PMAE-C:

a) shall set the Request-URI to the URI corresponding to the PAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-profile-query-request> element in the <pinapp-info> root element and within the <pin-profile-query-request> element:

1) shall include a <pin-id> element set to the identifier of the PIN that the PMAE-C intends to retrieve the PIN profile;

2) shall include a <security-credentials> element set to the security credentials corresponding to the PIN; and

3) shall include a <ue-id> element set to the identity of the PMAE-C.

The PMAE-C shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-profile-query-accept> element in the <pinapp-info> root element,

the PMAE-C shall store the retrieved PIN profile of the PIN, and consider the PIN profile recovery procedure is complete.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-profile-query-reject> element in the <pinapp-info> root element,

the PMAE-C shall consider the PIN profile recovery is rejected by the PAE-S.

5.4.8.2 PAE-S procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-profile-query-request> element in the <pinapp-info> root element,

the PAE-S shall determine whether the PMAE-C is one of the managers of the PIN and whether the PMAE-C is authorized to perform the PIN profile recovery.

If the PMAE-C is authorized to perform the PIN profile recovery, the PAE-S shall:

    a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-profile-query-accept> element in the <pinapp-info> root element and within the <pin-profile-query-accept> element:

            i) shall include a <pin-profile> element set to the PIN profile of the PIN identified by the PIN ID; and

    b) send the HTTP 200 (OK) response towards the PMAE-C.

If the PMAE-C is not authorized to perform the PIN profile recovery, the PAE-S shall:

    a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PAE-S:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-profile-query-reject> element in the <pinapp-info> root element and within the <pin-profile-query-reject> element:

            i) shall include a <cause> element set to an appropriate cause for PIN profile recovery failure; and

    b) send the HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

    0   Protocol error, unspecified;

    1   Operation not allowed;

    2   Requested information not available;

    3   Authorization failure; and

    7   Permanently denied.

5.4.9 Credential provision procedure

Authentication in PIN only relies on pre-provisioned information.

    NOTE 1: The method of pre-provision is up to implementations.

    NOTE 2: In this release of the specification, no dynamic credential provision procedure is defined.

5.4.10 PIN heartbeat

5.4.10.1 General

If the heartbeat timer expires at the PMAE-C without receiving a PIN heartbeat message from the PEAE-C or PGAE-C, the PMAE-C shall determine that the corresponding PEAE-C or PGAE-C is not available.

If the heartbeat timer expires at the PAE-S without receiving a PIN heartbeat message from the PMAE-C, the PAE-S shall determine that the PMAE-C is not available.

The following procedures are defined for PIN heartbeat:

    a) PIN heartbeat for PGAE-C and PEAE-C as specified in clause 5.4.10.2; and

b) PIN heartbeat for PMAE-C as specified in clause 5.4.10.3.

5.4.10.2 PIN heartbeat for PGAE-C and PEAE-C

5.4.10.2.1 Requesting entity procedure

The requesting entity can be a PEAE-C or a PGAE-C.

To indicate the availability of the requesting entity within the current heartbeat timer, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

    a) shall set the Request-URI to the URI of the PMAE-C;

    b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-heartbeat> element in the <pinapp-info> root element and within the <pin-heartbeat> element:

        1) shall include a <ue-id> element set to the PIN client ID of the requesting entity; and

        2) shall include a <pin-id> element set to the identifier of the PIN.

The requesting entity shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

5.4.10.2.2 PMAE-C procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-heartbeat> element in the <pinapp-info> root element,

the PMAE-C shall update the availability of the requesting entity.

5.4.10.3 PIN heartbeat for PMAE-C

5.4.10.3.1 PMAE-C procedure

To indicate the availability of the PMAE-C within the current heartbeat timer, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PMAE-C:

    a) shall set the Request-URI to the URI of the PAE-S;

    b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-heartbeat> element in the <pinapp-info> root element and within the <pin-heartbeat> element:

        1) shall include a <ue-id> element set to the PIN client ID of the PMAE-C; and

        2) shall include a <pin-id> element set to the identifier of the PIN.

The PMAE-C shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

5.4.10.3.2 PAE-S procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-heartbeat> element in the <pinapp-info> root element,

the PAE-S shall update the availability of the PMAE-C.

5.4.11   PIN services management

5.4.11.1   PEAE-C registers new service

5.4.11.1.1   PEAE-C procedure

When the PEAE-C needs to register a new service in a PIN, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 72S31 [4]. In the HTTP POST request, the PEAE-C:

a) shall set the Request-URI to the URI of the PMAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-registration-request> element in the <pinapp-info> root element and within the <pin-service-registration-request> element:

   1) shall include a <pin-id> element set to the identity of the involved PIN;

   2) shall include a <requesting-pine-id> element set to the identity of the PEAE-C; and

   3) shall include a <list-of-services> element set to the list of information on the service. Each entry of the list (i.e. for each service) shall include a service identifier and may include a service type, a service description, and a time duration indicating the availability period of service.

The PEAE-C shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-registration-accept> element in the <pinapp-info> root element,

the PEAE-C shall consider the new service(s) has successfully been registered in the PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-registration-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the new service(s) is reject to be registered in the PIN.

5.4.11.1.2   PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-registration-request> element in the <pinapp-info> root element,

the PMAE-C shall determine whether the PEAE-C is allowed to register new service(s) or not and whether the new service(s) are allowed to be offered by the PIN or not.

If the PEAE-C is allowed to register the new service(s) and all the new services are allowed to be offered by the PIN, the PMAE-C shall:

    a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml";

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-registration-accept> element in the <pinapp-info> root element and within the <pin-service-registration-accept> element:

            i) shall include a <pin-id> element set to the PIN ID of the PIN; and

            ii) shall include a <requesting-pine-id> element set to the identity of the PEAE-C;

    b) send the HTTP 200 (OK) response towards the PEAE-C; and

    c) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) in the PIN as specified in clause 5.4.6.4 to update the PIN profile.

If the PEAE-C is not allowed to register the new service(s) or at least one new service is not allowed to be offered by the PIN, the PMAE-C shall:

    a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PMAE-C:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-registration-reject> element in the <pinapp-info> root element and within the <pin-service-registration-reject> element:

            i) shall include a <pin-id> element set to the PIN ID of the PIN;

            ii) shall include a <requesting-pine-id> element set to the identity of the PEAE-C; and

            iii) shall include a <cause> element set to an appropriate cause for PIN service registration failure; and

    b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

The <cause> element shall set to one of the following:

    0   Protocol error, unspecified;

    1   Operation not allowed;

    3   Authorization failure;

    6   Maximum number of service is reached; and

    7   Permanently denied.

5.4.11.2 PEAE-C de-registers existing service

5.4.11.2.1 PEAE-C procedure

When the PEAE-C needs to de-register the existing service(s) in a PIN, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 72S31 [4]. In the HTTP POST request, the PEAE-C:

    a) shall set the Request-URI to the URI of the PMAE-C;

    b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-deregistration-request> element in the <pinapp-info> root element and within the <pin-service-deregistration-request> element:

        1) shall include a <pin-id> element set to the identity of the involved PIN;

        2) shall include a <requesting-pine-id> element set to the identity of the PEAE-C; and

3) shall include a <list-of-services> element set to the list of information on the service. Each entry of the list (i.e. for each service) shall include a service identifier and may include a service type and a service description.

The PEAE-C shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-deregistration-accept> element in the <pinapp-info> root element,

the PEAE-C shall consider the service(s) has successfully been de-registered in the PIN.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-deregistration-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the service(s) is reject to be deregistered in the PIN.

5.4.11.2.2 PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-deregistration-request> element in the <pinapp-info> root element,

the PMAE-C shall determine whether the PEAE-C is allowed to deregister all the requesting service(s) or not.

If the PEAE-C is allowed to deregister all the requesting service(s), the PMAE-C shall:

a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml";

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-deregistration-accept> element in the <pinapp-info> root element and within the <pin-service-deregistration-accept> element:

i) shall include a <pin-id> element set to the PIN ID of the PIN; and

ii) shall include a <requesting-pine-id> element set to the identity of the PEAE-C;

b) send the HTTP 200 (OK) response towards the PEAE-C; and

c) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) in the PIN as specified in clause 5.4.6.4 to update the PIN profile.

If the PEAE-C is not allowed to deregister at least one requesting service(s), the PMAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PMAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-deregistration-reject> element in the <pinapp-info> root element and within the <pin-service-deregistration-reject> element:

i) shall include a <pin-id> element set to the PIN ID of the PIN;

ii) shall include a <requesting-pine-id> element set to the identity of the PEAE-C; and

iii) shall include a <cause> element set to an appropriate cause for PIN service deregistration failure; and

b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure; and

7 Permanently denied.

5.4.12 PIN activation management procedure

5.4.12.1 General

The PIN activation management is managed by PMAE-C. When the PIN is in deactivated status, the services offered by the PIN are inaccessible, no PIN peer is allowed to join the PIN, and the PGAE-C is not allowed to enable the communication among the PIN peers or the PAE-S, and vice versa for the PIN in activated status.

The following procedures are defined for PIN activation management:

a) PIN activation as specified in clause 5.4.12.2; and

b) PIN deactivation as specified in clause 5.4.12.3.

PMAE-C may deactivate the PIN when the <valid-timer> element received in the <pin-creation-accept> element is expired but the PIN validity duration in the PIN profile is not expired (e.g. in case that the PIN may be activated again).

5.4.12.2 PIN activation

When the PMAE-C needs to activate a PIN which is in deactivated status, the PMAE-C shall:

a) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) in the PIN as specified in clause 5.4.6.4 to notify the PAE-S and PIN peer(s) in the PIN that the PIN is in activated status.

5.4.12.3 PIN deactivation

When the PMAE-C needs to deactivate a PIN which is in activated status, the PMAE-C shall:

a) initiate a PIN status notify procedure towards PAE-S and PIN peer(s) in the PIN as specified in clause 5.4.6.4 to notify the PAE-S and PIN peer(s) in the PIN that the PIN is in activated status.

5.4.13 PIN connectivity subscription

5.4.13.1 General

The purpose of the PIN connectivity subscription procedure is to enable a PEAE-C, PMAE-C, or PAE-S participating in a PIN to be notified of PIN connectivity events by a PGAE-C. PIN connectivity notification includes PIN connectivity information such as a connectivity change.

The following procedures are defined for the PIN connectivity subscription:

a) PIN connectivity subscribe as specified in clause 5.4.13.2;

b) PIN connectivity notify as specified in clause 5.4.13.3;

c) PIN connectivity update as specified in clause 5.4.13.4; and

d) PIN connectivity unsubscribe as specified in clause 5.4.13.5.

5.4.13.2 PIN connectivity subscribe

5.4.13.2.1 Initiating entity procedure

The initiating entity can be PEAE-C, PMAE-C, PAE-S.

The initiating entity, which wants to be notified about PIN connectivity events, subscribes to PGAE-C to receive PIN connectivity event notification. To subscribe for PIN connectivity information, the initiating entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the initiating entity:

a) shall set the Request-URI to the URI of the PGAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-subscribe-request> element in the <pinapp-info> root element and within the <pin-connectivity-subscribe-request> element:

    1) shall include a <subscriber-identifier> element set to the unique identifier of the initiating entity, such as PIN client ID;

    2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

    3) shall include a <subscription-id> element set to the event ID(s) for which the subscriber is notified. More than one event ID can be included;

    4) shall include a <pin-id> element set to the PIN ID, which identifies the PIN, serving the initiating entity;

    5) shall include a <notification-target-address> element set to the notification target address, (e.g. URL, IP address), where the notifications destined for the subscriber should be sent to; and

    6) may include a <proposed-expiration-time> element set to the proposed expiration time for the subscription.

The initiating entity shall send the generated HTTP POST request towards the PGAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-subscribe-accept> element in the <pinapp-info> root element,

the initiating entity shall consider it has successfully subscribed to the PIN connectivity event identified by the <subscription-id> element; and shall start an expiration timer if the <expiration-time> element is included. The value of the expiration timer shall be equal to the value in the <expiration-time> element. The initiating entity shall consider the subscription as valid for the duration of the expiration timer.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-subscribe-reject> element in the <pinapp-info> root element and within the <pin-connectivity-subscribe-reject> element;

the initiating entity shall consider the PIN connectivity subscribe request is not accepted by the PGAE-C.

5.4.13.2.2 PGAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-subscribe-request> element in the <pinapp-info> root element;

the PGAE-C shall verify whether the initiating entity is authorized to subscribe for PIN connectivity information. The authorization check may apply to an individual PIN.

If the initiating entity is allowed to subscribe for PIN connectivity events, the PGAE-C shall:

a) create and store the subscription for the initiating entity;

b) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PGAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-subscribe-accept> element in the <pinapp-info> root element and within the <pin-connectivity-subscribe-accept> element:

      i) shall include a <subscription-id> element set to the identity of the authorized subscription by PGAE-C; and

      ii) may include a <expiration-time> element set to the authorized expiration time for the subscription;

c) shall send the HTTP 200 (OK) response towards the initiating entity; and

d) start an expiration timer for the initiating entity if the <expiration-time> element is included. The value of the expiration timer shall be equal to the value in the <expiration-time> element. The PGAE-C shall treat the initiating entity as implicitly unsubscribed to the PIN connectivity event(s) if the initiating entity does not update the PIN connectivity event subscription within the expiration timer.

If the initiating entity is not allowed to subscribe for PIN connectivity events, the PGAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PGAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-subscribe-reject> element in the <pinapp-info> root element and within the <pin-connectivity-subscribe-reject> element:

      i) shall include a <cause> element set to an appropriate cause for PIN connectivity subscribe failure; and

b) send the HTTP 403 (Forbidden) response towards the initiating entity.

The <cause> element shall set to one of the following:

   0 Protocol error, unspecified;

   1 Operation not allowed;

   3 Authorization failure;

   4 Maximum number of PINE is reached; and

   7 Permanently denied.

5.4.13.3 PIN connectivity notify

5.4.13.3.1 PGAE-C procedure

The receiving entity can be PEAE-C, PMAE-C, or PAE-S.

The PAGE-C notifies the subscriber(s) when an event occurs at the PGAE-C, that satisfies triggering conditions. To notify subscribers, PGAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, PGAE-C:

   a) shall set the Request-URI to the URI of the receiving entity;

   b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-notify> element in the <pinapp-info> root element and within the <pin-connectivity-notify> element:

      1) shall include a <pegc-identifier> element set to the identifier of the PGAE-C, such as PIN client ID;

      2) shall include a <pin-id> element set to the PIN ID, which identifies the PIN, served by the PGAE-C;

      3) shall include a <pin-client-identifier> element set to the unique identifier of the PIN peer or PAE-S related to the connectivity change; and

      4) shall include a <event-type> element set to the type of event, including information about the connectivity event.

The PGAE-C shall send the generated HTTP POST request towards the receiving entities according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) response message, the PGAE-C shall consider the receiving entity has successfully received the notification.

Upon reception of an HTTP 403 (Forbidden) response message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-notify-reject> element in the <pinapp-info> root element,

the PGAE-C shall consider the receiving entity fails the PIN connectivity notify with the indicated cause.

5.4.13.3.2   Receiving entity procedure

Upon reception of an HTTP POST request message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-notify> element in the <pinapp-info> root element;

the receiving entity, upon receiving the notification, is able to successfully process the connectivity changes according to the <event-type> element in the PIN connectivity notification, shall:

   a) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; and

   b) shall send the HTTP 204 (No content) response towards the initiating entity.

If the receiving entity, upon receiving the notification, is not able to successfully process the connectivity changes according to the <event-type> element in the PIN connectivity notification, shall:

   a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]:

      1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

      2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-notify-reject> element in the <pinapp-info> root element and within the <pin-connectivity-notify-reject> element:

         i) shall include a <cause> element set to an appropriate cause for the failure; and

   b) send the HTTP 403 (Forbidden) response towards the initiating entity.

The <cause> element shall set to one of the following:

0   Protocol error, unspecified;

1   Operation not allowed;

3   Authorization failure; and

7   Permanently denied.

5.4.13.4 PIN connectivity update

5.4.13.4.1 Initiating entity procedure

The initiating entity can be PEAE-C, PMAE-C, PAE-S.

The initiating entity, which subscribed for notifications about PIN connectivity events, can update the subscription with PGAE-C. To update the subscription for PIN connectivity information, the initiating entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the initiating entity:

a)   shall set the Request-URI to the URI of the PGAE-C;

b)   shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c)   shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-update-request> element in the <pinapp-info> root element and within the <pin-connectivity-update-request> element:

   1)   shall include a <subscription-id> element set to the subscription identifier corresponding to the subscription;

   2)   shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

   3)   may include a <notification-target-address> element set to the notification target address, (e.g. URL, IP address), where the notifications destined for the subscriber should be sent to; and

   4)   may include a <proposed-expiration-time> element set to the proposed expiration time for the subscription.

The initiating entity shall send the generated HTTP POST request towards the PGAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) or an HTTP 200 (OK) response message containing:

a)   a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b)   an application/vnd.3gpp.pinapp-info+xml MIME body with a pin-connectivity-update-accept> element in the <pinapp-info> root element, and within the <pin-connectivity-update-accept> element,

the initiating entity shall consider it has successfully updated the subscription information for the requested subscription ID and start an expiration timer if the <expiration-time> element is included. The value of the expiration timer shall be equal to the value in the <expiration-time> element. The initiating entity shall consider the subscription as valid for the duration of the expiration timer.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a)   a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b)   an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-update-reject> element in the <pinapp-info> root element,

the initiating entity shall consider the PIN connectivity update request is not accepted by the PGAE-C and invalidate all the subscription towards the PGAE-C when the expiration timer expires.

5.4.13.4.2 PGAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-update-request> element in the <pinapp-info> root element;

the PGAE-C shall verify whether the initiating entity is authorized to update PIN connectivity subscription information of the requested subscription id or not.

If the initiating entity is authorized to update the subscription information for the requested subscription ID, the PGAE-C shall:

a) update the subscription for the requesting entity for the PIN;

b) generate an HTTP 204 (No content) response or an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PGAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-update-accept> element in the <pinapp-info> root element and within the <pin-connectivity-update-accept> element:

      i) shall include a <expiration-time> element set to the expiration time of the subscription. To maintain an active subscription, a subscription update is required before the expiration time;

c) shall send the HTTP 204 (No content) or HTTP 200 (OK) response towards the initiating entity; and

d) start an expiration timer for the initiating entity if the <expiration-time> element is included. The value of the expiration timer shall be equal to the value in the <expiration-time> element. The PGAE-C shall treat the initiating entity as implicitly unsubscribed to the PIN connectivity event(s) if the requesting entity does not update the PIN connectivity event subscription within the expiration timer.

If the initiating entity is not authorized to update the subscription for requested subscription ID, the PGAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PGAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-update-reject> element in the <pinapp-info> root element and within the <pin-connectivity-update-reject> element:

      i) shall include a <cause> element set to an appropriate cause for PIN connectivity update failure; and

b) send the HTTP 403 (Forbidden) response towards the initiating entity.

The <cause> element shall set to one of the following:

   0 Protocol error, unspecified;

   1 Operation not allowed;

   3 Authorization failure; and

   7 Permanently denied.

5.4.13.5 PIN connectivity unsubscribe

5.4.13.5.1 Initiating entity procedure

The initiating entity can be PEAE-C, PMAE-C, PAE-S.

The initiating entity, which wants to unsubscribe from receiving notification about PIN connectivity events, shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the initiating entity:

a) shall set the Request-URI to the URI of the PGAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-unsubscribe-request> element in the <pinapp-info> root element and within the <pin-connectivity-unsubscribe-request> element:

    1) shall include a <subscription-id> element set to the subscription identifier corresponding to the subscription; and

    2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service.

The initiating entity shall send the generated HTTP POST request towards the PGAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) response message, the initiating entity shall consider the PIN connectivity unsubscribe request is accepted by the PGAE-C.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-unsubscribe-reject> element in the <pinapp-info> root element; and within the <pin-connectivity-unsubscribe-reject> element,

the initiating entity shall consider the PIN connectivity unsubscribe request is not accepted by the PGAE-C.

5.4.13.5.2 PGAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-unsubscribe-request> element in the <pinapp-info> root element;

the PGAE-C shall verify whether the initiating entity is authorized to unsubscribe for PIN connectivity information.

If the initiating entity is allowed to unsubscribe for PIN connectivity information, the PGAE-C shall:

a) delete the related subscription for PIN connectivity information for the initiating entity;

b) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; and

c) send the HTTP 204 (No content) response towards the initiating entity.

If the initiating entity is not allowed to unsubscribe for PIN connectivity information, the PGAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PGAE-C:

    1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-connectivity-unsubscribe-reject> element in the <pinapp-info> root element and within the <pin-connectivity-unsubscribe-reject> element:

        i) shall include a <cause> element set to an appropriate cause for PIN connectivity unsubscribe failure; and

b) send the HTTP 403 (Forbidden) response towards the initiating entity.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure; and

7 Permanently denied.

5.5 PIN communication

5.5.1 General

Whether a PIN communication is allowed or not is decided by PMAE-C of the PIN. Hence if a PIN peer needs to initiate a PIN communication, it should interact with PMAE-C before sending the traffic directly to the PGAE-C for routing. Once the PIN communication is allowed by the PMAE-C, the PIN peer is allowed to send the traffic to the same target PIN peer or the same PIN server via the PGAE-C directly.

The following procedures are defined for PIN communication:

   a) PIN communication create as specified in clause 5.5.2;

   b) PIN communication update as specified in clause 5.5.3; and

   c) PIN communication delete as specified in clause 5.5.4.

5.5.2 PIN communication create procedure

5.5.2.1 Requesting entity procedure

The requesting entity can be PMAE-C, PEAE-C, or PGAE-C.

When the requesting entity needs to initiate a PIN communication, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

   a) shall set the Request-URI to the URI of the PMAE-C;

   NOTE 1: In case of the requesting entity is PMAE-C, the Request-URI sets to the URI of the PGAE-C.

   b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-create-request> element in the <pinapp-info> root element and within the <pin-communication-create-request> element:

   1) shall include a <pin-id> element set to the PIN ID of the PIN;

   2) shall include a <ue-id> element set to the identity of the requesting entity;

   3) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

   4) shall include a <pin-traffic-descriptor> element set to the PIN traffic descriptor that identifies the target traffic to or from the application server or the PIN peer;

   5) shall include a <pin-packet-filter> element set to the PIN packet filter that identifies one or more packet flow(s) (i.e. for the PGAE-C to route the traffic to the target application server or PIN peer);

   6) may include a <pin-requested-qos> element set to the QoS requirement of the packet flow that requested by the requesting entity; and

   7) may include a <ue-address> element set to the MAC address or IP address of the requesting entity.

The requesting entity shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

   NOTE 2: In case of the requesting entity is PMAE-C itself, the generated HTTP POST request is sent towards the PGAE-C.

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-create-accept> element in the <pinapp-info> root element,

the requesting entity shall consider the PIN communication is allowed by the PMAE-C and send the traffic to the PGAE-C when needed.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-create-reject> element in the <pinapp-info> root element,

the requesting entity shall consider the PIN communication is not allowed by the PMAE-C or the PGAE-C.

NOTE 3:   In case of the requested QoS requirement is not the same as the accepted QoS requirement according to the <pin-accepted-qos> element, it is left to UE implementation for further actions.

5.5.2.2   PMAE-C procedure

NOTE: This procedure is not performed if the requesting entity is the PMAE-C itself.

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-create-request> element in the <pinapp-info> root element,

the PMAE-C shall determine whether the requesting entity is allowed to perform the PIN communication or not.

If the requesting entity is allowed to perform the PIN communication, the PMAE-C shall forward the HTTP POST request message to PGAE-C with changing the Request-URI to the URI of the PGAE-C;

If the requesting entity is not allowed to perform the PIN communication, the PMAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PMAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-create-reject> element in the <pinapp-info> root element and within the <pin-communication-create-reject> element:

i) shall include a <cause> element set to an appropriate cause for PIN communication create procedure failure; and

b) send the HTTP 403 (Forbidden) response towards the requesting entity.

The <cause> element shall set to one of the following:

0   Protocol error, unspecified;

1   Operation not allowed;

3   Authorization failure;

5   Resource not sufficient; and

7   Permanently denied.

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-create-accept> element in the <pinapp-info> root element,

the PMAE-C shall forward the HTTP 200 (OK) response message to the requesting entity.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-create-reject> element in the <pinapp-info> root element,

the PMAE-C shall forward the HTTP 403 (Forbidden) response message to the requesting entity.

5.5.2.3   PGAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-create-request> element in the <pinapp-info> root element,

the PGAE-C:

a) shall configure the local rule according to the element in the <pin-communication-create-request> element respectively if acceptable;

b) may initiate either of the following:

1) a PDU session establishment procedure as specified in clause 6.4.1 of 3GPP TS 24.501 [11] if no PDU session has been established for this PIN; or

2) a PDU session modification procedure as specified in clause 6.4.2 of 3GPP TS 24.501 [11] with the following consideration:

i) the QoS flow descriptions IE is set according to the <pin-requested-qos> element; and

ii) the QoS rules IE is set according to the <pin-packet-filter> element;

c) shall generate one of the following to respond:

1) an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PGAE-C:

i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-create-accept> element in the <pinapp-info> root element and within the <pin-communication-create-accept> element:

A) shall include a <pin-accepted-qos> element set to the QoS requirement of the packet flow that is accepted by the PGAE-C; and

B) shall include a <pin-communication-flow-id> element set to the identity of the communication flow that is successfully created by the PGAE-C; or

2) an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PGAE-C:

i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-create-reject> element in the <pinapp-info> root element and within the <pin-communication-create-reject> element:

     i) shall include a <cause> element set to an appropriate cause for PIN communication create procedure failure; and

  d) shall send the HTTP 200 (OK) response or the HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  3 Authorization failure;

  5 Resource not sufficient; and

  7 Permanently denied.

5.5.3 PIN communication update procedure

5.5.3.1 Requesting entity procedure

The requesting entity can be PMAE-C, PEAE-C, or PGAE-C.

When the requesting entity needs to update a PIN communication, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

  a) shall set the Request-URI to the URI of the PMAE-C;

  NOTE 1: In case of the requesting entity is PMAE-C, the Request-URI sets to the URI of the PGAE-C.

  b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-update-request> element in the <pinapp-info> root element and within the <pin-communication-update-request> element:

    1) shall include a <pin-id> element set to the PIN ID of the PIN;

    2) shall include a <ue-id> element set to the identity of the requesting entity;

    3) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

    4) shall include a <pin-traffic-descriptor> element set to the PIN traffic descriptor that identifies the target traffic to or from the application server or the PIN peer;

    5) shall include a <pin-packet-filter> element set to the PIN packet filter that identifies one or more packet flow(s) (i.e. for the PGAE-C to route the traffic to the target application server or PIN peer);

    6) may include a <pin-requested-qos> element set to the QoS requirement of the packet flow that requested by the requesting entity; and

    7) may include a <ue-address> element set to the MAC address or IP address of the requesting entity.

The requesting entity shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

  NOTE 2: In case of the requesting entity is PMAE-C itself, the generated HTTP POST request is sent towards the PGAE-C.

Upon reception of an HTTP 200 (OK) response message containing:

  a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-update-accept> element in the <pinapp-info> root element,

the requesting entity shall consider the PIN communication update is allowed by the PMAE-C and send the traffic to the PGAE-C when needed.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-update-reject> element in the <pinapp-info> root element,

the requesting entity shall consider the PIN communication update procedure is not allowed by the PMAE-C or the PGAE-C.

5.5.3.2   PMAE-C procedure

NOTE: This procedure is not performed if the requesting entity is the PMAE-C itself.

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-update-request> element in the <pinapp-info> root element,

the PMAE-C shall determine whether the requesting entity is allowed to update the PIN communication or not.

