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Wireless Presence and Instant Messaging

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1. Executive Summary

The advances of new technologies and the convergence of different communication media are constantly changing not only our means and modes of communication with other people, but the notion of connectivity itself. Rather that being online or offline, we can be 'connected' in many different ways and without directly interacting with technology itself. 'Presence' awareness, facilitated by Instant Messaging applications, mobile phones, wireless handheld devices, location tracking and so on, can make someone reachable almost at any time. In view of this rapidly developing field, this report aims to identify the most important issues related to the development of Instant Messaging and Presence enabled applications for wireless devices.

The outline of the document is as follows: The subsequent section describes the technology and highlights the move of Instant Messaging (IM) to the wireless world. Then, Chapter 3 identifies the importance of Wireless Presence and Instant Messaging and the application domains affected by the introduction of these new technologies. The following section, titled Technical Overview, largely focuses on current technical developments as well as adaptation constraints for wireless IM and presence. Current messaging standards on mobile phones are presented and then discussed in relation to Instant Messaging. The report identifies important technological advancements for wireless IM and discusses the significant interoperability problem in the industry, with reference to the standards bodies involved. A brief introduction to Jabber technology aims to provide an alternative positive view for the future. Chapter 5 demonstrates the advantages of wireless Presence and Instant Messaging for Higher and Further Education drawing from existing research in the use of IM in professional and educational settings. The final section presents some future perspectives once the technology becomes established.

The report has been written for a diverse audience and for this reason technical terms have been kept to a minimum and explained in the Glossary section. Readers can also consult the references for more specialised technical information and details.

Keywords: presence, Instant Messaging (IM), wireless communications

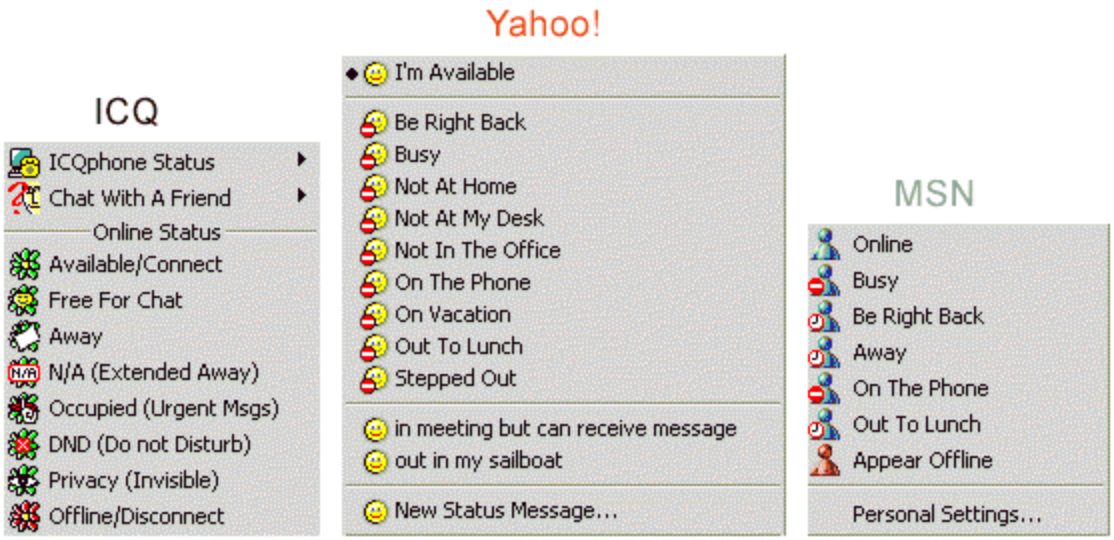
2. The Technology

Presence is becoming a key issue in the wired and wireless world. At the most basic level, presence awareness lets users know when other people in their contact list are online. However, the concept has expanded from the initial online/offline description to what we identify as rich presence. Thus, presence information can include more user details, such as availability, location, activity, device capability and other communication preferences, even expressed in more abstract terms, like 'mood' or 'intention'. A general notion of presence would answer the questions of Who (user), Where (location and

device), When (preference and willingness), How, (device capability) and Why (information exchange, leisure, keeping in touch etc) (Chakraborty, 2002).

