

Parlay PAM in 3GPP's IP-Multimedia Subsystem

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Abstract: The document will give a brief overview of the Presence and Availability -specification in general, protocols used in the IP Multimedia Subsystem - namely SIP and Diameter - and will show a possible mapping for PAM-methods to the underlying infrastructure. In addition it will describe the IMS infrastructure developed at Fraunhofer Fokus and the implementation of the PAM-server

Keywords: IMS , Parlay, Presence, Availability, UMTS, SIP, Diameter, service enabler

1 Introduction

In today's telecommunication networks there are several ways of communicating between users. People have telephones at home, telephones at work, a mobile phone, emails and sometimes use instant messaging applications. When one tries to get in contact with somebody else the question asked is often how to reach someone. Presence and Availability Management (PAM) defines interfaces allowing 3rd party service providers to use this information to create their services. Instead of being put into each service the necessary logic is put into the network itself. The network will then decide taking into account different criteria e.g. information from various networks such as GSM and Internet and user-preferences, whether a person is present as well as available to another person.

Several examples exist for this kind of service: T-Mobile Germany offers instant messaging services allowing subscribers to chat with their friends via their mobile devices while Vodafone Germany offers a system called "Friend-Finder". Vodafone's service takes it even further by taking location information into account allowing subscriber to get a notification if a friend is close to their current position. Another very interesting application is Push-to-Talk where a half-duplex data-connection is established allowing to talk to multiple recipients at the same time. These services could be provided using PAM.

There are several PAM-standards defined by groups like the Open Mobile Alliance (OMA). The advantage of the Parlay PAM-specification is the design of the interface which is network independent. The specification is supposed to run on top of different networks such as a GSM, UMTS or an IP Multimedia Subsystem (IMS). Parlay also standardizes other service enablers such as Call Control or Messaging allowing the service developer to create

services that will run on any kind of network using only one technology.

The IMS is a packet based multimedia network allowing communication methods such as instant messaging, voice and video telephony. It uses several protocols originating from the Internet domain and adapts them to the telecommunications domain. The Session Initiation Protocol (SIP) [RFC3261] and the Diameter protocol [RFC3588] are examples for these protocols.

SIP has been created especially to fit the needs of Voice over IP networks and has now become the most widely used protocol for these applications. Applications for the AAA-protocol Diameter on the other hand are still being standardized and are starting to be adopted by vendors outside of the research community.

2 Overview of Parlay PAM

The “Presence and Availability Management”-specification introduces several concepts such as identities and agents in addition to three Service Capability Features (SCFs). Identities are the electronic representation of either a single person or a group of people while agents represent the device which the identity uses in a network. See [ParlayPAM] for a detailed introduction to these concepts. It must be noted that contrary to the Parlay-Specification the OSA-Group, which works closely together with the Parlay Group, only specifies the latter two SCFs.

1. The Provisioning SCF allows applications to create and edit identities and agents in the database of the PAM-System. E.g. if a user subscribes to a service which uses PAM, it might be necessary to let the system know, that this user takes part in the service and that he should be monitored.
2. The Presence and Availability-SCF allows applications to retrieve presence and availability information about identities. It also offers the capability to set presence information on behalf of an user.
3. The Event SCF allows an application to subscribe to certain events concerning both Provisioning and Presence and Availability. To do this the Event SCF specifies 13 different event types which may be used in a subscription to specify the kind of event subscribed for e.g. there is an event specified called “Identity Created” which will be triggered whenever an identity is created via the Provisioning SCF. Some event types also allow for periodic updates so that the gateway will update the application regardless of change in the requested resource.

3 Presence Architecture in IMS

The basic presence architecture in an IMS is quite simple. There are only four main entities involved for basic functionality. Other components such as the Group List and Manage-

ment Server (GLMS) or the Resource List Server (RLS) offer additional capabilities but these are out of scope in this document. Between these four components the two different protocols mentioned above -SIP and Diameter- are used.

3.1 The Components

The functional entities involved are:

1. The Parlay-PAM-Server offers the PAM-interfaces to application outside the network. As described above three SCFs are specified each containing one or more set of interfaces. Not all of these interfaces must be implemented.
2. The Presence Server (PS) is used for managing presence information which comprise the state of SIP-user-agent as well as handling subscriptions to presence information and to watcher-information.
3. The Home Subscriber Server (HSS) is the database where all IMS-subscriber related information such as service usage information is stored.
4. The Serving-Call State Control Function (S-CSCF) handles incoming SIP-requests and “forwards” them to the appropriate entities e.g. an incoming subscribe-request for the presence “event” must be forwarded to the Presence Server. It is an essential part of the IMS and is therefore mentioned here as well even though it is not directly involved in obtaining presence information.
5. The Interrogating-Call State Control Function (I-CSCF) is the gateway for the home network. If a user is logged in to an IMS from a foreign network all signalling information may be required to be routed via the I-CSCF to the home network.

