An Enterprise Instant Messaging (EIM) Solution to Cater Issues Associated with Instant Messaging (IM) in Business

Muhammad Ehsan Rana[1], Gong Wei[2], Peter Hoornaert[3]
School of Computing & Technology
Asia Pacific University of Technology & Innovation,
Technology Park Malaysia, 57000 Bukit Jalil, Kuala Lumpur, Malaysia
muhd_ehsanrana@apu.edu.my[1], pgongwei0060@hotmail.com[2], peter.hoornaert@apu.edu.my[3]

***Abstract*— Nowadays instant messaging (IM), as a viable communication tool, has been widely adopted in the business field. Instant messaging delivers lots of benefits for business, but most people are unaware of its security problems and other potential implications. This paper focuses on investigating the problems and issues associated with the instant messaging in business. The existing literature is critically analyzed to represent the background, concept and relevant techniques of instant messaging related to the topic. Finally a model of Enterprise Instant Messaging (EIM) is proposed especially for small enterprises.**

Keywords*— *Instant Messaging (IM), XMPP Architecture, Business Risks, Enterprise Instant Messaging (EIM)

I. INTRODUCTION

Instant messaging (IM) is a text-based online communication service that allows real-time communication through personal computers or mobile computing devices. Before the Internet became universal, software developers tried to design chat room software and set it up on web servers. The chat room provides a place for a group of people chatting in message format that can be seen by everyone in the room. The instant messaging system typically consists of a private discussion between two persons, which has gained popularity and become increasingly popular in people's daily life.

The real beginning of instant message is the ICQ release on the Internet. The ICQ, shorthand for "I seek you," can be considered as the first modern, freely available instant message application, which was developed and released by the Mirabilis [1]. The original ICQ was not stable and had some compatibility problems, but it was still very popular at that time. Afterwards a number of instant message platforms similar to ICQ were released such as MSN and Yahoo Messenger but they were not limited to text-based messaging. Later these systems began to offer video calling, social networks integration, games and other diverse recreational features.

Currently, instant messaging is not only used for personal chat and entertainment, but it is also widely used in the business field. From The Second Annual Instant Messaging Trends Study, over 27 percent of instant messaging users now communicate via instant messaging at work, a 71 percent increase over 2003 [2]. Instant messaging provides many benefits for enterprises, for example, it allows users to communicate with colleagues and customers at a distance in real time. Some instant messaging systems have VoIP services which enterprises can utilize to place telephone calls [3].

Instant messaging can deliver lots of benefits for business, but it also carries several risks and issues. In 2004, Ronan Lavelle mentioned, "Uncontrolled instant messaging in the workplace is undeniably a security risk and potential diversion for staff" [4]. Public instant messaging can be a potential route for hacking and spreading computer viruses. Moreover employees can be easily distracted by the vibrant and colorful functions of instant messaging.

This research focuses on analyzing the existing public instant messaging techniques and then attempts to answer the question that possibly how existing popular IMs lead to problems and issues in business. Following this, an internal enterprise instant messaging (EIM) system for small enterprises is designed in an attempt to effectively solve the relevant problems associated with public instant messaging when used in business. The proposed internal enterprise instant messaging (EIM) restricts the functionality of the public IM systems and internalizes the users on the local area network. The system follows the essential business communication requirements, which can retain the original benefits for enterprises and avoid above mentioned risks and issues.

II. LITERATURE REVIEW AND ANALYSIS

Instant messaging is a useful tool for communicating with each other. To use instant messaging, users should log into the service with a name and password. The system provides the contact list (or buddy list) to maintain a list of people with whom the user want to interact. The system monitors

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the list of people and their status of being online or offline [5]. Many instant messaging applications also allow users to indicate their status, such as "busy" or "away". For real-time interaction, users should be online at the same time and the intended recipient must be willing to accept messages.

A. IM in Business

Instant messaging provides several benefits for enterprises. The major advantage of instant messaging is saving of time and effort in business. According to filtering technology firm Secure Control, in 2004 about 40% of employees at UK enterprises use IM software whilst in the office [4]. Instant messaging is a convenient method to communicate with co-workers, specifically when a group of people work on a project where they have busy schedules or work spread across different places. The instant messaging software can help them to communicate quickly and simply. Different from e-mail, there is no need to wait for formal long messages [2]. Research by the Radicati Group looked at the time it took staff to complete two typical daily tasks, both with and without instant messaging, and found that corporations could save an average of 40 minutes a day per user using instant messaging. They estimated that a company with 5,000 people could see a $37.5 million a year saving through increased productivity [6]. In some work environments, such as laboratories libraries and archives, people should remain silent as per regulations, so instant messaging is the best choice for communication.

