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3RD GENERATION
PARTNERSHIP
PROJECT 2
"3GPP2"

Network Presence

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NETWORK PRESENCE

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FOREWORD

This Technical Specification has been produced by the 3rd Generation Partnership Project 2 (3GPP2).

REVISION HISTORY

Revision	Content Changes	Date
1.0	Publication version	February 2008

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1 **1 Introduction**

The purpose of this section is to introduce the readers to the contents of the whole document.

1.1 **1.1 Scope**

The scope statement defines the objectives to be accomplished by the document that is being produced.

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2 References

2.1 Normative References

- [1] Void.
- [2] Void.
- [3] 3GPP2 X.S0027-003, "Presence Service; Functional Models, Information flows, and Protocol Details"
- [4] 3GPP2 X.S0011-D: "cdma2000 Wireless IP Network Standard".
- [5] RFC 3903 (October 2004): "Session Initiation Protocol (SIP) Extension for Event State Publication".
- [6] draft-ietf-simple-partial-pidf-format-08 (November 2006): "Presence Information Data format (PIDF) Extension for Partial Presence"
Editor's Note: The above document is a work in progress and should not be referenced unless and until it is approved and published. Until such time as this Editor's Note is removed, the inclusion of the above document is for informational purposes only.
- [7] RFC 3863 (August 2004): "Common Presence and Instant Messaging (CPIM) Presence Information Data Format"
- [8] draft-lonnfors-simple-partial-publish-06 (February 2007): "Partial Publication of Presence Information".
Editor's Note: The above document is a work in progress and should not be referenced unless and until it is approved and published. Until such time as this Editor's Note is removed, the inclusion of the above document is for informational purposes only.
- [9] RFC 4479 (July 2006): "A Data Model for Presence".
- [10] RFC 2865 (June 2000), Remote Authentication Dial In User Service (RADIUS).
- [11] RFC 2866 (June 2000), RADIUS Accounting.
- [12] RFC 3162 (August 2001), RADIUS and IPv6.

2.2 Informative References

- [13] 3GPP2 S.R0037: "IP Network Architecture Model for cdma2000 Spread Spectrum Systems", Version 3.0, September 2003
- [14] 3GPP2 S.R0062: "Presence service; Stage 1" Version 1.0, October 2002

3 Definitions, Symbols and Abbreviations

3.1 Definitions

For the purposes of the present document the following definitions apply:

Network Presence: information related to the network state of the presentity.

Presence Network Agent: network entity that collects and sends network related presence information on behalf of the presentity to a Presence Server

Presence Server: network entity responsible for managing presence information on behalf of a presence entity

Presence User Agent: a terminal or network located element that collects and sends user related presence information to a Presence Server on behalf of a Principal.

Presentity: A presentity combines devices, services and person information for a complete picture of a user's presence status on the network.

3.2 Symbols and Abbreviations

For the purposes of the present document the following definitions apply:

AAA	Authentication, Authorization, and Accounting
EPA	Event Publication Agent
ESN	Electronic Serial Number
FQDN	Fully Qualified Domain Name
HA	Home Agent
HAAA	Home AAA
HPLMN	Home Public Land Mobile Network
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
IRM	International Roaming MIN
MEID	Mobile Station Equipment Identifier
MIN	Mobile Identification Number
MIP	Mobile IP
MS	Mobile Station
MSID	Mobile Station Identifier
NAI	Network Access Identifier
PDSN	Packet Data Serving Node

PNA	Presence Network Agent
RADIUS	Remote Authentication Dial In User Service
VPLMN	Visited Public Land Mobile Network
VSA	Vendor Specific Attribute
XML	eXtensible Markup Language

4 Functional Overview

4.1 Objectives

4.2 Functional Capabilities of Network Presence

4.2.1 General

The Presence Network Agent collects the presence information on behalf of the presentity from network elements within the HPLMN and VPLMN, associates the presence information with the appropriate presentity, and publishes the presence information to the Presence Server across the Pen reference point.

The Presence Server obtains the IP-network presence information of the mobile station from the Home AAA (HAAA) via the Presence Network Agent (see Figure 1). The IP-network presence information, among other things, indicates whether the user's mobile station is connected to the IP network and the IP addresses that may be used to contact the mobile station. These IP addresses shall be globally routable. The Presence Server, Presence Network Agent, and HAAA are located in the mobile user's home network.