If the requesting entity is allowed to update the PIN communication, the PMAE-C shall forward the HTTP POST request message to PGAE-C with changing the Request-URI to the URI of the PGAE-C;

If the requesting entity is not allowed to update the PIN communication, the PMAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PMAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-update-reject> element in the <pinapp-info> root element and within the <pin-communication-update-reject> element:

i) shall include a <cause> element set to an appropriate cause for PIN communication update procedure failure; and

b) send the HTTP 403 (Forbidden) response towards the requesting entity.

The <cause> element shall set to one of the following:

0   Protocol error, unspecified;

1   Operation not allowed;

3   Authorization failure;

5   Resource not sufficient; and

7   Permanently denied.

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-update-accept> element in the <pinapp-info> root element,

the PMAE-C shall forward the HTTP 200 (OK) response message to the requesting entity.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-delete-reject> element in the <pinapp-info> root element,

the PMAE-C shall forward the HTTP 403 (Forbidden) response message to the requesting entity.

5.5.3.3 PGAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-update-request> element in the <pinapp-info> root element,

the PGAE-C:

a) shall configure the local rule according to the element in the <pin-communication-update-request> element respectively if acceptable;

b) may initiate a PDU session modification procedure as specified in clause 6.4.2 of 3GPP TS 24.501 [11] with the following consideration:

   1) the QoS flow descriptions IE is set according to the <pin-requested-qos> element; and

   2) the QoS rules IE is set according to <pin-packet-filter> element;

c) shall generate one of the following to respond:

   1) an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PGAE-C:

     i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

     ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-update-accept> element in the <pinapp-info> root element and within the <pin-communication-update-accept> element:

       A) shall include a <pin-accepted-qos> element set to the QoS requirement of the packet flow that is accepted by the PGAE-C; and

       B) shall include a <pin-communication-flow-id> element set to the identity of the communication flow that is successfully updated by the PGAE-C; or

   2) an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PGAE-C:

     i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

     ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-update-reject> element in the <pinapp-info> root element and within the <pin-communication-update-reject> element:

       i) shall include a <cause> element set to an appropriate cause for PIN communication update procedure failure; and

d) shall send the HTTP 200 (OK) response or the HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  3 Authorization failure;

5   Resource not sufficient; and

7   Permanently denied.

5.5.4   PIN communication delete procedure

5.5.4.1   Requesting entity procedure

The requesting entity can be PMAE-C, PEAE-C, or PGAE-C.

When the requesting entity needs to delete a PIN communication, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

  a) shall set the Request-URI to the URI of the PMAE-C;

  NOTE 1: In case of the requesting entity is PMAE-C, the Request-URI sets to the URI of the PGAE-C.

  b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-delete-request> element in the <pinapp-info> root element and within the <pin-communication-delete-request> element:

    1) shall include a <pin-id> element set to the PIN ID of the PIN;

    2) shall include a <ue-id> element set to the identity of the requesting entity;

    3) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service; and

    4) shall include a <pin-communication-flow-id> element set to the identity of the communication flow that is required to delete.

The requesting entity shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

  NOTE 2: In case of the requesting entity is PMAE-C itself, the generated HTTP POST request is sent towards the PGAE-C.

Upon reception of an HTTP 204 (No content) response message, the requesting entity shall consider the PIN communication identified by the <pin-communication-flow-id> element is successfully deleted.

Upon reception of an HTTP 403 (Forbidden) response message containing:

  a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-delete-reject> element in the <pinapp-info> root element,

the requesting entity shall consider the PIN communication is not allowed to delete by the PMAE-C.

  NOTE 3: The further actions for the requesting entity are left to UE implementation.

5.5.4.2   PMAE-C procedure

  NOTE: This procedure is not performed if the requesting entity is the PMAE-C itself.

Upon reception of an HTTP POST request message containing:

  a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-delete-request> element in the <pinapp-info> root element,

the PMAE-C shall determine whether the requesting entity is allowed to delete the PIN communication or not.

If the requesting entity is allowed to perform the PIN communication, the PMAE-C shall forward the HTTP POST request message to PGAE-C with changing the Request-URI to the URI of the PGAE-C.

If the requesting entity is not allowed to delete the PIN communication, the PMAE-C shall:

    a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PMAE-C:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-delete-reject> element in the <pinapp-info> root element and within the <pin-communication-delete-reject> element:

            i) shall include a <cause> element set to an appropriate cause for PIN communication delete procedure failure; and

    b) send the HTTP 403 (Forbidden) response towards the requesting entity.

The <cause> element shall set to one of the following:

    0 Protocol error, unspecified;

    1 Operation not allowed;

    3 Authorization failure; and

    7 Permanently denied.

Upon reception of an HTTP 204 (No content) response message, the PMAE-C shall forward the HTTP 204 (No content) response message to the requesting entity.

5.5.4.3   PGAE-C procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-delete-request> element in the <pinapp-info> root element,

the PGAE-C:

    a) shall delete the local rule according to the element in the <pin-communication-delete-request> element respectively if acceptable;

    b) may initiate a PDU session modification procedure as specified in clause 6.4.2 of 3GPP TS 24.501 [11] to modify the corresponding QoS rule and delete the corresponding packet filters;

    c) shall generate one of the following to respond:

        1) an HTTP 204 (No content) response according to IETF RFC 9110 [4]; or

        2) an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PGAE-C:

            i) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

            ii) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-communication-delete-reject> element in the <pinapp-info> root element and within the <pin-communication-delete-reject> element:

                i) shall include a <cause> element set to an appropriate cause for PIN communication delete procedure failure; and

    d) shall send the HTTP 204 (No content) response or the HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

    0   Protocol error, unspecified;

    1   Operation not allowed;

    3   Authorization failure; and

    7   Permanently denied.

5.6 Application server discovery in PIN

5.6.1 General

The PMAE-C and PAE-S can maintain the information related to the application servers that are available to the PIN peers within a PIN. Application server information may be pre-provisioned in the PMAE-C, PAE-S, or both. The purpose of application server discovery procedure is to enable the PMAE-C to provide the connectivity information to the PIN peer when requested by the PIN peer.

5.6.2 Requesting entity procedure

To obtain the connectivity information of the applications server, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PEAE-C:

    a) shall set the Request-URI to the URI of the PMAE-C;

    b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-as-discovery-request> element in the <pinapp-info> root element and within the <pin-as-discovery-request> element:

        1) shall include a <ue-id> element set to the identifier of the PEAE-C;

        2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN; and

        3) shall include a <service-id> element set to the identity of the requesting service(s).

The PEAE-C shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-as-discovery-accept> element in the <pinapp-info> root element,

the PEAE-C shall store the connectivity information of the application server.

Upon reception of an HTTP 403 (Forbidden) response message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-as-discovery-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the connectivity information of the application server is not available.

5.6.3 PMAE-C procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-as-discovery-request> element in the <pinapp-info> root element,

the PMAE-C shall determine whether the PEAE-C is allowed to request the connectivity information of the application server or not.

If the PEAE-C is allowed to request the connectivity information of the application server and the connectivity information of the application server is available in the PMAE-C, the PMAE-C shall:

a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-as-discovery-accept> element in the <pinapp-info> root element and within the <pin-as-discovery-accept> element:

i) shall include a <as-connectivity-info> element set to the connectivity information of the application server; and

b) send the HTTP 200 (OK) response towards the PEAE-C.

If the PEAE-C is allowed to request the connectivity information of the application server and the connectivity information of the application server is not available in the PMAE-C, the PMAE-C shall forward the received HTTP POST request message to PAE-S with changing the Request-URI to the URI of the PAE-S.

If the PEAE-C is not allowed to request the connectivity information of the application server, the PMAE-C shal:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PMAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-as-discovery-reject> element in the <pinapp-info> root element and within the <pin-as-discovery-reject> element:

i) shall include a <cause> element set to an appropriate cause for PIN application server discovery failure; and

b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

2 Requested information not available;

3 Authorization failure; and

7 Permanently denied.

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-as-discovery-accept> element in the <pinapp-info> root element,

the PMAE-C shall forward the received HTTP 200 (OK) response message to the corresponding PEAE-C.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-as-discovery-accept> element in the <pinapp-info> root element,

the PMAE-C shall forward the received HTTP 403 (Forbidden) response message to the corresponding PEAE-C.

5.6.4   PAE-S procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-as-discovery-request> element in the <pinapp-info> root element,

the PAE-S shall perform either of the following based on the processing result:

a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-as-discovery-accept> element in the <pinapp-info> root element and within the <pin-as-discovery-accept> element:

      i) shall include a <as-connectivity-info> element set to the connectivity information of the application server; or

b) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PAE-S:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-as-discovery-reject> element in the <pinapp-info> root element and within the <pin-as-discovery-reject> element:

      i) shall include a <cause> element set to an appropriate cause for PIN application server discovery failure.

The PAE-S shall send the HTTP 200 (OK) response or the HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

   0   Protocol error, unspecified;

   1   Operation not allowed;

   2   Requested information not available;

   3   Authorization failure; and

   7   Permanently denied.

5.7   Service Switch

5.7.1   General

The purpose of PIN service switch procedure is to enable a PEAE-C participating in a PIN, to transfer application traffic to a different PEAE-C or PGAE-C participating in the same PIN. Two scenarios are supported for the PIN service switch procedure:

a) PIN service switch with PAE-S support as specified in clause 5.7.2; and

b) PIN service switch without PAE-S support as specified in clause 5.7.3.

5.7.2 PIN service switch with PAE-S support

5.7.2.1 General

The purpose of PIN service switch with PAE-S support is to enable a PEAE-C participating in a PIN, to transfer application traffic to a different PEAE-C or PGAE-C participating in the same PIN, with assistance from the PAE-S. The PEAE-C requests assistance with service switch from the PAE-S. The PAE-S assistance can be in the form of authorization, identifying a PIN and the corresponding PMAE-C, identifying the appropriate PINE where the service can be switched and inititating the procedure with PMAE-C.

The following procedures are defined for the PIN service switch with PAE-S support:

   a) PIN Service Switch with assistance from PAE-S as specified in clause 5.7.2.2; and

   b) PIN Service Switch Configure with assistance from PAE-S as specified in clause 5.7.2.3.

5.7.2.2 PIN Service Switch with assistance from PAE-S

5.7.2.2.1 PEAE-C procedure

When the PEAE-C needs to switch service in a PIN, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PEAE-C:

   a) shall set the Request-URI to the URI of the PAE-S;

   b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-switch-request> element in the <pinapp-info> root element and within the <pin-service-switch-request> element:

   1) shall include a <pin-client-identifier> element set to the PIN client ID of the PEAE-C;

   2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

   3) shall include a <pin-id> element set to the PIN ID, which identifies the PIN where the service will be switched;

   4) shall include a <application-client-identifier> element set to the identifier of the application client, which identifies the application client in PINE where the service is terminated;

   5) shall include a <application-server-identifier> element set to the identifier of the application server, which identifies the application server producing the service;

   6) shall include a <application-session-identifier> element set to the identifier of the application traffic, which identifies the application traffic to be switched;

   7) may include a <application-traffic-descriptor> element set to the descriptor of application traffic flows (e.g., IP 4 tuple); and

   8) may include a <target-pin-client-identifier> element set to the PIN client ID of the target PEAE-C.

The PEAE-C shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

   a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-switch-accept> element in the <pinapp-info> root element,

the PEAE-C shall consider the PIN service switch request is accepted by the PAE-S and shall store the PIN client ID of the target PEAE-C if available.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-switch-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the PIN service switch request is not accepted by the PAE-S.

5.7.2.2.2 PAE-S procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-switch-request> element in the <pinapp-info> root element,

the PAE-S shall verify whether the PEAE-C is authorized to request service switch to a PIN and whether the PIN can support the service switch.

If the PEAE-C is allowed to switch service in a PIN, the PAE-S shall:

a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-switch-accept> element in the <pinapp-info> root element and within the <pin-service-switch-accept> element:

      i) may include a <target-pin-client-identifier> element set to the PIN client ID of the target PEAE-C if target PIN client is not provided in the PIN service switch request; and

b) shall send the HTTP 200 (OK) response towards the PEAE-C.

If the PEAE-C is not allowed to switch service in a PIN, the PAE-S shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PAE-S:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-switch-reject> element in the <pinapp-info> root element and within the <pin-service-switch-reject> element:

      i) shall include a <cause> element set to an appropriate cause for PIN service switch failure; and

b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

The <cause> element shall set to one of the following:

   0 Protocol error, unspecified;

   1 Operation not allowed;

   3 Authorization failure;

   5 Resource not sufficient; and

   7 Permanently denied.

5.7.2.3 PIN Service Switch Configure procedure with assistance from PAE-S

5.7.2.3.1 PAE-S procedure

If the PAE-S has accepted the service switch request to a PIN from the PEAE-C, the PAE-S shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PAE-S:

a) shall set the Request-URI to the URI of the PMAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-switch-configure-request> element in the <pinapp-info> root element and within the <pin-configuration-service-switch-configure-request> element:

    1) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

    2) shall include a <pin-id> element set to the PIN ID, which identifies the PIN where the service will be switched;

    3) shall include a <application-client-identifier> element set to the identifier of the application client, which identifies the application client in PINE where the service is terminated;

    4) may include a <application-server-identifier> element set to the identifier of the application server, which identifies the application server producing the service;

    5) shall include a <application-session-identifier> element set to the identifier of the application traffic, which identifies the application traffic to be switched;

    6) may include a <application-traffic-descriptor> element set to the description of application session, which is to be switched; and

    7) may include a <target-pin-client-identifier> element set to the PIN client ID of the target PEAE-C.

The PAE-S shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) response message from PMAE-C, the PAE-S shall consider the PIN configuration service switch configure request is accepted by the PMAE-C.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-switch-configure-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the PIN configuration service switch configure request is not accepted by the PMAE-C.

5.7.2.3.2 PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-switch-configure-request> element in the <pinapp-info> root element,

the PMAE-C shall check whether the PIN and receiving entity can support the requested service switch.

If the both the PIN and target PEAE-C can support the requested service switch, the PMAE-C shall generate the HTTP POST request message towards the receiving entity, according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PMAE-C:

a) shall set the Request-URI to the URI of the receiving entity (PGAE-C or PEAE-C);

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-service-switch-configure-request> element in the <pinapp-info> root element and within the <pin-management-service-switch-configure-request> element:

    1) shall include a <pin-management-client-identifier> element set to the PEMC ID of the PMAE-C;

2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

3) shall include a <pin-id> element set to the PIN ID, which identifies the PIN where the service will be switched;

4) shall include a <application-client-identifier> element set to the identifier of the application client, which identifies the application client in PINE where the service is terminated;

5) shall include a <application-server-identifier> element set to the identifier of the application server, which identifies the application server producing the service;

6) shall include a <target-pin-client-identifier> element set to the PIN client ID of the target PEAE-C, if the receiving entity is PMAE-C;

7) shall include a <application-traffic-identifier> element set to the identifier of the application session, which identifies the application session to be switched;

8) may include a <application-traffic-descriptor> element set to the description of application session, which is to be switched; and

9) may include a <pegc-id> element set to the PEGC ID of the PGAE-C, if the receiving entity is the PGAE-C.

The PMAE-C shall send the generated HTTP POST request towards the receiving entity according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message from the receiving entity, with:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-service-switch-configure-accept> element in the <pinapp-info> root element,

the PMAE-C shall consider the PIN management service switch configure request is accepted by the receiving entity, and the PMAE-C:

a) shall generate an HTTP 204 (No content) response message according to IETF RFC 9110 [4]; and

b) shall send the generated HTTP 204 (No content) response message towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 403 (Forbidden) response message from the receiving entity, with:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-service-switch-configure-reject> element in the <pinapp-info> root element,

the PMAE-C shall consider the PIN management service switch configure request is not accepted by the receiving entity, and the PMAE-C:

a) shall generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PMAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-service-switch-configure-reject> element in the <pinapp-info> root element and within the <pin-management-service-switch-configure-reject> element:

i) shall include a <cause> element set to an appropriate cause for PIN service switch configure failure; and

b) shall send the HTTP 403 (Forbidden) response towards the PAE-S.

The <cause> element shall set to one of the following:

0   Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure;

5 Resource not sufficient; and

7 Permanently denied.

If either the PIN or the target PEAE-C cannot support the requested service switch, the PMAE-C shall generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PMAE-C:

a) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-switch-configure-reject> element in the <pinapp-info> root element and within the <pin-configuration-service-switch-configure-reject> element:

1) shall include a <cause> element set to indicate the cause of the failure.

The PMAE-C shall send the generated HTTP 403 (Forbidden) response towards the receiving entity according to IETF RFC 9110 [4].

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure;

5 Resource not sufficient; and

7 Permanently denied.

5.7.2.3.3 Receiving entity procedure

The receiving entity can be a PGAE-C or PEAE-C.

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a < pin-management-service-switch-configure-request> element in the <pinapp-info> root element,

the receiving entity shall check whether receiving entity can be configured to support the service switch request.

If the PGAE-C can be configured to support the requested service switch, receiving entity shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the receiving entity:

a) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-service-switch-configure-accept> element in the <pinapp-info> root element.

The receiving entity shall send the generated HTTP 200 (OK) response towards the PMAE-C according to IETF RFC 9110 [4].

If the receiving entity cannot be configured to support the requested service switch, receiving entity shall generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the receiving entity:

a) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-service-switch-configure-reject> element in the <pinapp-info> root element and within the <pin-management-service-switch-configure-reject> element:

      1) shall include a <cause> element set to indicate the cause of the failure.

The receiving entity shall send the generated HTTP 403 (Forbidden) response towards the PMAE-C according to IETF RFC 9110 [4].

The <cause> element shall set to one of the following:

    0 Protocol error, unspecified;

    1 Operation not allowed;

    3 Authorization failure;

    5 Resource not sufficient; and

    7 Permanently denied.

5.7.3 PIN service switch without PAE-S support

5.7.3.1 PEAE-C procedure

When the PEAE-C needs to switch service in a PIN, the PEAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 72S31 [4]. In the HTTP POST request, the PEAE-C:

    a) shall set the Request-URI to the URI of the PMAE-C;

    b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-discovery-request> element in the <pinapp-info> root element and within the <pin-service-discovery-request> element:

      1) shall include a <pin-id> element set to the identity of the involved PIN;

      2) shall include a <ue-id> element set to the identity of the PEAE-C;

      3) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

      4) shall include a <service-type> element set to the type of the requesting service(s). More than one new service can be included; and

      5) may include a <requesting-pine-address> element set to the IP address or MAC address of the PEAE-C.

The PEAE-C shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message from PMAE-C containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-discovery-accept> element in the <pinapp-info> root element,

the PEAE-C shall:

    a) consider the target PEAE-C in the <pin-service-discovery-accept> element is available to support the service switch;

    b) generate an HTTP POST request according to procedures as specified in IETF RFC 72S31 [4]. In the HTTP POST request, the PEAE-C:

      1) shall set the Request-URI to the URI of the target PEAE-C;

2) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

3) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-switch-configure-request> element in the <pinapp-info> root element and within the <pin-configuration-service-switch-configure-request> element:

    i) shall include a <pin-server-identifier> element set to the identity of the PEAE-C;

    ii) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

    iii) shall include a <pin-id> element set to the PIN ID, which identifies the PIN where the service will be switched;

    iv) shall include a <pin-service-info> element set to the PIN service information of the PEAE-C;

    v) may include a <application-client-identifier> element set to the identifier of the application client, which identifies the application client in PEAE-C where the service is terminated;

    vi) may include a <application-server-identifier> element set to the identifier of the application server, which identifies the application server producing the service;

    vii) may include a <application-session-identifier> element set to the identifier of the application traffic, which identifies the application traffic to be switched; and

    viii) may include a <application-traffic-descriptor> element set to the description of application session, which is to be switched; and

c) send the generated HTTP POST request towards the target PEAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 403 (Forbidden) response message from PMAE-C containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-discovery-reject> element in the <pinapp-info> root element,

the PEAE-C shall consider the service switch is not supported for the requested service.

Upon reception of an HTTP 204 (No content) response message from target PEAE-C, the PEAE-C shall consider the target PEAE-C accepts the service switch. From this time onward, the PEAE-C switches the traffic flow to the target PEAE-C via the PGAE-C for the requested service.

Upon reception of an HTTP 403 (Forbidden) response message from target PEAE-C containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a<pin-configuration-service-switch-configure-reject> element in the <pinapp-info> root element,

the PEAE-C:

a) shall consider the service switch is not accepted for the requested service; and

b) may generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4] that includes an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-switch-configure-request> element in the <pinapp-info> root element toward another PEAE-C in the <target-pine-id> element as specified in this clause.

5.7.3.2 PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-discovery-request> element in the <pinapp-info> root element,

the PMAE-C shall check whether the PEAE-C is allowed to discover a PEAE-C for service switch or not, and check whether there is any PEAE-C available to support the service switch.

If the PEAE-C is allowed to discover a PEAE-C for service switch and at least one PEAE-C is available to support the service switch, the PMAE-C shall:

    a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml";

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-discovery-accept> element in the <pinapp-info> root element and within the <pin-service-discovery-accept> element:

            i) shall include a <target-pine-id> element set to the identifier of the target PEAE-C that can provide the requested PIN service; and

            ii) shall include a <target-pine-address> element set to the identity of the PEAE-C; and

    b) send the HTTP 200 (OK) response towards the PEAE-C.

If the PEAE-C is not allowed to discover a PEAE-C for service switch, the requested service is not supported to perform service switch, or no PEAE-C is available to support the service switch, the PMAE-C shall:

    a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PMAE-C:

        1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

        2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-service-discovery-reject> element in the <pinapp-info> root element and within the <pin-service-discovery-reject> element:

            i) shall include a <cause> element set to an appropriate cause for the failure; and

    b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

The <cause> element shall set to one of the following:

    0 Protocol error, unspecified;

    1 Operation not allowed;

    3 Authorization failure;

    5 Resource not sufficient; and

    7 Permanently denied.

5.7.3.3   Target PEAE-C procedure

Upon reception of an HTTP POST request message containing:

    a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

    b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-switch-configure-request> element in the <pinapp-info> root element,

the target PEAE-C shall check whether to accept the requested service switch.

If the target PEAE-C accepts the requested service switch, the target PEAE-C:

    a) generate an HTTP 204 (No content) response according to IETF RFC 9110 [4]; and

    b) send the HTTP 204 (No content) response towards the PEAE-C.

If the target PEAE-C rejects the requested service switch, the PMAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the HTTP 403 (Forbidden) response message, the PEAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-switch-configure-reject> element in the <pinapp-info> root element and within the <pin-configuration-service-switch-configure-reject> element:

     i) shall include a <cause> element set to an appropriate cause for the failure; and

b) send the HTTP 403 (Forbidden) response towards the PEAE-C.

5.8 Service Continuity

5.8.1 General

The purpose of the PIN service continuity procedure is to enable a PEAE-C participating in a PIN to maintain service when PEAE-C(s) move within the PIN, enter or leave the PIN. Two scenarios are supported for the PIN service continuity procedure:

a) PIN service continuity in PGAE-C relocation as specified in clause 5.8.2; and

b) PIN service continuity in changing access to 5GS as specified in clause 5.8.3.

5.8.2 PIN service continuity in PGAE-C relocation

5.8.2.1 General

A PEAE-C is communicating with an PAE-S via a PGAE-C. Service continuity can be triggered, when the PGAE-C becomes unreachable, to find a replacement PGAE-C and re-configure connectivity between the PEAE-C, the replacement PGAE-C and the PAE-S.

The purpose of PIN service continuity in PGAE-C relocation is to find a replacement PGAE-C for the PIN peer to continue the service. Service continuity procedure in PGAE-C relocation is triggered by the first PGAE-C, which detected the PEAE-C is out of reach and informing PMAE-C to initiate the procedure. PMAE-C authorizes the request, discovers replacement PGAE-C and configures it to setup the application session between PEAE-C and PAE-S.

The following procedures are defined for the PIN service continuity in PGAE-C relocation:

a) PIN management PEGC service continuity as specified in clause 5.8.2.2;

b) PIN management PEGC configuration as specified in clause 5.8.2.3;

c) PIN configuration service continuity update as specified in clause 5.8.2.4; and

d) PIN management PEGC discovery as specified in clause 5.8.2.5.

5.8.2.2 PIN Management PEGC Service Continuity

5.8.2.2.1 Initiating entity procedure

The initiating entity can be PGAE-C or PEAE-C.

The initiating entity, which has an ongoing application session, detects the PEGC has become unavailable and needs to maintain service continuity in the PIN, the initiating entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the initiating entity:

a) shall set the Request-URI to the URI of the PMAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-service-continuity-request> element in the <pinapp-info> root element and within the <pin-management-pegc-service-continuity-request> element:

    1) shall include a <pin-client-identifier> element set to the client ID of the initiating entity;

    2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

    3) shall include a <pin-id> element set to the PIN ID, which identifies the PIN where the service continuity is requested;

    4) shall include a <pine-id> element set to the PINE ID, which identifies the PIN Element for which service continuity is requested;

    5) shall include a <source-pin-gateway-client-identifier> element set to the PEGC ID of the PGAE-C (e.g., IP address, GPSI, MSIDDN);

    6) shall include a <application-client-identifier> element set to the identifier of the application client, which identifies the application client in PINE where the service is terminated;

    7) shall include a <application-server-identifier> element set to the identifier of the application server, which identifies the application server producing the service;

    8) shall include a <application-session-identifier> element set to the identifier of the application traffic, which identifies the application traffic to be continued; and

    9) may include a <application-session-descriptor> element set to the descriptor of application traffic flows (e.g., IPv4 tuple).

The initiating entity shall send the generated HTTP POST request towards the PMAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) or an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-service-continuity-accept> element in the <pinapp-info> root element, and within the <pin-management-pegc-service-continuity-accept> element,

the initiating entity shall consider the PIN service continuity request is accepted by the PMAE-C and shall store the PIN gateway client ID of the target PGAE-C if available.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-service-continuity-reject> element in the <pinapp-info> root element, ; and within the <pin-management-pegc-service-continuity-reject> element,

the initiating entity shall consider the PIN management PEGC service continuity request is not accepted by the PMAE-C.

5.8.2.2.2 PMAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-service-continuity-request> element in the <pinapp-info> root element;

the PMAE-C shall verify whether the initiating entity is authorized to request service continuity for a PIN element , if the PIN Element has subscribed for service continuity and whether the PIN can support the service continuity.

If the initiating entity is allowed to request service continuity and the PIN element has subscribed for service continuity in a PIN, the PMAE-C shall:

a) generate an HTTP 204 (No content) or an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-service-continuity-accept> element in the <pinapp-info> root element and within the <pin-management-pegc-service-continuity-accept> element:

i) shall include a <target-pin-gateway-client-identifier> element set to the PEGC ID of the target PGAE-C (e.g., IP address, GPSI, MSIDDN); and

b) shall send the HTTP 204 (No content) or the HTTP 200 (OK) response towards the initiating entity.

If the initiating entity is not allowed to request service continuity in a PIN or if service continuity is not supported for PIN Client, the PMAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PMAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-service-continuity-reject> element in the <pinapp-info> root element and within the <pin-management-pegc-service-continuity-reject> element:

i) shall include a <cause> element set to an appropriate cause for PIN service continuity failure; and

b) send the HTTP 403 (Forbidden) response towards the initiating entity.