B. Problems Associated with IM in Business

Instant messaging is becoming more and more popular in business. However, before the benefits of instant messaging can be delivered for enterprises, the potential risks and problems should be considered.

Security Risks: The public instant messaging systems, such as Windows Live Messenger and Yahoo! Messenger, are free to download and have a huge user base, which can be a good route for hacking and spreading computer viruses. A study from the IMlogic Threat Center shows that the IM attacks in December 2005 grew by an additional 241 threats, adding to more than 300 for November 2005 and 292 in October 2005 [7]. These attacks can steal confidential information from the computer, or attack the company system rendering it useless. Eventually the use of instant messaging in business will result in security risks to enterprises.

Legal Risks: In most countries, they have laws related to electronic messaging. In United States if employees use the instant messaging to disseminate defamatory statement or implement business in illegal procedure, it is against the law and the company may face criminal liability charges. Therefore, many organizations do not keep track of their employees' instant messages, according to the 2004 Workplace E-Mail and Instant Messaging Survey [2].

Information Leakage: When people uses instant messaging for business, their messages may be recorded and monitored which results in their sensitive data or confidential information to be leaked or revealed. Almost all popular instant messaging systems provide file transmission functionality. Data transmitted over the Internet can be viewed by programs such as packet sniffers, with some specially crafted techniques. Therefore instant messaging may lead to information leakage risk in business.

Productivity Decrease: Employees are easily distracted by colorful functions of instant messaging in workplace. They just enjoy the personal chat and other recreational functions like playing games and music in working time, which can result in low work efficiency of employees. According to the filtering technology firm Secure Control, about 40% of employees at UK enterprises use instant messaging whilst in the office. Many use it because it is fast to communicate with colleagues however it is noted in the same survey that 31% uses instant messaging to communicate with friends in order to avoid sending private messages via corporate e-mail system [4]. Hence the use of instant messaging in workplace may result in productivity loss.

C. IM Architecture

Historically, instant messaging systems used the traditional Client-Server model. The users connect to the instant messaging network via the server and the server handles all the clients' requests (See Figure 1). However in this architecture, the system's reliability and security relies a lot on the server. If servers fail, the entire instant messaging network fails [8]. To resolve this issue, the Peer-to-Peer (P2P) networking paradigm is implemented in the system architecture.

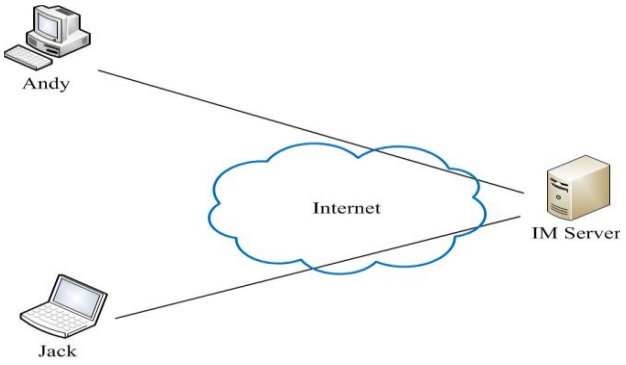

Fig. 1. Client-Server Architecture of IM

Peer-to-peer (P2P) technology is a distributed structure that partitions tasks or workload between nodes. P2P is widely used in instant messaging (See Figure 2). In P2P, the clients do not need to contact the server every time. The functionality of the server is distributed amongst the participating peers in the system. The P2P model reduces

the server load, but the server cannot control nor enhance the message delivery flow.

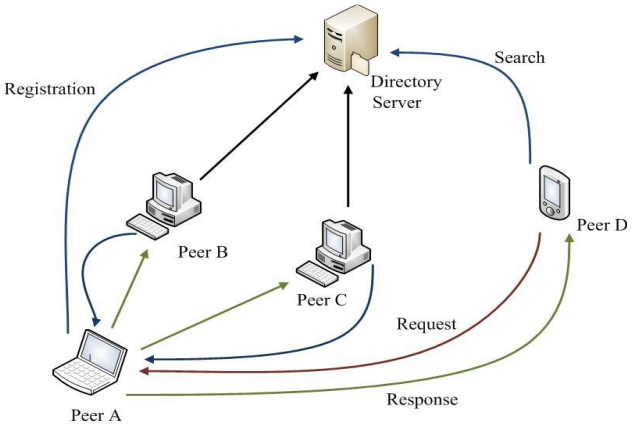

Fig. 2. P2P Architecture of IM

D. IM Concepts

a) Presence Service

Presence information demonstrates the status of a user that others can know if he or she is available f communication. It helps instant messaging to offer mu better service by displaying clients' presence status. As can see from figure 3, the presence information contai client's location, schedule, time and status to provide a vivid display of their preference information [9].

