IMS Based Mobile Presence Service

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ABSTRACT
One of the key factors associated with mobile data services is the ability to provide greater contextualization of user activity through information such as personal presence. One of the barriers to the provision of context information for services operating over mobile phone networks has been the inflexibility of the existing architecture which has its roots in voice services. The aim of IMS is to introduce greater flexibly to the mobile phone networks for a range of data services using a new architecture based on SIP. In this paper we present the design and implementation of a novel IMS presence service called SipPres running on a mobile phone that allows users to illustrate a greater range of contextualized information. The application practically illustrates how presence can be used to enrich a range of mobile services and the tremendous opportunities IMS will offer.

Categories and Subject Descriptors
J.7 **Computers In Other Systems**

General Terms
Design, Experimentation, Human Factors.

Keywords
Mobile, IMS, Presence, Context, Messaging.

1. INTRODUCTION
The idea of using context within mobile applications has been dicussed for a number of years [1] and indeed there have been a number of research projects illustrating various uses of context [2][4]. However, despite the huge expansion in the power of mobile phone operating systems [5] they have failed to appear as large scale commercial implementations arguably because they failed to address the inherent nature of the current mobile phones networks. The IP Multimedia Subsystem (IMS) aims to evolve existing mobile networks and in particular allow more complex data orientated services such as context to be created across a range of applications.

IMS is a service oriented architecture and employs a distributed component model for the applications running on top of it. This means that it aims to separate the services from the underlying networks that carry them. It originated from the Third Generation Partnership Project (3GPP) as means of providing 3G mobile operators migrating from the Global System for Mobile Communication (GSM) to deliver more effective data services. Since then it has been adopted by other standards organizations for both wire and wireless networks. With the Session Initiation Protocol (SIP) as the backbone of the system it is widely gaining backing from services providers, vendors, application developers and infrastructure vendors.

The architecture of IMS consists of three layers namely the transport layer, the control layer and the application layer. Since IMS can separate the services from the underlying carrier, a GPRS enabled mobile phone can connect to IMS equally as well as a PC connected via a Digital Subscriber Line (DSL). More importantly in a mobile environment, where a user has ability to roam, the access independence of IMS can not only allow both the physical roaming of the user but also provide the ability for his/her device to roam between various connection methods. Both of these features ensure that the upper layers are saved from large amounts of data traffic.

As an element of IMS, presence technology aims to implement a more intuitive network and satisfy growing demand for contextualised information. It differentiates from many current presence services running on HTTP because being based on SIP it becomes interoperable across a variety of networks.

Despite some industry analysts' opinion that IMS is yet immature and unproven, a number of operators (Nokia, Alcatel, amongst others) have recognized its considerable long-term value and provided their own IMS solutions for both mobile and fixed networks [5]. A totally IP based network infrastructure means standardized and open access. The horizontal deployment architecture of IMS also gives vendors, particularly mobile carriers the ability to construct diverse service opportunities and generate incremental revenue [5]. Essentially, customers are eager to be served with multiple choices within a single user experience. With the introducing of IMS, therefore, traditional wireless and wireline service providers will be impacted and forced into Integration, Migration and Substitution (I.M.S.).

As commercial deployments IMS are still in their infancy and have not yet reached levels to warrant large scale investment only a very small number of applications for IMS have been developed and none of them have included a mobile presence service. In the forthcoming sections we present the design an implementation of a novel IMS presence service which illustrates practically the enormous potential for future applications running over IMS on mobile networks.

2. ARCHITECTURE
The architecture of IMS-based mobile presence service has been built entirely of standardized open source server elements along with the mobile presence terminal. It embodies the Open IMS Core system [6] as the IMS network, the combination of the OpenSER server [7] and the OpenXCAP server [8] (both of which are dedicated to provide rich presence services), and a presence client programmed by J2ME (as shown in Figure 1). By installing the presence application, an IMS-enabled mobile handset allows users to share their presence with others over an underlying transfer network such as GPRS or WIFI.