The <cause> element shall set to one of the following:

0 Protocol error, unspecified;

1 Operation not allowed;

3 Authorization failure;

5 Resource not sufficient; and

7 Permanently denied.

5.8.2.3 PIN Management PEGC Configuration

5.8.2.3.1 PMAE-C procedure

PMAE-C, after accepting service continuity request from PGAE-C, initiate configuring a target PEGC client. To configure a target PEGC client, the PMAE-C shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the PMAE-C:

a) shall set the Request-URI to the URI of the PGAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-configuration-request> element in the <pinapp-info> root element and within the <pin-management-pegc-configuration-request> element:

1) shall include a <pin-client-identifier> element set to the PIN client ID of the PMAE-C;

2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

3) shall include a <pin-id> element set to the PIN ID, which identifies the PIN where the service continuity is requested;

4) shall include a <pine-id> element set to the PINE ID, which identifies the PIN Element for which service continuity is requested;

5) shall include a <application-client-identifier> element set to the identifier of the application client, which identifies the application client in PINE where the service is terminated;

6) shall include a <application-server-identifier> element set to the identifier of the application server, which identifies the application server producing the service;

7) shall include a <application-session-identifier> element set to the identifier of the application traffic, which identifies the application traffic to be continued; and

8) may include a <application-session-descriptor> element set to the descriptor of application traffic flows (e.g., IP v4 tuple).

The PMAE-C shall send the generated HTTP POST request towards the target PGAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) or an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-configuration-accept> element in the <pinapp-info> root element, and within the <pin-management-pegc-configuration-accept> element,

the PMAE-C shall consider the PIN management PEGC configuration request is accepted by the target PGAE-C and shall store the target PIN gateway client connectivity information, if available.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-configuration-reject> element in the <pinapp-info> root element, and within the <pin-management-pegc-configure-reject> element,

the PMAE-C shall consider the PIN management PEGC configuration request is not accepted by the PGAE-C.

5.8.2.3.2   PGAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-configuration-request> element in the <pinapp-info> root element;

the PGAE-C shall verify whether the PMAE-C is authorized to request PEGC configuration.

If the PMAE-C is allowed to request PEGC configuration, PGAE-C creates a new configuration for the PIN Client(s) and service that are indicated in the request. After successful creation of new configuration, the PGAE-C shall:

a) generate an HTTP 204 (No content) or an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PGAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-configuration-accept> element in the <pinapp-info> root element and within the <pin-management-pegc-configuration-accept> element:

     i) shall include a <pegc-connectivity-information> element set to the configured PEGC connectivity information to be used by PIN Element (e.g., IP address, Port#, URL, GPSI, MSIDDN); and

   b) shall send the HTTP 204 (No content) or the HTTP 200 (OK) response towards the PMAE-C.

If the PMAE-C is not allowed to request PEGC configuration, the PGAE-C shall:

   a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PGAE-C:

     1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

     2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-configuration-reject> element in the <pinapp-info> root element and within the <pin-management-pegc-configuration-reject> element:

       i) shall include a <cause> element set to an appropriate cause for PEGC configuration failure; and

   b) send the HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

   0 Protocol error, unspecified;

   1 Operation not allowed;

   3 Authorization failure;

   5 Resource not sufficient; and

   7 Permanently denied.

5.8.2.4 PIN Configuration Service Continuity Update

5.8.2.4.1 PMAE-C procedure

PMAE-C, after accepting service continuity request for a PIN Element, generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4] to update the PIN Server. In the HTTP POST request, the PMAE-C:

   a) shall set the Request-URI to the URI of the PGAE-C;

   b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-continuity-update-request> element in the <pinapp-info> root element and within the <pin-configuration-service-continuity-update-request> element:

     1) shall include a <pin-client-identifier> element set to the PIN client ID of the PMAE-C;

     2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

     3) shall include a <pin-id> element set to the PIN ID, which identifies the PIN where the service continuity is requested;

     4) shall include a <pine-id> element set to the PINE ID, which identifies the PIN Element for which service continuity is requested;

     5) shall include a <source-pin-gateway-client-identifier> element set to the PEGC ID of the source PGAE-C (e.g., IP address, GPSI, MSIDDN);

     6) shall include a <target-pin-gateway-client-identifier> element set to the PEGC ID of the target PGAE-C (e.g., IP address, GPSI, MSIDDN);

     7) shall include a <application-client-identifier> element set to the identifier of the application client, which identifies the application client in PINE where the service is terminated;

8) shall include a <application-server-identifier> element set to the identifier of the application server, which identifies the application server producing the service;

9) shall include a <application-session-identifier> element set to the identifier of the application traffic, which identifies the application traffic to be continued; and

10) may include a <application-session-descriptor> element set to the descriptor of application traffic flows (e.g., IPv4 tuple).

The PMAE-C shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) or an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-continuity-update-accept> element in the <pinapp-info> root element, and within the <pin-configuration-service-continuity-update-accept> element,

the PMAE-C shall consider the PIN configuration service continuity update request is accepted by the PAE-S and shall store the service continuity policy information, if available.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-continuity-update-reject> element in the <pinapp-info> root element, and within the <pin-configuration-service-continuity-update-reject> element,

the PMAE-C shall consider the PIN configuration service continuity update request is not accepted by the PAE-S.

5.8.2.4.2 PAE-S procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-continuity-update-request> element in the <pinapp-info> root element;

the PAE-S shall validate the request and check if the PMAE-C is authorized to request service continuity update.

If the PMAE-C is allowed to update service continuity and the PIN element is authorized, determines policy information for the PINE. After successful validation and authorization of PMAE-C, the PAE-S shall:

a) generate an HTTP 204 (No content) or an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-continuity-update-accept> element in the <pinapp-info> root element and within the <pin-configuration-service-continuity-update-accept> element:

i) shall include a <service-continuity-policy-information> element set to information about service continuity policy; and

b) shall send the HTTP 204 (No content) or HTTP 200 (OK) response towards the PMAE-C.

If the PMAE-C is not allowed to update service continuity, the PAE-S shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-configuration-service-continuity-update-reject> element in the <pinapp-info> root element and within the <pin-configuration-service-continuity-update-reject> element:

    i) shall include a <cause> element set to an appropriate cause for PIN configuration service continuity update failure; and

  b) send the HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

  0 Protocol error, unspecified;

  1 Operation not allowed;

  3 Authorization failure;

  5 Resource not sufficient; and

  7 Permanently denied.

5.8.2.5 PIN Management PEGC Discovery

5.8.2.5.1 PMAE-C procedure

PMAE-C, after accepting service continuity request for a PIN Element and do not know target PEGC, generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4] to discover a target PEGC, which can support service continuity. In the HTTP POST request, the PMAE-C:

  a) shall set the Request-URI to the URI of the PGAE-C;

  b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-discovery-request> element in the <pinapp-info> root element and within the <pin-management-pegc-discovery-request> element:

    1) shall include a <pin-client-identifier> element set to the PIN client ID of the PMAE-C;

    2) shall include a <security-credentials> element set to the security credentials resulting from a successful authorization for the PIN service;

    3) shall include a <pin-id> element set to the PIN ID, which identifies the PIN where the service continuity is requested;

    4) shall include a <pine-id> element set to the PINE ID, which identifies the PIN Element for which service continuity is requested; and

    5) shall include a <pegc-information-list> element set to a list of PEGC IDs (e.g., IP address, GPSI, MSIDDN) in the PIN.

The PMAE-C shall send the generated HTTP POST request towards the target PEAE-C according to IETF RFC 9110 [4].

Upon reception of an HTTP 204 (No content) or an HTTP 200 (OK) response message containing:

  a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

  b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-discovery-accept> element in the <pinapp-info> root element, and within the <pin-management-pegc-discovery-accept> element,

the PMAE-C shall consider the PIN management PEGC discovery request is accepted by the PEAE-C and selects the target PEGC based on the list of available PEGCs received.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-discovery-reject> element in the <pinapp-info> root element, and within the <pin-management-pegc-discovery-reject> element,

the PMAE-C shall consider the PIN management PEGC discovery request is not accepted by the PAE-S.

5.8.2.5.2 PEAE-C procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-discovery-request> element in the <pinapp-info> root element,

the PEAE-C shall validate the request and check if the PMAE-C is authorized to request PEGC discovery.

If the PMAE-C is allowed to request PEGC discovery, PEAE-C uses the PEGC information provided in the request to identify PEGC(s) that are reachable and creates a list of PEGC identifier(s) that are available to the PIN Element. After successful discovery of available PEGCs, the PEAE-C shall:

a) generate an HTTP 204 (No content) or an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PMAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-discovery-accept> element in the <pinapp-info> root element and within the <pin-management-pegc-discovery-accept> element:

      i) shall include a <pegc-information-list> element set to a list of PEGC IDs (e.g., IP address, GPSI, MSIDDN) available to PIN Element; and

b) shall send the HTTP 204 (No content) or HTTP 200 (OK) response towards the PMAE-C.

If the PMAE-C is not allowed to request PEGC discovery, the PEAE-C shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PAE-S:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

   2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pin-management-pegc-discovery-reject> element in the <pinapp-info> root element and within the <pin-management-pegc-discovery-reject> element:

      i) shall include a <cause> element set to an appropriate cause for PEGC discovery request failure; and

b) send the HTTP 403 (Forbidden) response towards the PMAE-C.

The <cause> element shall set to one of the following:

   0 Protocol error, unspecified;

   1 Operation not allowed;

   3 Authorization failure;

   5 Resource not sufficient; and

   7 Permanently denied.

5.8.3 Service continuity in changing access to 5GS

5.8.3.1 General

The purpose of service continuity in changing access to 5GS is to enable a PIN peer to communicate with another PIN peer via a target PGAE-C when the PIN peer leaves the coverage of the current PGAE-C.

5.8.3.2 Requesting entity procedure

The requesting entity can be PMAE-C or PEAE-C.

To maintain the service continuity, according to the access control information, the requesting entity shall perform the following in a decreasing order:

a) if there are other PGAE-C(s) within the same PIN, shall initiate a PIN communication update procedure as specified in clause 5.5.3 towards the target PGAE-C; or

b) if there is no other PGAE-C within the same PIN, may initiate a PIN discovery procedure as specified in clause 5.4.4, may initiate a PEAE-C requested joining into a PIN via PGAE-C or PMAE-C as specified in clause 5.4.7, and may initiate a PIN communication update procedure as specified in clause 5.5.3 towards the target PGAE-C.

Upon successfully finishing the PIN communication update procedure as specified in clause 5.5.3, the requesting entity shall consider the communication link between the target PGAE-C and the requesting entity is ready to use for service continuity.

If the PIN communication update procedure fails, the requesting entity shall consider the requested QoS is not supported by the PGAE-C. Further handling of this is up to UE implementation.

5.8.3.3 Target PGAE-C procedure

The target PGAE-C shall behave as specified in clause 5.5.3 for PIN communication update procedure, behave as specified in clause 5.4.4 for PIN discovery procedure (if any), and behave as specified in clause 5.4.7 for PEAE-C requested joining into a PIN via PGAE-C or PMAE-C (if any).

5.9.0 General

The purpose of the PIN authorization procedure is to enable a PIN peer to acquire the security information (i.e. security credential) that is for authorization in all other procedures defined in this specification.

The security information may also be obtained via CAPIF mechanisms (see 3GPP TS 29.222 [16]) if a PIN peer has the CAPIF API invoker capability, which is not in scope of present document.

5.9 PIN authorization

5.9.1 Requesting entity procedure

The requesting entity can be PMAE-C, PEAE-C, or PGAE-C.

When the requesting entity needs to request for security information, the requesting entity shall generate an HTTP POST request according to procedures as specified in IETF RFC 9110 [4]. In the HTTP POST request, the requesting entity:

a) shall set the Request-URI to the URI of PAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

c) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-authorization-request> element in the <pinapp-info> root element and within the <pine-authorization-request> element:

1) shall include a <ue-id> element set to the identity of the requesting entity (i.e. GPSI or PIN client ID);

2) shall include a <pin-id> element set to the identity of the requested PIN; and

3) may include a <ip-address> element set to the IP address of the requesting entity;

The requesting entity shall send the generated HTTP POST request towards the PAE-S according to IETF RFC 9110 [4].

Upon reception of an HTTP 200 (OK) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-authorization-accept> element in the <pinapp-info> root element,

the requesting entity shall store the received PIN credential in the <pine-authorization-accept> element.

Upon reception of an HTTP 403 (Forbidden) response message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-authorization-reject> element in the <pinapp-info> root element,

the requesting entity shall consider the PIN authorization is rejected by the PAE-S with the indicated cause.

5.9.2 PAE-S procedure

Upon reception of an HTTP POST request message containing:

a) a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

b) an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-authorization-request> element in the <pinapp-info> root element,

the PAE-S shall check whether the requesting entity identified by the <ue-id> element is authorized to request the security information.

If the requesting entity is authorized to request the security information, PAE-S shall:

a) generate an HTTP 200 (OK) response according to IETF RFC 9110 [4]. In the HTTP 200 (OK) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-authorization-accept> element in the <pinapp-info> root element and within the <pine-authorization-accept> element:

i) shall include a <security-credentials> element set to the security credentials of the requesting entity; and

b) send the HTTP 200 (OK) response towards the requesting entity.

If the requesting entity is not authorized to request the security information, PAE-S shall:

a) generate an HTTP 403 (Forbidden) response according to IETF RFC 9110 [4]. In the 403 (Forbidden) response message, the PAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.pinapp-info+xml"; and

2) shall include an application/vnd.3gpp.pinapp-info+xml MIME body with a <pine-authorization-reject> element in the <pinapp-info> root element and within the <pine-authorization-reject> element:

i) shall include a <cause> element set to an appropriate cause for PIN authorization failure; and

b) send the HTTP 403 (Forbidden) response towards the requesting entity.

The <cause> element shall set to one of the following:

0   Protocol error, unspecified;

1   Operation not allowed;

2   Requested information not available;

3   Authorization failure; and

7   Permanently denied.

6   Coding

6.1   General

This clause contains the definition and contents of the messages used in the procedures described in the present document.

6.2   PINAPP protocol messages

6.2.1   General

This clause defines the XML schema and MIME type related to PINAPP protocol messages.

6.2.2   Structure

The <pinapp-info> element shall be the root element of the document.

The <pinapp-info> element shall include at least one of the followings:

   a) PINAPP protocol messages only applicable to interface between PIN peer and PIN peer:

      1) <server-discovery-request> element;

      2) <server-discovery-accept>element;

      3) <server-discovery-reject>element;

      4) <pin-creation-notification-request> element;

      5) <pin-creation-notification-reject> element;

      6) <pine-represent-registration-accept> element;

      7) <pine-represent-registration-reject> element;

      8) <pin-pemc-takeover-request> element;

      9) <pin-pemc-takeover-accept> element;

      10) <pin-pemc-takeover-reject> element;

      11) <pin-pegc-takeover-request> element;

      12) <pin-pegc-takeover-accept> element;

      13) <pin-pegc-takeover-reject> element;

      14) <pin-management-pine-join-request> element;

      15) <pin-management-pine-join-accept> element;

16)<pin-management-pine-join-reject> element;

17)<pin-management-pine-leave-request> element;

18)<pin-management-pine-leave-reject> element;

19)<pin-service-registration-request> element;

20)<pin-service-registration-accept> element;

21)<pin-service-registration-reject> element;

22)<pin-service-deregistration-request> element;

23)<pin-service-deregistration-accept> element;

24)<pin-service-deregistration-reject> element;

25)<pin-communication-create-request> element;

26)<pin-communication-create-accept> element;

27)<pin-communication-create-reject> element;

28)<pin-communication-update-request> element;

29)<pin-communication-update-accept> element;

30)<pin-communication-update-reject> element;

31)<pin-communication-delete-request> element;

32)<pin-communication-delete-reject> element;

33)<pin-management-service-switch-configure-request> element;

34)<pin-management-service-switch-configure-reject> element;

35)<pin-service-discovery-request> element;

36)<pin-service-discovery-accept> element;

37)<pin-service-discovery-reject> element;

38)<pin-management-pegc-service-continuity-request> element;

39)<pin-management-pegc-service-continuity-accept> element;

40)<pin-management-pegc-service-continuity-reject> element;

41)<pin-management-pegc-configuration-request> element;

42)<pin-management-pegc-configuration-accept> element;

43)<pin-management-pegc-configuration-reject> element;

44)<pin-management-pegc-discovery-request> element;

45)<pin-management-pegc-discovery-accept> element; and

46)<pin-management-pegc-discovery-reject> element;

b) PINAPP protocol messages only applicable to interface between PIN peer and PAE-S:

1) <pine-registration-request> element;

2) <pine-registration-accept> element;

3) <pine-registration-reject> element;

    4) <pine-deregistration-request> element;

    5) <pine-deregistration-reject> element;

    6) <pine-update-registration-request> element;

    7) <pine-update-registration-reject> element;

    8) <pin-creation-request> element;

    9) <pin-creation-accept> element;

    10)<pin-creation-reject> element;

    11)<pin-deletion-request> element;

    12)<pin-deletion-reject> element;

    13)<pin-configuration-request> element;

    14)<pin-configuration-accept> element;

    15)<pin-configuration-reject> element;

    16)<pin-management-request> element;

    17)<pin-management-reject> element;

    18)<pin-profile-query-request> element;

    19)<pin-profile-query-accept> element;

    20)<pin-profile-query-reject> element;

    21)<pin-service-switch-request> element;

    22)<pin-service-switch-accept> element;

    23)<pin-service-switch-reject> element;

    24)<pin-configuration-service-continuity-update-request> element;

    25)<pin-configuration-service-continuity-update-accept> element;

    26)<pin-configuration-service-continuity-update-reject> element;

    27)<pine-authorization-request> element;

    28)<pine-authorization-accept> element; and

    29)<pine-authorization-reject> element; and

  c) PINAPP protocol messages applicable to all interfaces:

    1) <pin-deletion-notification-request> element;

    2) <pin-deletion-notification-reject> element;

    3) <pin-discovery-request> element;

    4) <pin-discovery-accept> element;

    5) <pin-discovery-reject> element;

    6) <pin-status-subscribe-request> element;

    7) <pin-status-subscribe-accept> element;

    8) <pin-status-subscribe-reject> element;

9) <pin-status-update-request> element;

10) <pin-status-update-accept> element;

11) <pin-status-update-reject> element;

12) <pin-status-notify> element;

13) <pin-status-unsubscribe-request> element;

14) <pin-status-unsubscribe-reject> element;

15) <pin-heartbeat> element;

16) <pin-connectivity-subscribe-request> element;

17) <pin-connectivity-subscribe-accept> element;

18) <pin-connectivity-subscribe-reject> element;

19) <pin-connectivity-notify> element;

20) <pin-connectivity-notify-reject> element;

21) <pin-connectivity-update-request> element;

22) <pin-connectivity-update-accept> element;

23) <pin-connectivity-update-reject> element;

24) <pin-connectivity-unsubscribe-request> element;

25) <pin-connectivity-unsubscribe-reject> element;

26) <pin-as-discovery-request> element;

27) <pin-as-discovery-accept> element;

28) <pin-as-discovery-reject> element;

29) <pin-configuration-service-switch-configure-request> element; and

30) <pin-configuration-service-switch-configure-reject> element.

The <server-discovery-request> element:

a) shall include a <ue-id> element;

b) may include a <ue-location> element; and

c) may include a <mac-address> element.

The <server-discovery-accept> element shall include a <endpoint-information-content> element.

The <endpoint-information-content> element shall include at least one of the followings:

a) a <uri> element;

b) a <fqdn> element;

c) a <ipv4-address> element; and

d) a <ipv6-address> element.

The <server-discovery-reject> element shall include a <cause> element.

The <pine-registration-request> element:

a) shall include a <ue-id> element;

b) shall include a <security-credentials> element;

c) shall include a <port-number> element;

d) may include a <mac-address> element;

e) may include a <vendor-name> element;

f) may include a <device-description> element;

g) may include a <pine-address> element;

h) may include a <pine-capabilities> element;

i) may include a <maximum-number-of-pines> element;

j) may include a <representation-indication> element; and

k) may include a <registration-info> element.

The <registration-info> element:

a) shall include a <ue-id> element;

b) shall include a <security-credentials> element;

c) shall include a <port-number> element;

d) may include a <mac-address> element;

e) may include a <vendor-name> element;

f) may include a <device-description> element;

g) may include a <pine-address> element;

h) may include a <pine-capabilities> element; and

i) may include a <maximum-number-of-pines> element.

The <pine-registration-accept> element:

a) shall include a <pin-client-id> element;

b) may include a <role-of-pemc> element;

c) may include a <role-of-pegc> element;

d) may include a <accepted-registration-info> element; and

e) may include a <rejected-registration-info> element.

The <accepted-registration-info> element:

a) shall include a <ue-id> element;

b) shall include a <pin-client-id> element;

c) may include a <role-of-pemc> element; and

d) may include a <role-of-pegc> element.

The <rejected-registration-info> element:

a) shall include a <ue-id> element; and

b) shall include a <cause> element.

The <pine-registration-reject> element shall include a <cause> element.

The <pine-represent-registration-accept> element:

    a) shall include a <pin-client-id> element;

    b) may include a <role-of-pemc> element; and

    c) may include a <role-of-pegc> element.

The <pine-represent-registration-reject> element shall include a <cause> element.

The <pine-deregistration-request> element:

    a) shall include a <ue-id> element;

    b) shall include a <security-credentials> element;

    c) may include a <mac-address> element;

    d) may include a <vendor-name> element;

    e) may include a <device-description> element; and

    f) may include a <ip-address> element.

The <pine-deregistration-reject> element shall include a <cause> element.

The <pine-update-registration-request> element:

    a) shall include a <ue-id> element;

    b) shall include a <security-credentials> element;

    c) may include a <mac-address> element;

    d) may include a <vendor-name> element;

    e) may include a <device-description> element;

    f) may include a <ip-address> element;

    g) may include a <port-number> element;

    h) may include a <pine-capabilities> element; and

    i) may include a <maximum-number-of-pines> element.

The <pine-update-registration-reject> element shall include a <cause> element.

The <pin-creation-request> element:

    a) shall include a <ue-id> element;

    b) shall include a <security-credentials> element;

    c) may include a <pin-client-profile> element;

    d) may include a <ue-location> element;

    e) may include a <pine-list> element; and

    f) may include a <additional-pemc> element.

The <pin-creation-accept> element:

    a) shall include a <pin-id> element;

    b) shall include a <valid-timer> element;

    c) may include a <pine-list> element;

    d) shall include a <pegc-id> element;

    e) may include a <pegc-address> element;

    f) may include a <access-control-info> element; and

    g) shall include a <heartbeat-timer> element.

The <pin-creation-reject> element shall include a <cause> element.

The <pin-creation-notification-request> element:

    a) shall include a <pin-id> element;

    b) shall include a <heartbeat-timer> element;

    c) shall include a <pin-member-indication> element;

    d) may include a <pegc-address> element;

    e) may include a <pegc-id> element; and

    f) may include a <access-control-info> element.

The <pin-creation-notification-reject> element shall include a <cause> element.

The <pin-deletion-notification-request> element shall include a <pin-id> element.

The <pin-deletion-notification-reject> element shall include a <cause> element.

The <pin-creation-request> element:

    a) shall include a <pin-id> element; and

    b) shall include a <security-credentials> element.

The <pin-creation-reject> element shall include a <cause> element.

The <pin-discovery-request> element:

    a) shall include a <ue-id> element;

    b) shall include a <security-credentials> element;

    c) may include a <filter-info> element; and

    d) may include a <ue-location> element.

The <pin-discovery-accept> element shall include a <pin-info> element.

The <pin-discovery-reject> element shall include a <cause> element.

The <pin-pemc-takeover-request> element:

    a) shall include a <pin-id> element;

    b) shall include a <current-pemc-id> element; and

    c) shall include a <new-pemc-id> element.

The <pin-pemc-takeover-accept> element shall include a <pin-id> element.

The <pin-pemc-takeover-reject> element:

    a) shall include a <pin-id> element; and

    b) shall include a <cause> element.

The <pin-pegc-takeover-request> element:

a) shall include a <pin-id> element;

b) shall include a <current-pemc-id> element; and

c) shall include a <new-pemc-id> element.

The <pin-pegc-takeover-accept> element shall include a <pin-id> element.

The <pin-pegc-takeover-reject> element:

a) shall include a <pin-id> element; and

b) shall include a <cause> element.

The <pin-configuration-request> element:

a) shall include a <pin-id> element;

b) shall include a <requestor-pemc-id> element;

c) shall include a <authorization-type> element;

d) shall include a <failure-pemc-id> element;

e) may include a <new-pemc-id> element; and

f) may include a <additional-pemc-ids> element.

The <pin-configuration-accept> element shall include a <pin-profile> element.

The <pin-configuration-reject> element shall include a <cause> element.

The <pin-management-request> element:

a) shall include a <requestor-id> element;

b) shall include a <modification-type> element; and

c) shall include a <pin-profile> element.

The <pin-management-reject> element shall include a <cause> element.

The <pin-status-subscribe-request> element:

a) shall include a <ue-id> element;

b) shall include a <security-credentials> element;

c) shall include a <pin-id> element;

d) shall include a <subscribed-event> element;

e) may include a <notification-target-address> element; and

f) may include a <expected-subscription-time> element.

The <pin-status-subscribe-accept> element:

a) shall include a <accepted-subscription-id> element;

b) may include a <authorized-subscription-time> element; and

c) may include a <rejected-subscription-id> element.

The <pin-status-subscribe-reject> element shall include a <cause> element.

The <pin-status-update-request> element:

a) shall include a <ue-id> element;

    b) shall include a <security-credentials> element;

    c) shall include a <pin-id> element;

    d) shall include a <subscribed-event> element;

    e) may include a <notification-target-address> element; and

    f) may include a <expected-subscription-time> element.

The <pin-status-update-accept> element shall include a <authorized-subscription-time> element.

The <pin-status-update-reject> element shall include a <cause> element.

The <pin-status-notify> element:

    a) shall include a <event-id> element;

    b) shall include a <pin-id> element;

    c) may include a <pine-management-type> element;

    d) may include a <pine-id> element;

    e) may include a <pin-client-profile> element;

    f) may include a <pegc-id> element;

    g) may include a <pegc-address> element;

    h) may include a <access-control-info> element;

    i) may include a <pemc-id> element;

    j) may include a <pemc-address> element;

    k) may include a <pin-profile> element;

    l) may include a <dynamic-pin-profile> element;

    m) may include a <pin-status-type> element.

The <pin-status-unsubscribe-request> element:

    a) shall include a <security-credentials> element; and

    b) shall include a <unsubscription-id> element.

The <pin-status-unsubscribe-reject> element shall include a <cause> element.

The <pin-management-pine-join-request> element:

    a) shall include a <pin-id> element;

    b) shall include a <security-credentials> element;

    c) shall include a <ue-id> element;

    d) shall include a <target-pemc-id> element;

    e) may include a <pin-client-profile> element;

    f) may include a <endpoint-information-content> element;

    g) may include a <ue-location> element; and

    h) may include a <pin-service-info> element.

The <pin-management-pine-join-accept> element:

   a)   shall include a <heartbeat-timer> element;

   b)   shall include a <valid-timer> element;

   c)   may include a <pin-client-profile> element;

   d)   may include a <pegc-id> element;

   e)   may include a <pegc-address> element; and

   f)   may include a <access-control-info> element.

The <pin-management-pine-join-reject> element shall include a <cause> element.

The <pin-management-pine-leave-request> element:

   a)   shall include a <pin-id> element;

   b)   shall include a <security-credentials> element;

   c)   shall include a <ue-id> element; and

   d)   shall include a <target-pemc-id> element.

The <pin-management-pine-leave-reject> element shall include a <cause> element.

The <pin-profile-query-request> element:

   a)   shall include a <pin-id> element;

   b)   shall include a <security-credentials> element; and

   c)   shall include a <ue-id> element.

The <pin-profile-query-accept> element shall include a <pin-profile> element.

The <pin-profile-query-reject> element shall include a <cause> element.

The <pin-heartbeat> element:

   a)   shall include a <ue-id> element; and

   b)   shall include a <pin-id> element.