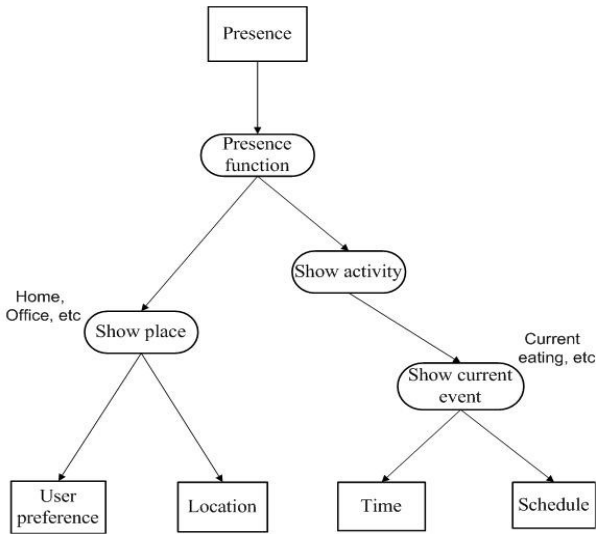

Fig. 3. Presence Availability [9]

The Internet Engineering Task Force (IETF) provided the Presence and Instant Messaging Model, RFC-2778 in 2002. This model describes the basic functions and implementation procedures of the presence system. As shown in figure 4 below, this presence system concept model explains how the presence service works. The presence service includes two kinds of users: presentities and watchers.

Presentities gather presence information from different user devices, such as PC and cell phone, and then send them to the server. The Watchers are responsible for receiving the presence information from the service [10].

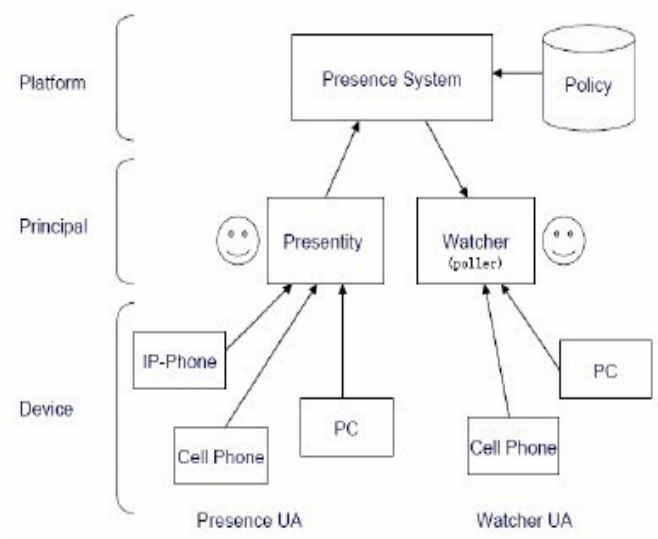

Fig. 4. Presence Concept Model [10]

b) Standards and Protocols

The Institution of Electronics and Telecommunication Engineers (IETE) produces various standards and protocols to build internet-scaled instant messaging systems. There are two main working groups in the IETF, which are The Extensible Messaging and Presence Protocol (XMPP) and Session Initiation Protocol for Instant Messaging and Presence Leveraging Extensions (SIMPLE).

"XMPP is an open technology for real-time communication, which powers a wide range of applications including instant messaging, presence, multi-party chat, voice and video calls, collaboration, lightweight middleware, content syndication, and generalized routing of XML data" [11]. XMPP was originally known as Jabber created by the Jabber open-source community in 1999. The original developers were focused on developing an instant messaging platform, but the extensible nature of XML has made XMPP attractive to application developers who need a reliable infrastructure for rapidly exchanging structured data not just instant messaging features [12].