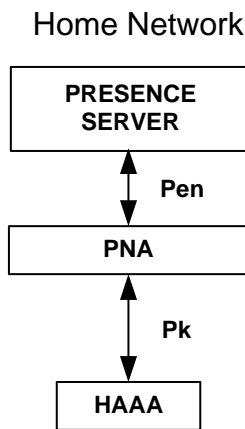


Figure 1 Network Presence

4.2.2 Role of Presence Network Agent

The function of the Presence Network Agent is to make IP-network presence information of the presentity (e.g. mobile user) available to the Presence Server. The Presence Network Agent will receive the IP-network presence information, pertaining to the mobile station identified with its NAI, from the HAAA over the Pk interface. When transferring the IP-network presence information across the Pk interface, the HAAA will act as a client while the

Presence Network Agent will act as a server. The HAAA will convey the IP-network presence information to the Presence Network Agent in the update request message.

When the Presence Network Agent receives the update request message containing the mobile station's IP addresses that have been connected to or disconnected from the IP network, the Presence Network Agent will convert this information into a XML document [see Annex A]. When creating the XML document, the Presence Network Agent may also use local policy or the locally stored information pertaining to the respective mobile station. For example, the Presence Network Agent may allocate different priorities to the Simple IPv4, Simple IPv6, Mobile IPv4, or Mobile IPv6 addresses that are currently allocated to the mobile station. Upon creating the XML document, the Presence Network Agent will act as an Event Publication Agent (EPA) and publish this information to the Presence Server over the Pen interface in accordance with [5]. The Presence Network Agent will maintain the IP-network presence state of the mobile station, i.e. the list of all IP addresses that the mobile station has currently connected to the IP network and associated parameters. The Presence Network Agent may publish full IP-network presence information about the mobile station (including the entire list of currently connected IP addresses) or a partial IP-network presence information (including the IP addresses that have been added or removed from the list since the last publication). The binding information between the NAI and the URI that identifies the presentity, associated with the received IP addresses, is established at the time of subscription to the IP-network presence service. There may be more than one NAI bound to a single presentity.

If the Presence Network Agent deems the information received in the update request message invalid or it is unable to perform the requested function, it shall return the update reject message with an error indication to the HAAA. Otherwise, the Presence Network Agent shall respond with the update accept message and publish the received information.

4.2.3 Role of HAAA

Whenever the user's mobile station connects or disconnects an IP address to/ from the IP network utilizing its NAI, the HAAA shall send an update request message to the Presence Network Agent. The update request message shall list all IP addresses that the mobile station has connected to the IP network and the IP addresses that have been disconnected from the IP network caused by this connect or disconnect event. The mobile station may use IPv4 addresses, IPv6 addresses, or both. The procedure that describes when and how the HAAA obtains mobile station's IP addresses that have been connected or disconnected to/from the IP network (e.g. from the Accounting-Request message) is specified in [4]. When a mobile station's IP address is hotlined and the MS is not reachable through the IP address, the HAAA shall report the IP address as disconnected to the PNA. The HAAA shall report the IP address as connected when a previously set hotlining rule is removed or the hotlining rule is updated to allow IP packets destined to the MS.

The method used by the HAAA to locate the Presence Network Agent is not described in this specification (e.g. the IP address or the FQDN of the Presence Network Agent may be provisioned in the HAAA by the home network operator).

In the update request message sent to the Presence Network Agent, the HAAA shall include the following values:

- the NAI used when the IP addresses were connected to the IP network;
- MSID (Mobile Station ID), represented as either:

1 ➤ MIN, or

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3 ➤ IRM, or

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5 ➤ E.212 IMSI

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9 • Mobile station Electronic Serial Number (ESN) or Mobile Equipment Identity (MEID);
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12 • the list of IP addresses, their Internet address classes (IPv4 or IPv6), and an indication for each address in the list whether it has been connected to or disconnected from the IP network; for each IP address in the list, an indication whether the respective IP address is using Simple IPv4, Simple IPv6, Mobile IPv4, or Mobile IPv6 operation; and
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17 • additional information available to the HAAA may be included. For example, the HAAA may have information about the URI of the presentity associated with the NAI, the link level connection type, the bandwidth of the forward and/or reverse link, etc. The specific additional information provided by the HAAA is for further study.

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NOTE: In most cases the list of IP addresses will contain only a single IP address that has been connected or disconnected from the IP network.

If an IP address has been disconnected from the IP network, it will be included in the update request message only when disconnected, i.e. it will not be listed in subsequent update request messages as disconnected.

The communication between the HAAA and the Presence Network Agent may be protected with IP security. The establishment of the security association between these two home-network entities is outside the scope of this specification.