The most commonly used tools that facilitate presence awareness are the various **Instant Messaging (IM)** applications, though there is an increasing trend towards recognising that IM is itself just one (communication-oriented) of many facets of presence management. Instant Messaging is one of the fastest growing areas of the internet for the past few years that allows millions of users around the world to contact friends and colleagues in a convenient way, with more immediacy than e-mail and without the expense of a phone call. All widely used desktop IM applications, like ICQ, MSN Messenger, Yahoo! Messenger, AIM, Odigo and Jabber have the following basic features and some include more advanced communication capabilities, like voice chat and file exchange:

- Contact list management. Allows users to create lists of friends and colleagues and organize them into groups, in order to be able to see their presence information and contact them directly. Most IM systems have also the option of audio alerts, signaling when people in the contact list come online or offline.
- Person to person communication is achieved through sending and receiving instant messages. Usually messages can also be sent to users who are offline, for later retrieval. Most clients support saving received messages (message history) and others (like ICQ for instance) show the preceding messages in the same window as communication takes place. Another communication mode is chat, which can also be multi-user and is closer to the concept of IRC (Internet Relay Chat). One-to-one and multi-participant chat is supported by most major IM systems.
- Presence Management. What is typically called ‘state’ is the user information others can see, for instance, whether someone is online or offline, available for a chat or busy etc. Some IM applications support also an ‘invisible’ mode, allowing a user to appear online only for people in their contact lists and appear ‘offline’ for everyone else. In addition, a custom ‘status’, a user-specified message display is often available.
- User database search. Users can search through a directory to find others according to interests and profile or search by name, nickname, e-mail or other IM specific identity.



Screenshots illustrating different presence 'states' in desktop IM applications: ICQ Messenger (www.icq.com), Yahoo! Messenger (http://messenger.yahoo.com/messenger/) and MSN Messenger (http://messenger.msn.com/).

An IM service can be either device-based or network-based. In the former case, the user needs to have a client application installed on a computer or other device. Contact lists, user information and preferences are then stored on the device. If a user wants to access the system from another device, for example a mobile phone or PDA, all the information must be set again by the user for every device. Any future changes (e.g. adding another contact to the contact list) would then need to be made manually for every device used to access the system. The advantages of a network-based system where all information is stored on a dedicated server and updated dynamically are evident. A client application still needs to be installed or embedded on every device used to access the system, but then all information need to be provided only once and all changes will be updated, so that all devices display the same information. However, this model has the trade-off of security risks and lack of privacy, particularly for corporate IM use. For wireless IM communication, a network-based system is highly recommended, partly because of low memory availability on handheld devices. A network-based system can also serve to provide translation mechanisms, allowing users with different device specifications (e.g screen size), capabilities and software to communicate with each other. While desktop IM users are quite used to having more than one IM application running, we expect that wireless users will be more willing to use only one client, due to the limited resources on wireless devices and since switching between clients is more complicated. For this reason, a server would need to provide gateways to other IM providers.

Most familiar today is computer-to-computer instant messaging, but IM is clearly moving to the wireless domain. Major desktop IM providers have already formed partnerships with wireless carriers to add SMS (Short Message Services) functionality to their systems. Currently IM is also implemented on mobile phones through WAP-based clients and also as a separate Java application for Java enabled mobile phones.

Screenshots of Yahoo! Messenger for mobile phones, which is based on SMS, using specified commands and codes to organise contact lists and send instant messages (http://messenger.yahoo.com/messenger/wireless).

Presence is the key feature that differentiates wireless Instant Messaging to the existing SMS messaging facility on mobile phones. Without presence, the user does not know of a person's availability or device status. Presence is a constantly evolving dynamic construct with a great potential for future telecommunication applications.

3. The Technology Watch Issue

With the introduction of the latest mobile phone technology and as IM moves to the wireless domain, one of the key functions is connectivity between the internet and the mobile world. Interworking between IM on PCs and IM on mobile devices marks a true convergence. This inevitably affects usage patterns and can extend the functionality of IM to various directions. By adding the element of mobility and location to IM, another level of presence awareness is introduced. For example, users can find about other people's approximate location as well as availability. In this way, they can contact each other to meet when in vicinity. Other uses of this application, like multiplayer games, are also likely to emerge.

The telecommunications industry has high expectations from the integration of IM with mobile services. Apart from increasing revenue streams through advanced messaging services, wireless presence and IM are also beneficial for mobile commerce, business use and location based services (LBS).

With the addition of IP telephony capability an IM application can become a major communications platform. When integrated with the phone, IM allows users to negotiate availability and avoid interruptive phone calls. In this way, an IM system can act as a personal communications portal, providing users with the ability to specify their communication preferences according to the device they are using or who they want or do not want to communicate with.

Presence technology and Instant Messaging integrated in the wireless domain will affect our daily communication patterns and behaviors, even more strongly than desktop IM has already done. IM is informal in nature, but provides great assistance for group collaboration. In professional and educational settings the impact of desktop IM has been significant so far: work coordination, meeting arrangements, quick exchange of information and a sense of being 'connected' with people at a distance are some of the most important facilities offered by IM. Wireless Instant Messaging (WIM) can have an

even greater effect, by providing more flexibility in time management and meeting arrangements as well as an 'always in touch' state, which can foster group interaction. The value of IM for HE/FE is illustrated through relevant examples in Chapter 5.