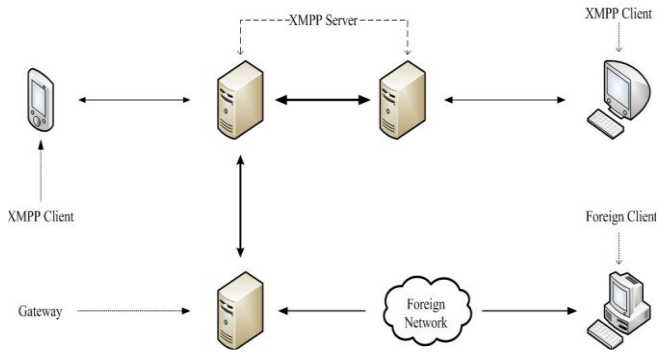

Fig. 5. XMPP Architecture

The XMPP architecture includes three parts, client, server and gateways to foreign networks (See Figure 5). The server is used for connection management and routing. The gateway provides a bridge between different networks and has to control different protocols. The connection of any two XMPP parts is Transmission Control Protocol (TCP). A TCP connection must be established first for XML streaming before the content session. A TCP connection can carry many sessions, which are identified by their unique address.

The SIMPLE working group focuses on the application of the Session Initiation Protocol (SIP) to the suite of Presence Leveraging Extensions. The group proposed methods like SUBSCRIBE, NOTIFY and MESSAGE in SIMPLE. When a user wants to know about presence information of another user, SUBSCRIBE method will be used. After subscription has been done, NOTIFY will be produced, which is used to describe presence information of a presentity. Interaction of different components for SIMPLE is illustrated in Figure 6 [13].

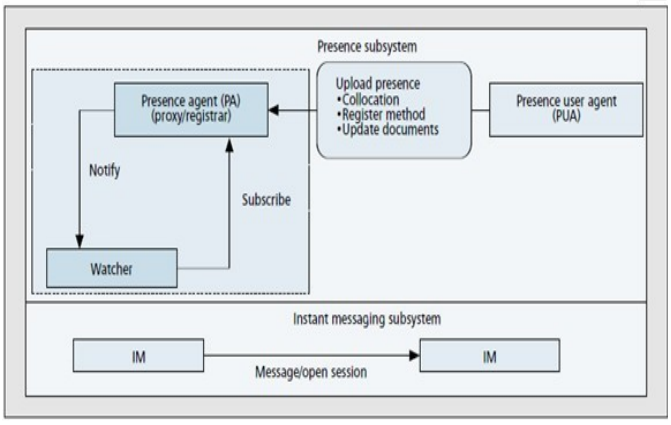

Fig. 6. SIMPLE Components [13]

In the SIMPLE architecture (See Figure 6), the presence user agent (PUA) sends presence information to a client. The presence agent (PA) responds to SUBSCRIBE requests received and generates notifications for presence state of a client. Watchers are parties interested in knowing presence information of other clients. Each of these SIMPLE components registers with the SIMPLE provider to send and receive messages. According to the architecture, there are three ways for presence information exchanging: Collocation, Register method and Update documents. When people add contacts to their list, they subscribe to these contacts' presence information.

XMPP and SIMPLE have some similar features such as IETF standards, open source, text based and so on. However SIMPLE and XMPP are very different technologies and are currently in different stages of development [13]. SIMPLE has more promising features than XMPP because it can be connected to other services through the SIP protocol. However, there have been fewer deployable instant messaging solutions than in XMPP. XMPP is more stable and widely used through Jabber. But it has limited capability to connect different devices as compared to SIMPLE.

III. Proposed Solution

A. EIM for Enterprises

The solution for the stated problem is to design an effective internal enterprise instant messaging (EIM) system for businesses. Unlike public IM systems which are mainly focused on chatting features and entertainment, this internal EIM system caters for the business communication requirements. This EIM is intended to use for enterprises in order to improve their communications, business productivity, inter-colleague relationships and efficiency. The proposed system should conform to the relevant standards in critical areas.

There are eight essential features to consider when the EIM system is designed for enterprises:

1. Security – ability to control and protect communications
2. Stability – operates reliably within high network traffic and other demands
3. Efficiency – utilization of minimum system resources
4. Versatility – effective and rich in features
5. Compatibility – ability to integrate with the existing system without much alteration
6. Scalability – adaptable in a changing business environment
7. Simplicity – easier to learn and practice by the business end-users
8. Affordability – believed to be within enterprises' financial means [14]

Because of unsecure services of public IM system in business, widespread adoption of secure enterprise instant messaging (EIM) for the company is inevitable. Currently,

most EIM systems are not free and the cost depends on the number of users, however, some small enterprises do not have enough budget for these EIM systems and their relevant security technology support is poor. Therefore, on the basis of EIM essential elements, they expect to have some low price EIM systems with restricted functionality.