4.2.3.1 Simple IPv4 and Simple IPv6 Operation

The HAAA shall send the update request message to the Presence Network Agent for the user indicating that the given IP address has been connected to the IP network under the following conditions:

- when the HAAA removes an existing hotlining rule in the PDSN/HA or changes an existing hotlining rule to allow IP packets destined to the MS; or, the HAAA receives a RADIUS Accounting-Request (Start) record from PDSN containing the Beginning-Session VSA and the IP-Technology VSA indicates Simple IP;
- the HAAA is configured to send the update request message to the Presence Network Agent; and
- the user profile indicates that IP-network presence service is enabled for simple IP for IPv4 and/or IPv6 for this user.

Upon sending the update request message to the Presence for the user, the HAAA shall store the NAI and IP address of the user received in the Accounting-Request (Start) record in its database.

The HAAA shall send the update request message to the Presence Network Agent for a user indicating that the previously connected IP address has been disconnected from the IP network under the following conditions:

- when the HAAA sets an hotlining rule in the PDSN/HA disallowing packets destined for the mobile station's IP address; or, the HAAA receives a RADIUS Accounting-Request (Stop) record from the PDSN currently serving the user, and the Session-Continue VSA is either absent or is included but the value is set to FALSE and the IP-Technology VSA indicates Simple IP; and
- the HAAA has previously sent the update request message to the Presence Network Agent for the user indicating that the given IP address has been connected to the IP network.

Upon sending the update request message to the Presence Network for the user, the HAAA shall delete the IP address of the user received in the Accounting-Request (Stop) record from its database. If there are no IP addresses allocated to this user, the HAAA shall delete the entire record for this user from its database.

4.2.3.2 Mobile IPv4 Operation

The HAAA shall send the update request message to the Presence Network Agent for the user indicating that the given IP address has been connected to the IP network under the following conditions:

- when the HAAA removes an existing hotlining rule in the PDSN/HA or changes an existing hotlining rule to allow IP packets destined to the MS; or, the HAAA receives an Accounting-Request (Start) record containing the Beginning Session VSA, Framed-IP Address indicating IPv4, and the IP-Technology VSA indicates Mobile IP, and the given IP address is not currently indicated as connected (inter PDSN handoff with MIP);
- the HAAA is configured to send the update request message to the Presence Network Agent; and
- the user profile indicates that IP-network presence service is enabled for Mobile IPv4 this user.

Upon sending the update request message to the Presence Network for the user, the HAAA shall store the NAI and IP address of the user received in the Accounting-Request (Start) record in its database.

The HAAA shall send the update request message to the Presence Network Agent for a user indicating that the previously connected IP address has been disconnected from the IP network under the following conditions:

- when the HAAA sets an hotlining rule in the PDSN/HA disallowing packets destined for the mobile station's IP address; or, the HAAA receives an Accounting-Request (Stop) record containing the Framed-IP Address indicating IPv4 and the IP-Technology VSA that indicates Mobile IP, and does not contain the Session-Continue VSA or the Session-Continue VSA is included but the value is set to FALSE; and the HAAA has not previously received an Accounting-Request (Start) from another PDSN with the same IP Address (inter PDSN handoff with MIP), and

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- the HAAA has previously sent the update request message to the Presence Network Agent for the user indicating that the given IP address has been connected to the IP network.

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Upon sending the update request message to the Presence Network for the user, the HAAA shall delete the IP address of the user received in the Accounting-Request (Stop) record from its database. If there are no IP addresses allocated to this user, the HAAA shall delete the entire record for this user from its database.

10 4.2.3.3 Mobile IPv6 Operation

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The HAAA shall send the update request message to the Presence Network Agent for the user indicating that the mobile station's home IPv6 address has been connected to the IP network under the following conditions:

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- the HAAA receives a RADIUS Accounting-Request (Start) record from the home agent containing the Beginning Session VSA, MIP6-HoA VSA containing Mobile IPv6 home address, and the IP-Technology VSA indicates Mobile IP;
 - the HAAA is configured to send the update request message to the Presence Network Agent; and
 - the user profile indicates that IP-network presence service is enabled for Mobile IPv6 for this user. Upon sending the update request message to the Presence Network Agent for the user, the HAAA shall store the NAI, Mobile IPv6 indicator indicating that this IPv6 address uses Mobile IPv6, and home IPv6 address, of the user in its database.