At the moment however, there are significant technological and economic constraints preventing Presence and IM from becoming truly revolutionary technologies, widely accepted by wireless device users. The problem originates from desktop IM and becomes more complicated when it comes to mobile phones. Unlike the internet, IM has not been based on open standards and therefore most users can only communicate with people using the same protocol. For IM to become a broader communications platform, the various systems need to be able to communicate on a standards basis, which means that major IM providers like AOL should open their systems to other providers. Despite valuable interoperability efforts, the issue is still the hottest topic in the industry. Wireless Instant Messaging on the other hand, requires the cooperation of wireless carriers for standards establishment. Since the technology is so new, it will be very interesting to see how it will evolve. After the introduction of the third generation mobile phone (3G) technology and during the next few years, interoperability developments will determine the use and adaptation of wireless presence and Instant Messaging.

4. Technical Overview

4.1 Messaging Developments

This section of the report outlines the most important developments in wireless messaging and presents current and future directions for the implementation of presence enabled applications and IM on mobile phones.

4.1.1 Mobile Messaging Standards

SMS - EMS- MMS

Messaging on mobile phones is rapidly evolving from pure text messages (SMS) to messages that resemble multimedia presentations (MMS – Multimedia Messaging Service) and can include graphics, data, animations, audio clips, voice transmissions and short video sequences. In between SMS and MMS we have the Enhanced Messaging Service (EMS), which can contain combinations of text, simple images and melodies. The text of an EMS message can be formatted. EMS has added a degree of personalization to text messaging. MMS is definitely an important advancement over SMS and EMS, however new network infrastructure components and new handsets are required. The introduction of MMS has shown so far that it is not going to be a seamless customer experience due to serious interoperability problems (Tulloch, 2002). Technical complexity put aside, it is still hard to achieve network interoperability for commercial

reasons; operators use different tariff schemes to charge messaging services. There are concerns that users might not adopt MMS as they did with SMS because of interoperability problems as well as high costs.

IM and SMS

The advance of mobile messaging standards from SMS to MMS will not really influence the way IM itself currently works on mobile phones, apart from offering the ability to send audiovisual data to contacts. While IM has already been combined with SMS, it will be more successful and easy to use when we will have persistent 'always on' internet connectivity on mobile phones.

The combination of IM with SMS resulted in a hybrid technology possessing attributes of both. Messaging patterns are quite similar, both IM and SMS messages are usually shorter than 100 characters with no attachments. Contrary to desktop IM, SMS enjoys global connectivity, like e-mail. IM benefits from the store-forward capability of SMS (i.e. messages are sent via an SMS centre), which allows users to send messages to recipients that might have their mobile phone switched off (Pulver.com, 2001). The advantage of SMS as an established technology with a great user base and popularity in both Europe and Asia, has created expectations in the industry that it will drive the uptake of wireless IM. Basic IM functionality (send/receive messages and contact list) can already become available on existing handsets and networks. It is interesting to note that although SMS has been extremely popular in Europe and Asia, it has not been successfully launched in the US. SMS was delayed in the US due to interoperability problems. While in Europe SMS functionality was easily added on all standard GSM phones, technical differences between the two US standards, TDMA and CDMA, have complicated the implementation. In addition to those initial problems, there are cultural and commercial complications as well. In Europe, customers tend to keep their mobile phones always switched on. In the US however, another barrier to SMS take-up is the habit of a large proportion of users to keep their mobile turned off unless they want to make an outgoing call, consequently not knowing when an SMS arrives. This is due to the call termination charge that the receiver must pay in the US (Chasey, 2002). While in Europe mobile phones took off before the internet, it worked the other way around in the US; great internet penetration and extensive use of free IM resulted in completely different usage patterns. For this reason, other alternatives are overtaking SMS, such as the IM capability provided in recently developed handheld devices (e.g. DangerHiptop, 2002). An International Engineering Consortium (IEC) study, Advanced Messaging: Killer App or Niche Market?, reveals expectations that two years from now North American SMS will most likely still not have achieved the large take-up rates it has already earned in Europe and Asia (IEC, 2002).