3.2 The architecture

As figure 1 shows the PAM-Server is connected to the S-CSCF via the ISC-Reference [3GPP-23228] point which uses SIP and to the Home Subscriber Server (HSS) using the Diameter Protocol (the Sh-reference point [3GPP-29328]). The same is true for the Presence Server (PS) since both - the Parlay PAM-SCS and the Presence Server- are application servers from an IMS point of view.

Communication between the PAM- and the Presence Server takes place indirectly via the S-CSCF. Both PS and PAM implement the ISC-reference point. This reference point is specified to use SIP so that SIP-requests can be sent between the entities.

The Cx-reference point shown in figure 1 between the HSS and the S-CSCF is outside the scope of this document.

As shown in figure 1 a SIP-UA would publish its presence information to the S-CSCF using SIP. The S-CSCF forwards the SIP-request to the presence server. The presence server

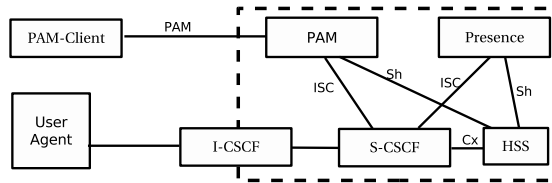


Figure 1: Presence Architecture in IMS

would answer the sending user agent with a SIP-response either accepting or rejecting the published information. If the PAM-Server received a request for a user's presence information it may contact the HSS via the Sh-reference using the Diameter protocol and retrieve the user's IMS status and then contact the presence server using SIP. This mechanism is described in more detail in section 4.2.

4 Example Mappings from Parlay to SIP

As the Parlay-Specification [ParlayPAM] states, it shall be possible to publish Presence information from outside of the network via the PAM-interfaces as well as retrieve information from the network. The IMS-standard specifies how this is done via SIP. There are three SIP-methods specified: publish, subscribe, notify. The Publish-method allows an user-agent to "publish" information about itself to the network e.g. let the presence server know its status. The publish method is specified in[RFC3903].

The following three chapters describe the mapping from Parlay PAM to SIP only for very basic operations though further information can be obtained from the author.

4.1 Publishing Presence information to the IMS

The PAM-Server may use the Publish-method [RFC3903] to change the presence status of an agent. The publish-method is specified in to be used for publishing presence information to a PS [3GPP-24841]. To do this an application using PAM must specify the agent or identity for which the presence status is to be changed so that the PAM-Server may use the agent name as the sender address. The presence server will receive the SIP-message and will assume that the "real" sender has sent this message. It will evaluate the body of the SIP-request, update its database accordingly and notifies all entities subscribed to the presence information of this user. Entities subscribed to a presentity [RFC2778] are called watchers [RFC2778]. Figure 2 shows the sequence of this mechanism.

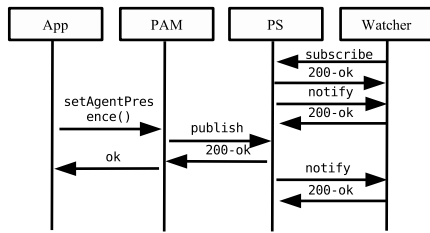


Figure 2: Publish sequence

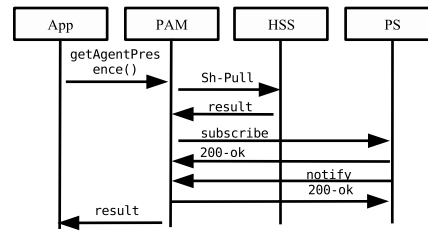


Figure 3: Subscribe-Notify Sequence

4.2 Retrieving Presence Information

Retrieving presence data from the network is achieved via the SIP-event-mechanism described in [RFC3265]. A watcher subscribes to an entity using the Subscribe-method which contains the event - in this case “presence” - and the entity that is being subscribed. As soon as there is a change concerning the event the subscribed entity will create a Notify-request for each subscribed watcher. In an environment containing a presence server it is not the user agent who will create the notifications but the server. As soon as it receives a Publish-request from an user-agent it looks up all watchers for the sender-entity and creates the notification for these watchers.

Using this mechanism the PAM-server can act as a watcher on behalf of an application. Figure 3 shows the sequence for subscribing and retrieving presence information of an user currently being online. The PAM-server first contacts the HSS to find out whether the requested user-agent is logged in to the IMS and will then contact the PS to retrieve specific information. If the requested user-agent is not logged into the IMS a trigger can be set in the HSS that will notify the PAM-server as soon as this user logs in (not shown in Figure 3).

The drawback using this approach is that a user agent retrieving the list of watchers will see the user-agent of the PAM-Server. It will not see the real subscriber.

4.3 Retrieving Watcher Information

The PAM documents also specify a way for an application to find out about all watchers of an user agent. The PAM-application must subscribe to a “Watcher-Changed-Event” for a specific user-agent. It will then be informed whenever the status of one or more of the watchers change. One way to achieve this is by using the watcherinfo-package as specified in [RFC3857] and [draftWINFO]. The watcherinfo-package allows user agents to subscribe to watcher-information using the event mechanism defined in [RFC3265]. Since watcher-information is of a private nature, the presence server must make sure that only authorized entities can subscribe to the watcherinfo-package. Of course the user-agent of the watchers shall be allowed to subscribe to its own information but the PAM-Server must be allowed as well.