The <pin-service-registration-request> element:

   a)   shall include a <pin-id> element;

   b)   shall include a <requesting-pine-id> element; and

   c)   shall include a <list-of-services> element.

The <pin-service-registration-accept> element:

   a)   shall include a <pin-id> element; and

   b)   shall include a <requesting-pine-id> element.

The <pin-service-registration-reject> element:

   a)   shall include a <pin-id> element;

   b)   shall include a <requesting-pine-id> element; and

   c)   shall include a <cause> element.

The <pin-service-deregistration-request> element:

   a)   shall include a <pin-id> element;

    b) shall include a <requesting-pine-id> element; and

    c) shall include a <list-of-services> element.

The <pin-service-deregistration-accept> element:

    a) shall include a <pin-id> element; and

    b) shall include a <requesting-pine-id> element.

The <pin-service-deregistration-reject> element:

    a) shall include a <pin-id> element;

    b) shall include a <requesting-pine-id> element; and

    c) shall include a <cause> element.

The <pin-connectivity-subscribe-request> element:

    a) shall include a <subscriber-identifier> element;

    b) shall include a <security-credentials> element;

    c) shall include a <subscription-id> element;

    d) shall include a <pin-id> element;

    e) shall include a <notification-target-address> element; and

    f) may include a <proposed-expiration-time> element.

The <pin-connectivity-subscribe-accept> element:

    a) shall include a <subscription-id> element; and

    b) may include a <expiration-time> element.

The <pin-connectivity-subscribe-reject> element shall include a <cause> element.

The <pin-connectivity-notify> element:

    a) shall include a <pegc-identifier> element;

    b) shall include a <pin-id> element;

    c) shall include a <pin-client-identifier> element; and

    d) shall include a <event-type> element.

The <pin-connectivity-notify-reject> element shall include a <cause> element.

The <pin-connectivity-update-request> element:

    a) shall include a <subscription-id> element;

    b) shall include a <security-credentials> element;

    d) may include a <notification-target-address> element; and

    e) may include a <proposed-expiration-time> element.

The <pin-connectivity-update-accept> element shall include a <expiration-time> element.

The <pin-connectivity-update-reject> element shall include a <cause> element.

The <pin-connectivity-unsubscribe-request> element:

    a) shall include a <subscription-id> element; and

    b) shall include a <security-credentials> element.

The <pin-connectivity-unsubscribe-reject> element shall include a <cause> element.

The <pin-communication-create-request> element:

    a) shall include a <pin-id> element;

    b) shall include a <ue-id> element;

    c) shall include a <security-credentials> element;

    d) shall include a <pin-traffic-descriptor> element;

    e) shall include a <pin-packet-filter> element;

    f) may include a <pin-requested-qos> element; and

    g) may include a <ue-address> element.

The <pin-communication-create-accept> element:

    a) shall include a <pin-accepted-qos> element; and

    b) shall include a <pin-communication-flow-id> element.

The <pin-communication-create-reject> element shall include a <cause> element.

The <pin-communication-update-request> element:

    a) shall include a <pin-id> element;

    b) shall include a <ue-id> element;

    c) shall include a <security-credentials> element;

    d) shall include a <pin-traffic-descriptor> element;

    e) shall include a <pin-packet-filter> element;

    f) may include a <pin-requested-qos> element; and

    g) may include a <ue-address> element.

The <pin-communication-update-accept> element:

    a) shall include a <pin-accepted-qos> element; and

    b) shall include a <pin-communication-flow-id> element.

The <pin-communication-update-reject> element shall include a <cause> element.

The <pin-communication-delete-request> element:

    a   shall include a <pin-id> element;

    b) shall include a <ue-id> element;

    c) shall include a <security-credentials> element; and

    d) shall include a <pin-communication-flow-id> element.

The <pin-communication-delete-reject> element shall include a <cause> element.

The <pin-as-discovery-request> element:

    a) shall include a <ue-id> element;

    b) shall include a <security-credentials> element; and

   c) shall include a <service-id> element.

The <pin-as-discovery-accept> element shall include a <as-connectivity-info> element.

The <pin-as-discovery-reject> element shall include a <cause> element.

The <pin-service-switch-request> element:

   a) shall include a <pin-client-identifier> element;

   b) shall include a <security-credentials> element;

   c) shall include a <pin-id> element;

   d) shall include a <application-client-identifier> element;

   e) shall include a <application-server-identifier> element;

   f) shall include a <application-session-identifier> element;

   g) may include a <application-traffic-descriptor> element; and

   h) may include a <target-pin-client-identifier> element.

The <pin-service-switch-accept> element shall include a <target-pin-client-identifier> element.

The <pin-service-switch-reject> element shall include a <cause> element.

The <pin-configuration-service-switch-configure-request> element:

   a) shall include a <security-credentials> element;

   b) shall include a <pin-id> element;

   c) shall include a <application-client-identifier> element;

   d) shall include a <application-server-identifier> element;

   e) shall include a <application-session-identifier> element;

   f) may include a <application-traffic-descriptor> element; and

   g) may include a <target-pin-client-identifier> element.

The <pin-configuration-service-switch-configure-reject> element shall include a <cause> element.

The <pin-management-service-switch-configure-request> element:

   a) shall include a <pin-management-client-identifier> element;

   b) shall include a <security-credentials> element;

   c) shall include a <pin-id> element;

   d) shall include a <application-client-identifier> element;

   e) shall include a <application-server-identifier> element;

   f) shall include a <target-pin-client-identifier> element;

   g) shall include a <application-traffic-identifier> element;

   h) may include a <application-traffic-descriptor> element;

   i) may include a <pegc-id> element.

The <pin-management-service-switch-configure-reject> element shall include a <cause> element.

The <pin-service-discovery-request> element:

   a)   shall include a <pin-id> element;

   b)   shall include a <ue-id> element;

   c)   shall include a <security-credentials> element;

   d)   shall include a <service-type> element; and

   e)   may include a <requesting-pine-address> element.

The <pin-service-discovery-accept> element:

   a)   shall include a <target-pine-id> element; and

   b)   shall include a <target-pine-address> element.

The <pin-service-discovery-reject> element shall include a <cause> element.

The <pin-management-pegc-service-continuity-request> element:

   a)   shall include a <pin-client-identifier> element;

   b)   shall include a <security-credentials> element;

   c)   shall include a <pin-id> element;

   d)   shall include a <pine-id> element;

   e)   shall include a <source-pin-gateway-client-identifier> element;

   f)   shall include a <application-client-identifier> element;

   g)   shall include a <application-server-identifier> element;

   h)   shall include a <application-session-identifier> element; and

   i)   may include a <application-session-descriptor> element.

The <pin-management-pegc-service-continuity-accept> element shall include a <target-pin-gateway-client-identifier> element.

The <pin-management-pegc-service-continuity-reject> element shall include a <cause> element.

The <pin-management-pegc-configuration-request> element:

   a)   shall include a <pin-client-identifier> element;

   b)   shall include a <security-credentials> element;

   c)   shall include a <pin-id> element;

   d)   shall include a <pine-id> element;

   e)   shall include a <application-client-identifier> element;

   f)   shall include a <application-server-identifier> element;

   g)   shall include a <application-session-identifier> element; and

   h)   may include a <application-session-descriptor> element.

The <pin-management-pegc-configuration-accept> element shall include a <pegc-connectivity-information> element.

The <pin-management-pegc-configuration-reject> element shall include a <cause> element.

The <pin-configuration-service-continuity-update-request> element:

   a)   shall include a <pin-client-identifier> element;

    b) shall include a <security-credentials> element;

    c) shall include a <pin-id> element;

    d) shall include a <pine-id> element;

    e) shall include a <source-pin-gateway-client-identifier> element;

    f) shall include a <target-pin-gateway-client-identifier> element;

    g) shall include a <application-client-identifier> element;

    h) shall include a <application-server-identifier> element;

    i) shall include a <application-session-identifier> element; and

    j) may include a <application-session-descriptor> element.

The <pin-configuration-service-continuity-update-accept> element shall include a <service-continuity-policy-information> element.

The <pin-configuration-service-continuity-update-reject> element shall include a <cause> element.

The <pin-management-pegc-discovery-request> element:

    a) shall include a <pin-client-identifier> element;

    b) shall include a <security-credentials> element;

    c) shall include a <pin-id> element;

    d) shall include a <pine-id> element; and

    e) shall include a <pegc-information-list> element.

The <pin-management-pegc-discovery-accept> element shall include a <pegc-information-list> element.

The <pin-management-pegc-discovery-reject> element shall include a <cause> element.

The <pine-authorization-request> element:

    a) shall include a <ue-id> element;

    b) shall include a <pin-id> element; and

    c) may include a <ip-address> element.

The <pine-authorization-accept> element shall include a <security-credentials> element.

The <pine-authorization-reject> element shall include a <cause> element.

6.2.3   MIME type

The MIME type of the document shall be "application/vnd.3gpp.pinapp-info+xml MIME body".

The MIME type is used to carry information related to the PINAPP operation. It shall be coded as an XML document containing one of the following PINAPP protocol messages:

    a) PINAPP protocol messages only applicable to interface between PIN peer and PIN peer:

        1) server-discovery-request;

        2) server-discovery-accept;

        3) server-discovery-reject;

        4) <pin-creation-notification-request> element;

5) <pin-creation-notification-reject> element;

6) <pine-represent-registration-accept> element;

7) <pine-represent-registration-reject> element;

8) <pin-pemc-takeover-request> element;

9) <pin-pemc-takeover-accept> element;

10) <pin-pemc-takeover-reject> element;

11) <pin-pegc-takeover-request> element;

12) <pin-pegc-takeover-accept> element;

13) <pin-pegc-takeover-reject> element;

14) <pin-management-pine-join-request> element;

15) <pin-management-pine-join-accept> element;

16) <pin-management-pine-join-reject> element;

17) <pin-management-pine-leave-request> element;

18) <pin-management-pine-leave-reject> element;

19) <pin-service-registration-request> element;

20) <pin-service-registration-accept> element;

21) <pin-service-registration-reject> element;

22) <pin-service-deregistration-request> element;

23) <pin-service-deregistration-accept> element;

24) <pin-service-deregistration-reject> element;

25) <pin-communication-create-request> element;

26) <pin-communication-create-accept> element;

27) <pin-communication-create-reject> element;

28) <pin-communication-update-request> element;

29) <pin-communication-update-accept> element;

30) <pin-communication-update-reject> element;

31) <pin-communication-delete-request> element;

32) <pin-communication-delete-reject> element;

33) <pin-management-service-switch-configure-request> element;

34) <pin-management-service-switch-configure-reject> element;

35) <pin-service-discovery-request> element;

36) <pin-service-discovery-accept> element;

37) <pin-service-discovery-reject> element;

38) <pin-management-pegc-service-continuity-request> element;

39) <pin-management-pegc-service-continuity-accept> element;

40) \<pin-management-pegc-service-continuity-reject\> element;

41) \<pin-management-pegc-configuration-request\> element;

42) \<pin-management-pegc-configuration-accept\> element;

43) \<pin-management-pegc-configuration-reject\> element;

44) \<pin-management-pegc-discovery-request\> element;

45) \<pin-management-pegc-discovery-accept\> element; and

46) \<pin-management-pegc-discovery-reject\> element;

  b) PINAPP protocol messages only applicable to interface between PIN peer and PAE-S:

1) \<pine-registration-request\> element;

2) \<pine-registration-accept\> element;

3) \<pine-registration-reject\> element;

4) \<pine-deregistration-request\> element;

5) \<pine-deregistration-reject\> element;

6) \<pine-update-registration-request\> element;

7) \<pine-update-registration-reject\> element;

8) \<pin-creation-request\> element;

9) \<pin-creation-accept\> element;

10) \<pin-creation-reject\> element;

11) \<pin-deletion-request\> element;

12) \<pin-deletion-reject\> element;

13) \<pin-configuration-request\> element;

14) \<pin-configuration-accept\> element;

15) \<pin-configuration-reject\> element;

16) \<pin-management-request\> element;

17) \<pin-management-reject\> element;

18) \<pin-profile-query-request\> element;

19) \<pin-profile-query-accept\> element;

20) \<pin-profile-query-reject\> element;

21) \<pin-service-switch-request\> element;

22) \<pin-service-switch-accept\> element;

23) \<pin-service-switch-reject\> element;

24) \<pin-configuration-service-continuity-update-request\> element;

25) \<pin-configuration-service-continuity-update-accept\> element;

26) \<pin-configuration-service-continuity-update-reject\> element;

27) \<pine-authorization-request\> element;

28) <pine-authorization-accept> element; and

29) <pine-authorization-reject> element; and

  c) PINAPP protocol messages applicable to all interfaces:

1) <pin-deletion-notification-request> element;

2) <pin-deletion-notification-reject> element;

3) <pin-discovery-request> element;

4) <pin-discovery-accept> element;

5) <pin-discovery-reject> element;

6) <pin-status-subscribe-request> element;

7) <pin-status-subscribe-accept> element;

8) <pin-status-subscribe-reject> element;

9) <pin-status-update-request> element;

10) <pin-status-update-accept> element;

11) <pin-status-update-reject> element;

12) <pin-status-notify> element;

13) <pin-status-unsubscribe-request> element;

14) <pin-status-unsubscribe-reject> element;

15) <pin-heartbeat> element;

16) <pin-connectivity-subscribe-request> element;

17) <pin-connectivity-subscribe-accept> element;

18) <pin-connectivity-subscribe-reject> element;

19) <pin-connectivity-notify> element;

20) <pin-connectivity-notify-reject> element;

21) <pin-connectivity-update-request> element;

22) <pin-connectivity-update-accept> element;

23) <pin-connectivity-update-reject> element;

24) <pin-connectivity-unsubscribe-request> element;

25) <pin-connectivity-unsubscribe-reject> element;

26) <pin-as-discovery-request> element;

27) <pin-as-discovery-accept> element;

28) <pin-as-discovery-reject> element;

29) <pin-configuration-service-switch-configure-request> element; and

30) <pin-configuration-service-switch-configure-reject> element.

Each of the above message is presented in the XML document as an XML element named after the corresponding message.

6.2.4 XML schema

An entity receiving the XML body ignores any unknown XML element and any unknown XML attribute.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
           xmlns:pinapp="urn:3GPP:ns:pinapp:2023"
           elementFormDefault="qualified"
           targetNamespace="urn:3GPP:ns:pinapp:2023">
      <xs:annotation>
         <xs:documentation>
            Info for PINAPP protocol Messages Syntax
         </xs:documentation>
      </xs:annotation>

<!-- Top level PINAPP protocpl Message definition -->
  <xs:element name="pinapp-info">
    <xs:complexType>
      <xs:choice>
        <xs:element name="server-discovery-request" type="pinapp:pin-server-discovery-req-info"/>
        <xs:element name="server-discovery-accept" type="pinapp:pin-server-discovery-acc-info"/>
        <xs:element name="server-discovery-reject" type="pinapp:pin-server-discovery-rej-info"/>
        <xs:element name="pine-registration-request" type="pinapp:pine-reg-req-info"/>
        <xs:element name="pine-registration-accept" type="pinapp:pine-reg-acc-info"/>
        <xs:element name="pine-registration-reject" type="pinapp:pine-reg-rej-info"/>
        <xs:element name="pine-represent-registration-accept" type="pinapp:pine-repreg-acc-info"/>
        <xs:element name="pine-represent-registration-reject" type="pinapp:pine-repreg-rej-info"/>
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        <xs:element name="pine-deregistration-reject" type="pinapp:pine-dereg-rej-info"/>
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        <xs:element name="pine-update-registration-reject" type="pinapp:pine-update-reg-rej-info"/>
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        <xs:element name="pin-creation-accept" type="pinapp:pin-creation-acc-info"/>
        <xs:element name="pin-creation-reject" type="pinapp:pin-creation-rej-info"/>
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info"/>
        <xs:element name="pin-creation-notification-reject" type="pinapp:pin-creation-noti-rej-
info"/>
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info"/>
        <xs:element name="pin-deletion-notification-reject" type="pinapp:pin-deletion-noti-rej-
info"/>
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        <xs:element name="pin-discovery-accept" type="pinapp:pin-discovery-acc-info"/>
        <xs:element name="pin-discovery-reject" type="pinapp:pin-discovery-rej-info"/>
        <xs:element name="pin-pemc-takeover-request" type="pinapp:pin-pemcto-req-info"/>
        <xs:element name="pin-pemc-takeover-accept" type="pinapp:pin-pemcto-acc-info"/>
        <xs:element name="pin-pemc-takeover-reject" type="pinapp:pin-pemcto-rej-info"/>
        <xs:element name="pin-pegc-takeover-request" type="pinapp:pin-pegcto-req-info"/>
        <xs:element name="pin-pegc-takeover-accept" type="pinapp:pin-pegcto-acc-info"/>
        <xs:element name="pin-pegc-takeover-reject" type="pinapp:pin-pegcto-rej-info"/>
        <xs:element name="pin-management-pine-join-request" type="pinapp:pin-join-req-info"/>
        <xs:element name="pin-management-pine-join-accept" type="pinapp:pin-join-acc-info"/>
        <xs:element name="pin-management-pine-join-reject" type="pinapp:pin-join-rej-info"/>
        <xs:element name="pin-management-pine-leave-request" type="pinapp:pin-leave-req-info"/>
        <xs:element name="pin-management-pine-leave-reject" type="pinapp:pin-leave-rej-info"/>
        <xs:element name="pin-service-registration-request" type="pinapp:pin-service-reg-req-info"/>
        <xs:element name="pin-service-registration-accept" type="pinapp:pin-service-reg-acc-info"/>
        <xs:element name="pin-service-registration-reject" type="pinapp:pin-service-reg-rej-info"/>
        <xs:element name="pin-service-deregistration-request" type="pinapp:pin-service-dereg-req-
info"/>
        <xs:element name="pin-service-deregistration-accept" type="pinapp:pin-service-dereg-acc-
info"/>
        <xs:element name="pin-service-deregistration-reject" type="pinapp:pin-service-dereg-rej-
info"/>
        <xs:element name="pin-communication-create-request" type="pinapp:pin-comm-cre-req-info"/>
        <xs:element name="pin-communication-create-accept" type="pinapp:pin-comm-cre-acc-info"/>
        <xs:element name="pin-communication-create-reject" type="pinapp:pin-comm-cre-rej-info"/>
        <xs:element name="pin-communication-update-request" type="pinapp:pin-comm-upd-req-info"/>
        <xs:element name="pin-communication-update-accept" type="pinapp:pin-comm-upd-acc-info"/>
        <xs:element name="pin-communication-update-reject" type="pinapp:pin-comm-upd-rej-info"/>
        <xs:element name="pin-communication-delete-request" type="pinapp:pin-comm-del-req-info"/>
        <xs:element name="pin-communication-delete-reject" type="pinapp:pin-comm-del-rej-info"/>
        <xs:element name="pin-management-service-switch-configure-request" type="pinapp:pin-ssc-req-
info"/>
```

```
        <xs:element name="pin-management-service-switch-configure-reject" type="pinapp:pin-ssc-rej-
info"/>
        <xs:element name="pin-service-discovery-request" type="pinapp:pin-service-dis-req-info"/>
        <xs:element name="pin-service-discovery-accept" type="pinapp:pin-service-dis-acc-info"/>
        <xs:element name="pin-service-discovery-reject" type="pinapp:pin-service-dis-rej-info"/>
        <xs:element name="pin-management-pegc-service-continuity-request" type="pinapp:pin-psc-req-
info"/>
        <xs:element name="pin-management-pegc-service-continuity-accept" type="pinapp:pin-psc-acc-
info"/>
        <xs:element name="pin-management-pegc-service-continuity-reject" type="pinapp:pin-psc-rej-
info"/>
        <xs:element name="pin-management-pegc-configuration-request" type="pinapp:pin-pcfg-req-
info"/>
        <xs:element name="pin-management-pegc-configuration-accept" type="pinapp:pin-pcfg-acc-
info"/>
        <xs:element name="pin-management-pegc-configuration-reject" type="pinapp:pin-pcfg-rej-
info"/>
        <xs:element name="pin-management-pegc-discovery-request" type="pinapp:pin-pdis-req-info"/>
        <xs:element name="pin-management-pegc-discovery-accept" type="pinapp:pin-pdis-acc-info"/>
        <xs:element name="pin-management-pegc-discovery-reject" type="pinapp:pin-pdis-rej-info"/>
        <xs:element name="pin-configuration-request" type="pinapp:pin-config-req-info"/>
        <xs:element name="pin-configuration-accept" type="pinapp:pin-config-acc-info"/>
        <xs:element name="pin-configuration-reject" type="pinapp:pin-config-rej-info"/>
        <xs:element name="pin-management-request" type="pinapp:pin-mana-req-info"/>
        <xs:element name="pin-management-reject" type="pinapp:pin-mana-rej-info"/>
        <xs:element name="pin-profile-query-request" type="pinapp:pin-prof-query-req-info"/>
        <xs:element name="pin-profile-query-accept" type="pinapp:pin-prof-query-acc-info"/>
        <xs:element name="pin-profile-query-reject" type="pinapp:pin-prof-query-rej-info"/>
        <xs:element name="pin-service-switch-request" type="pinapp:pin-service-swi-req-info"/>
        <xs:element name="pin-service-switch-accept" type="pinapp:pin-service-swi-acc-info"/>
        <xs:element name="pin-service-switch-reject" type="pinapp:pin-service-swi-rej-info"/>
        <xs:element name="pin-configuration-service-continuity-update-request" type="pinapp:pin-csc-
upd-req-info"/>
        <xs:element name="pin-configuration-service-continuity-update-accept" type="pinapp:pin-csc-
upd-acc-info"/>
        <xs:element name="pin-configuration-service-continuity-update-reject" type="pinapp:pin-csc-
upd-rej-info"/>
        <xs:element name="pine-authorization-request" type="pinapp:pin-auth-req-info"/>
        <xs:element name="pine-authorization-accept" type="pinapp:pin-auth-acc-info"/>
        <xs:element name="pine-authorization-reject" type="pinapp:pin-auth-rej-info"/>
        <xs:element name="pin-status-subscribe-request" type="pinapp:pin-sta-sub-req-info"/>
        <xs:element name="pin-status-subscribe-accept" type="pinapp:pin-sta-sub-acc-info"/>
        <xs:element name="pin-status-subscribe-reject" type="pinapp:pin-sta-sub-rej-info"/>
        <xs:element name="pin-status-update-request" type="pinapp:pin-sta-upd-req-info"/>
        <xs:element name="pin-status-update-accept" type="pinapp:pin-sta-upd-acc-info"/>
        <xs:element name="pin-status-update-reject" type="pinapp:pin-sta-upd-rej-info"/>
        <xs:element name="pin-status-notify" type="pinapp:pin-sta-notify-info"/>
        <xs:element name="pin-status-unsubscribe-request" type="pinapp:pin-sta-unsub-req-info"/>
        <xs:element name="pin-status-unsubscribe-reject" type="pinapp:pin-sta-unsub-rej-info"/>
        <xs:element name="pin-heartbeat" type="pinapp:pin-heartbeat-info"/>
        <xs:element name="pin-connectivity-subscribe-request" type="pinapp:pin-conn-sub-req-info"/>
        <xs:element name="pin-connectivity-subscribe-accept" type="pinapp:pin-conn-sub-acc-info"/>
        <xs:element name="pin-connectivity-subscribe-reject" type="pinapp:pin-conn-sub-rej-info"/>
        <xs:element name="pin-connectivity-notify" type="pinapp:pin-conn-notify-info"/>
        <xs:element name="pin-connectivity-notify-reject" type="pinapp:pin-conn-notify-rej-info"/>
        <xs:element name="pin-connectivity-update-request" type="pinapp:pin-conn-upd-req-info"/>
        <xs:element name="pin-connectivity-update-accept" type="pinapp:pin-conn-upd-acc-info"/>
        <xs:element name="pin-connectivity-update-reject" type="pinapp:pin-conn-upd-rej-info"/>
        <xs:element name="pin-connectivity-unsubscribe-request" type="pinapp:pin-conn-unsub-req-
info"/>
        <xs:element name="pin-connectivity-unsubscribe-reject" type="pinapp:pin-conn-unsub-rej-
info"/>
        <xs:element name="pin-as-discovery-request" type="pinapp:pin-as-dis-req-info"/>
        <xs:element name="pin-as-discovery-accept" type="pinapp:pin-as-dis-acc-info"/>
        <xs:element name="pin-as-discovery-reject" type="pinapp:pin-as-dis-rej-info"/>
        <xs:element name="pin-configuration-service-switch-configure-request" type="pinapp:pin-cssc-
req-info"/>
        <xs:element name="pin-configuration-service-switch-configure-reject" type="pinapp:pin-cssc-
rej-info"/>
        <xs:element name="message-ext" type="pinapp:DiscMsgExtType"/>
        <xs:any namespace="##other" processContents="lax"/>
      </xs:choice>
    </xs:complexType>
  </xs:element>

  <!-- Complex types defined for Message-level -->
  <xs:complexType name="pin-server-discovery-req-info">
    <xs:sequence>
```

```
    <xs:element name="discovery-request" type="pinapp:SerDiscReq-info" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </xs:sequence>
   <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-server-discovery-acc-info">
   <xs:sequence>
    <xs:element name="discovery-accept" type="pinapp:SerDiscAcc-info" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </xs:sequence>
   <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-server-discovery-rej-info">
   <xs:sequence>
    <xs:element name="discovery-reject" type="pinapp:SerDiscRej-info" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </xs:sequence>
   <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pine-reg-req-info">
   <xs:sequence>
    <xs:element name="regisration-request" type="pinapp:PineRegReq-info" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </xs:sequence>
   <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pine-reg-acc-info">
   <xs:sequence>
    <xs:element name="regisration-accept" type="pinapp:PineRegAcc-info" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </xs:sequence>
   <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pine-reg-rej-info">
   <xs:sequence>
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maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </xs:sequence>
   <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pine-repreg-acc-info">
   <xs:sequence>
    <xs:element name="reg-rep-accept" type="pinapp:PineRegAcc-info" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </xs:sequence>
   <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pine-repreg-rej-info">
   <xs:sequence>
    <xs:element name="reg-rep-reject" type="pinapp:PineRegRej-info" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </xs:sequence>
   <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
```

```
<xs:complexType name="pine-dereg-req-info">
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   <xs:element name="deregisration-request" type="pinapp:PineDeregReq-info" minOccurs="0"
maxOccurs="unbounded"/>
   <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
   <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
 </xs:complexType>

 <xs:complexType name="pine-dereg-rej-info">
  <xs:sequence>
   <xs:element name="deregisration-reject" type="pinapp:PineDeregRej-info" minOccurs="0"
maxOccurs="unbounded"/>
   <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
   <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
 </xs:complexType>

 <xs:complexType name="pine-update-reg-req-info">
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   <xs:element name="regisration-update-request" type="pinapp:PineUpdRegReq-info" minOccurs="0"
maxOccurs="unbounded"/>
   <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
   <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
 </xs:complexType>

 <xs:complexType name="pine-update-reg-rej-info">
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   <xs:element name="regisration-update-reject" type="pinapp:PineUpdRegRej-info" minOccurs="0"
maxOccurs="unbounded"/>
   <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
   <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
 </xs:complexType>

 <xs:complexType name="pin-creation-req-info">
  <xs:sequence>
   <xs:element name="pin-creation-request" type="pinapp:PinCreReq-info" minOccurs="0"
maxOccurs="unbounded"/>
   <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
   <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
 </xs:complexType>

 <xs:complexType name="pin-creation-acc-info">
  <xs:sequence>
   <xs:element name="pin-creation-accept" type="pinapp:PinCreAcc-info" minOccurs="0"
maxOccurs="unbounded"/>
   <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
   <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
 </xs:complexType>