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The HAAA shall send the update request message to the Presence Network Agent for a user indicating that the previously connected home IPv6 address has been disconnected from the IP network under the following conditions:

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- the HAAA receives a RADIUS Accounting-Request (Stop) record from the home agent containing the MIP6-HoA VSA containing mobile IPv6 home address, the IP-Technology VSA indicates Mobile IP, and does not contain the Session-Continue VSA or the Session-Continue VSA is included but the value is set to FALSE, (that indicates that the home agent has removed the Binding Cache Entry (BCE) for the home IPv6 address), and

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NOTE : The RADIUS Accounting-Request (Stop) record was sent by the home agent upon receiving the Binding Update message from the mobile station with Lifetime field value equal zero 0, or upon the expiry of the Binding Cache Entry (BCE) Lifetime of the home IPv6 address;

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- the HAAA has previously sent the update request message to the Presence Network Agent for the user indicating that the home IPv6 address has been connected to the IP network.

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Upon sending the update request message to the Presence Network Agent for the user, the HAAA shall delete the Mobile IPv6 indicator and home IPv6 address of the user from its database. If no IP addresses are allocated to the user identified with its NAI, the HAAA shall delete the entire record for this user from its database.

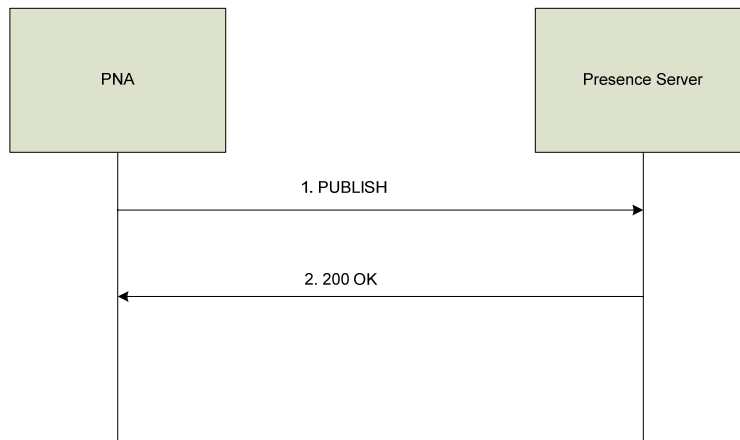
4.3 Relationship of Functional Entities

4.3.1 Number of AAAs, PNAs, and Presence Servers

For each reference point, there is a distinct Presence Network Agent instance that supports the protocol between this Presence Network Agent instance and its peer across the respective reference point. For example, a Presence Network Agent will communicate with the HAAA, across the Pk reference point using a protocol as specified in subclause 6.

5 Operational Procedures and Information Flows

5.1 Publishing Presence information from the PNA to Presence Server



1. The PNA publishes the device specific presence information on behalf of an MS to the Presence server using the PUBLISH method. The body of the PUBLISH request can contain the full state information or the partial state information of the MS.
2. The Presence Server responds with a 200 OK message.

6 Pk Interface Protocol Specification

For the Pk interface Stage 3, as specified in this section, the update request message [see section 4.2.2] contains only a single IP address. If the HAAA has to report more than a single IP address, it will send an update request message for each IP address, rather than list all IP addresses in a single update request message.

The Pk interface shall be implemented using the RADIUS protocol as defined in [10] and [11]. The HAAA shall act as a RADIUS client towards the PNA. The PNA shall act as a RADIUS server towards the HAAA. The HAAA shall use the RADIUS Accounting-Request (Start) to indicate that given IP address has been connected to the IP network. The HAAA shall use the RADIUS Accounting-Request (Stop) to indicate that a given IP address has been disconnected from the IP network. The PNA shall respond to the Accounting-Requests with the Accounting-Response message as specified in [11].

6.1 Message Definitions

6.1.1 Accounting-Request (Start)

Whenever the HAAA is notified that an MS is connected to the IP network with a new IP address, the HAAA shall generate a RADIUS Accounting-Request (Start) towards the PNA. The HAAA shall not generate another Accounting-Request (Start) with the same IP address unless an Accounting-Request (Stop) was previously received for the same IP address. The HAAA shall generate a new Acct-Session-Id for every new RADIUS Accounting start message. The Acct-Session-Id is used to match a single RADIUS Start and Stop pair. The HAAA shall include the following RADIUS attributes and Vendor Specific Attributes in the Accounting-Request message.