B. Overivew of the System Design

The requirements of the proposed internal EIM system in this research are defined through the analysis of survey and literature review.

From the analysis, it was found that enterprises can maximize their benefits from instant messaging, but they are also troubled by the related risks and issues specifically security risks, productivity loss, information leakage and legal risks. These problems are mainly resulted from the vibrant functionalities, large user base of public IM systems and IM attacks from the Internet. Therefore, an internal enterprise instant messaging system is proposed for enterprises to avoid related risks and issues. The proposed EIM system design follows the essential business communication requirements, which advocates to restrict recreational functions and internalize the users on the company LAN.

The main functions of an internal enterprise instant messaging (EIM) system are provided below:

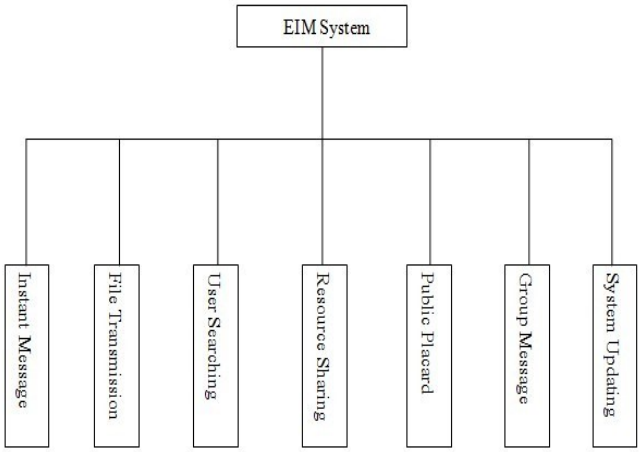

Fig. 7. System Function Architecture

In addition, by considering user's perception and preference from the survey, the proposed system should also provide features including simple and familiar user interface, contact lists and presence services. The interface design is suggested to be similar to public IM systems so that the proposed system can be adopted easily by employees. Unlike public IM systems, the proposed EIM model should work on the company LAN (Local Area Network) in order to restrict users to talk with unintended people. This can avoid employees spending too much time chatting with outsiders on non-work related issues using public IM systems. This instant messaging works on LAN that can also avoid employees using the system to inadvertently disseminate illegal information and prevent IM viruses infecting the system. The features of the proposed internal EIM system are described below.

Features List:

- Buddy List: it lists names and icons of contacts allowing users to add a new contact by inputting the IP address.
- Tray Control: it provides a system tray on the windows taskbar to control system display, hiding and relevant accesses.
- Familiar User Interface: as users are already familiar with public IM systems, they will feel comfortable using this EIM system.
- Chat Scene Selection: the system provides different dialog box interface to users, so they can choose their favorite one.
- Expression Function: the system provides expression selection function. It is used to save and send different images.
- Increased Productivity: By design, the system does not allow users to talk to people outside of the system. This will decrease the amount of time people spend talking to outsiders on non-work related issues using public IM systems.
- Encryption: All communication, including file transfer, is done through an encrypted channel to ensure the integrity and confidentiality of the data.
- No Internet Connection Required: unlike public IM systems, this EIM program only requires a LAN (Local Area Network) to function.
- Public Placard: the manager can use the EIM system to post notices to employees.
- Resource Sharing: users can set the folder to public so that other users on the buddy list will have the authority to access this folder.

For this internal EIM model, we decided to use SIP/SIMPLE standard by comparing SIP/SIMPLE with XMPP and by considering the findings discussed in the literature review. The data transaction in the EIM system network is using the User Datagram Protocol (UDP). The UDP is a protocol supporting packet-switched communication in an interconnected set of computer networks, which is succinct and efficient. It gives a process for software programs to send messages to other programs with a minimum of protocol mechanism (Jon RFC 768). It was also found that the P2P architecture is more stable and feasible than the client-server model for IM system network in the company, which doesn't require a specific server. Considering the above points, P2P architecture was chosen for the proposed EIM network. In the P2P, the functionality of the server is distributed amongst the participating peers in

the system. Each internal EIM application can be regarded as client and server so that users can maintain and manage the application by themselves.

This model is designed using P2P architecture on the company LAN. The overview of high level LAN architecture is shown below. As we can see from the figure, the system nodes are connected by switches and routers on the company LAN in different floors.