 <xs:complexType name="pin-creation-rej-info">
  <xs:sequence>
   <xs:element name="pin-creation-reject" type="pinapp:PinCreRej-info" minOccurs="0"
maxOccurs="unbounded"/>
   <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
   <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
 </xs:complexType>

 <xs:complexType name="pin-creation-noti-req-info">
  <xs:sequence>
   <xs:element name="pin-creation-notification-request" type="pinapp:PinCreNotiReq-info"
minOccurs="0" maxOccurs="unbounded"/>
   <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
   <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
```

```
      </xs:complexType>

  <xs:complexType name="pin-creation-noti-rej-info">
    <xs:sequence>
     <xs:element name="pin-creation-notification-reject" type="pinapp:PinCreNotiRej-info"
minOccurs="0" maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-deletion-req-info">
    <xs:sequence>
     <xs:element name="pin-deletion-request" type="pinapp:PinDelReq-info" minOccurs="0"
maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-deletion-rej-info">
    <xs:sequence>
     <xs:element name="pin-deletion-reject" type="pinapp:PinDelRej-info" minOccurs="0"
maxOccurs="unbounded"/>
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    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-deletion-noti-req-info">
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minOccurs="0" maxOccurs="unbounded"/>
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    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-deletion-noti-rej-info">
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minOccurs="0" maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
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  <xs:complexType name="pin-discovery-req-info">
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maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
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    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-discovery-acc-info">
    <xs:sequence>
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maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-discovery-rej-info">
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     <xs:element name="pin-disc-reject" type="pinapp:PinDisRej-info" minOccurs="0"
maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
```

```
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="pin-pemcto-req-info">
      <xs:sequence>
       <xs:element name="pin-pemcto-req" type="pinapp:PinPemcToReq-info" minOccurs="0"
maxOccurs="unbounded"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
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    </xs:complexType>

    <xs:complexType name="pin-pemcto-acc-info">
      <xs:sequence>
       <xs:element name="pin-pemcto-acc" type="pinapp:PinPemcToAcc-info" minOccurs="0"
maxOccurs="unbounded"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="pin-pemcto-rej-info">
      <xs:sequence>
       <xs:element name="pin-pemcto-rej" type="pinapp:PinPemcToRej-info" minOccurs="0"
maxOccurs="unbounded"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="pin-pegcto-req-info">
      <xs:sequence>
       <xs:element name="pin-pegcto-req" type="pinapp:PinPegcToReq-info" minOccurs="0"
maxOccurs="unbounded"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="pin-pegcto-acc-info">
      <xs:sequence>
       <xs:element name="pin-pegcto-acc" type="pinapp:PinPegcToAcc-info" minOccurs="0"
maxOccurs="unbounded"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="pin-pegcto-rej-info">
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maxOccurs="unbounded"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="pin-join-req-info">
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maxOccurs="unbounded"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
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      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="pin-join-acc-info">
      <xs:sequence>
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maxOccurs="unbounded"/>
```

```
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
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  <xs:complexType name="pin-join-rej-info">
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maxOccurs="unbounded"/>
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    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-leave-req-info">
    <xs:sequence>
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maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-leave-rej-info">
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maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
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maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
     </xs:sequence>
     <xs:anyAttribute namespace="##any" processContents="lax"/>
   </xs:complexType>

   <xs:complexType name="pin-sta-upd-acc-info">
     <xs:sequence>
      <xs:element name="pin-sta-upd-acc" type="pinapp:PinStaUpdAcc-info" minOccurs="0"
maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
     </xs:sequence>
     <xs:anyAttribute namespace="##any" processContents="lax"/>
   </xs:complexType>

   <xs:complexType name="pin-sta-upd-rej-info">
     <xs:sequence>
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maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
     </xs:sequence>
     <xs:anyAttribute namespace="##any" processContents="lax"/>
   </xs:complexType>
```

```
  <xs:complexType name="pin-sta-notify-info">
    <xs:sequence>
     <xs:element name="pin-sta-notify" type="pinapp:PinStaNoti-info" minOccurs="0"
maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-sta-unsub-req-info">
    <xs:sequence>
     <xs:element name="pin-sta-unsub-req" type="pinapp:PinStaUnsubReq-info" minOccurs="0"
maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-sta-unsub-rej-info">
    <xs:sequence>
     <xs:element name="pin-sta-unsub-rej" type="pinapp:PinStaUnsubRej-info" minOccurs="0"
maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-heartbeat-info">
    <xs:sequence>
     <xs:element name="pin-heartbeat" type="pinapp:PinHbt-info" minOccurs="0"
maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-conn-sub-req-info">
    <xs:sequence>
     <xs:element name="pin-conn-sub-req" type="pinapp:PinConSubReq-info" minOccurs="0"
maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-conn-sub-acc-info">
    <xs:sequence>
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maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-conn-sub-rej-info">
    <xs:sequence>
     <xs:element name="pin-conn-sub-rej" type="pinapp:PinConSubRej-info" minOccurs="0"
maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="pin-conn-notify-info">
    <xs:sequence>
     <xs:element name="pin-conn-notify" type="pinapp:PinConNoti-info" minOccurs="0"
maxOccurs="unbounded"/>
     <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
```

```
        </xs:complexType>

     <xs:complexType name="pin-conn-notify-rej-info">
        <xs:sequence>
         <xs:element name="pin-conn-notify-rej" type="pinapp:PinConNotiRej-info" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
         <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
     </xs:complexType>

     <xs:complexType name="pin-conn-upd-req-info">
        <xs:sequence>
         <xs:element name="pin-conn-upd-req-info" type="pinapp:PinConUpdReq-info" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
         <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
     </xs:complexType>

     <xs:complexType name="pin-conn-upd-acc-info">
        <xs:sequence>
         <xs:element name="pin-conn-upd-acc-info" type="pinapp:PinConUpdAcc-info" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
         <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
     </xs:complexType>

     <xs:complexType name="pin-conn-upd-rej-info">
        <xs:sequence>
         <xs:element name="pin-conn-upd-rej-info" type="pinapp:PinConUpdRej-info" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
         <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
     </xs:complexType>

     <xs:complexType name="pin-conn-unsub-req-info">
        <xs:sequence>
         <xs:element name="pin-conn-unsub-req" type="pinapp:PinConUnsubReq-info" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
         <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
     </xs:complexType>

     <xs:complexType name="pin-conn-unsub-rej-info">
        <xs:sequence>
         <xs:element name="pin-conn-unsub-rej" type="pinapp:PinConUnsubRej-info" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
         <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
     </xs:complexType>

     <xs:complexType name="pin-as-dis-req-info">
        <xs:sequence>
         <xs:element name="pin-as-dis-req" type="pinapp:PinAsDisReq-info" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
         <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
     </xs:complexType>

     <xs:complexType name="pin-as-dis-acc-info">
        <xs:sequence>
         <xs:element name="pin-as-dis-acc" type="pinapp:PinAsDisAcc-info" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
         <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
```

```
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="pin-as-dis-rej-info">
      <xs:sequence>
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maxOccurs="unbounded"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="pin-cssc-req-info">
      <xs:sequence>
       <xs:element name="pin-cssc-req" type="pinapp:PinCsscReq-info" minOccurs="0"
maxOccurs="unbounded"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="pin-cssc-rej-info">
      <xs:sequence>
       <xs:element name="pin-cssc-rej" type="pinapp:PinCsscRej-info" minOccurs="0"
maxOccurs="unbounded"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>


    <!-- Complex types defined for parameters with complicated structure -->
    <xs:complexType name="SerDiscReq-info">
      <xs:sequence>
       <xs:element name="ue-id" type="xs:string"/>
       <xs:element name="mac-address" type="xs:string" minOccurs="0"/>
       <xs:element name="ue-location" type="pinapp:Location-info" minOccurs="0"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="Location-info">
      <xs:sequence>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:attribute name="NCGI" type="pinapp:NCGI-type" use="optional"/>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:simpleType name="NCGI-type">
      <xs:restriction base="xs:hexBinary"/>
    </xs:simpleType>

    <xs:complexType name="SerDiscAcc-info">
      <xs:sequence>
       <xs:element name="endpoint-information-content" type="pinapp:EndPoiInfo"/>
       <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="EndPoiInfo">
      <xs:sequence>
       <xs:element name="uri" type="xs:anyURI" minOccurs="0" maxOccurs="1"/>
       <xs:element name="fqdn" type="xs:string" minOccurs="0" maxOccurs="1"/>
       <xs:element name="ipv4-address" type="xs:string" minOccurs="0" maxOccurs="1"/>
       <xs:element name="ipv6-address" type="xs:string" minOccurs="0" maxOccurs="1"/>
       <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
```

```xml
    </xs:complexType>

    <xs:complexType name="SerDiscRej-info">
      <xs:sequence>
        <xs:element name="cause" type="xs:integer"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PineRegReq-info">
      <xs:sequence>
        <xs:element name="ue-id" type="xs:string"/>
        <xs:element name="security-credentials" type="xs:string"/>
        <xs:element name="port-number" type="xs:integer"/>
        <xs:element name="mac-address" type="xs:string" minOccurs="0"/>
        <xs:element name="vendor-name" type="xs:string" minOccurs="0"/>
        <xs:element name="device-description" type="xs:string" minOccurs="0"/>
        <xs:element name="pine-address" type="xs:string" minOccurs="0"/>
        <xs:element name="pine-capability" type="xs:integer" minOccurs="0"/>
        <xs:element name="maximum-number-of-pines" type="xs:integer" minOccurs="0"/>
        <xs:element name="representation-indication" type="xs:boolean" minOccurs="0"/>
        <xs:element name="registration-info" type="pinapp:Reg-Info" minOccurs="0"
maxOccurs="unbounded"/>
        <xs:element name="pin-service-info" type="pinapp:PIN-Service-Info" minOccurs="0"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PineRegAcc-info">
      <xs:sequence>
        <xs:element name="pin-client-id" type="xs:string"/>
        <xs:element name="role-of-pemc" type="xs:integer" minOccurs="0"/>
        <xs:element name="role-of-pegc" type="xs:integer" minOccurs="0"/>
        <xs:element name="acc-reg-info" type="pinapp:AccReg-Info" minOccurs="0"
maxOccurs="unbounded"/>
        <xs:element name="rej-reg-info" type="pinapp:RejReg-Info" minOccurs="0"
maxOccurs="unbounded"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PineRegRej-info">
      <xs:sequence>
        <xs:element name="cause" type="xs:integer"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PineDeregReq-info">
      <xs:sequence>
        <xs:element name="ue-id" type="xs:string"/>
        <xs:element name="security-credentials" type="xs:string"/>
        <xs:element name="mac-address" type="xs:string" minOccurs="0"/>
        <xs:element name="vendor-name" type="xs:string" minOccurs="0"/>
        <xs:element name="device-description" type="xs:string" minOccurs="0"/>
        <xs:element name="pine-address" type="xs:string" minOccurs="0"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PineDeregRej-info">
      <xs:sequence>
        <xs:element name="cause" type="xs:integer"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>
```

```xml
<xs:complexType name="PineUpdRegReq-info">
  <xs:sequence>
    <xs:element name="ue-id" type="xs:string"/>
    <xs:element name="security-credentials" type="xs:string"/>
    <xs:element name="port-number" type="xs:integer"/>
    <xs:element name="mac-address" type="xs:string" minOccurs="0"/>
    <xs:element name="vendor-name" type="xs:string" minOccurs="0"/>
    <xs:element name="device-description" type="xs:string" minOccurs="0"/>
    <xs:element name="pine-address" type="xs:string" minOccurs="0"/>
    <xs:element name="pine-capability" type="xs:integer" minOccurs="0"/>
    <xs:element name="maximum-number-of-pines" type="xs:integer" minOccurs="0"/>
    <xs:element name="pin-service-info" type="pinapp:PIN-Service-Info" minOccurs="0"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PineUpdRegRej-info">
  <xs:sequence>
    <xs:element name="cause" type="xs:integer"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinCreReq-info">
  <xs:sequence>
    <xs:element name="ue-id" type="xs:string"/>
    <xs:element name="security-credentials" type="xs:string"/>
    <xs:element name="pin-client-profile" type="pinapp:PIN-Client-Profile"/>
    <xs:element name="pin-profile" type="pinapp:PIN-Profile"/>
    <xs:element name="ue-location" type="pinapp:Location-info" minOccurs="0"/>
    <xs:element name="pine-list" type="pinapp:UE-Id-List" minOccurs="0"/>
    <xs:element name="pemc-list" type="pinapp:UE-Id-List" minOccurs="0"/>
    <xs:element name="pin-service-info" type="pinapp:PIN-Service-Info" minOccurs="0"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinCreAcc-info">
  <xs:sequence>
    <xs:element name="pin-id" type="xs:string"/>
    <xs:element name="valid-timer" type="xs:integer"/>
    <xs:element name="heartbeat-timer" type="pinapp:Heartbeat-timer-list"/>
    <xs:element name="pegc-id" type="pinapp:UE-Id-List"/>
    <xs:element name="pegc-address" type="pinapp:UE-Address-List" minOccurs="0"/>
    <xs:element name="access-control-info" type="pinapp:Access-Control-Info" minOccurs="0"/>
    <xs:element name="pine-list" type="pinapp:UE-Id-List" minOccurs="0"/>
    <xs:element name="pin-profile" type="pinapp:PIN-Profile" minOccurs="0"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinCreRej-info">
  <xs:sequence>
    <xs:element name="cause" type="xs:integer"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinCreNotiReq-info">
  <xs:sequence>
    <xs:element name="pin-id" type="xs:string"/>
    <xs:element name="heartbeat-timer" type="xs:integer"/>
    <xs:element name="pin-member-indication" type="xs:integer"/>
    <xs:element name="pegc-id" type="pinapp:UE-Id-List" minOccurs="0"/>
    <xs:element name="pegc-address" type="pinapp:UE-Address-List" minOccurs="0"/>
    <xs:element name="access-control-info" type="pinapp:Access-Control-Info" minOccurs="0"/>
    <xs:element name="pin-profile" type="pinapp:PIN-Profile" minOccurs="0"/>
```

```
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinCreNotiRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinDelNotiReq-info">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinDelNotiRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinDelReq-info">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinDelRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PIN-Client-Profile">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="pin-client-id" type="xs:string"/>
      <xs:element name="ue-id" type="xs:string" minOccurs="0"/>
      <xs:element name="device-description" type="xs:string" minOccurs="0"/>
      <xs:element name="role-in-pin" type="xs:integer" minOccurs="0"/>
      <xs:element name="pine-capability" type="xs:integer"/>
      <xs:element name="visibility-indication" type="xs:integer"/>
      <xs:element name="application-info" type="pinapp:Application-info" minOccurs="0"/>
      <xs:element name="access-type" type="xs:integer"/>
      <xs:element name="ip-address" type="xs:string" minOccurs="0"/>
      <xs:element name="port-number" type="xs:string"/>
      <xs:element name="required-service-info" type="pinapp:Service-info" minOccurs="0"/>
      <xs:element name="supported-service-info" type="pinapp:Service-info" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="UE-Id-List">
    <xs:sequence>
      <xs:element name="number" type="xs:integer"/>
      <xs:element name="ue-id" type="xs:string" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
```

```
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="UE-Address-List">
    <xs:sequence>
      <xs:element name="number" type="xs:integer"/>
      <xs:element name="ue-address" type="xs:string" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="Application-info">
    <xs:sequence>
      <xs:element name="application-id" type="xs:string" minOccurs="0"/>
      <xs:element name="application-schedule" type="xs:hexBinary" minOccurs="0"/>
      <xs:element name="application-kpi" type="pinapp:Application-KPI" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="Service-info">
    <xs:sequence>
      <xs:element name="number" type="xs:integer"/>
      <xs:element name="service-id" type="xs:string" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="Application-KPI">
    <xs:sequence>
      <xs:element name="PIN-bandwidth" type="xs:string"/>
      <xs:element name="PIN-request-rate" type="xs:string" minOccurs="0"/>
      <xs:element name="PIN-response-time" type="xs:integer" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="Access-Control-Info">
    <xs:sequence>
      <xs:element name="username" type="xs:string" minOccurs="0"/>
      <xs:element name="account-info" type="xs:string" minOccurs="0"/>
      <xs:element name="ssid-info" type="xs:string" minOccurs="0"/>
      <xs:element name="bssid-info" type="xs:string" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="Heartbeat-timer-list">
    <xs:sequence>
      <xs:element name="pemc-heartbeat-timer" type="xs:integer"/>
      <xs:element name="pegc-heartbeat-timer" type="xs:integer"/>
      <xs:element name="pine-heartbeat-timer" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PIN-Profile">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="pin-description" type="xs:integer"/>
      <xs:element name="pin-duration" type="xs:integer"/>
      <xs:element name="pemc-list" type="pinapp:PEMC-List"/>
      <xs:element name="pegc-list" type="pinapp:PEGC-List"/>
      <xs:element name="pine-list" type="pinapp:UE-Id-List"/>
```

```
        <xs:element name="maximum-number-of-pines" type="xs:integer" minOccurs="0"/>
        <xs:element name="pin-service-info" type="pinapp:PIN-Service-Info" minOccurs="0"/>
        <xs:element name="pin-server-id" type="xs:string" minOccurs="0"/>
        <xs:element name="pin-server-endpoint-info" type="pinapp:EndPoiInfo" minOccurs="0"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PEMC-List">
      <xs:sequence>
        <xs:element name="pemc-info" type="pinapp:PEMC-Info" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PEGC-List">
      <xs:sequence>
        <xs:element name="pegc-info" type="pinapp:PEGC-Info" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PEGC-Info">
      <xs:sequence>
        <xs:element name="ue-id" type="xs:string"/>
        <xs:element name="ip-address" type="xs:string"/>
        <xs:element name="role-indication" type="xs:integer"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PIN-Service-Info">
      <xs:sequence>
        <xs:element name="pin-service-id" type="xs:string"/>
        <xs:element name="pin-service-type" type="xs:integer"/>
        <xs:element name="pin-service-feature" type="xs:string"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="Reg-Info">
      <xs:sequence>
        <xs:element name="ue-id" type="xs:string"/>
        <xs:element name="security-credentials" type="xs:string"/>
        <xs:element name="port-number" type="xs:integer"/>
        <xs:element name="mac-address" type="xs:string" minOccurs="0"/>
        <xs:element name="vendor-name" type="xs:string" minOccurs="0"/>
        <xs:element name="device-description" type="xs:string" minOccurs="0"/>
        <xs:element name="pine-address" type="xs:string" minOccurs="0"/>
        <xs:element name="pine-capability" type="xs:integer" minOccurs="0"/>
        <xs:element name="maximum-number-of-pines" type="xs:integer" minOccurs="0"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="AccReg-Info">
      <xs:sequence>
        <xs:element name="ue-id" type="xs:string"/>
        <xs:element name="pin-client-id" type="xs:string"/>
        <xs:element name="role-of-pemc" type="xs:integer" minOccurs="0"/>
        <xs:element name="role-of-pegc" type="xs:integer" minOccurs="0"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="RejReg-Info">
```

```xml
    <xs:sequence>
      <xs:element name="ue-id" type="xs:string"/>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinDisReq-info">
    <xs:sequence>
      <xs:element name="ue-id" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="ue-location" type="pinapp:Location-info" minOccurs="0"/>
      <xs:element name="filter-info" type="pinapp:Filter-info" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="Filter-info">
    <xs:sequence>
      <xs:element name="requested-pin-service" type="pinapp:PIN-Service-Info"/>
      <xs:element name="pin-service-area" type="pinapp:Location-info"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinDisAcc-info">
    <xs:sequence>
      <xs:element name="pin-info" type="pinapp:PIN-Info" minOccurs="1" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PIN-Info">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="pin-description" type="xs:string" minOccurs="0"/>
      <xs:element name="pin-service-list" type="pinapp:PIN-Service-Info" minOccurs="0"/>
      <xs:element name="pemc-info" type="pinapp:PEMC-Info" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PEMC-Info">
    <xs:sequence>
      <xs:element name="ue-id" type="xs:string"/>
      <xs:element name="ip-address" type="xs:string" minOccurs="0"/>
      <xs:element name="role-indication" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinDisRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinPemcToReq-info">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="current-pemc-id" type="xs:string"/>
      <xs:element name="new-pemc-id" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
```

```xml
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PinPemcToAcc-info">
      <xs:sequence>
        <xs:element name="pin-id" type="xs:string"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PinPemcToRej-info">
      <xs:sequence>
        <xs:element name="pin-id" type="xs:string"/>
        <xs:element name="cause" type="xs:integer"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PinPegcToReq-info">
      <xs:sequence>
        <xs:element name="pin-id" type="xs:string"/>
        <xs:element name="current-pegc-id" type="xs:string"/>
        <xs:element name="new-pegc-id" type="xs:string"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PinPegcToAcc-info">
      <xs:sequence>
        <xs:element name="pin-id" type="xs:string"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PinPegcToRej-info">
      <xs:sequence>
        <xs:element name="pin-id" type="xs:string"/>
        <xs:element name="cause" type="xs:integer"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PinJoinReq-info">
      <xs:sequence>
        <xs:element name="pin-id" type="xs:string"/>
        <xs:element name="security-credentials" type="xs:string"/>
        <xs:element name="ue-id" type="xs:string"/>
        <xs:element name="target-pemc-id" type="xs:string"/>
        <xs:element name="pin-client-profile" type="pinapp:PIN-Client-Profile" minOccurs="0"/>
        <xs:element name="endpoint-information-content" type="pinapp:EndPoiInfo" minOccurs="0"/>
        <xs:element name="ue-location" type="pinapp:Location-info" minOccurs="0"/>
        <xs:element name="pin-service-info" type="pinapp:PIN-Service-Info" minOccurs="0"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PinJoinAcc-info">
      <xs:sequence>
        <xs:element name="heartbeat-timer" type="xs:integer"/>
        <xs:element name="valid-timer" type="xs:integer"/>
        <xs:element name="pin-client-profile" type="pinapp:PIN-Client-Profile" minOccurs="0"/>
        <xs:element name="pegc-id" type="xs:string" minOccurs="0"/>
        <xs:element name="pegc-address" type="pinapp:UE-Address-List" minOccurs="0"/>
        <xs:element name="access-control-info" type="pinapp:Access-Control-Info" minOccurs="0"/>
```

```
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinJoinRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinLevReq-info">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="ue-id" type="xs:string"/>
      <xs:element name="target-pemc-id" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinLevRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinSerRegReq-info">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="requesting-pine-id" type="xs:string"/>
      <xs:element name="list-of-services" type="pinapp:PIN-Service-Info"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinSerRegAcc-info">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="requesting-pine-id" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinSerRegRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinSerDeregReq-info">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="requesting-pine-id" type="xs:string"/>
      <xs:element name="list-of-services" type="pinapp:PIN-Service-Info"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinSerDeregAcc-info">
```

```
        <xs:sequence>
          <xs:element name="pin-id" type="xs:string"/>
          <xs:element name="requesting-pine-id" type="xs:string"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinSerDeregRej-info">
        <xs:sequence>
          <xs:element name="cause" type="xs:integer"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinComCreReq-info">
        <xs:sequence>
          <xs:element name="pin-id" type="xs:string"/>
          <xs:element name="ue-id" type="xs:string"/>
          <xs:element name="security-credentials" type="xs:string"/>
          <xs:element name="pin-traffic-descriptor" type="pinapp:PIN-Traffic-Descriptor" minOccurs="1"
maxOccurs="unbounded"/>
          <xs:element name="pin-packet-filter" type="pinapp:PIN-Packet-Filter" minOccurs="1"
maxOccurs="unbounded"/>
          <xs:element name="pin-requested-qos" type="xs:hexBinary" minOccurs="0"/>
          <xs:element name="ue-address" type="xs:string" minOccurs="0"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PIN-Traffic-Descriptor">
        <xs:sequence>
          <xs:element name="PIN-traffic-descriptor-type" type="xs:hexBinary"/>
          <xs:element name="PIN-traffic-descriptor-content" type="xs:string"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PIN-Packet-Filter">
        <xs:sequence>
          <xs:element name="packet-filter-direction" type="xs:integer"/>
          <xs:element name="packet-filter-identifier" type="xs:string"/>
          <xs:element name="length-of-the-packet-filter-contents" type="xs:integer"/>
          <xs:element name="packet-filter-contents" type="xs:string"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinComCreAcc-info">
        <xs:sequence>
          <xs:element name="pin-accepted-qos" type="xs:hexBinary"/>
          <xs:element name="pin-communication-flow-id" type="xs:string"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinComCreRej-info">
        <xs:sequence>
          <xs:element name="cause" type="xs:integer"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinComUpdReq-info">
        <xs:sequence>
```

```
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="ue-id" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="pin-traffic-descriptor" type="pinapp:PIN-Traffic-Descriptor" minOccurs="1"
maxOccurs="unbounded"/>
      <xs:element name="pin-packet-filter" type="pinapp:PIN-Packet-Filter" minOccurs="1"
maxOccurs="unbounded"/>
      <xs:element name="pin-requested-qos" type="xs:hexBinary" minOccurs="0"/>
      <xs:element name="ue-address" type="xs:string" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinComUpdAcc-info">
    <xs:sequence>
      <xs:element name="pin-accepted-qos" type="xs:hexBinary"/>
      <xs:element name="pin-communication-flow-id" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinComUpdRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinComDelReq-info">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="ue-id" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="pin-communication-flow-id" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinComDelRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinSscReq-info">
    <xs:sequence>
      <xs:element name="pin-management-client-identifier" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="application-server-identifier" type="xs:string"/>
      <xs:element name="application-client-identifier" type="xs:string"/>
      <xs:element name="target-pin-client-identifier" type="xs:string"/>
      <xs:element name="application-traffic-identifier" type="xs:string"/>
      <xs:element name="application-traffic-descriptor" type="pinapp:Application-Session-Descriptor"
minOccurs="0"/>
      <xs:element name="pegc-id" type="xs:string" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="Application-Session-Descriptor">
    <xs:sequence>
      <xs:element name="PIN-application-session-descriptor-length" type="xs:integer"/>
      <xs:element name="PIN-application-session-descriptor-content" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
```

```xml
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

  <xs:complexType name="PinSscRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinSerDisReq-info">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="ue-id" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="service-type" type="pinapp:PIN-Service-Info"/>
      <xs:element name="requesting-pine-address" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinSerDisAcc-info">
    <xs:sequence>
      <xs:element name="target-pine-id" type="xs:string"/>
      <xs:element name="target-pine-address" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinSerDisRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinPscReq-info">
    <xs:sequence>
      <xs:element name="pin-client-identifier" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="pine-id" type="xs:string"/>
      <xs:element name="source-pin-gateway-client-identifier" type="xs:string"/>
      <xs:element name="application-client-identifier" type="xs:string"/>
      <xs:element name="application-server-identifier" type="xs:string"/>
      <xs:element name="application-session-identifier" type="xs:string"/>
      <xs:element name="application-session-descriptor" type="pinapp:Application-Session-Descriptor"
minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinPscAcc-info">
    <xs:sequence>
      <xs:element name="target-pin-gateway-client-identifier" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinPscRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
```