RADIUS Attributes/3GPP2 VSAs	Type/Vendor Type	Mandatory /Optional in Accounting-Request (Start)	Max Payload Length (octets)	Format	Description	Special Values and Syntax.
Acct-Session-Id	44	M	8	string	Indicates the session ID of the accounting message.	ASCII string of session ID. See [10].
Acct-Status-Type	40	M	6	integer	This attribute is set to Start.	Set to 1 to indicate Accounting Start Request.
Calling-Station-Id	31	M	15	string	Indicates MSID of the MS.	See [4].
3GPP2_ESN	26/52	O (Note 1)	15	string	Indicates ESN of MS.	ASCII string of ESN. See [4].
3GPP2_MEID	26/116	O (Note 1)	14	string	Indicates MEID of MS.	ASCII string of MEID. See [4].
User-Name	1	M	72	string	The attribute is set to the Network Access Identifier (NAI) of mobile station.	See [10].
Framed-IP-Address	8	O (Note 2)	4	ip-addr	Indicates the IPv4 address of the MS.	See [10].
Framed-IPv6-Prefix	97	O (Note 2)	4-20	IPv6-prefix	Indicates the IPv6 prefix of the MS.	See [12].
Framed-Interface-ID	96	O (Note 2)	10	string	Indicates the Interface ID of the	See [12].

					MS.	
MIP6-HoA	26/119	O (Note 2)	16	ipv6-addr	Indicates the Home Address of the MS.	See [4].
MIP6-CoA	26/141	O (Note 2)	16	ipv6-addr	Indicates the Care-of-Address used by the MS.	See [4].
3GPP2_IP_Tech	26/22	M	4	integer	Indicates whether the MS uses Simple IP or Mobile IP.	1=Simple IP, 2=Mobile IP. See [4].
NAS-Port-Type	61	O	6	Integer	Indicates the access network type of MS.	See [4].
3GPP2_HA_IP_Address	26/7	O (Note 3)	4	ip-addr	A HA IP address used during a MIP session by the user as defined in RFC 2002.	See [4].
NAS-IP-Address	4	O (Note 3)	4	ip-addr	IPv4 address of the RADIUS client in the PDSN	See [10].
NAS-IPv6-Address	95	O (Note 3)	16	Ipv6-addr	Indicates IPv6 address of the the PDSN when 3GPP2_IP_Tech is Simple IP or IPv6 address of Home Agent when 3GPP2_IP_Tech is Mobile IP.	See [12].
3GPP2_FA_CoA	26/79	O (Note 3)	4	ip-addr	The IPv4 address of the FA-CoA.	See [4].

Table 1. Accounting Request (Start)

Note 1: The Accounting-Request (Start) shall contain either the ESN attribute or MEID attribute of MS.

Note 2: The Accounting-Request (Start) shall contain one of the following:

- the Framed-IP-Address attribute indicating the Mobile IPv4 or the Simple IPv4 address of the MS, or
- the Framed-IPv6-Prefix and Framed-Interface-ID attributes indicating the Simple IPv6 address of the MS, or
- the MIP6-HoA and MIP6-CoA attributes indicating the Mobile IPv6 home address and the IPv6 care-of-address of the MS.

Note 3: The Accounting-Request (Start) shall contain at least one of the infrastructure ids. The accounting request may contain more than one infrastructure id; for e.g., the Accounting-Request (Start) for a MIPv4 client can contain the NAS-IP-Address, 3GPP2_FA_CoA and the 3GPP2_HA_IP_Addr. The AAA shall include all the known infrastructure ids in the Accounting-Request (Start).

6.1.2 Accounting-Request (Stop)

Whenever the HAAA is notified that an MS has disconnected an IP address from the IP network, the HAAA shall generate a RADIUS Accounting-Request (Stop) towards the PNA.

The HAAA shall use the same Acct-Session-Id which was used in the corresponding Accounting-Request (start) for the given IP address. The HAAA shall include the following RADIUS attributes and Vendor Specific Attributes in the Accounting-Request message.