4.1.2 Protocols and networks

Currently wireless IM is also implemented in Europe through WAP (Wireless Application Protocol). Presence and IM based on WAP are not very promising, since WAP has not been overall successful. On one hand, sending/receiving information is a quite slow, often interrupted process and on the other hand, WAP services can be very expensive for IM purposes because of the high connection charges per minute. The user

base is also much smaller for WAP than for SMS. That is why SMS-based IM is a better option for the moment. While there are IM applications currently implemented for WAP enabled devices, most expectations focus on the introduction of the interim (2.5G) and third (3G) generation mobile networks, allowing more persistent connectivity and high bandwidth data services. Interim generation technologies, GPRS (General Packet Radio Service) and the enhanced EDGE (Enhanced Data for Global Evolution) can transmit information more quickly and efficiently across the mobile network. The gradual establishment of the third generation Universal Mobile Telecommunications System (UMTS) during the next several years will bring high bandwidth mobile data services. In the future, users will be spending more time online with their mobile phone, which is critical for the broad adaptation and use of IM and presence enabled applications.

4.1.3 Java application development

Sun Microsystems' Java™ technology on mobile phones is at an introduction phase, at least in Europe. Few handsets are available and the potential of Java for rich content has not yet been fully explored. In Japan, however, Java has successfully been deployed on NTTDoCoMo's i-mode platform. Interactive content on i-mode is more advanced and graphically interesting than most mobile content available in Europe (e.g. users can send full color animated messages with cartoon characters, FunMail, 2002). The J2ME (*Java™ 2 Platform, Micro Edition*, 2001) technology is a driving force for content development on mobile phones, personal digital assistants and other handheld devices. Wireless IM can be implemented as a separate application on Java enabled devices and in the future IM and presence information could be combined with other applications as well, for example multiplayer games.

4.2 Interoperability

Lack of interoperability is the greatest problem for both desktop and wireless IM. In the desktop world, the greatest obstacles have been posed by major service providers, like AOL, who want to protect their user base. AOL has sidestepped IM standardization efforts from the Internet Engineering Task Force (IETF) and, citing privacy concerns, shut out rivals who figured out how to let their users access AOL's IM services (Ulfelder, 2001). Unfortunately, the perspectives of IM becoming a truly universal standard like e-mail are quite unrealistic, at least for the next few years. Interoperability is however, even more vital for the success of wireless IM and Presence, since users are unlikely going to pay for a service if they cannot communicate with people on other networks or using a different service provider. The value of an IM service to end users is dependent on the number of other users of the same service. A critical mass is required for early adoption, in order to fuel usage growth.

4.2.1 Billing – related problems

Unfortunately, most important interoperability constraints are not technical, but commercial in nature, particularly when considering the interworking of wireless IM with

existing desktop based IM services. Mobile operators have always been charging for messaging services, while desktop IM has been free for internet users, thus PC-to-SMS messaging becomes problematic since billing issues need to be resolved.

Many operators, particularly in the US, have formed partnerships with IM service providers. They are also likely to launch their own services in the future. The most important motives for this, according to the "Wireless Instant Messaging" white paper from Wiral are: a) Larger share of revenues b) Increased brand value c) Greater control over service development c) Security and reliability issues (Internet IM services have not proved secure enough for business use) d) Leveraging of complementary services, such as location services by combining subscriber presence information with location information (Wiral, 2001).

Alliances between wireless carriers and major internet IM providers usually operate on a dual model, without promoting interoperability standards for the rest of market.

4.2.2 Standards Bodies and Protocols

Several groups are currently working on establishing standard protocols for messaging interoperability, however, while their efforts do not necessarily contradict each other, those groups are not working together.

IETF – Internet Engineering Task Force

The Internet Engineering Task Force is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet (IETF, 2002). Working groups within IETF focus on developing protocols for Presence and Instant Messaging. The MMUSIC (Multiparty Multimedia Session Control) working group has developed the SIP (Session Initiation Protocol), a signaling protocol for Internet conferencing, telephony, presence, events notification and instant messaging (IETF, 2001). Another group within IETF, the SIMPLE group, develops the SIP (Session Initiation Protocol) for Instant Messaging and Presence Leveraging Extensions. The SIP-based architecture of the SIMPLE protocol aims to integrate presence and instant messaging with traditional telephone communications and web conferencing. This protocol has acquired a lot of industry support so far, particularly from two of the largest software corporations, Microsoft and IBM. There is also the Instant Messaging and Presence Protocol (IMPP) group within IETF, working on protocols and data formats necessary to build an internet-scale end-user presence awareness, notification and instant messaging system (IMPP, 2002). Finally, the most recently established group (October 31, 2002) is the Extensible Messaging and Presence Protocol XMPP working group. XMPP is the XML-based core protocol of the Jabber Instant Messaging and Presence technology, an open source community initiative (see section 4.2.3 for a description of the Jabber project).

PAM Forum – Presence and Availability Management

The Presence and Availability Management (PAM) Forum is an independent, nonprofit consortium established to standardize the management and sharing of presence and availability information across multiple services and networks. The goal is to establish a standard for maintaining and publishing information about user identity, presence (including information like location, device state and communication capabilities) and availability. The PAM specification also provides a mechanism for privacy management, to allow users have control over their private information. The focus of the PAM forum is to develop and promote a presence and availability application programming interface (API) specification (PAM, 2002).