```
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinPcfgReq-info">
        <xs:sequence>
          <xs:element name="pin-client-identifier" type="xs:string"/>
          <xs:element name="security-credentials" type="xs:string"/>
          <xs:element name="pin-id" type="xs:string"/>
          <xs:element name="pine-id" type="xs:string"/>
          <xs:element name="application-client-identifier" type="xs:string"/>
          <xs:element name="application-server-identifier" type="xs:string"/>
          <xs:element name="application-session-identifier" type="xs:string"/>
          <xs:element name="application-session-descriptor" type="pinapp:Application-Session-Descriptor"
minOccurs="0"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinPcfgAcc-info">
        <xs:sequence>
          <xs:element name="pegc-connectivity-information" type="pinapp:EndPoiInfo"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinPcfgRej-info">
        <xs:sequence>
          <xs:element name="cause" type="xs:integer"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinPdisReq-info">
        <xs:sequence>
          <xs:element name="pin-client-identifier" type="xs:string"/>
          <xs:element name="security-credentials" type="xs:string"/>
          <xs:element name="pin-id" type="xs:string"/>
          <xs:element name="pine-id" type="xs:string"/>
          <xs:element name="pegc-information-list" type="pinapp:UE-Id-List"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinPdisAcc-info">
        <xs:sequence>
          <xs:element name="pegc-information-list" type="pinapp:UE-Id-List"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinPdisRej-info">
        <xs:sequence>
          <xs:element name="cause" type="xs:integer"/>
          <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
          <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:anyAttribute namespace="##any" processContents="lax"/>
      </xs:complexType>

      <xs:complexType name="PinConfReq-info">
        <xs:sequence>
          <xs:element name="pin-id" type="xs:string"/>
          <xs:element name="requestor-pemc-id" type="xs:string"/>
          <xs:element name="authorization-type" type="xs:integer"/>
          <xs:element name="failure-pemc-id" type="xs:string"/>
          <xs:element name="new-pemc-id" type="xs:string" minOccurs="0"/>
          <xs:element name="additional-pemc-ids" type="pinapp:PEMC-List" minOccurs="0"/>
```

```
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinConfAcc-info">
  <xs:sequence>
    <xs:element name="pin-profile" type="pinapp:PIN-Profile"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinConfRej-info">
  <xs:sequence>
    <xs:element name="cause" type="xs:integer"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinManReq-info">
  <xs:sequence>
    <xs:element name="requestor-id" type="xs:string"/>
    <xs:element name="modification-type" type="xs:integer"/>
    <xs:element name="pin-profile" type="pinapp:PIN-Profile"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinManRej-info">
  <xs:sequence>
    <xs:element name="cause" type="xs:integer"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinProQueReq-info">
  <xs:sequence>
    <xs:element name="pin-id" type="xs:string"/>
    <xs:element name="security-credentials" type="xs:string"/>
    <xs:element name="ue-id" type="xs:string"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinProQueAcc-info">
  <xs:sequence>
    <xs:element name="pin-profile" type="pinapp:PIN-Profile"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinProQueRej-info">
  <xs:sequence>
    <xs:element name="cause" type="xs:integer"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinSerSwiReq-info">
  <xs:sequence>
    <xs:element name="pin-client-identifier" type="xs:string"/>
    <xs:element name="security-credentials" type="xs:string"/>
    <xs:element name="pin-id" type="xs:string"/>
```

```
      <xs:element name="application-client-identifier" type="xs:string"/>
      <xs:element name="application-server-identifier" type="xs:string"/>
      <xs:element name="application-session-identifier" type="xs:string"/>
      <xs:element name="application-session-descriptor" type="pinapp:Application-Session-Descriptor"
minOccurs="0"/>
      <xs:element name="target-pin-client-identifier" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinSerSwiAcc-info">
    <xs:sequence>
      <xs:element name="target-pin-client-identifier" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinSerSwiRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinCscUpdReq-info">
    <xs:sequence>
      <xs:element name="pin-client-identifier" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="pine-id" type="xs:string"/>
      <xs:element name="source-pin-gateway-client-identifier" type="xs:string"/>
      <xs:element name="target-pin-gateway-client-identifier" type="xs:string"/>
      <xs:element name="application-client-identifier" type="xs:string"/>
      <xs:element name="application-server-identifier" type="xs:string"/>
      <xs:element name="application-session-identifier" type="xs:string"/>
      <xs:element name="application-session-descriptor" type="pinapp:Application-Session-Descriptor"
minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinCscUpdAcc-info">
    <xs:sequence>
      <xs:element name="service-continuity-policy-information" type="pinapp:PIN-Continuity-Policy"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PIN-Continuity-Policy">
    <xs:sequence>
      <xs:element name="service-continuity-policy-length" type="xs:integer"/>
      <xs:element name="service-continuity-policy-content" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinCscUpdRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinAuthReq-info">
```

```xml
    <xs:sequence>
      <xs:element name="ue-id" type="xs:string"/>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="ip-address" type="xs:string" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinAuthAcc-info">
    <xs:sequence>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinAuthRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinStaSubReq-info">
    <xs:sequence>
      <xs:element name="ue-id" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="subscribed-event" type="pinapp:Event-List"/>
      <xs:element name="notification-target-address" type="xs:string" minOccurs="0"/>
      <xs:element name="expected-subscription-time" type="xs:integer" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="Event-List">
    <xs:sequence>
      <xs:element name="number-of-events" type="xs:integer"/>
      <xs:element name="event-id" type="xs:integer" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinStaSubAcc-info">
    <xs:sequence>
      <xs:element name="accepted-subscription-id" type="pinapp:Event-List"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinStaSubRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinStaUpdReq-info">
    <xs:sequence>
      <xs:element name="ue-id" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="subscribed-event" type="pinapp:Event-List"/>
      <xs:element name="notification-target-address" type="xs:string" minOccurs="0"/>
      <xs:element name="expected-subscription-time" type="xs:integer" minOccurs="0"/>
```

```
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinStaUpdAcc-info">
    <xs:sequence>
      <xs:element name="authorized-subscription-time" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinStaUpdRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinStaNoti-info">
    <xs:sequence>
      <xs:element name="event-id" type="pinapp:Event-List"/>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="pine-management-type" type="xs:integer" minOccurs="0"/>
      <xs:element name="pine-id" type="xs:string" minOccurs="0"/>
      <xs:element name="pin-client-profile" type="pinapp:PIN-Client-Profile" minOccurs="0"/>
      <xs:element name="pegc-id" type="pinapp:UE-Id-List" minOccurs="0"/>
      <xs:element name="pegc-address" type="pinapp:UE-Address-List" minOccurs="0"/>
      <xs:element name="access-control-info" type="pinapp:Access-Control-Info" minOccurs="0"/>
      <xs:element name="pemc-id" type="pinapp:UE-Id-List" minOccurs="0"/>
      <xs:element name="pemc-address" type="pinapp:UE-Address-List" minOccurs="0"/>
      <xs:element name="pin-profile" type="pinapp:PIN-Profile" minOccurs="0"/>
      <xs:element name="dynamic-pin-profile" type="pinapp:Dynamic-PIN-Profile" minOccurs="0"/>
      <xs:element name="pin-status-type" type="xs:boolean" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="Dynamic-PIN-Profile">
    <xs:sequence>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="pin-state" type="xs:boolean"/>
      <xs:element name="current-PEMC-list" type="pinapp:PEMC-List"/>
      <xs:element name="current-PEGC-list" type="pinapp:UE-Id-List"/>
      <xs:element name="pine-info" type="pinapp:PINE-Info"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PINE-Info">
    <xs:sequence>
      <xs:element name="pine-list" type="pinapp:UE-Id-List"/>
      <xs:element name="endpoint-information" type="pinapp:EndPoiInfo"/>
      <xs:element name="pin-service-info" type="pinapp:PIN-Service-Info"/>
      <xs:element name="internal-ip-address" type="xs:string"/>
      <xs:element name="application-info" type="pinapp:Application-info"/>
      <xs:element name="default-pegc-list" type="pinapp:UE-Id-List"/>
      <xs:element name="backup-pegc-list" type="pinapp:UE-Id-List"/>
      <xs:element name="pin-heartbeat-timer" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="PinStaUnsubReq-info">
    <xs:sequence>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="unsubscription-id" type="pinapp:Event-List"/>
```

```xml
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>


  <xs:complexType name="PinStaUnsubRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>


  <xs:complexType name="PinHbt-info">
    <xs:sequence>
      <xs:element name="ue-id" type="xs:string"/>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>


  <xs:complexType name="PinConSubReq-info">
    <xs:sequence>
      <xs:element name="subscriber-identifier" type="xs:string"/>
      <xs:element name="security-credentials" type="xs:string"/>
      <xs:element name="subscription-id" type="pinapp:Event-List"/>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="notification-target-address" type="xs:string"/>
      <xs:element name="proposed-expiration-time" type="xs:integer" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>


  <xs:complexType name="PinConSubAcc-info">
    <xs:sequence>
      <xs:element name="subscription-id" type="pinapp:Event-List"/>
      <xs:element name="expiration-time" type="xs:integer" minOccurs="0"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>


  <xs:complexType name="PinConSubRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>


  <xs:complexType name="PinConNoti-info">
    <xs:sequence>
      <xs:element name="pegc-identifier" type="xs:string"/>
      <xs:element name="pin-id" type="xs:string"/>
      <xs:element name="pin-client-identifier" type="xs:string"/>
      <xs:element name="event-type" type="pinapp:Event-List"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>


  <xs:complexType name="PinConNotiRej-info">
    <xs:sequence>
      <xs:element name="cause" type="xs:integer"/>
      <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
```

```
<xs:complexType name="PinConUpdReq-info">
  <xs:sequence>
    <xs:element name="subscriber-identifier" type="xs:string"/>
    <xs:element name="security-credentials" type="xs:string"/>
    <xs:element name="notification-target-address" type="xs:string" minOccurs="0"/>
    <xs:element name="proposed-expiration-time" type="xs:integer" minOccurs="0"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinConUpdAcc-info">
  <xs:sequence>
    <xs:element name="expiration-time" type="xs:integer" />
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinConUpdRej-info">
  <xs:sequence>
    <xs:element name="cause" type="xs:integer"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinConUnsubReq-info">
  <xs:sequence>
    <xs:element name="security-credentials" type="xs:string"/>
    <xs:element name="subscription-id" type="pinapp:Event-List"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinConUnsubRej-info">
  <xs:sequence>
    <xs:element name="cause" type="xs:integer"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinAsDisReq-info">
  <xs:sequence>
    <xs:element name="ue-id" type="xs:string"/>
    <xs:element name="security-credentials" type="xs:string"/>
    <xs:element name="service-id" type="xs:string"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinAsDisAcc-info">
  <xs:sequence>
    <xs:element name="as-connectivity-info" type="pinapp:EndPoiInfo"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="PinAsDisRej-info">
  <xs:sequence>
    <xs:element name="cause" type="xs:integer"/>
    <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
```

```
    <xs:complexType name="PinCsscReq-info">
      <xs:sequence>
        <xs:element name="security-credentials" type="xs:string"/>
        <xs:element name="pin-id" type="xs:string"/>
        <xs:element name="application-client-identifier" type="xs:string"/>
        <xs:element name="application-server-identifier" type="xs:string"/>
        <xs:element name="application-session-identifier" type="xs:string"/>
        <xs:element name="application-session-descriptor" type="pinapp:Application-Session-Descriptor"
minOccurs="0"/>
        <xs:element name="target-pin-client-identifier" type="xs:string" minOccurs="0"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <xs:complexType name="PinCsscRej-info">
      <xs:sequence>
        <xs:element name="cause" type="xs:integer"/>
        <xs:element name="anyExt" type="pinapp:anyExtType" minOccurs="0"/>
        <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>

    <!--  extension allowed -->
    <xs:complexType name="DiscMsgExtType">
      <xs:sequence>
        <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>
    <!--  XML attribute for any future extensions  -->
    <xs:complexType name="anyExtType">
      <xs:sequence>
        <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:complexType>