RADIUS Attributes/3GPP2 VSAs	Type/Vendor Type	Mandatory /Optional in Accounting-Request (Stop)	Max Payload Length (octets)	Format	Description	Special Values and Syntax.
Acct-Session-Id	44	M	8	string	Indicates the session ID of the accounting message.	ASCII string of session ID. See [10].
Acct-Status-Type	40	M	6	integer	This attribute is set to Stop.	Set to 2 to indicate Accounting Stop Request.
Calling-Station-Id	31	M	15	string	Indicates MSID of the MS.	See [4].
3GPP2_ESN	26/52	O (Note 1)	15	string	Indicates ESN of MS.	ASCII string of ESN. See [4].
3GPP2_MEID	26/116	O (Note 1)	14	string	Indicates MEID of MS.	ASCII string of MEID. See [4].
User-Name	1	M	72	string	The attribute is set to the Network Access Identifier (NAI) of mobile station.	See [10].
Framed-IP-Address	8	O (Note 2)	4	ip-addr	Indicates the IPv4 address of the MS.	See [10].
Framed-IPv6-Prefix	97	O (Note 2)	4-20	IPv6-prefix	Indicates the IPv6 prefix of the MS.	See [12].
Framed-Interface-ID	96	O (Note 2)	10	string	Indicates the Interface ID of the MS.	See [12].
MIP6-HoA	26/119	O (Note 2)	16	ipv6-addr	Indicates the Home Address of the MS.	See [4].
MIP6-CoA	26/141	O (Note 2)	16	ipv6-addr	Indicates the Care-of-Address used by the MS.	See [4].
3GPP2_IP_Tech	26/22	M	4	integer	Indicates whether the MS uses Simple IP or Mobile IP.	1=Simple IP, 2=Mobile IP. See [4].
NAS-Port-Type	61	O	6	Integer	Indicates the access network type of MS.	See [4].
3GPP2_HA_IP_Address	26/7	O (Note 3)	4	ip-addr	A HA IP address used during a MIP session by the user as defined in RFC 2002.	See [4].
NAS-IP-Address	4	O (Note 3)	4	ip-addr	IPv4 address of the RADIUS client in the PDSN	See [10].
NAS-IPv6-Address	95	O (Note 3)	16	Ipv6-addr	Indicates IPv6 address of the the PDSN when 3GPP2_IP_Tech is Simple IP or IPv6 address of Home Agent when 3GPP2_IP_Tech is Mobile IP.	See [12].
3GPP2_FA_CoA	26/79	O (Note 3)	4	ip-addr	The IPv4 address	See [4].

					of the FA-CoA.	
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Table 2. Accounting Request (Stop)

Note 1: The Accounting-Request (Stop) shall contain either the ESN attribute or MEID attribute of MS. The Accounting-Request (Stop) request shall contain the same attribute type which was present in the corresponding Accounting-Request (Start) request.

Note 2: The Accounting-Request (Stop) shall contain one of the following:

- the Framed-IP-Address attribute indicating the Mobile IPv4 or the Simple IPv4 address of the MS, or
- the Framed-IPv6-Prefix and Framed-Interface-ID attributes indicating the Simple IPv6 address of the MS, or
- the MIP6-HoA and MIP6-CoA attributes indicating the Mobile IPv6 home address and the IPv6 care-of-address of the MS.

The Accounting-Request (Stop) request shall contain the same attribute type which was present in the corresponding Accounting-Request (Start) request.

Note 3: The Accounting-Request (Stop) request shall contain the same infrastructure ids which were present in the corresponding Accounting-Request (Start) request.

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7 Pen Interface Protocol Specification

The following subsection defines the protocol specification for the Pen interface.

7.1 PNA Procedures

7.1.1 Construction of PUBLISH requests

For each mobile station registered for network presence service, the PNA shall maintain a mapping between the NAI of the mobile station and a SIP URI. The PNA uses the SIP URI to publish presence information to the Presence Server. The PNA shall use the PUBLISH method [5] to supply presence information to the Presence Server. The Request-URI of the PUBLISH request shall be populated with the SIP URI of resource for which the PNA wishes to publish event state.

7.1.2 Construction of presence information

The PNA shall formulate the presence information according to the PIDF format [7]. The PNA may support partial publication of presence information as specified in [8]. In this case, the PNA shall formulate the presence information according to the partial-PIDF format [6]. The PNA shall use the PIDF extensions defined in Annex A and the presence data model defined in [9] when formulating the presence document it publishes.

The PNA shall publish the <device-nwpresence> under the <device> element defined in [9]. There can be multiple occurrences of the <device-nwpresence> element within a given <device>. Each occurrence has a unique identifier, called the occurrence identifier. This identifier is unique within that particular <device> instance. The “id” attribute of the <device-nwpresence> element is set to the occurrence identifier. The PNA shall set the value of the <deviceID> element under <device> to the ESN or MEID of the MS.

If the <ip-type> is set to “mobileIP” and the <ipaddress> contains <ipv6address>, the PNA shall include the <coa-address> element in <ipaddress>. For Mobile IPv6, the <coa-address> shall contain the associated care-of-address address of the MS. If the <ip-type> is set to “simpleIP”, the PNA shall not include the <coa-address> element in the <ipaddress>.

The PNA shall include all the known infrastructure-ids associated with the ipaddresses.

7.1.2.1 RADIUS to XML mapping

The following table shows how the RADIUS attributes received on the Pk interface are mapped to the XML elements defined on Pen interface.

RADIUS Attributes/3GPP2 VSAs	XML elements	XML type	Description
Calling-Station-Id	<msid>	msid. Choice of: a) min (string) b) irm (string) c) e212-imsi (string)	Indicates MSID of the MS.