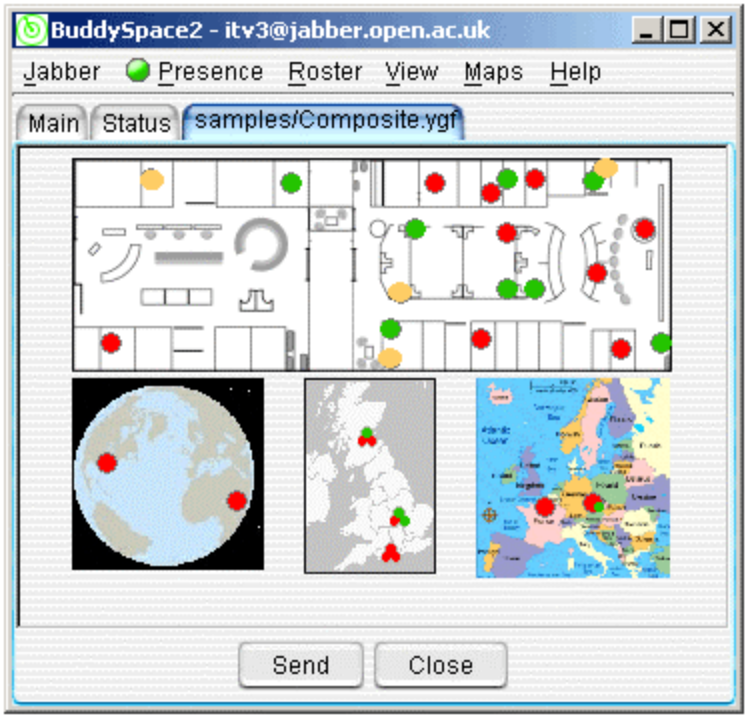
Wireless Village

The Wireless Village initiative was founded by Ericsson, Motorola and Nokia in April 2001 to define and promote a set of universal specifications for mobile instant messaging and presence services. The specifications concern the exchange of messages and presence information between mobile devices, mobile services and Internet-based instant messaging services. It is the only group with a clear focus on wireless IM and Presence; though the other groups also take wireless technologies into consideration, they keep a more general approach. The Wireless Village proposes a standard protocol for instant messaging and presence service (IMPS), which includes presence information management, Instant Messaging, group management and shared content (Wireless Village, 2002). Unlike the PAM Forum, which separates availability from the rest of presence information, in the Wireless Village specification, presence includes availability, as well as other information such as location, device capability, profile etc.

4.2.3 The example of Jabber

While it is clearly hard to predict the future of wireless IM industry, the Jabber Project works against incompatibility by providing an open and extensible IM standard. In early 1998, Jeremie Miller started the Jabber project with the simple hope of a cross platform IM system. Today, Jabber is a set of open, XML-based protocols for which there exist multiple implementations. Jabber compliant servers and clients provide instant messaging and presence services on thousands of domains worldwide. The Jabber platform is free, open source and unlike major IM solutions that depend on a centralized server, Jabber employs a distributed server architecture. Anyone may set up a Jabber server and add users to communicate with any other Jabber server, much like Internet's e-mail system where users can be contacted via user@domain.com (Landrum, 2001).

In a professional context, a user might not even need to add every contact separately to their contact lists, since all working group information stored on corporate databases and directories can be set to appear in the user's IM client. The Knowledge Media Institute (KMi) at the Open University has developed the 'BuddySpace', a jabber IM prototype with automatic contact list generation for workgroups, which aims to facilitate IM use for professional and educational purposes.



*Screenshot of KMi's BuddySpace client (*http://buddyspace.sourceforge.net/*). A composite view of custom maps displaying the presence information of people in contact lists.*

Moreover, by adding the contacts' location information, as illustrated in the screenshot of custom maps in 'BuddySpace' above, we can have a greater sense of 'shared' space and being 'in touch' with colleagues at different locations. The use of maps adds value to the visual perception of 'who is there' and facilitates the representation of distributed workgroups, particularly with many people, often displayed in inconveniently long contact lists.

Every Jabber server supports loadable gateways (or transports) that translate the Jabber protocol to a foreign protocol, achieving in this way communication with several other major IM systems. Although the Jabber project is still under progress, the extensible and flexible protocol and architecture are very promising, pushing the concept of presence beyond desktop and even beyond wireless IM. Features under development include additional applications such as whiteboards, gateways to SMS services, and the extension of Jabber to wireless devices and embedded applications. As far as device diversity is concerned, by enabling embedded applications to communicate, the Jabber platform will provide a new level of convergence where the transport of data would be transparent to the data source. Being open source, flexible, extensible and highly ubiquitous, Jabber has a lot to offer to the development of presence enabled applications for HE/FE.