</xs:schema>
```

6.2.5 Data semantics

6.2.5.1 General

The <pinapp-info> element is the root element of this XML document and it can be one of the following elements:

   a) PINAPP protocol messages only applicable to interface between PIN peer and PIN peer:

      1) <server-discovery-request> element;

      2) <server-discovery-accept> element;

      3) <server-discovery-reject> element;

      4) <pin-creation-notification-request> element;

      5) <pin-creation-notification-reject> element;

      8) <pin-pemc-takeover-request> element;

      9) <pin-pemc-takeover-accept> element;

      10)<pin-pemc-takeover-reject> element;

      11)<pin-pegc-takeover-request> element;

      12)<pin-pegc-takeover-accept> element;

      13)<pin-pegc-takeover-reject> element;

14) <pin-management-pine-join-request> element;

15) <pin-management-pine-join-accept> element;

16) <pin-management-pine-join-reject> element;

17) <pin-management-pine-leave-request> element;

18) <pin-management-pine-leave-reject> element;

19) <pin-service-registration-request> element;

20) <pin-service-registration-accept> element;

21) <pin-service-registration-reject> element;

22) <pin-service-deregistration-request> element;

23) <pin-service-deregistration-accept> element;

24) <pin-service-deregistration-reject> element;

25) <pin-communication-create-request> element;

26) <pin-communication-create-accept> element;

27) <pin-communication-create-reject> element;

28) <pin-communication-update-request> element;

29) <pin-communication-update-accept> element;

30) <pin-communication-update-reject> element;

31) <pin-communication-delete-request> element;

32) <pin-communication-delete-reject> element;

33) <pin-management-service-switch-configure-request> element;

34) <pin-management-service-switch-configure-reject> element;

35) <pin-service-discovery-request> element;

36) <pin-service-discovery-accept> element;

37) <pin-service-discovery-reject> element;

38) <pin-management-pegc-service-continuity-request> element;

39) <pin-management-pegc-service-continuity-accept> element;

40) <pin-management-pegc-service-continuity-reject> element;

41) <pin-management-pegc-configuration-request> element;

42) <pin-management-pegc-configuration-accept> element;

43) <pin-management-pegc-configuration-reject> element;

44) <pin-management-pegc-discovery-request> element;

45) <pin-management-pegc-discovery-accept> element; and

46) <pin-management-pegc-discovery-reject> element;

b) PINAPP protocol messages only applicable to interface between PIN peer and PAE-S:

1) <pine-registration-request> element;

2) <pine-registration-accept> element;

3) <pine-registration-reject> element;

4) <pine-deregistration-request> element;

5) <pine-deregistration-reject> element;

6) <pine-update-registration-request> element;

7) <pine-update-registration-reject> element;

8) <pin-creation-request> element;

9) <pin-creation-accept> element;

10) <pin-creation-reject> element;

11) <pin-deletion-request> element;

12) <pin-deletion-reject> element;

13) <pin-configuration-request> element;

14) <pin-configuration-accept> element;

15) <pin-configuration-reject> element;

16) <pin-management-request> element;

17) <pin-management-reject> element;

18) <pin-profile-query-request> element;

19) <pin-profile-query-accept> element;

20) <pin-profile-query-reject> element;

21) <pin-service-switch-request> element;

22) <pin-service-switch-accept> element;

23) <pin-service-switch-reject> element;

24) <pin-configuration-service-continuity-update-request> element;

25) <pin-configuration-service-continuity-update-accept> element;

26) <pin-configuration-service-continuity-update-reject> element;

27) <pine-authorization-request> element;

28) <pine-authorization-accept> element; and

29) <pine-authorization-reject> element; and

  c) PINAPP protocol messages applicable to all interfaces:

1) <pin-deletion-notification-request> element;

2) <pin-deletion-notification-reject> element;

3) <pin-discovery-request> element;

4) <pin-discovery-accept> element;

5) <pin-discovery-reject> element;

6) <pin-status-subscribe-request> element;

7) <pin-status-subscribe-accept> element;

8) <pin-status-subscribe-reject> element;

9) <pin-status-update-request> element;

10) <pin-status-update-accept> element;

11) <pin-status-update-reject> element;

12) <pin-status-notify> element;

13) <pin-status-unsubscribe-request> element;

14) <pin-status-unsubscribe-reject> element;

15) <pin-heartbeat> element;

16) <pin-connectivity-subscribe-request> element;

17) <pin-connectivity-subscribe-accept> element;

18) <pin-connectivity-subscribe-reject> element;

19) <pin-connectivity-notify> element;

20) <pin-connectivity-notify-reject> element;

21) <pin-connectivity-update-request> element;

22) <pin-connectivity-update-accept> element;

23) <pin-connectivity-update-reject> element;

24) <pin-connectivity-unsubscribe-request> element;

25) <pin-connectivity-unsubscribe-reject> element;

26) <pin-as-discovery-request> element;

27) <pin-as-discovery-accept> element;

28) <pin-as-discovery-reject> element;

29) <pin-configuration-service-switch-configure-request> element; and

30) <pin-configuration-service-switch-configure-reject> element.

6.2.5.2 Semantics of <service-discovery-request>

The <service-discovery-request> element contains:

a) one <ue-id> element as specified in clause 7.2.1;

b) zero or one <mac-address> element as specified in clause 7.2.2;

c) zero or one <ue-location> element;

d) zero or one <anyExt> element containing elements defined in future releases;

e) zero, one or more elements from other namespaces defined in future releases; and

f) zero, one or more attributes defined in future releases.

The <ue-location> element carries information about an NG-RAN cell where the UE was camping on or which the UE used in the 5GMM-CONNECTED mode. The <ue-location> element contains:

a) a "NCGI" attribute containing the parameter defined in clause 7.2.3;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.3 Semantics of <service-discovery-accept>

The < service-discovery-accept> element contains:

a) one <endpoint-information-content> element as specified in clause 7.2.4;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

The <endpoint-information-content> element contains one of the followings:

a) a <uri> element;

b) a <fqdn> element;

c) a <ipv4-address> element; and

d) a <ipv6-address> element.

6.2.5.4 Semantics of <service-discovery-reject>

The <service-discovery-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.5 Semantics of <pine-registration-request>

The <pine-registration-request> element contains:

a) one <ue-id> element as specified in clause 7.2.1;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <port-number> element as specified in clause 7.2.7;

d) zero or one <mac-address> element as specified in clause 7.2.2;

e) zero or one <vendor-name> element as specified in clause 7.2.8;

f) zero or one <device-description> element as specified in clause 7.2.9;

g) zero or one <pine-address> element as specified in clause 7.2.10;

h) zero or one <pine-capabilities> element as specified in clause 7.2.11;

i) zero or one <maximum-number-of-pines> element as specified in clause 7.2.12;

j) zero or one <pin-service-info> element as specified in clause 7.2.30;

k) zero or one <representation-indication> element as specified in clause 7.2.32;

l) zero or one <registration-info> element;

m) zero or one <anyExt> element containing elements defined in future releases;

n) zero, one or more elements from other namespaces defined in future releases; and

o) zero, one or more attributes defined in future releases.

The <registration-info> element:

a) one <ue-id> element as specified in clause 7.2.1;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <port-number> element as specified in clause 7.2.7;

d) zero or one <mac-address> element as specified in clause 7.2.2;

e) zero or one <vendor-name> element as specified in clause 7.2.8;

f) zero or one <device-description> element as specified in clause 7.2.9;

g) zero or one <pine-address> element as specified in clause 7.2.10;

h) zero or one <pine-capabilities> element as specified in clause 7.2.11;

i) zero or one <maximum-number-of-pines> element as specified in clause 7.2.12;

j) zero or one <anyExt> element containing elements defined in future releases;

k) zero, one or more elements from other namespaces defined in future releases; and

l) zero, one or more attributes defined in future releases.

6.2.5.6 Semantics of <pine-registration-accept>

The <pine-registration-accept> element contains:

a) one <pin-client-id> element as specified in clause 7.2.1;

b) zero or one <role-of-pemc> element as specified in clause 7.2.23;

c) zero or one <role-of-pegc> element as specified in clause 7.2.24;

d) zero or one <accepted-registration-info> element;

e) zero or one <rejected-registration-info> element;

f) zero or one <anyExt> element containing elements defined in future releases;

g) zero, one or more elements from other namespaces defined in future releases; and

h) zero, one or more attributes defined in future releases.

The <accepted-registration-info> element:

a) one <ue-id> element as specified in clause 7.2.1;

b) one <pin-client-id> element as specified in clause 7.2.25;

c) zero or one <role-of-pemc> element as specified in clause 7.2.23;

d) zero or one <role-of-pegc> element as specified in clause 7.2.24;

e) zero or one <anyExt> element containing elements defined in future releases;

f) zero, one or more elements from other namespaces defined in future releases; and

g) zero, one or more attributes defined in future releases.

The <rejected-registration-info> element:

    a) one <ue-id> element as specified in clause 7.2.1;

    b) one <cause> element as specified in clause 7.2.5;

    c) zero or one <anyExt> element containing elements defined in future releases;

    d) zero, one or more elements from other namespaces defined in future releases; and

    e) zero, one or more attributes defined in future releases.

6.2.5.7 Semantics of <pine-registration-reject>

The <pine-registration-reject> element contains:

    a) one <cause> element as specified in clause 7.2.5;

    b) zero or one <anyExt> element containing elements defined in future releases;

    c) zero, one or more elements from other namespaces defined in future releases; and

    d) zero, one or more attributes defined in future releases.

6.2.5.8 Semantics of <pine-deregistration-request>

The <pine-deregistration-request> element contains:

    a) one <ue-id> element as specified in clause 7.2.1;

    b) one <security-credentials> element as specified in clause 7.2.6;

    c) zero or one <mac-address> element as specified in clause 7.2.2;

    d) zero or one <vendor-name> element as specified in clause 7.2.8;

    e) zero or one <device-description> element as specified in clause 7.2.9;

    f) zero or one <ip-address> element as specified in clause 7.2.10;

    g) zero or one <anyExt> element containing elements defined in future releases;

    h) zero, one or more elements from other namespaces defined in future releases; and

    i) zero, one or more attributes defined in future releases.

6.2.5.9 Semantics of <pine-deregistration-reject>

The <pine-deregistration-reject> element contains:

    a) one <cause> element as specified in clause 7.2.5;

    b) zero or one <anyExt> element containing elements defined in future releases;

    c) zero, one or more elements from other namespaces defined in future releases; and

    d) zero, one or more attributes defined in future releases.

6.2.5.10 Semantics of <pine-update-registration-request>

The <pine-update-registration-request> element contains:

    a) one <ue-id> element as specified in clause 7.2.1;

    b) one<security-credentials> element as specified in clause 7.2.6;

   c) zero or one <mac-address> element as specified in clause 7.2.2;

   d) zero or one <vendor-name> element as specified in clause 7.2.8;

   e) zero or one <device-description> element as specified in clause 7.2.9;

   f) zero or one <ip-address> element as specified in clause 7.2.10;

   g) zero or one <port-number> element as specified in clause 7.2.7;

   h) zero or one <pine-capabilities> element as specified in clause 7.2.11;

   i) zero or one <maximum-number-of-pines> element as specified in clause 7.2.12;

   j) zero or one <pin-service-info> element as specified in clause 7.2.30;

   k) zero or one <anyExt> element containing elements defined in future releases;

   l) zero, one or more elements from other namespaces defined in future releases; and

   m) zero, one or more attributes defined in future releases.

6.2.5.11 Semantics of <pine-update-registration-reject>

The <pine-update-registration-reject> element contains:

   a) one <cause> element as specified in clause 7.2.5;

   b) zero or one <anyExt> element containing elements defined in future releases;

   c) zero, one or more elements from other namespaces defined in future releases; and

   d) zero, one or more attributes defined in future releases.

6.2.5.12 Semantics of <pin-creation-request>

The <pin-creation-request> element contains:

   a) one <ue-id> element as specified in clause 7.2.1;

   b) one <security-credentials> element as specified in clause 7.2.6;

   c) one <pin-profile> element as specified in clause 7.2.28;

   d) zero or one <pin-client-profile> element as specified in clause 7.2.13;

   e) zero or one <ue-location> element;

   f) zero or one <pine-list> element as specified in clause 7.2.14;

   g) zero or one <additional-pemc> element as specified in clause 7.2.15;

   h) zero or one <pin-service-info> element as specified in clause 7.2.30;

   i) zero or one <anyExt> element containing elements defined in future releases;

   j) zero, one or more elements from other namespaces defined in future releases; and

   k) zero, one or more attributes defined in future releases.

The <ue-location> element carries information about an NG-RAN cell where the UE was camping on or which the UE used in the 5GMM-CONNECTED mode. The <ue-location> element contains:

   a) a "NCGI" attribute containing the parameter defined in clause 7.2.3;

   b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.13 Semantics of <pin-creation-accept>

The <pin-creation-accept> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <valid-timer> element as specified in clause 7.2.17;

c) one <heartbeat-timer-list> element;

d) one <pegc-id> element as specified in clause 7.2.19;

e) zero or one <pegc-address> element as specified in clause 7.2.20;

f) zero or one <access-control-info> element as specified in clause 7.2.21;

g) zero or one <pine-list> element as specified in clause 7.2.14;

h) zero or one <pin-profile> element as specified in clause 7.2.28;

i) zero or one <anyExt> element containing elements defined in future releases;

j) zero, one or more elements from other namespaces defined in future releases; and

k) zero, one or more attributes defined in future releases.

The <heartbeat-timer-list> element contains:

a) one <pemc-heartbeat-timer> element as specified in clause 7.2.18;

b) one <pegc-heartbeat-timer> element as specified in clause 7.2.18; and

c) one <pine-heartbeat-timer> element as specified in clause 7.2.18.

6.2.5.14 Semantics of <pin-creation-reject>

The <pin-creation-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.15 Semantics of <pin-creation-notification-request>

The <pin-creation-notification-request> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <heartbeat-timer> element as specified in clause 7.2.18;

c) one <pin-member-indication> element as specified in clause 7.2.22;

d) zero or one <pegc-address> element as specified in clause 7.2.20;

e) zero or one <pegc-id> element as specified in clause 7.2.19;

f) zero or one <access-control-info> element as specified in clause 7.2.21;

g) zero or one <pin-profile> element as specified in clause 7.2.28;

h) zero or one <anyExt> element containing elements defined in future releases;

i) zero, one or more elements from other namespaces defined in future releases; and

j) zero, one or more attributes defined in future releases.

6.2.5.16 Semantics of <pin-creation-notification-reject>

The <pin-creation-notification-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.17 Semantics of <pin-deletion-notification-request>

The <pin-deletion-notification-request> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.18 Semantics of <pin-deletion-notification-reject>

The <pin-deletion-notification-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.19 Semantics of <pin-deletion-request>

The <pin-deletion-request> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <security-credentials> element as specified in clause 7.2.6;

c) zero or one <anyExt> element containing elements defined in future releases;

d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.20 Semantics of <pin-deletion-reject>

The <pin-deletion-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.21 Semantics of <pine-represent-registration-accept>

The <pine-registration-request> element contains:

    a) one <pin-client-id> element as specified in clause 7.2.25;

    b) zero or one <role-of-pemc> element as specified in clause 7.2.23;

    c) zero or one <role-of-pegc> element as specified in clause 7.2.24;

    d) zero or one <anyExt> element containing elements defined in future releases;

    e) zero, one or more elements from other namespaces defined in future releases; and

    f) zero, one or more attributes defined in future releases.

6.2.5.22 Semantics of <pine-represent-registration-reject>

    a) one <cause> element as specified in clause 7.2.5;

    b) zero or one <anyExt> element containing elements defined in future releases;

    c) zero, one or more elements from other namespaces defined in future releases; and

    d) zero, one or more attributes defined in future releases.

6.2.5.23 Semantics of <pin-discovery-request>

The <pin-discovery-request> element contains:

    a) one <ue-id> element as specified in clause 7.2.1;

    b) one <security-credentials> element as specified in clause 7.2.6;

    c) zero or one <filter-info> element;

    d) zero or one <ue-location> element;

    e) zero or one <anyExt> element containing elements defined in future releases;

    f) zero, one or more elements from other namespaces defined in future releases; and

    g) zero, one or more attributes defined in future releases.

The <ue-location> element carries information about an NG-RAN cell where the UE was camping on or which the UE used in the 5GMM-CONNECTED mode. The <ue-location> element contains:

    a) a "NCGI" attribute containing the parameter defined in clause 7.2.3;

    b) zero or one <anyExt> element containing elements defined in future releases;

    c) zero, one or more elements from other namespaces defined in future releases; and

    d) zero, one or more attributes defined in future releases.

The <filter-info> element contains:

    a) zero or one <requested-pin-service> element as specified in clause 7.2.30;

    b) zero or one <pin-service-area> element as specified in clause 7.2.3;

    c) zero or one <anyExt> element containing elements defined in future releases;

    d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.24   Semantics of <pin-discovery-accept>

The <pin-discovery-accept> element contains:

   a) one or more <pin-info> element;

   b) zero or one <anyExt> element containing elements defined in future releases;

   c) zero, one or more elements from other namespaces defined in future releases; and

   d) zero, one or more attributes defined in future releases.

The <pin-info> element contains:

   a) one <pin-id> element as specified in clause 7.2.16;

   b) zero or one <pin-description> element as specified in clause 7.2.29;

   c) zero or one <pin-service-list> element as specified in clause 7.2.30;

   d) zero or one <pemc-info> element;

   e) zero or one <anyExt> element containing elements defined in future releases;

   f) zero, one or more elements from other namespaces defined in future releases; and

   g) zero, one or more attributes defined in future releases.

The <pemc-info> element contains:

   a) one <ue-id> element as specified in clause 7.2.1;

   b) one <ue-address> element as specified in clause 7.2.10;

   c) zero or one <anyExt> element containing elements defined in future releases;

   d) zero, one or more elements from other namespaces defined in future releases; and

   e) zero, one or more attributes defined in future releases.

6.2.5.25   Semantics of <pin-discovery-reject>

The <pin-discovery-reject> element contains:

   a) one <cause> element as specified in clause 7.2.5;

   b) zero or one <anyExt> element containing elements defined in future releases;

   c) zero, one or more elements from other namespaces defined in future releases; and

   d) zero, one or more attributes defined in future releases.

6.2.5.26   Semantics of <pin-pemc-takeover-request>

The <pin-pemc-takeover-request> element:

   a) one <pin-id> element as specified in clause 7.2.16;

   b) one <current-pemc-id> element as specified in clause 7.2.1;

   c) one <new-pemc-id> element as specified in clause 7.2.1;

   d) zero or one <anyExt> element containing elements defined in future releases;

   e) zero, one or more elements from other namespaces defined in future releases; and

f) zero, one or more attributes defined in future releases.

6.2.5.27 Semantics of <pin-pemc-takeover-accept>

The <pin-pemc-takeover-accept> element:

a) one <pin-id> element as specified in clause 7.2.16;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.28 Semantics of <pin-pemc-takeover-reject>

The <pin-pemc-takeover-reject> element:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <cause> element as specified in clause 7.2.5;

c) zero or one <anyExt> element containing elements defined in future releases;

d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.29 Semantics of <pin-pegc-takeover-request>

The <pin-pegc-takeover-request> element:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <current-pegc-id> element as specified in clause 7.2.1;

c) one <new-pegc-id> element as specified in clause 7.2.1;

d) zero or one <anyExt> element containing elements defined in future releases;

e) zero, one or more elements from other namespaces defined in future releases; and

f) zero, one or more attributes defined in future releases.

6.2.5.30 Semantics of <pin-pegc-takeover-accept>

The <pin-pegc-takeover-accept> element:

a) one <pin-id> element as specified in clause 7.2.16;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.31 Semantics of <pin-pegc-takeover-reject>

The <pin-pegc-takeover-reject> element:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <cause> element as specified in clause 7.2.5;

c) zero or one <anyExt> element containing elements defined in future releases;

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d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.32 Semantics of <pin-configuration-request>

The <pin-configuration-request> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <requestor-pemc-id> element as specified in clause 7.2.1;

c) one <authorization-type> element as specified in clause 7.2.33;

d) one <failure-pemc-id> element as specified in clause 7.2.1;

e) zero or one <new-pemc-id> element as specified in clause 7.2.1;

f) zero or one <additional-pemc-ids> element as specified in clause 7.2.15;

g) zero or one <anyExt> element containing elements defined in future releases;

h) zero, one or more elements from other namespaces defined in future releases; and

i) zero, one or more attributes defined in future releases.

6.2.5.33 Semantics of <pin-configuration-accept>

The <pin-configuration-request> element contains:

a) one <pin-profile> element as specified in clause 7.2.28;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.34 Semantics of <pin-configuration-reject>

The <pin-configuration-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.35 Semantics of <pin-management-request>

The <pin-management-request> element:

a) shall include a <requestor-id> element as specified in clause 7.2.1;

b) shall include a <modification-type> element as specified in clause 7.2.34;

c) shall include a <pin-profile> element as specified in clause 7.2.28;

d) zero or one <anyExt> element containing elements defined in future releases;

e) zero, one or more elements from other namespaces defined in future releases; and

f) zero, one or more attributes defined in future releases.

6.2.5.36 Semantics of <pin-management-reject>

The <pin-management-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.37 Semantics of <pin-status-subscribe-request>

The <pin-status-subscribe-request> element contains:

a) one <ue-id> element as specified in clause 7.2.1;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <pin-id> element as specified in clause 7.2.16;

d) one <subscribed-event> element as specified in clause 7.2.35;

e) zero or one <notification-target-address> element as specified in clause 7.2.10;

f) zero or one <expected-subscription-time> element as specified in clause 7.2.36;

g) zero or one <anyExt> element containing elements defined in future releases;

h) zero, one or more elements from other namespaces defined in future releases; and

i) zero, one or more attributes defined in future releases.

6.2.5.38 Semantics of <pin-status-subscribe-accept>

The <pin-status-subscribe-accept> element:

a) one <accepted-subscription-id> element as specified in clause 7.2.35;

b) zero or one <authorized-subscription-time> element as specified in clause 7.2.36;

c) zero or one <rejected-subscription-id> element as specified in clause 7.2.35;

d) zero or one <anyExt> element containing elements defined in future releases;

e) zero, one or more elements from other namespaces defined in future releases; and

f) zero, one or more attributes defined in future releases.

6.2.5.39 Semantics of <pin-status-subscribe-reject>

The <pin-status-subscribe-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.40 Semantics of <pin-status-update-request>

The <pin-status-subscribe-request> element contains:

a) one <ue-id> element as specified in clause 7.2.1;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <pin-id> element as specified in clause 7.2.16;

d) one <subscribed-event> element as specified in clause 7.2.35;

e) zero or one <notification-target-address> element as specified in clause 7.2.10;

f) zero or one <expected-subscription-time> element as specified in clause 7.2.35;

g) zero or one <anyExt> element containing elements defined in future releases;

h) zero, one or more elements from other namespaces defined in future releases; and

i) zero, one or more attributes defined in future releases.

6.2.5.41 Semantics of <pin-status-update-accept>

The <pin-status-subscribe-accept> element:

a) zero or one <authorized-subscription-time> element as specified in clause 7.2.36;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.42 Semantics of <pin-status-update-reject>

The <pin-status-update-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.43 Semantics of <pin-status-notify>

The <pin-status-notify> element contains:

a) one <event-id> element as specified in clause 7.2.35;

b) one <pin-id> element as specified in clause 7.2.16;

c) zero or one <pine-management-type> element as specified in clause 7.2.37;

d) zero or one <pine-id> element as specified in clause 7.2.14;

e) zero or one <pin-client-profile> element as specified in clause 7.2.13;

f) zero or one <pegc-id> element as specified in clause 7.2.19;

g) zero or one <pegc-address> element as specified in clause 7.2.20;

h) zero or one <access-control-info> element as specified in clause 7.2.21;

i) zero or one <pemc-id> element as specified in clause 7.2.15;

j) zero or one <pemc-address> element as specified in clause 7.2.20;

k) zero or one <pin-profile> element as specified in clause 7.2.28;

l) zero or one <dynamic-pin-profile> element as specified in clause 7.2.38;

m) zero or one <pin-status-type> element as specified in clause 7.2.39;

n) zero or one <anyExt> element containing elements defined in future releases;

o) zero, one or more elements from other namespaces defined in future releases; and

p) zero, one or more attributes defined in future releases.

6.2.5.44 Semantics of <pin-status-unsubscribe-request>

The <pin-status-unsubscribe-request> element contains:

b) one <security-credentials> element as specified in clause 7.2.6;

b) one <unsubscription-id> element as specified in clause 7.2.35;

c) zero or one <anyExt> element containing elements defined in future releases;

d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.45 Semantics of <pin-status-unsubscribe-reject>

The <pin-status-unsubscribe-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.46 Semantics of <pin-management-pine-join-request>

The <pin-management-pine-join-request> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <ue-id> element as specified in clause 7.2.1;

d) one <target-pemc-id> element as specified in clause 7.2.1;

e) zero or one <pin-client-profile> element as specified in clause 7.2.13;

f) zero or one <endpoint-information-content> element as specified in clause 7.2.4;

g) zero or one <ue-location> element;

h) zero or one <pin-service-info> element as specified in clause 7.2.30;

i) zero or one <anyExt> element containing elements defined in future releases;

j) zero, one or more elements from other namespaces defined in future releases; and

k) zero, one or more attributes defined in future releases.

The <ue-location> element carries information about an NG-RAN cell where the UE was camping on or which the UE used in the 5GMM-CONNECTED mode. The <ue-location> element contains:

a) a "NCGI" attribute containing the parameter defined in clause 7.2.3;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.47 Semantics of <pin-management-pine-join-accept>

The <pin-management-pine-join-accept> element contains:

a) one <heartbeat-timer> element as specified in clause 7.2.18;

b) one <valid-timer> element as specified in clause 7.2.17;

c) zero or one <pin-client-profile> element as specified in clause 7.2.13;

d) zero or one <pegc-id> element as specified in clause 7.2.19;

e) zero or one <pegc-address> element as specified in clause 7.2.20;

f) zero or one <access-control-info> element as specified in clause 7.2.21;

g) zero or one <anyExt> element containing elements defined in future releases;

h) zero, one or more elements from other namespaces defined in future releases; and

i) zero, one or more attributes defined in future releases.

6.2.5.48 Semantics of <pin-management-pine-join-reject>

The <pin-status-unsubscribe-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.49 Semantics of <pin-management-pine-leave-request>

The <pin-management-pine-leave-request> element:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <ue-id> element as specified in clause 7.2.1;

d) one <target-pemc-id> element as specified in clause 7.2.1;

e) zero or one <anyExt> element containing elements defined in future releases;

f) zero, one or more elements from other namespaces defined in future releases; and

g) zero, one or more attributes defined in future releases.

6.2.5.50 Semantics of <pin-management-pine-leave-reject>

The <pin-management-pine-leave-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.51 Semantics of <pin-profile-query-request>

The <pin-profile-query-request> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <ue-id> element as specified in clause 7.2.1;

d) zero or one <anyExt> element containing elements defined in future releases;

e) zero, one or more elements from other namespaces defined in future releases; and

f) zero, one or more attributes defined in future releases.

6.2.5.52 Semantics of <pin-profile-query-accept>

The <pin-profile-query-accept> element contains:

a) one <pin-profile> element as specified in clause 7.2.28;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.53 Semantics of <pin-profile-query-reject>

The <pin-profile-query-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.53 Semantics of <pin-heartbeat>

The <pin-heartbeat> element contains:

a) one <ue-id> element as specified in clause 7.2.1;

b) one <pin-id> element as specified in clause 7.2.16;

c) zero or one <anyExt> element containing elements defined in future releases;

d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.54 Semantics of <pin-service-registration-request>

The <pin-service-registration-request> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <requesting-pine-id> element as specified in clause 7.2.1;

   c) one <list-of-services> element as specified in clause 7.2.30;

   d) zero or one <anyExt> element containing elements defined in future releases;

   e) zero, one or more elements from other namespaces defined in future releases; and

   f) zero, one or more attributes defined in future releases.

6.2.5.55 Semantics of <pin-service-registration-accept>

The <pin-service-registration-accept> element contains:

   a) one <pin-id> element as specified in clause 7.2.16;

   b) one <requesting-pine-id> element as specified in clause 7.2.1;

   c) zero or one <anyExt> element containing elements defined in future releases;

   d) zero, one or more elements from other namespaces defined in future releases; and

   e) zero, one or more attributes defined in future releases.

6.2.5.56 Semantics of <pin-service-registration-reject>

The <pin-service-registration-reject> element contains:

   a) one <pin-id> element as specified in clause 7.2.16;

   b) one <requesting-pine-id> element as specified in clause 7.2.1;

   c) one <cause> element as specified in clause 7.2.5;

   d) zero or one <anyExt> element containing elements defined in future releases;

   e) zero, one or more elements from other namespaces defined in future releases; and

   f) zero, one or more attributes defined in future releases.

6.2.5.57 Semantics of <pin-service-deregistration-request>

The <pin-service-deregistration-request> element contains:

   a) one <pin-id> element as specified in clause 7.2.16;

   b) one <requesting-pine-id> element as specified in clause 7.2.1;

   c) one <list-of-services> element as specified in clause 7.2.30;

   d) zero or one <anyExt> element containing elements defined in future releases;

   e) zero, one or more elements from other namespaces defined in future releases; and

   f) zero, one or more attributes defined in future releases.

6.2.5.58 Semantics of <pin-service-deregistration-accept>

The <pin-service-deregistration-accept> element contains:

   a) one <pin-id> element as specified in clause 7.2.16;

   b) one <requesting-pine-id> element as specified in clause 7.2.1;

   c) zero or one <anyExt> element containing elements defined in future releases;

   d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.59 Semantics of <pin-service-deregistration-reject>

The <pin-service-deregistration-reject> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <requesting-pine-id> element as specified in clause 7.2.1;

c) one <cause> element as specified in clause 7.2.5;

d) zero or one <anyExt> element containing elements defined in future releases;

e) zero, one or more elements from other namespaces defined in future releases; and

f) zero, one or more attributes defined in future releases.

6.2.5.60 Semantics of <pin-connectivity-subscribe-request>

The <pin-connectivity-subscribe-request> element contains:

a) one <subscriber-identifier> element as specified in clause 7.2.1;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <subscription-id> element as specified in clause 7.2.35;

d) one <pin-id> element as specified in clause 7.2.16;

e) one <notification-target-address> element as specified in clause 7.2.4;

f) zero or one <proposed-expiration-time> element as specified in clause 7.2.36;

g) zero or one <anyExt> element containing elements defined in future releases;

h) zero, one or more elements from other namespaces defined in future releases; and

i) zero, one or more attributes defined in future releases.

6.2.5.60 Semantics of <pin-connectivity-subscribe-accept>

The <pin-connectivity-subscribe-accept> element contains:

a) one <subscription-id> element as specified in clause 7.2.35;

b) zero or one <expiration-time> element as specified in clause 7.2.36;

c) zero or one <anyExt> element containing elements defined in future releases;

d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.61 Semantics of <pin-connectivity-subscribe-reject>

The <pin-connectivity-subscribe-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.62 Semantics of <pin-connectivity-notify>

The <pin-connectivity-notify> element contains:

a) one <pegc-identifier> element as specified in clause 7.2.1;

b) one <pin-id> element as specified in clause 7.2.16;

c) one <pin-client-identifier> element as specified in clause 7.2.25;

d) one <event-type> element as specified in clause 7.2.35;

e) zero or one <anyExt> element containing elements defined in future releases;

f) zero, one or more elements from other namespaces defined in future releases; and

g) zero, one or more attributes defined in future releases.

6.2.5.63 Semantics of <pin-connectivity-notify-reject>

The <pin-connectivity-notify-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.64 Semantics of <pin-connectivity-update-request>

The <pin-connectivity-subscribe-request> element contains:

a) one <subscription-id> element as specified in clause 7.2.35;

b) one <security-credentials> element as specified in clause 7.2.6;

d) zero or one <notification-target-address> element as specified in clause 7.2.4;

e) zero or one <proposed-expiration-time> element as specified in clause 7.2.36;

f) zero or one <anyExt> element containing elements defined in future releases;

g) zero, one or more elements from other namespaces defined in future releases; and

h) zero, one or more attributes defined in future releases.

6.2.5.65 Semantics of <pin-connectivity-update-accept>

The <pin-connectivity-update-accept> element contains:

a) one <expiration-time> element as specified in clause 7.2.36;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.66 Semantics of <pin-connectivity-update-reject>

The <pin-connectivity-update-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.67 Semantics of <pin-connectivity-unsubscribe-request>

The <pin-connectivity-unsubscribe-request> element contains:

a) one <subscription-id> element as specified in clause 7.2.35;

b) one <security-credentials> element as specified in clause 7.2.6;

c) zero or one <anyExt> element containing elements defined in future releases;

d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.68 Semantics of <pin-connectivity-unsubscribe-reject>

The <pin-connectivity-unsubscribe-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.69 Semantics of <pin-communication-create-request>

The <pin-communication-create-request> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <ue-id> element as specified in clause 7.2.1;

c) one <security-credentials> element as specified in clause 7.2.6;

d) one <pin-traffic-descriptor> element as specified in clause 7.2.40;

e) one <pin-packet-filter> element as specified in clause 7.2.41;

f) zero or one <pin-requested-qos> element as specified in clause 7.2.42;

g) zero or one <ue-address> element as specified in clause 7.2.10;

h) zero or one <anyExt> element containing elements defined in future releases;

i) zero, one or more elements from other namespaces defined in future releases; and

j) zero, one or more attributes defined in future releases.

6.2.5.70 Semantics of <pin-communication-create-accept>

The <pin-communication-create-accept> element contains:

a) one <pin-accepted-qos> element as specified in clause 7.2.42;

b) one <pin-communication-flow-id> element as specified in clause 7.2.43;

c) zero or one <anyExt> element containing elements defined in future releases;

d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.71 Semantics of <pin-communication-create-reject>

The <pin-communication-create-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.72 Semantics of <pin-communication-update-request>

The <pin-communication-update-request> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <ue-id> element as specified in clause 7.2.1;

c) one <security-credentials> element as specified in clause 7.2.6;

d) one <pin-traffic-descriptor> element as specified in clause 7.2.40;

e) one <pin-packet-filter> element as specified in clause 7.2.41;

f) zero or one <pin-requested-qos> element as specified in clause 7.2.42;

g) zero or one <ue-address> element as specified in clause 7.2.10;

h) zero or one <anyExt> element containing elements defined in future releases;

i) zero, one or more elements from other namespaces defined in future releases; and

j) zero, one or more attributes defined in future releases.

6.2.5.73 Semantics of <pin-communication-update-accept>

The <pin-communication-update-accept> element contains:

a) one <pin-accepted-qos> element as specified in clause 7.2.41;

b) one <pin-communication-flow-id> element as specified in clause 7.2.43;

c) zero or one <anyExt> element containing elements defined in future releases;

d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.74 Semantics of <pin-communication-update-reject>