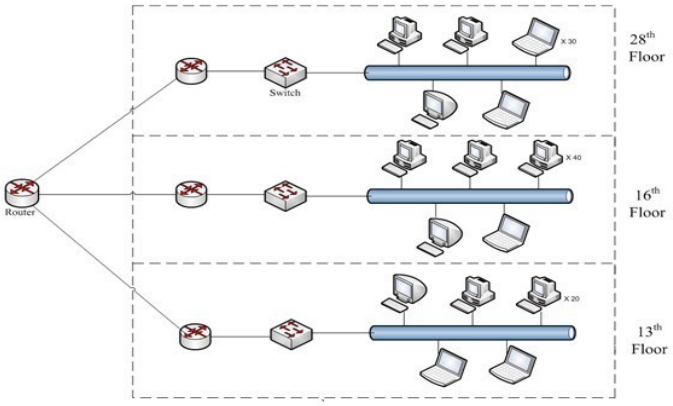

Fig. 8. the Company LAN Architecture

IV. Conclusion

The goal of this study is to research the problems and issues of the public instant messaging in business, and then develop an effective internal EIM system for small enterprises. The definition, background, concepts, features, architecture, standards and relevant techniques of the instant messaging is discussed in the paper.

As the research indicates, using instant messaging in business results in security risks, productivity loss, information leakage and legal issues, therefore an internal EIM system is designed to solve the problems of using public IM system. The proposed model restricts all recreational functionalities present in the public IM system and internalize the system interaction on the company LAN.

One of the limitation of this internal EIM is that the system only allows internal interactions between colleagues on the company LAN which implies that EIM system model cannot be used for customer service or accessing information from the Internet. In addition, the deliverable EIM model was just developed to focus on core business requirements, but in large enterprises, they always expect more functionality from the EIM system. Thus the proposed EIM system is limited and suited only for small enterprises.

Future research for this study includes improving the functionality and security of the internal EIM system. Moreover other powerful features for enterprises, such as online conferencing and office automation management can be added. To provide a wide range of services, the proposed EIM system should connect to the Internet for better communication with customers and suppliers. However, there is a need for further research on security and EIM management strategy to avoid the problems from using a public network.

V. References

[1] Paul Piccard, Marcus Sachs, Brian Baskin, George Spillman, "Securing IM and P2P applications for the enterprise", USA Syngress Publishing, US, 2005, pp.134.

[2] Peter Alexander , "Should Your Business Use Instant Messaging?", November 14, 2005, http://www.entrepreneur.com/technology/techtrendscolumnistpeteralexander/article81050.html

[3] Deb Shinder, "Instant Messaging: Does it have a Place in Business Networks?", 2005, http://www.windowsecurity.com/articles/Instant-Messaging-Business-Networks.html

[4] Fran Howarth, "The problems with Instant Messaging", 2004, http://www.it-director.com/technology/security/content.php?cid=7032

[5] John W. Rittinghouse, James F. Ransome, "IM Instant Messaging Security", Elsevier Digital Press, USA, 2005.

[6] "Measuring IM Productivity in the Enterprise", The Radicati Group, Inc., London, UK, 2004.

[7] "Instant Messaging Attacks Increased 826 Percent over December 2004", IMIlogic Threat Center, News Report, 2006, http://www.govtech.com/security/Instant-Messaging-Attacks-Increased-826-Percent.html

[8] Matthew Benford, Michael Boyce, Priyanka Mahalanabis, Steve Webb, "Peer-to-Peer Instant Messaging (P2P IM)", Intel Opportunity Scholar's Program, http://www.cc.gatech.edu/~webb/P2P_IM.htm050.html

[9] Ramiro Liscano, "Presence and Awareness Services", SITE U. Of Ottawa, Canada, 2003.

[10] Sam Chang, "SIP and Presence Service and Instant Messaging", Industrial Technology Research Institute, Computer & Communication Research Laboratories

[11] "About XMPP", XMPP Standards Foundation, http://xmpp.org/about-xmpp/

[12] Peter Saint-Andre , Kevin Smith, Remko Tronçon, "XMPP: The Definitive Guide" O'Reilly Media, UK 2009

[13] Samir Chatterjee, Tarun Abhichandani, Haiqing Li, Bengisu Tulu, Jongbok Byun, "Instant Messaging and Presence Technologies for College Campuses", IEEE Network, 2005.

[14] "What is Enterprise IM?", GTV Solutions, Inc.http://www.sonork.com/eng/what_is_eim.html, 2003

[15] Jon Postel, "RFC 768 User Datagram Protocol", England, 1980