4.3 Other constraints

4.3.1 Privacy concerns

As presence technology becomes more ubiquitous, personal information can be accessed by others at any time, bringing not only a sense of 'being connected', but new possibilities of surveillance as well. By observing the activity that takes place on contact lists, people can understand their contacts' daily routines (e.g. arrival at work, being away from the desk etc). In a professional environment, this is one of the major constraints for a broader adaptation of IM. Although basic IM systems allow users to become 'invisible' to others or to block communication from certain users, more advanced presence management systems will be required, particularly as IM moves gradually to the wireless domain. Location tracking is a very sensitive issue, for instance. Having the option to 'switch off' the location positioning of a mobile phone is not enough. It would be instead more useful to introduce some limits or user defined restrictions to the accuracy of location information; a more approximate estimation of where the user is would ensure more privacy.

4.3.2 Security

Security is also a very important factor, particularly for business use of IM. Major desktop IM services (AOL, Yahoo, MSN etc) have proved to be unsuitable for corporate environments because of their centralized server architecture. Sensitive data can be exposed and there are virus risks as well. The issues in security involve client to client encryption, client to server and server to server encryption. Separate enterprise solutions are common practice to ensure security in professional settings. Message archives stored sometimes by default on users' computers for later retrieval, though very useful, pose some security risks as well.

4.3.3 Usability

Handheld devices have limited text input and display capabilities. For wireless IM, this means a lot of menu navigating and key pressing before sending an instant message. IM design should adjust to these limitations of wireless technologies. On the other hand, mobile phones gradually become more sophisticated, with small complete keyboards, which have proved to be a convenient input mechanism for handheld devices.

5. What is the value for HE/FE

Wireless IM and Presence can be useful for Higher and Further Education in assisting group communication and collaboration, much like desktop IM has already done. Little research has been carried out in this new field, however early studies of the use of Presence and IM in learning environments are very encouraging.

According to ethnographic studies of IM use in the workplace (Nardi and Whittaker, 2000), IM is supportive of informal, flexible and expressive communication. People usually use IM for: quick questions and clarifications, coordination and scheduling, organising impromptu social meetings and negotiating availability. People use contact

lists and instant messages to see whether others are available, to start opportunistic conversations, as well as to negotiate availability for conversations in other media than IM. Phone interruptions can be reduced by using this more unobtrusive way for contacting people. IM is also used to hold intermittent conversations over longer periods of time, allowing people to do other tasks simultaneously. Intermittent instant messages give participants a sense of shared space and are more immersive than e-mail (Nardi and Whittaker, 2000).

However, most important is presence awareness, as it creates and maintains a sense of social connection to other people. Nardi and Whittaker report that people in their study found value in simply knowing who else was 'around' as they checked their buddy list, without necessarily wanting to interact with buddies. A feeling of 'being connected' even if people are not in the same space creates a shared 'world', which is extremely important, especially to workers collaborating at a distance. In the context of distance learning, a sense of other students' presence adds great value to the experience. But even more leisure oriented learning activities (e.g a virtual Pub Quiz for Open University students, Scott & Eisenstadt, 2000), aiming to foster relationships between isolated students can make use of presence information in an innovative and creative way.

Reffell and Eklund have researched the use of IM in an educational environment, particularly in the context of project-based learning and looked at how it can assist groups of students to overcome scheduling and co-location problems. They reported widespread use of IM among students (especially from Computer Science), primarily social and only secondarily academic or work-related. Presence awareness is used by students to locate resources, for quick exchange of information and to organize meetings either online or face-to-face. Almost half of the users surveyed used IM to collaborate on documents or projects simultaneously. IM allows group members to work separately while maintaining contact and sporadic but ongoing conversation between them. The research identified certain IM features that are valuable for educational use. Academic users tend to work from several locations, thus a network-based system storing all the IM information on the server is necessary. Other research in professional IM use has also suggested that the ability to be simultaneously logged to clients in different locations with the system sending messages to the latest 'active' location can also prove very useful, even if full mobility is not supported (Isaacs et all, 2002). Another significant feature for educational use is the automatic logging of messages, very important for users to be able to review conversations and data at a later stage. A reliable file transfer capability is very valuable as well. Students like to have the option of an 'invisible' presence state to retain their privacy and avoid interruptions while working. Finally, IM applications should have an easy way to flag a group message as having been sent to the group so that each recipient is aware of the distribution (Reffel and Eklund, 2002).