3GPP2_ESN	<deviceID>	deviceID_t see[9].	Indicates ESN of MS. The <deviceID> attribute of the <device> element is set to either the ESN or the MEID of the MS.
3GPP2_MEID	<deviceID>	deviceID_t see[9].	Indicates MEID of MS. The <deviceID> attribute of the <device> element is set to either the ESN or the MEID of the MS.
User-Name	<nai>	string	The attribute is set to the Network Access Identifier (NAI) of mobile station.
Framed-IP-Address	<ipv4address>	ipv4addresstype	Indicates the IPv4 address of the MS.
Framed-IPv6-Prefix	<ipv6address>	ipv6addresstype	Indicates the IPv6 prefix of the MS. The <ipv6address> element contains both the Framed-IPv6-Prefix and the Framed-Interface-ID.
Framed-Interface-ID	<ipv6address>	ipv6addresstype	Indicates the Interface ID of the MS. The <ipv6address> element contains both the Framed-IPv6-Prefix and the Framed-Interface-ID.
MIP6-HoA	<ipv6address>	ipv6addresstype	Indicates the Home Address of the MS.
MIP6-CoA	<coa-address>	ipv6addresstype	Indicates the Care-of-Address associated with the corresponding MIP6-HoA.
3GPP2_IP_Tech	<ip-type>	string. Allowed values: a) simpleIP b) mobileIP	Indicates whether the MS uses Simple IP or Mobile IP.
NAS-Port-Type	<access-network-type>	string. Allowed values: a) cdma1x b) cdma1x-evdo c) wlan	Indicates the access network type of MS.
3GPP2_HA_IP_Address	<home-agent-ipv4>	ipv4addresstype	Indicate the ipv4 address of MIPv4 Home Agent.
NAS-IP-Address	<nas-ipv4>	ipv4addresstype	Indicates the IPv4 address of the RADIUS client in the PDSN
NAS-IPv6-Address	<nas-ipv6>	ipv6addresstype	Indicates IPv6 address of the the PDSN when 3GPP2_IP_Tech/<ip-type> is Simple IP or IPv6 address of Home Agent when 3GPP2_IP_Tech/<ip-type> is Mobile IP.
3GPP2_FA_CoA	<fa-coa>	ipv4addresstype	Indicates the IPv4 address of the FA-CoA.

Table 3. RADIUS to XML Mapping

A XML Schema and Sample XML output

This section provides the XML schema and one possible XML example document.

A.1 XML Schema (Normative)

The following schema is registered under the <device> element defined in [9].

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema      xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified">
  <!-- This import brings in the XML language attribute
  xml:lang-->
  <xs:import      namespace="http://www.w3.org/XML/1998/namespace"
  schemaLocation="http://www.w3.org/2001/xml.xsd"/>
  <xs:annotation>
    <xs:documentation xml:lang="en">
      Describes network presence extensions for PIDF device
      element.
    </xs:documentation>
  </xs:annotation>
  <xs:simpleType name="ipv6addresstype">
    <xs:annotation>
      <xs:documentation>IPv6 address as per RFC2373.  "::" not
      supported</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:minLength value="15"/>
      <xs:maxLength value="45"/>
      <xs:pattern      value="([\dA-Fa-f]{1,4}:){6}([[\dA-Fa-
      f]{1,4}:[\dA-Fa-f]{1,4})|(([\d]{1,3}\.){3}[\d]{1,3}))"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="ipv4addresstype">
    <xs:annotation>
```

```

1         <xs:documentation>IPv4 address </xs:documentation>
2
3     </xs:annotation>
4
5     <xs:restriction base="xs:string">
6         <xs:minLength value="7"/>
7         <xs:maxLength value="15"/>
8         <xs:pattern value="([\d]{1,3}\.){3}[\d]{1,3}"/>
9
10    </xs:restriction>
11
12 </xs:simpleType>
13
14 <xs:complexType name="ipaddress">
15     <xs:annotation>
16         <xs:documentation>Represents a IPv4 or IPv6
17         address</xs:documentation>
18     </xs:annotation>
19     <xs:choice>
20         <xs:element name="ipv4address" type="ipv4addresstype"/>
21         <xs:sequence>
22             <xs:element name="ipv6address" type="ipv6addresstype"/>
23             <xs:element name="coa-address" type="ipv6addresstype"
24             minOccurs="0"/>
25         </xs:sequence>
26     </xs:choice>
27 </xs:complexType>
28
29 <xs:complexType name="msid">
30     <xs:annotation>
31         <xs:documentation>Represents the Mobile Station
32         ID</xs:documentation>
33     </xs:annotation>
34     <xs:choice>
35         <xs:element name="min" type="xs:string"/>
36         <xs:element name="irm" type="xs:string"/>
37         <xs:element name="e212-imsi" type="xs:string"/>
38     </xs:choice>
39 </xs:complexType>
40
41 <xs:element name="device-nwpresence">
42     <xs:annotation>
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```

