Available online at www.sciencedirect.com
ScienceDirect
Computer Communications 29 (2006) 3766–3779
computer communications
www.elsevier.com/locate/comcom

Personalization of internet telephony services for presence with SIP and extended CPL

Dongmei Jiang [a], Ramiro Liscano [b], Luigi Logrippo [a,c,*]

[a] School of Information Technology and Engineering, University of Ottawa, Canada
[b] Faculty of Engineering and Applied Science, University of Ontario Institute of Technology, Canada
[c] Département d'informatique et ingénierie, Université du Québec en Outaouais, Canada

Received 16 March 2006; received in revised form 30 June 2006; accepted 3 July 2006
Available online 1 August 2006

Abstract

This paper discusses issues of personalization of presence services in the context of Internet Telephony. Such services take into consideration the willingness and ability of a user to communicate in a network, as well as possibly other factors such as time, address, etc. Via a three-layer service architecture for communications in the session initiation protocol (SIP) standard, presence system basic services and personalized services (personal policies) are clearly separated and discussed. To enrich presence related services, presence information is illustratively extended from the well known "online" and "offline" indicators to a much broader meaning that includes "location", "lineStatus", "role", "availability", etc. Based on this, the call processing language (CPL) is extended in order to describe presence related personalized services for both call processing systems and presence systems using information such as a person's presence status, time, address, language, or any of their combinations. A web-based system is designed and implemented to simulate these advanced services. In the implementation, personal policies are programmed by end users via a graphic user interface (GUI) and are automatically translated into extended CPL. The simulation system clearly displays when, where and what CPL policies should be used for the provision of personalized presence services and call processing services. Policy conflicts are also addressed by setting policy priorities in the system.

Keywords: SIP; Presence; PIDF; Presence extensions; CPL; CPL extensions

1. Introduction

1.1. Presence

Presence in communications conveys the willingness and the ability of a user to communicate with others on a network. "Presence" has been called "the best thing that ever happened to voice" by Jonathan Rosenberg, one of the session initiation protocol (SIP) authors. With awareness of the presence information of other users, unwanted and interrupting calls can be avoided and presence information is very helpful to establish successful communication sessions. The RFC 2778 [1] from internet engineering task force (IETF) defines a model and terminology for describing systems that provide presence information. A SIP implementation of this model defines a presence event package for SIP [2]. In this model, a presence system is a presence service that accepts, stores and delivers presence information to the interested parties defined as *watchers*.

An ETSI/Parlay standard deals with presence services in Parlay X open services architecture (OSA) [3]. The OSA specifications define an architecture that enables application developers to make use of network functionalities through an open standardized interface, i.e., the OSA APIs. [3] specifies in detail a number of presence service scenarios.

Currently, the main advantage of Internet Telephony (or voice over IP, VoIP) [4] is lower infrastructure costs over conventional telephony systems. Of course another very important characteristic is its ability to handle

* Corresponding author. Tel.: +1 819 595 3900; fax: +1 819 773 1638.
E-mail addresses: djiang@site.uottawa.ca (D. Jiang), rliscano@site.uottawa.ca (R. Liscano), luigi@site.uottawa.ca (L. Logrippo).

0140-3664/$ - see front matter © 2006 Elsevier B.V. All rights reserved.
doi:10.1016/j.comcom.2006.07.004

multimedia communications and presence. Multimedia communications with presence can provide uninterrupted multimedia services via the formats of instant messaging, audio call, video call, multiparty conferencing, etc. After "I Seek You" (ICQ) was introduced in 1996, numerous variations of instant messaging with presence, and more recently, presence based multimedia communications have come to the market very quickly.

1.2. SIP

Currently, there are two main signaling standards in the Internet telephony world: SIP from IETF and H.323 [5] from the International Telecommunications Union – Telecommunications Standard Sector (ITU-T). The session initiation protocol (SIP) [5–7] has become a dominant signaling standard because of its simplicity. It is the standard that will be considered in this paper, although our concepts apply to either standard. SIP is an application layer protocol responsible for establishing, modifying and terminating multimedia sessions or calls. Defined on top of a transport layer (TCP or UDP), SIP messages can convey arbitrary payloads: session description, instant message, presence document, JPEG and MIME type. SIP, an end-to-end protocol, can be made available to end user devices to makes it possible to define new personalized services. These services are able to combine conventional telephony services with web, email, instant messaging, presence, text chat, interactive games, etc. Because of the explosion of new features, it has become critical to control and manage them. One of the main challenges of Internet Telephony is service programming [8]. Built on top of SIP, CPL is a solution created in the IETF for end users to describe and control their specific services.

The advantage of agreeing on standard protocols and languages such as SIP or CPL is the fact that such languages provide commonly understood signals and interfaces by which different implementers can build and exchange applications.

1.3. CPL

CPL [9] was accepted as a proposed standard from the IETF in 2004. It is designed for end users to describe and control their specific telephony services. CPL itself is a very simple programming language in extensible markup language (XML) syntax [10]. CPL does not have variables or loops and can only access limited resources. It is designed to be safe for non-professional users to describe their personalized policies. A CPL script represents a tree of decisions in terms of tags of nodes and links. Each node or link corresponds to a tag in CPL. A node (such as <reject>, <address-switch>) specifies an action to take or a decision to make. A link (such as <address>) specifies the result of an action and displays which decision was taken. CPL is independent of signaling protocols. It can work on top of either the IETF SIP or ITU-T H.323 [5]. As a simple example, the policy for Alice's feature "rejecting anonymous incoming calls" is shown in Fig. 1.

A CPL script (policy) can be executed on a user's device or on a proxy server that acts on behalf of the user. It is associated with or owned by a particular user, i.e., it is only triggered if the request (e.g., a SIP INVITE) is for that user. In the above example the script would be associated with a particular user (Alice) and the script is executed when a signaling request is received for an incoming-call (defined by the <incoming> tag) for that user, Alice. As well, a CPL script can react to a <outgoing> signaling request message. Current CPL can only describe and control call processing services with two directions "incoming" and "outgoing" considered.

1.4. Motivation and contributions

Currently available presence systems such as Microsoft MSN Messenger or Yahoo Messenger can provide presence information only in one parameter, i.e., an indicator of "online" or "offline" etc., which is too limited to offer rich services related to presence. Personalized services such as how to process a watcher's request and how to notify a watcher based on a person's status, time, address, etc. are not offered to users in current available systems. This paper will overcome these limitations. Our contributions mainly consist of four parts:

(1) By proposing a three-layer service architecture, system basic services and personalized services can be clearly separated and described.
(2) To enrich presence information and presence related services, we extend presence information and CPL for presence.
(3) On the basis of the above extensions, presence related new services can be implemented that take into consideration a person's status, time, language, priority, address or any of their combinations in both a call processing system and a presence system.
(4) We have implemented a simulation system to demonstrate these advanced presence related Internet Telephony services written in extended CPL.

While [3] describes a Web service, our proposed presence system is not dependent on a Web implementation.

```
<cpl>
  <incoming>
    <address-switch field="origin" subfield="user">
    <!- decision made by checking the original address of the caller -->
    <address is="anonymous">
      <reject/>
<!- if the caller's  name is unavailable, action "reject" is taken and the script
stops -->
    </address>
    </address-switch>
  </incoming>
</cpl>
```

Fig. 1. Screening anonymous incoming-call.