As a group collaboration tool, IM however, has also its limitations. If conversation becomes more complicated or detailed or if there is some kind of misunderstanding, it becomes much more efficient to talk than type. Sometimes it is also necessary to have access to the same visual shared workspace and sharing documents over IM is not sufficient.

Overall IM and Presence, both on desktop computers and wireless devices, are valuable tools for HE/FE. Universities could set up their own server (using the Jabber technology

for instance) and develop their own, customised to fit their needs, IM application to assist student communication and collaboration and foster interactions beyond the lecture theatre and the lab. With more Java enabled phones, more persistent connections in the future and most students having a mobile phone, this could be a remarkably valuable tool for keeping in touch and organising university life and collaborative work. However, for collective adoption of IM in an educational setting, a highly interested group of users, a 'critical mass' is necessary. Through persistent use of the new technology, the 'critical mass' would then demonstrate utility to others, who in turn become more likelier to adopt the technology (Herbsleb, Atkins et al. 2002). This is particularly important for such an informal communication tool, which does not have any specific task orientation. Some basic group training on the use of the system would also prove very useful.

6. Future directions

This report has identified key developments, implementation problems, likely applications and benefits in regards to wireless Instant Messaging and Presence. We are still uncertain about how exactly the industry will be formed in the future and when the interoperability issue will be resolved. There is one thing clear though: the future of wireless IM and Presence depends upon the establishment and general acceptance of standards for the exchange of presence information and instant messages between different service providers, networks and devices. While we have identified contrasting interests, monopoly trends in desktop IM and hard competition for the greatest share in this new, yet undefined, wireless market, the benefits from interoperability will be great and presence will then become a revolutionary technology. There are already several coordinated interoperability initiatives. Particularly the development of SIP and SIMPLE protocols by IETF has marked a great step towards interoperability resolution. Very valuable and promising is the contribution of the open source community through the Jabber project and the newly formed XMPP working group and we can expect many significant applications of this technology in the near future.

Wireless presence and Instant Messaging are clearly very promising and have already attracted a great interest. The gradual establishment of the third generation of mobile network technology will facilitate persistent 'always-on' connection with friends, family and colleagues through IM. Moreover, presence is becoming increasingly important and currently moving beyond IM to a variety of domains. We can already see the emergence of innovative applications on mobile phones based on presence, including information and location based services, entertainment applications and multiplayer games. Rapid technological convergence will continue and we can envision presence information becoming more ubiquitous and driving embedded software development beyond mobile phones. Presence will not only include the notion of user or device state, but almost anything can have a presence state, from the printer and the coffee machine to any work in progress in our computer.

Within the next ten years, our communication and collaboration practices will definitely change significantly. Considering mobility and learning practices in particular, we will see learning move away from designated areas (e.g. the classroom) and become an everyday practice. The world will be a valuable source for learning material and informal

learning will take place in a variety of settings (e.g. the display on our mobile phone will receive information from surrounding objects and locations as we move from one place to another). We can envision users being able to exchange documents, images, simulations and other learning material in various formats and view them on a variety of devices (computers, mobile phones, PDA's, projectors etc), increasing lifelong learning opportunities. Our ways of interacting with our environment are bound to change if the surrounding objects and devices begin to have a 'presence' state. Being in an 'always in touch' state, will foster group communication and collaboration even more, allowing people to coordinate their activities on the move.

Some of the above scenarios might seem to be yet quite far from the current state-of-the-art of the wireless presence and IM industry. However, if we consider how fast and how much telecommunication technologies have progressed in the past ten years, a lot more is actually possible within ten years from now.

7. Acknowledgments

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8. Resources for further information

Newsletters and reports:

The Instant Messaging Planet: http://www.instantmessagingplanet.com/

IEC (International Engineering Consortium) publications: http://www.iec.org/pubs/

Pulver.com on IP Communications: http://pulver.com/index.html

Telecoms.com on 3G and the mobile internet: http://www.telecoms.com

Related Bodies:

The Internet Engineering Consortium, IETF: http://www.ietf.org/

The Jabber software foundation at: http://www.jabber.org/. For the Jabber project also see http://www.jabber.com and http://www.jabbercentral.com/