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    <xs:documentation>Describes Network presence extensions
    for PIDF device element.</xs:documentation>
  </xs:annotation>
  <xs:complexType>
    <xs:sequence>
      <xs:element name="nai" type="xs:string"/>
      <xs:element name="msid" type="msid"/>
      <xs:element name="access-network-type" minOccurs="0">
        <xs:simpleType>
          <xs:restriction base="xs:string">
            <xs:enumeration value="cdmalx"/>
            <xs:enumeration value="cdmalx-evdo"/>
            <xs:enumeration value="wlan"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:element>
      <xs:any namespace="##other" processContents="lax"
      minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="infrastructure-ids" minOccurs="0">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="nas-ipv4"
            type="ipv4addresstype" minOccurs="0"/>
            <xs:element name="nas-ipv6"
            type="ipv6addresstype" minOccurs="0"/>
            <xs:element name="fa-coa" type="ipv4addresstype"
            minOccurs="0"/>
            <xs:element name="home-agent-ipv4"
            type="ipv4addresstype" minOccurs="0"/>
            <xs:element name="home-agent-ipv6"
            type="ipv6addresstype" minOccurs="0"/>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
      <xs:element name="address-info" maxOccurs="unbounded">
        <xs:complexType>

```

```
1         <xs:sequence>
2
3             <xs:element name="ip-type">
4                 <xs:simpleType>
5                     <xs:restriction base="xs:string">
6                         <xs:enumeration value="simpleIP"/>
7                         <xs:enumeration value="mobileIP"/>
8                     </xs:restriction>
9                 </xs:simpleType>
10            </xs:element>
11
12            <xs:element name="ip-state" minOccurs="0">
13                <xs:simpleType>
14                    <xs:restriction base="xs:string">
15                        <xs:enumeration value="connected"/>
16                        <xs:enumeration value="disconnected"/>
17                    </xs:restriction>
18                </xs:simpleType>
19            </xs:element>
20
21            <xs:element name="ipaddress">
22                <xs:complexType>
23                    <xs:complexContent>
24                        <xs:extension base="ipaddress"/>
25                    </xs:complexContent>
26                </xs:complexType>
27            </xs:element>
28        </xs:sequence>
29    </xs:complexType>
30    </xs:element>
31    <xs:attribute name="id" type="xs:string"/>
32</xs:complexType>
33</xs:element>
34</xs:sequence>
35</xs:sequence>
36</xs:attribute name="id" type="xs:string"/>
37</xs:complexType>
38</xs:element>
39</xs:sequence>
40</xs:sequence>
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```

A.2 Example XML document

```

<?xml version="1.0" encoding="UTF-8"?>
<presence xmlns="urn:ietf:params:xml:ns:pidf" entity="sip:someone@example.com"
xmlns:dm="urn:ietf:params:xml:ns:pidf:data-model"
xmlns:dp="http://www.3gpp2.org/NetworkPresence">
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<dm:device id="cdma-phone123">
<dm:deviceID>urn:esn:600b40c7</dm:deviceID>
<dp:device-nwpresence>
  <dp:nai>String</dp:nai>
  < dp:msid>
    < dp:min>8584443432</ dp:min>
  </ dp:msid>
  < dp:access-network-type>cdma1x</ dp:access-network-type>
  < dp:infrastructure-ids>
    < dp:nas-ip4> 129.45.32.10 </ dp:nas-ip4>
  </ dp:infrastructure-ids>
  < dp:address-info>
    < dp:ip-type>simpleIP</ dp:ip-type>
    < dp:ip-state>connected</ dp:ip-state>
    < dp:ipaddress>
      < dp:ipv4address>129.45.32.12</ dp:ipv4address>
    </ dp:ipaddress>
  </ dp:address-info>
  < dp:address-info>
    < dp:ip-type>simpleIP</ dp:ip-type>
    < dp:ip-state>connected</ dp:ip-state>
    < dp:ipaddress>
      < dp:ipv4address>129.45.32.11</ dp:ipv4address>
    </ dp:ipaddress>
  </ dp:address-info>
</ dp:device-nwpresence>
</dm:device>

```

</presence>

A.3 XML Data Structure