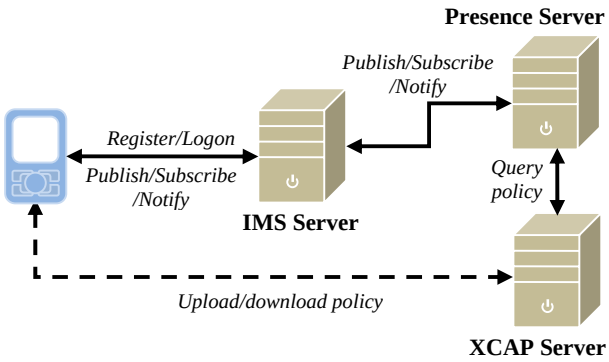


Figure 1 Service Architecture
SIP HTTP

2.1 Subscription, Publication and Policy

The delivery of presence information requires presence subscription and presence publication. The client initiates a request for subscription and then the IMS server establishes and maintains this subscription dialog (a connection) to the client. Other communications indicating changes in presence then follow this same path as shown in Figure 2. The service is terminated by un-subscribe request. In the SipPres application starting and cancelling a subscription are automatically performed by the client during logging on and logging out.

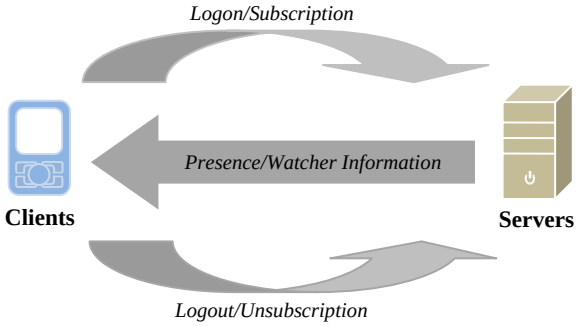


Figure 2 Presence Service Life Cycle

From Figure 1, the IMS forwards the specific service request to the presence server that queries the policy document from the relational database in the XML Configuration Access Protocol (XCAP) server to authorize access to defined data items. Depending on the permission provided by the presence user, the presence server determines whether the subscriber is eligible for the knowledge of the particular user's information. If the policy is insufficient, the process of subscription will remain pending. When the subscription is complete, a real-time interaction based upon presence delivery will be established between the client and the server. Any change that occurs in the presence then would be delivered to the recipient who requests that information.

The upload and update of personal presence are tagged with a unique value that matches the specific presence entity with his/her presence document. By searching the existing presence record according to the tag value received from the client, the server executes updating operation or saving new data if no record matches.

As is illustrated in Figure 1 the transaction regarding privacy filtering bypasses the administration of the IMS and is controlled through a distinct protocol suite. Therefore, a verification of identity is imposed on per session request to the XCAP server to ensure effective control of access to the server back end.

2.2 Data Storage and Synchronization

The IMS database is responsible of administering the IMS users' accounts. It uses user's SIP Uniform Resource Identifier (URI) to identify different account and links to the raw XML formatted presence information and the policy documents. The mobile client fetches the presence record and the permission roster from the server database at each logon.

To avoid asynchronously saving data between the client and the server, the application will attempt to resend the updating request if a failure or abnormal termination happens without user intervention. In case of the failure of reaching its target after number of attempts, an alert will be typically provided on the mobile screen for the approval of any further action.

2.3 Authentication and Authorization

As they run on different protocols the IMS and XCAP using separate authentication and authorization (AA). An additional server program is designed that operates in parallel with other servers and aims to unify the verification management by creating the identical username and password for IMS and XCAP at the moment of registering new IMS account.

3. CLIENT APPLICATION

SipPres is effectively a presence-capable application built around the flexibility of IMS which could easily be incorporated in a variety of applications such as games or social networks.. The client provides three kinds of presence services that are presence delivery, watcher identification and privacy control. Figure 3 illustrates some of the current features.

3.1 SIP URI

IMS users are identified by SIP Uniform Resource Identifier (SIP URI) which consists of SIP schema, username and domain name of IMS delimited by @ sign (e.g. sip:alice@open-ims.test). By only using this, mobile users can logon to the certain IMS network and be provided with its services. New applicant for IMS account needs to supply username and password to obtain the SIP UIR. This token is used for all subsequent SIP transactions.

3.2 Presence Information and Watcher Identification

In addition to indications of basic user status, contacting methods (mobile number, Email and SIP URI that is used for instant SIP messaging) and personalized notes and signature, the client also features 'Location', 'Activities' and 'Mood' as part of the presence services. This can assist the caller in deciding the target communication more effectively before initiating communication, for instance, if someone is indicating their mood as 'Sad@ their friends might wish to speak to them directly or if they are indicating their activity as 'Playing Games' a text might be more applicable. User can access this information from the presence indicator icon on each friend's detail (Figure 3.3) but rather than trying to automate the response the client allows the users to

define their own requirements.. Currently SipPres allows presence information which shown in Table 1.