The <pin-communication-update-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.74 Semantics of <pin-communication-delete-request>

The <pin-communication-delete-request> element:

    a   one <pin-id> element as specified in clause 7.2.16;

    b) one <ue-id> element as specified in clause 7.2.1;

    c) one <security-credentials> element as specified in clause 7.2.6;

    d) one <pin-communication-flow-id> element as specified in clause 7.2.43;

    e) zero or one <anyExt> element containing elements defined in future releases;

    f) zero, one or more elements from other namespaces defined in future releases; and

    g) zero, one or more attributes defined in future releases.

6.2.5.75 Semantics of <pin-communication-delete-reject>

The <pin-communication-delete-reject> element contains:

    a) one <cause> element as specified in clause 7.2.5;

    b) zero or one <anyExt> element containing elements defined in future releases;

    c) zero, one or more elements from other namespaces defined in future releases; and

    d) zero, one or more attributes defined in future releases.

6.2.5.76 Semantics of <pin-as-discovery-request>

The <pin-as-discovery-request> element contains:

    a) shall include a <ue-id> element as specified in clause 7.2.1;

    b) shall include a <security-credentials> element as specified in clause 7.2.6;

    c) shall include a <service-id> element as specified in clause 7.2.27;

    d) zero or one <anyExt> element containing elements defined in future releases;

    e) zero, one or more elements from other namespaces defined in future releases; and

    f) zero, one or more attributes defined in future releases.

6.2.5.77 Semantics of <pin-as-discovery-accept>

The <pin-as-discovery-accept> element contains:

    a) one <as-connectivity-info> element as specified in clause 7.2.4;

    b) zero or one <anyExt> element containing elements defined in future releases;

    c) zero, one or more elements from other namespaces defined in future releases; and

    d) zero, one or more attributes defined in future releases.

6.2.5.78 Semantics of <pin-as-discovery-reject>

The <pin-as-discovery-reject> element contains:

    a) one <cause> element as specified in clause 7.2.5;

    b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.79   Semantics of <pin-service-switch-request>

The <pin-service-switch-request> element contains:

a) one <pin-client-identifier> element as specified in clause 7.2.25;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <pin-id> element as specified in clause 7.2.16;

d) one <application-client-identifier> element as specified in clause 7.2.27;

e) one <application-server-identifier> element as specified in clause 7.2.31;

f) one <application-session-identifier> element as specified in clause 7.2.44;

g) zero or one <application-traffic-descriptor> element as specified in clause 7.2.45;

h) zero or one <target-pin-client-identifier> element as specified in clause 7.2.25;

i) zero or one <anyExt> element containing elements defined in future releases;

j) zero, one or more elements from other namespaces defined in future releases; and

k) zero, one or more attributes defined in future releases.

6.2.5.80   Semantics of <pin-service-switch-accept>

The <pin-service-switch-accept> element contains:

a) one <target-pin-client-identifier> element as specified in clause 7.2.25;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.81   Semantics of <pin-service-switch-reject>

The <pin-service-switch-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.82   Semantics of <pin-configuration-service-switch-configure-request>

The <pin-configuration-service-switch-configure-request> element:

a) one <security-credentials> element as specified in clause 7.2.6;

b) one <pin-id> element as specified in clause 7.2.16;

c) one <application-client-identifier> element as specified in clause 7.2.27;

d) one <application-server-identifier> element as specified in clause 7.2.31;

e) one <application-session-identifier> element as specified in clause 7.2.44;

f) zero or one <application-traffic-descriptor> element as specified in clause 7.2.45;

g) zero or one <target-pin-client-identifier> element as specified in clause 7.2.25;

h) zero or one <anyExt> element containing elements defined in future releases;

i) zero, one or more elements from other namespaces defined in future releases; and

j) zero, one or more attributes defined in future releases.

6.2.5.83   Semantics of <pin-configuration-service-switch-configure-reject>

The <pin-configuration-service-switch-configure-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.84   Semantics of <pin-management-service-switch-configure-request>

The <pin-management-service-switch-configure-request> element contains:

a) one <pin-management-client-identifier> element as specified in clause 7.2.25;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <pin-id> element as specified in clause 7.2.16;

d) one <application-client-identifier> element as specified in clause 7.2.27;

e) one <application-server-identifier> element as specified in clause 7.2.31;

f) one <target-pin-client-identifier> element as specified in clause 7.2.25;

g) one <application-traffic-identifier> element as specified in clause 7.2.44;

h) zero or one <application-traffic-descriptor> element as specified in clause 7.2.45;

i) zero or one <pegc-id> element as specified in clause 7.2.1;

j) zero or one <anyExt> element containing elements defined in future releases;

k) zero, one or more elements from other namespaces defined in future releases; and

l) zero, one or more attributes defined in future releases.

6.2.5.85   Semantics of <pin-management-service-switch-configure-reject>

The <pin-management-service-switch-configure-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.86 Semantics of <pin-service-discovery-request>

The <pin-service-discovery-request> element contains:

a) one <pin-id> element as specified in clause 7.2.16;

b) one <ue-id> element as specified in clause 7.2.1;

c) one <security-credentials> element as specified in clause 7.2.6;

d) one <service-type> element as specified in clause 7.2.30;

e) one <requesting-pine-address> element as specified in clause 7.2.10;

f) zero or one <anyExt> element containing elements defined in future releases;

g) zero, one or more elements from other namespaces defined in future releases; and

h) zero, one or more attributes defined in future releases.

6.2.5.87 Semantics of <pin-service-discovery-accept>

The <pin-service-discovery-accept> element contains:

a) one <target-pine-id> element as specified in clause 7.2.25;

b) one <target-pine-address> element as specified in clause 7.2.10;

c) zero or one <anyExt> element containing elements defined in future releases;

d) zero, one or more elements from other namespaces defined in future releases; and

e) zero, one or more attributes defined in future releases.

6.2.5.88 Semantics of <pin-service-discovery-reject>

The <pin-service-discovery-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.89 Semantics of <pin-management-pegc-service-continuity-request>

The <pin-management-pegc-service-continuity-request> element contains:

a) one <pin-client-identifier> element as specified in clause 7.2.25;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <pin-id> element as specified in clause 7.2.16;

d) one <pine-id> element as specified in clause 7.2.1;

e) one <source-pin-gateway-client-identifier> element as specified in clause 7.2.25;

f) one <application-client-identifier> element as specified in clause 7.2.27;

g) one <application-server-identifier> element as specified in clause 7.2.31;

h) one <application-session-identifier> element as specified in clause 7.2.44;

i) zero or one <application-session-descriptor> element as specified in clause 7.2.45;

j) zero or one <anyExt> element containing elements defined in future releases;

k) zero, one or more elements from other namespaces defined in future releases; and

l) zero, one or more attributes defined in future releases.

6.2.5.90 Semantics of <pin-management-pegc-service-continuity-accept>

The <pin-management-pegc-service-continuity-accept> element contains:

a) one <target-pin-gateway-client-identifier> element as specified in clause 7.2.25;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.91 Semantics of <pin-management-pegc-service-continuity-reject>

The <pin-management-pegc-service-continuity-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.92 Semantics of <pin-management-pegc-configuration-request>

The <pin-management-pegc-configuration-request> element contains:

a) one <pin-client-identifier> element as specified in clause 7.2.25;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <pin-id> element as specified in clause 7.2.16;

d) one <pine-id> element as specified in clause 7.2.1;

e) one <application-client-identifier> element as specified in clause 7.2.27;

f) one <application-server-identifier> element as specified in clause 7.2.31;

g) one <application-session-identifier> element as specified in clause 7.2.44;

h) zero or one <application-session-descriptor> element as specified in clause 7.2.45;

i) zero or one <anyExt> element containing elements defined in future releases;

j) zero, one or more elements from other namespaces defined in future releases; and

k) zero, one or more attributes defined in future releases.

6.2.5.93 Semantics of <pin-management-pegc-configuration-accept>

The <pin-management-pegc-configuration-accept> element contains:

a) one <pegc-connectivity-information> element as specified in clause 7.2.4;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.94 Semantics of <pin-management-pegc-configuration-reject>

The <pin-management-pegc-configuration-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.95 Semantics of <pin-configuration-service-continuity-update-request>

The <pin-configuration-service-continuity-update-request> element:

a) one <pin-client-identifier> element as specified in clause 7.2.25;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <pin-id> element as specified in clause 7.2.16;

d) one <pine-id> element as specified in clause 7.2.1;

e) one <source-pin-gateway-client-identifier> element as specified in clause 7.2.25;

f) one <target-pin-gateway-client-identifier> element as specified in clause 7.2.25;

g) one <application-client-identifier> element as specified in clause 7.2.27;

h) one <application-server-identifier> element as specified in clause 7.2.31;

i) one <application-session-identifier> element as specified in clause 7.2.44;

j) zero or one <application-session-descriptor> element as specified in clause 7.2.45;

k) zero or one <anyExt> element containing elements defined in future releases;

l) zero, one or more elements from other namespaces defined in future releases; and

m) zero, one or more attributes defined in future releases.

6.2.5.96 Semantics of <pin-configuration-service-continuity-update-accept>

The <pin-configuration-service-continuity-update-accept> element contains:

a) one <service-continuity-policy-information> element as specified in clause 7.2.46;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.97 Semantics of <pin-configuration-service-continuity-update-reject>

The <pin-configuration-service-continuity-update-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.98 Semantics of <pin-management-pegc-discovery-request>

The <pin-management-pegc-discovery-request> element contains:

a) one <pin-client-identifier> element as specified in clause 7.2.25;

b) one <security-credentials> element as specified in clause 7.2.6;

c) one <pin-id> element as specified in clause 7.2.16;

d) one <pine-id> element as specified in clause 7.2.1;

e) one <pegc-information-list> element as specified in clause 7.2.19;

f) zero or one <anyExt> element containing elements defined in future releases;

g) zero, one or more elements from other namespaces defined in future releases; and

h) zero, one or more attributes defined in future releases.

6.2.5.99 Semantics of <pin-management-pegc-discovery-accept>

The <pin-management-pegc-discovery-accept> element contains:

a) one <pegc-information-list> element as specified in clause 7.2.19;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.100 Semantics of <pin-management-pegc-discovery-reject>

The <pin-management-pegc-discovery-reject> element contains:

a) one <cause> element as specified in clause 7.2.5;

b) zero or one <anyExt> element containing elements defined in future releases;

c) zero, one or more elements from other namespaces defined in future releases; and

d) zero, one or more attributes defined in future releases.

6.2.5.101 Semantics of <pine-authorization-request>

The <pine-authorization-request> element contains:

a) one <ue-id> element as specified in clause 7.2.1;

b) one <pin-id> element as specified in clause 7.2.16;

c) zero or one <ip-address> element as specified in clause 7.2.10;

d) zero or one <anyExt> element containing elements defined in future releases;

e) zero, one or more elements from other namespaces defined in future releases; and

f) zero, one or more attributes defined in future releases.

6.2.5.102 Semantics of <pine-authorization-accept>

The <pine-authorization-accept> element contains:

    a) one <security-credentials> element as specified in clause 7.2.6;

    b) zero or one <anyExt> element containing elements defined in future releases;

    c) zero, one or more elements from other namespaces defined in future releases; and

    d) zero, one or more attributes defined in future releases.

6.2.5.103 Semantics of <pine-authorization-reject>

The <pine-authorization-reject> element contains:

    a) one <cause> element as specified in clause 7.2.5;

    b) zero or one <anyExt> element containing elements defined in future releases;

    c) zero, one or more elements from other namespaces defined in future releases; and

    d) zero, one or more attributes defined in future releases.

6.2.6 IANA registration

<MCC name>

Your Email Address:

<MCC email address>

Media Type Name:

Application

Subtype name:

application/vnd.3gpp.pinapp-info+xml

Required parameters:

None

Optional parameters:

"charset" the parameter has identical semantics to the charset parameter of the "application/xml" media type as specified in section 9.1 of IETF RFC 7303.

Encoding considerations:

binary.

Security considerations:

Same as general security considerations for application/xml media type as specified in section 9.1 of IETF RFC 7303. In addition, this media type provides a format for exchanging information in SIP or in HTTP, so the security considerations from IETF RFC 3261 apply while exchanging information in SIP and the security considerations from IETF RFC 9110 apply while exchanging information in HTTP.

The information transported in this media type does not include active or executable content.

Mechanisms for privacy and integrity protection of protocol parameters exist. Those mechanisms as well as authentication and further security mechanisms are described in 3GPP TS 24.229.

This media type does not include provisions for directives that institute actions on a recipient's files or other resources.

This media type does not include provisions for directives that institute actions that, while not directly harmful to the recipient, may result in disclosure of information that either facilitates a subsequent attack or else violates a recipient's privacy in any way.

This media type does not employ compression.

Interoperability considerations:

Same as general interoperability considerations for application/xml media type as specified in section 9.1 of IETF RFC 7303. Any unknown XML elements and any unknown XML attributes are to be ignored by recipient of the MIME body.

Published specification:

3GPP TS 24.583 "Application layer support for Personal IoT Network (PINAPP); Stage 3", available via https://www.3gpp.org/ftp/Specs/archive/24_series/24.583.

Applications which use this media type:

Application layer support for Personal IoT Network (PINAPP) as described in the published specification.

Fragment identifier considerations:

The handling in section 5 of IETF RFC 7303 applies.

Restrictions on usage:

None

Provisional registration? (standards tree only):

N/A

Additional information:

1. Deprecated alias names for this type: none

2. Magic number(s): none

3. File extension(s): none

4. Macintosh File Type Code(s): none

5. Object Identifier(s) or OID(s): none

Intended usage:

Common

Person to contact for further information:

- Name: <MCC name>

- Email: <MCC email address>

- Author/Change controller:

    i) Author: 3GPP CT1 Working Group/3GPP_TSG_CT_WG1@LIST.ETSI.ORG

    ii) Change controller: <MCC name>/<MCC email address>

7 Parameters in PIN application layer procedures.

7.1 Data types format in XML schema

To exchange structured information over the transport protocol, XML text format/notation is introduced.

The corresponding XML data types for the data types used in ProSe messages are provided in table 11.4.1.1.

Table 11.4.1.1: Primitive or derived types for PINAPP parameter type

PINAPP parameter type	Type in XML schema
Integer	xs:integer
String	xs:string
Boolean	xs:boolean
Binary	xs:hexBinary
Bit string	xs:hexBinary
Time	xs:dateTime

For complex data types described in clause 7.2, an XML "complexType" can be used.

Message construction shall be compliant with W3C REC-xmlschema-2-
20041028: "XML Schema Part 2: Datatypes" [12].

7.2 Parameter format

7.2.1 UE identity

This parameter is used to carry the UE identity contained in a PINAPP protocol message. The format of the UE identity is encoded as:

   a) if GPSI is included: same as GPSI (see clause 28.8 of 3GPP TS 23.003 [7]); or

   b) if identity token is included: a string with a variable length.

7.2.2 MAC address

This parameter is used to carry the MAC address contained in a PINAPP protocol message. The format of the MAC address contains the binary representation of the MAC address of the PIN peer, starting with the least significant bit of the first octet of the MAC address.

7.2.3 NCGI

This parameter is used to indicate the NG-RAN Cell Global ID (NCGI) of the serving cell where the PIN peer is camping. It is a length of 512 long binary number as shown in figure 7.2.3-1 and table 7.2.3-1.

8	7	6	5	4	3	2	1	
MCC digit 2				MCC digit 1				octet 1
MNC digit 3				MCC digit 3				octet 2
MNC digit 2				MNC digit 1				octet 3
NCI digit 2				NCI digit 1				octet 4
NCI digit 4				NCI digit 3				octet 5
NCI digit 6				NCI digit 5				octet 6
NCI digit 8				NCI digit 7				octet 7
Spare				NCI digit 9				octet 8

Figure 7.2.3.1: NCGI parameter

Table 7.2.3.1: NCGI parameter

MCC, Mobile country code The MCC field is coded as in ITU-T Rec. E.212 [6], Annex A. MNC, Mobile network code The coding of this field is the responsibility of each administration but BCD coding shall be used. If MNC consists of 2 digits, MNC is coded as "1111". NCI, NR cell identity The NCI field is coded as in 3GPP TS 23.003 [7]. Spare The Spare field is coded as zeros.

7.2.4   Endpoint information

This parameter is used to carry the endpoint information contained in a PINAPP protocol message. The format of the endpoint information is coded as one of the followings:

   a) URI;

   b) FQDN;

   c) IPv4 address; and

   d) IPv6 address.

The format of FQDN contains a sequence of one octet FQDN length field and a FQDN value of variable size. The FQDN value field shall be encoded as defined in clause 28.3.2.1 of 3GPP TS 23.003 [7].

The format of IPv4 address structure is defined in IETF RFC 791 [8].

The format of IPv6 address structure is defined in IETF RFC 4291 [9].

The format of URI structure is defined in IETF RFC 3986 [10].

7.2.5   PINAPP protocol cause value

This parameter is used to indicate the particular reason why a PINAPP protocol message is rejected either by a PIN peer or PAE-S. It is an integer in the 0-255 range encoded in table 7.2.5.1.

Table 7.2.5.1: PINAPP protocol cause value

0	Protocol error, unspecified
1	Operation not allowed
2	Requested information not available
3	Authorization failure
4	Maximum number of PINE is reached
5	Resource not sufficient
6	Maximum number of service is reached
7	Permanently denied (NOTE)
8-255	Unused. Any other value received by the entity shall be treated as 0, "protocol error, unspecified".
NOTE:	This value can be used to mitigate repeated attempts to perform PIN operations (e.g. mitigate a flood of messages).

7.2.6   Security credentials

This parameter is used to indicate the security credentials that is used in PIN for authorization (see clause 8.10 of 3GPP TS 23.542 [2]). It is a string with a maximum length of 65535 bytes.

7.2.7 Port number

This parameter is used to indicate the port number of a PIN peer. It is an integer in the 0-65535 range.

7.2.8 Vendor name

This parameter is used to indicate the vendor name of a PIN peer. The format of the vendor name is a UTF8-encoded string in the 0-255 range.

7.2.9 Device description

This parameter is used to indicate the device description of a PIN peer. The format of the device description is a UTF8-encoded string in the 0-65535 range.

7.2.10 IP Address

This parameter is used to carry the IP address of a PIN peer.

The format of IPv4 address structure is defined in IETF RFC 791 [8].

The format of IPv6 address structure is defined in IETF RFC 4291 [9].

7.2.11 PINE capability

This parameter is used to indicate the capability of a PIN peer to act as a PGAE-C or PMAE-C. It is an integer in the 0-3 range encoded as table 7.2.11.1.

Table 7.2.11.1: PINE capability

0	Only PEGC
1	Only PEMC
2	Both PEGC and PEMC
3	Unused

7.2.12 Maximum number of PINEs

This parameter is used to indicate the maximum number of the PINEs can be managed simultaneously. The maximum number of PINEs is an integer in the 1-255 range.

7.2.13 PIN client profile

This parameter is used to indicate the PIN client profile of a PIN peer. It contains one PIN ID as specified in clause 7.2.16, PIN client ID as specified in clause 7.2.25, zero or one UE identity as specified in clause 7.2.1, zero or one device description as specified in clause 7.2.9, zero or one role in the PIN as specified in table 7.2.13.1, one PINE capability as specified in clause 7.2.11, one visibility indication as specified in table 7.2.13.2, zero or one application info as specified in clause 7.2.26, one access type as specified in table 7.2.13.3, zero or one IP address as specified in clause 7.2.10, one port number as specified in clause 7.2.7, zero or one required service info, zero or one supported service info:

a) Role in the PIN: this parameter is used to indicate the role of a PIN peer in a PIN. It is an integer in the 0-3 range encoded in table 7.2.26.1.

Table 7.2.13.1: Role in the PIN

0	Only PINE
1	Only PEGC
2	Only PEMC
3	Both PEMC and PEGC

b) visibility indication: this parameter is used to indicate the visibility of a PIN peer in a PIN. It is an integer in the 0-3 range encoded in table 7.2.13.2.

Table 7.2.13.2: Visibility indication

0	Only discoverable within the PIN
1	Only discoverable outside the PIN
2	Discoverable both within and outside the PIN
3	Not discoverable either within or outside the PIN

c) access type: this parameter is used to indicate the access type of a PIN peer in a PIN. It is an integer in the 0-7 range encoded in table 7.2.13.3.

Table 7.2.13.3: Access type

0	Only direct type via non-3GPP supported (e.g. WiFi, BlueTooth)
1	Only direct type via 3GPP supporetd (e.g. PC5)
2	Both direct type via non-3GPP and 3GPP supported
3	Only indirect type via PEGC supported
4	Both direct type via non-3GPP and indirect type via PEGC supported
5	Both direct type via 3GPP and indirect type via PEGC supported
6	All direct and indirect types supported
7	Unused

d) required service info: this parameter is used to indicate the required service info of a PIN peer in a PIN. It contains an integer in the 0-255 range to indicate the number of service identifiers, and a sequence of service identifiers as specified in clause 7.2.27.

e) supported service info: this parameter is used to indicate the supported service info of a PIN peer in a PIN. It contains an integer in the 0-255 range to indicate the number of service identifiers, and a sequence of service identifiers as specified in clause 7.2.27.

7.2.14   PINE list

This parameter is used to indicate a list of PINE identifiers. It contains one number of PINEs, and PINE list content:

a) number of PINEs: this parameter is used to indicate the number of PINEs in the list. It is an integer in the 0-255 range.

b) PINE list content: this parameter is used to indicate the content of PINE list. The PINE list content contains at least one PINE identifiers coded as UE identity as specified in clause 7.2.1 or PIN client ID as specified in clause 7.2.25, and zero or one address list as specified in clause 7.2.20.

7.2.15   PEMC list

This parameter is used to indicate a list of PEMC identifiers. It contains one number of PEMCs, and PEMC list content:

a) number of PEMCs: this parameter is used to indicate the number of PEMCs in the list. It is an integer in the 0-255 range.

b) PEMC list content: this parameter is used to indicate the content of PEMC list. The PEMC list content contains at least one PEMC identifiers coded as UE identity as specified in clause 7.2.1 or PIN client ID as specified in clause 7.2.25, and zero or one address list as specified in clause 7.2.20, and zero or one role indication as table 7.2.15.1 for each PEMC identifier if contained in PIN profile as specified in clause 7.2.28:

1) role indication: this parameter is used to indicate the state of a PIN. It is an integer in the 0-3 range encoded coded as follows:

Table 7.2.15.1: Role indication

0	Primary PEMC
1	Secondary PEMC
2-3	Unused

7.2.16 PIN ID

This parameter is used to indicate the identifier of a PIN (see clause 7.2.2 of 3GPP TS 23.542 [2]). It is a string with variable length. Its coding shall comply with the UE policy part type as defined in clause 5.2 of 3GPP TS 24.526 [15].

7.2.17 PIN valid timer

This parameter is used to indicate the value of validity timer for a PIN. It is an integer in the 1-525600 range representing the timer value in unit of minutes.

7.2.18 PIN heartbeat timer

This parameter is used to indicate the value of heartbeat timer for a PIN. It is an integer in the 1-525600 range representing the timer value in unit of minutes.

7.2.19 PEGC list

This parameter is used to indicate a list of PEGC identifiers. It contains one number of PEGCs, and PEGC list content:

a) number of PEGCs: this parameter is used to indicate the number of PEGCs in the list. It is an integer in the 0-255 range.

b) PEGC list content: this parameter is used to indicate the content of PEGC list. the PEGC list content contains at least one PEGC identifiers coded as UE identity as specified in clause 7.2.1 or PIN client ID as specified in clause 7.2.25, and zero or one address list as specified in clause 7.2.20.

7.2.20 Address list

This parameter is used to indicate a list of address for the included PIN peers. It contains one number of address, and one address list content:

a) number of address: this parameter is used to indicate the number of address in the list. It is an integer in the 0-255 range.

b) address list content: this parameter is used to indicate the content of address list. The list content contains at least one address coded as IP address as specified in clause 7.2.10 or port number as specified in clause 7.2.7.

7.2.21 Access control information

This parameter is used to indicate the access control information of a PGAE-C. It contains one username, one account info, one SSID info, one BSSID info:

a) user name: this parameter is used to indicate the username of a PIN peer. It is a string in a range of 1-255;

b) account info: this parameter is used to indicate the account of a PIN peer. It is a string in a range of 1-255;

c) SSID info: this parameter is used to indicate the SSID of a PIN; and

d) BSSID info: this parameter is used to indicate the BSSID of a PIN.

The format of SSID and BSSID is defined in IEEE Std 802.11 [13].

7.2.22 PIN member indication

This parameter is used to indicate the whether a device is added as a PIN peer in a PIN. It is an integer in the 0-1 range encoded as specified in table 7.2.22.1.

Table 7.2.22.1: PIN member indication

0	PIN member included
1	Unused

7.2.23 PEMC role indication

This parameter is used to indicate the whether a device is assigned as a PEMC during registration. It is an integer in the 0-1 range encoded as table 7.2.23.1.

Table 7.2.23.1: PEMC role indication

0	PEMC assigned
1	Unused

7.2.24 PEGC role indication

This parameter is used to indicate the whether a device is assigned as a PEGC during registration. It is an integer in the 0-1 range encoded as table 7.2.24.1.

Table 7.2.24.1: PEGC role indication

0	PEGC assigned
1	Unused

7.2.25 PIN client ID

This parameter is a globally unique value that identifies a PIN client. It is a string in the 1-255 range.

7.2.26 Application info

This parameter is used to indicate the application info. It contains at least one of the application identity, application schedule, and application KPIs:

   a) application identity: this parameter is used to indicate the identity of an application. It contains a string in 0-255 range.

   b) application schedule: this parameter is used to indicate the schedule of an application. It contains a sequence of a Starttime field and a Stoptime field. The Starttime field is represented by the number of seconds since 00:00:00 on 1 January 1970 and is encoded as the 64-bit NTP timestamp format defined in IETF RFC 5905 [14], where binary encoding of the integer part is in the first 32 bits and binary encoding of the fraction part in the last 32 bits. The encoding of the Stoptime field is the same as the Starttime field.

   c) application KPIs: this parameter is used to indicate the KPIs of an application. It contains at least one of the PIN bandwidth, PIN request rate, and PIN response time. The PIN bandwidth contains a string in 0-255 range in unit of MHz, the PIN request rate contains a string in 0-255 range in unit of bps, and the PIN response time contains an integer in the 1-65025 range representing the timer value in unit of minutes.

7.2.27 Service identifier

This parameter is used to indicate the service identifier of a service that the PIN peer is requesting to or can be provided by the PIN peer. The service identifier is a string in 0-255 range.

7.2.28   PIN profile

This parameter is used to indicate the PIN profile of a PIN. It contains one PIN ID as specified in clause 7.2.16, one PIN description as specified in clause 7.2.29, one PIN duration as specified in clause 7.2.17, one PEMC list as specified in clause 7.2.15, one PEGC list as specified in clause 7.2.19, one PINE list as specified in clause 7.2.14, one maximum number of PINEs as specified in clause 7.2.12 for PMAE-C and PAE-S, one PIN service info as specified in clause 7.2.30 for PMAE-C and PAE-S, one PAE-S identifier as specified in clause 7.2.31 for PMAE-C and PGAE-C, one PAE-S endpoint information as specified in clause 7.2.4 for PMAE-C and PGAE-C.

7.2.29   PIN description

This parameter is used to indicate the description of a PIN. The format of the PIN description is a UTF8-encoded string in the 0-65535 range.

7.2.30   PIN service info

This parameter is used to indicate the service info of a PIN. It contains one PIN service provider identifier, one PIN service type, and one PIN service feature:

   a) PIN service provider identifier: this parameter is used to indicate the identifier of a PIN service provider. It is a string in the 1-255 range;

   b) PIN service type: this parameter is used to indicate the type of a PIN service. It is an integer in the 0-15 range encoded coded as table 7.2.30.1:

Table 7.2.30.1: PIN service type

0	Video service
1	Music service
2	Game service
3	Streaming media service
4	Other service
5-15	Unused

   c) PIN service feature: this parameter is used to indicate the service description of a PIN. The format of PIN service feature is a UTF8-encoded string in the 0-65535 range.

7.2.31   PAE-S identifier

This parameter is a globally unique value that identifies a PAE-S. It is a string in the 1-255 range.

7.2.32   Representation indication

This parameter is used to indicate whether a registration is represented or not. It is a Boolean value coded as follows:

   1) false: not represented; or

   2) true: represented.

7.2.33   Authorization type

This parameter is used to indicate the authorization type that triggers PIN modification procedure. It is an integer in the 0-3 range encoded as table 7.2.33.1.

Table 7.2.33.1: Authorization type

0	PMAE-C role change
1	PGAE-C role change
2-3	Unused

7.2.34 Modification type

This parameter is used to indicate the modification type that the PIN modification procedure is used for. It is an integer in the 0-3 range encoded as table 7.2.34.1.

Table 7.2.34.1: Modification type

0	PEMC assignment
1	PEGC assignment
2-3	Unused

7.2.35 Events list

This parameter is used to indicate:

    a) the list of events that a requestor subscribes or unsubscribes;

    b) the list of events that a processer accepts or rejects; or

    c) the list of events to be notified.

It contains one number of events and at least one event IDs:

    a) number of events: this parameter is used to indicate the number of the events. It is an integer in 0-255 range;

    b) event ID: this parameter is used to indicate the event ID of the events. It is an integer in 0-15 range as table 7.2.35.1.

Table 7.2.35.1: Event ID

0	PINE management
1	PIN modification
2	PIN profiles update
3	PIN status update
4	PIN connectivity
5-15	Unused

7.2.36 Expected time

This parameter is used to indicate the value of the expected time. It is an integer in the 1-525600 range representing the timer value in unit of minutes.

7.2.37 PINE management type

This parameter is used to indicate the PINE management type for PIN status notify. It is an integer in the 0-7 range encoded as table 7.2.37.1.

Table 7.2.37.1: PINE management type

0	PINE joins into a PIN
1	PINE leaves a PIN
2	PINE is removed from a PIN
3-7	Unused

7.2.38 Dynamic PIN profile

This parameter is used to indicate the dynamic PIN profile of a PIN. It contains one PIN ID as specified in clause 7.2.16, one PIN state, one current PEMC list as specified in clause 7.2.15, one PEGC list as specified in clause 7.2.19, one PINE info list:

a) PIN state: this parameter is used to indicate the state of a PIN. It is a Boolean value coded as follows:

1) false: the PIN is deactivated; or

2) true: the PIN is activated.

b) PINE info list: this parameter is used to indicate the information of the PEAE-Cs in a PIN. It contains one PINE list as specified in clause 7.2.14, one endpoint information as specified in clause 7.2.4, one PIN service info as specified in clause 7.2.30, one internal IP address as specified in clause 7.2.10, one application info as specified in clause 7.2.26, one list of default PEGC authorized to service the PEAE-C as specified in clause 7.2.19, one backup PEGCs authorized to service the PEAE-C as specified in clause 7.2.19, and one PIN heartbeat timer as specified in clause 7.2.18.

7.2.39 PIN status type

This parameter is used to indicate the PIN status type for PIN status notify. It is a Boolean value coded as follows:

1) false: the PIN is deactivated; or

2) true: the PIN is activated.

7.2.40 PIN traffic descriptor

This parameter is used to indicate the traffic descriptor for PIN communication. It contains one PIN traffic descriptor type and one PIN traffic descriptor content:

a) PIN traffic descriptor type: this parameter is used to indicate the type of PIN traffic descriptor. It is coded as Traffic descriptor component type identifier in Table 5.2.1 of 3GPP TS 24.526 [15].

b) PIN traffic descriptor content: this parameter is used to indicate the content of PIN traffic descriptor. It is coded as traffic descriptor component value field in Table 5.2.1 of 3GPP TS 24.526 [15].

7.2.41 PIN packet filter

This parameter is used to indicate the packet filter for PIN communication. It contains one packet filter direction, one packet filter identifier, one length of the packet filter contents, and one packet filter contents:

a) packet filter direction: this parameter is used to indicate the direction of packet filter. It is an integer in the 0-3 range encoded as table 7.2.41.1.

Table 7.2.41.1: Packet filter direction

0	Downlink only
1	Uplink only
2	Bidirectional
3	Unused

b) packet filter identifier: this parameter is used to indicate the identifier of packet filter. It is a string with a maximum length of 15 bytes.

c) length of the packet filter contents: this parameter is used to indicate the identifier of packet filter. It is an integer in the 0-65535 range.

d) packet filter contents: this parameter is used to indicate the contents of packet filter. It is a string coded as packet filter contents field in Table 9.11.4.13.1 of 3GPP TS 24.501 [11].

7.2.42 PIN QoS

This parameter is used to indicate the QoS for PIN communication. It is coded as 5QI in Table 9.11.4.12.1 of 3GPP TS 24.501 [11].

7.2.43   PIN communication flow ID

This parameter is used to uniquely identity a communication flow for PIN communication. It is a string with a maximum length of 255 bytes.

7.2.44   PIN application session ID

This parameter is used to uniquely identity an application session for PIN communication. It is a string with a maximum length of 255 bytes.

7.2.45   PIN application session descriptor

This parameter is used to indicate the IP 4 tuple of an application session for PIN communication. It contains one PIN application session descriptor length and one PIN application session descriptor content:

   a) PIN application session descriptor length: this parameter is used to indicate the length of a PIN application session descriptor. It is an Integer in the 1-255 range.

   b) PIN application session descriptor content: this parameter is used to indicate the content of a PIN application session descriptor. The PIN application session descriptor content is a string with a maximum length of 65535 bytes. Further format of PIN application session descriptor content is left to implementation (e.g. IP 4 tuple).

7.2.46   Service continuity policy

This parameter is used to indicate the service continuity policy information about the service continuity for a PIN peer. It contains one service continuity policy length and one service continuity policy content:

   a) service continuity policy length: this parameter is used to indicate the length of the service continuity policy content. It is an integer in the 1-65535 range.

b) service continuity policy content: this parameter is used to indicate the content of service continuity policy. It is a string with a maximum length of 65535 bytes and further format of service continuity policy content is left to implementation.

Annex A: Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2023-02	CT1#140	C1-230988				Draft TS skeleton provided by the rapporteur.	0.0.0
2023-04	CT1#141-e					Inclusion of C1-232915, C1-232916, C1-232917, C1-232918, C1-232919, C1-232920, C1-232921, C1-232922, C1-232923 Correction from the rapporteur.	0.1.0
2023-05	CT1#142					Inclusion of C1-233481, C1-234012, C1-234013, C1-234014, C1-234015, C1-234016, C1-234017, C1-234018, C1-234019, C1-234020, C1-234021, C1-234022, C1-234023, C1-234024, C1-234025. Correction from the rapporteur.	0.2.0
2023-08	CT1#143					Inclusion of C1-236111, C1-236112, C1-236113, C1-236114, C1-236115, C1-236116, C1-236117, C1-236118, C1-236119, C1-236320, C1-236321, C1-236323, C1-236324, C1-236326, C1-236369, C1-236370. Correction from the rapporteur.	0.3.0
2023-10	CT1#144					Inclusion of C1-237051, C1-237054, C1-237055, C1-237059, C1-237061, C1-237062, C1-237063, C1-237115, C1-238153, C1-238154, C1-238155, C1-238156, C1-238157, C1-238158, C1-238159, C1-238160. Correction from the rapporteur.	0.4.0
2023-11	CT1#145					Inclusion of C1-239095, C1-239096, C1-239100, C1-239101, C1-239102, C1-239103, C1-239462, C1-239463, C1-239465, C1-239466, C1-239468, C1-239469, C1-239470, C1-239471, C1-239574, C1-239575, C1-239576. Correction from the rapporteur.	0.5.0
2023-12	CT#102					Version 1.0.0 created for presentation to TSG CT#102 for information.	1.0.0
2024-03	CT1#147					Inclusion of C1-240745, C1-240746, C1-240749, C1-240752, C1-240753, C1-240768, C1-241560, C1-241561, C1-241562, C1-241563. Correction from the rapporteur. Version 2.0.0 created for presentation to TSG CT#103 for approval.	2.0.0
2024-03	CT#103					Approved in CT#103	18.0.0
2024-06	CT#104	CP-241191	0002	-	F	Update to PIN authorization to Remove description and name	18.1.0
2024-06	CT#104	CP-241191	0001	1	F	Correction on PIN peer may invoke CAPIF	18.1.0
2024-06	CT#104	CP-241191	0003	1	F	Update to PIN configuration request and response	18.1.0
2024-06	CT#104	CP-241191	0006	1	F	Resolve EN on security credentials	18.1.0
2024-06	CT#104	CP-241191	0004	1	F	Resolve EN on IANA registration	18.1.0
2024-06	CT#104	CP-241191	0005	2	F	Resolve EN on UE identity	18.1.0
2024-06	CT#104	CP-241191	0008	-	F	Alignment of term direct connection	18.1.0
2024-06	CT#104	CP-241191	0007	3	F	Clarification on PINAPP protocol cause value	18.1.0
2024-06	CT#104	CP-241191	0009	2	F	EN clean-up on credential provision procedure	18.1.0

History

Document history		
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