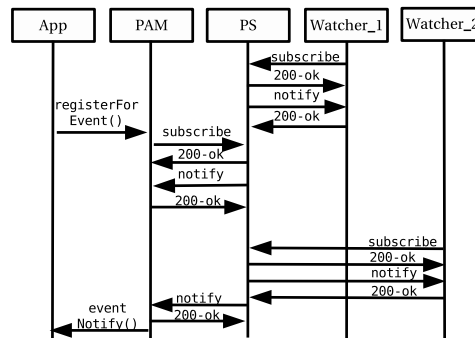


Figure 4: Watcherinfo-request

When an application requests watcher information there are three different types of subscriptions on the Parlay level. The application can subscribe either for a one-time notification i.e. it gets only notified once and then the subscription will expire, or for a periodic subscription where a time interval may be specified and a notification mode where the application will be informed as soon as the information changes. The first and the last notification modes may be mapped directly to SIP. If a “one time”-subscription is requested by the application the user-agent may set the expires header to a value of “0” as [RFC3265] states. This polls the state of a resource without establishing a persistent subscription. A “change-only”-subscription can be handled by SIP by setting the expire-header to a non-zero value. The Presence Server will then notify the subscriber whenever the state changes. The periodic interval must be handled by the PAM-Server as SIP does not offer have the ability to handle periodic updates by itself. Figure 4 shows the sequence for the change-only subscription.

5 OpenIMS at Fraunhofer FOKUS

Fraunhofer Fokus has developed an IMS-test center called the Open IMS. It is a unique test- and development center allowing to research IMS-solutions. Based on the experience gained by Fokus in the area of Voice over IP and next generation network service delivery platforms, the Open IMS consists of implementations made by Fokus as well as implementations made by industrial partners. The Open IMS @ FOKUS is an integral part of the BMBF National Host for 3Gb Applications Testbeds which has been established in 2002. The PAM-server has been integrated into the Open IMS as well along with several other components. Figure 5 shows a high level overview of the Open IMS. In addition to the PAM-Server there is also a SIP-Servlet container implemented by Fokus allowing to run services in the IMS using the SIP-servlet specification. The Fokus PAM-implementation that this document is based on is integrated into the IMS and allows services to obtain presence information about users logged into the IMS.

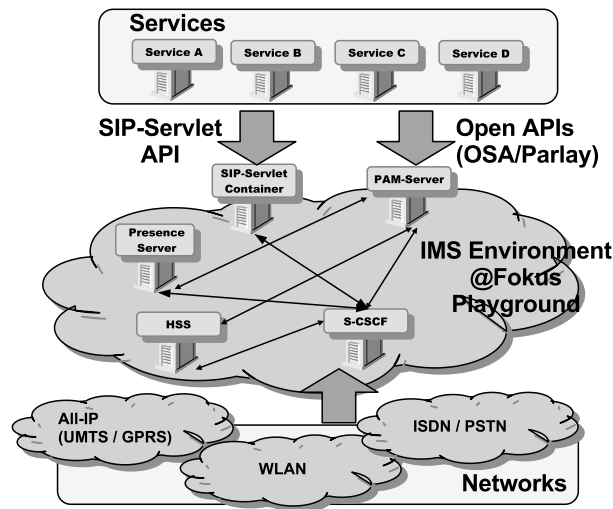


Figure 5: Overview of the IMS@Fokus

6 Conclusion

Considering the basic functionality of the PAM specification there is no problem to map them to an IMS. Functions like retrieving and publishing presence information for a user agent can be done by using the SIP-publish-method or the SIP-Event-framework. It is also possible to map the PAM-event-interface to the IMS though it needs to be evaluated whether all in [ParlayPAM] specified event types are applicable to an IMS.

Other issues may include e.g. PAM-Group Identities though this specific issue can be resolved by extending the Presence Architecture described in this document with an GLMS and an RLS (as specified by 3GPP). Another quite important issue for further evaluation is security including topics such as: if the PAM-server is allowed to publish presence information on behalf of an user agent, how is the PAM-server supposed to authenticate itself to the presence server so that only the PAM-server can publish information.

Acronyms

AAA Authentication, Authorization, Accounting

BMBF Bildungsministerium fuer Bildung und Forschung - German Federal Ministry of Education and Research

HSS Home Subscriber Server

I-CSCF Interrogating Call State Control Function

IMS IP Multimedia Subsystem
OSA Open Service Access
PAM Presence and Availability Management
PS Presence Server
SIP Session Initiation Protocol
S-CSCF Serving Call State Control Function
SCF Service Capability Feature
SCS Service Capability Server
UA User Agent
UMTS Universal Mobile Telecommunication System

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