Watcher information can help the user know who watches his/her presence data by displaying a blue eye on the watcher icon. This feature allows users to know and control who has access to their presence information.

(1) (2) (3) (4)

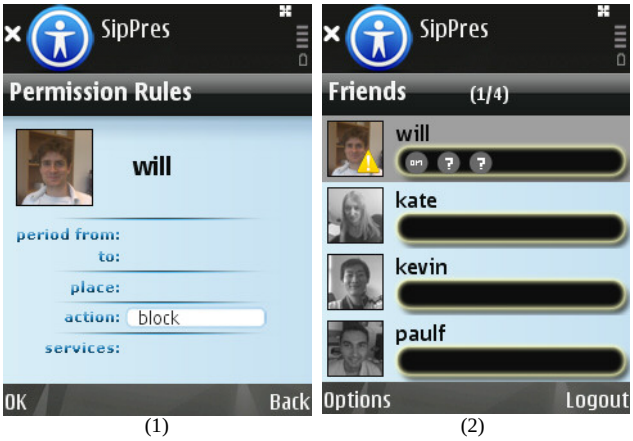
Figure 3 SipPres Screenshots

STATUS	LOCATION	ACTIVITIES	MOOD
Online	Home	Driving	Happy
Offline	Office	Meeting	Sad
Appear offline	School	Gaming	Dopey
Away	On Way Home	Shopping	
Busy		Sleeping	
Do not disturb		Watching TV	

Table 1 Instant Presence Collection

3.3 Privacy Control

To protect personal privacy, the application does not allow universal searching of 'friends from the overall database of users as offered by some social networking sites such as Tencent QQ that is the most popular chat and social networking application in China. With SipPres, mobile user has to have the exact friend's SIP URI before adding it. Although a stranger could browse the user's presence information if he/she has the SIP URI of the user the application supports blacklist and whitelist policy. This allows users to block unwanted watchers. Those blocked watchers will not be able to get the users presence delivery service unless they get the permission from the user. In Figure 4 (2) a yellow exclamation on the users icon indicates that this user has been blocked.



(1) (2)

Figure 4 Policy Making

3.4 Contact Priority

Under some certain situations, users usually do not expect to be contacted directly such as when in a meeting meeting. Creating different priorities for contacts according to the situations can help users to handle those unexpected disturbances. Setting priority value of a contacting way to '0' means that this kind of communication is unavailable at the moment, and others will not see it on their screens.

3.5 Network and Access Point

SipPres can connect to different IMS networks by pre-configuring the intended IMS including proxy address and host address, and in various ways, for instance, over GPRS or WIFI environments. The application always prompts an access point in which the users can select the certain connections. It is not recommended that using wireless connection which needs identification may result the application in failure of linking with IMS. Because the login page for authorizing the use of the access point would not be displayed.

4. USER EXPERIENCE

Thus far the application has only been tried around the restricted environment of our research laboratory using a dedicated WiFi router as security restrictions and lack of commercial IMS infrastructure means that we are unable to test the service on a wider scale. In terms of a critical evaluation therefore the scope has been somewhat limited as many of the benefits of this type and level of context are most applicable to social group that is predominantly mobile.

However, this initial feedback did raise a number of interesting points as users certainly liked having the context information of their social group displayed on their phone and many liked the

constant feeling of connectedness without necessarily having to engage in a conversation. The ability to quickly glance at the status whilst engaged in other activities seemed highly desirable. Another popular feature was the ability to see who was also watching you and the ability to block unwanted attention. Interestingly many said that as context information become more detailed they would prefer to know who was using this information and perhaps set context levels of engage in context blurring as this information was extended outside their more intimate social group.

Although this information is quite restricted in scope it does raise a number of interesting issues which encourages to work towards a large scale trial.

5. CONCLUSIONS AND FURTHER WORK

Most existing mobile presence implementations are tied to specific environments and users are often faced with updating their presence profile individually across these environments for example Facebook, Twitter, Jaiku, etc. IMS-based presence will allow such information to be easily accessed across a range of applications thus providing users with a single requirement for presence update no matter what particular application they are using at any one time. However, as our preliminary user experience shows as this raise interesting research questions on how to control access this information which many social networking sites currently ignore

Whilst at first sight SiPPres may appear to offer very similar facilities to those many existing services being based around IMS it has a flexibility and power way to be extended beyond the current implementation and integrate into many cuurent online services.

Additionally, the provision of context data on the mobile phone screen raises a number of interesting research questions on how this would affect the cohesion of more intimate social networks and how access to these networks is best managed and controlled.

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