The PAM (Presence and Availability Management) Forum: www.pamforum.org

The Wireless Village initiative: www.wireless-village.org

9. Glossary

2.5G	Interim Generation wireless network technologies: GPRS and EDGE
3G	The Third Generation of wireless technology. Designed to support applications with high bandwidth requirements, like video and multimedia transmissions.
CDMA	Code Division Multiple Access. A digital, wireless telephony transmission technique allowing multiple frequencies to be used simultaneously.
EMS	Enhanced Messaging Service. Mobile messaging service through which users can send a combination of text and simple images and melodies.
EDGE	Enhanced Data Rates for GSM Evolution. An improvement to GPRS increasing data transmission rates.
GSM	Global System for Mobile Communications. The current technology standard used for mobile telephony networks in most of the world.
GPRS	General Packet Radio Service. More persistent connection and higher data transmission rate than GSM. An intermediate step to 3G (2.5G).
I – mode	Packet – based information service for mobile phones that is very popular in Japan. It was launched in 1999 by NTTDoCoMo.
IP Telephony	IP telephony or Voice-over IP (VoIP) refers to the transmission of telephone calls over a data network. IP stands for Internet Protocol.
J2ME	Java ™ 2 Platform, Micro Edition. A platform for the development of downloadable or embedded applications for network-connectable devices with limited resources (e.g. mobile phones, two-way pagers etc).
LBS	Location Based Services. A variety of location dependent services (e.g. information, emergency, advertisement and entertainment) available on wireless devices with a location positioning capability, for example GPS (Global Positioning System).
MMS	Multimedia Messaging Service. A mobile messaging service allowing the transmission of formatted text, graphics, data, animations, images, audio clips and video.

Open source	Term coined in March 1998 to describe software distributed in source under licenses guaranteeing anybody rights to freely use, modify, and redistribute, the code.
PDA	Personal Digital Assistant. A small, handheld device that offers functions such as address storage, calendar and e-mail.
SIP	Stands for Session Initiation Protocol. SIP is a signaling protocol used to establish Internet telephone calls, multimedia conferences, chat sessions, instant messaging and interactive communications. The protocol initiates call setup, routing, authentication and other feature messages to endpoints within an IP domain.
SMS	The Short Messaging Service was launched in 1992 and has become the most successful mobile data service in Europe up to date. SMS allows mobile phone users to send and receive text messages of up to 160 characters.
TDMA	Time Division Multiple access. A digital technology that allows multiple users to share the same voice channel by having each conversation transmitted alternately over short lengths of time.
UMTS	Universal Mobile Telephone System. The future 3G mobile network standard, allowing persistent connectivity, high bandwidth data transmission, global roaming etc.
WAP	Wireless Application Protocol. A set of communication protocol standards for mobile internet access.
XML	The Extensible Markup Language is playing an increasingly important role in the exchange of a wide variety of data on the internet and on other networks.

10. References

Chakraborty, R. (2002). *Presence: A Disruptive Technology*, JabberConf 2001 presentation, Denvor.

Chasey, J. (2002). SMS, IM and Mobile Games. *Mobilizing Entertainment Content: North American Best Practice in Mobile Entertainment*, Department of Trade and Industry.

DangerHiptop (2002). Danger, Inc. http://www.danger.com/products.php

Dano, M. (2001). *Instant Messaging prepares to take spotlight*. http://corp.bantu.com/press/rcmwireless_article.html

Formulasys *The Basics of Wireless - White Paper*. http://www.formulasys.com/Whitepapers/Basics-of-Wireless_Formulasys.pdf

FunMail (2002). *FunMail: Content Driven Wireless Messaging Solutions*. http://www.funmail.com/

Guernsey, L. *You Can Surf, but You Can't Hide*. The New York Times, 07/02/2002

Herbsleb, J., Atkins, D., et al. (2002). *Introducing Instant Messaging and Chat in the Workplace*. CHI 2002, Minneapolis, Minnesota, USA.

IEC (2002). Advanced Messaging: Killer Application or Niche Market? Report.

IEC (2002). *Instant Messaging*. http://www.iec.org/online/tutorials/instant_msg/

IETF (2002). *Overview of the IETF*. http://www.ietf.org/overview.html

IETF (2001). *SIP: Session Initiation Protocol*. The Internet Society. http://www.cs.columbia.edu/sip/drafts/draft-ietf-sip-rfc2543bis-03.pdf

IMPP (2002). *Instant Messaging and Presence Protocol (impp)*. IETF. www.ietf.org/html.charters/impp-charter.html

Isaacs, E., Walendowski, A., et al. (2002). *Hubbub: A sound-enhanced mobile instant messenger that supports awareness and opportunistic nteractions*. CHI 2002, Minneapolis, Minnesota, USA, ACM.

J2ME: *Java 2 Platform, Micro Edition*. Sun Microsystems (2001) http://java.sun.com/j2me/j2me-ds-0201.pdf

Jurvis, J. (2001). *Jabber: Smooth talking for Short Messages*. DevX.com. www.devx.com/upload/free/features/xml/2001/01jan01/jj0101xml/jj0101xml.asp

Landrum, E. (2000). Making Sense of Jabber. *Web Techniques*. **12**.

Landrum, E. and Charron, T. (2001). *The New Face of Instant Messaging*. Jabber Central. http://www.jabbercentral.com/features/

Marsan, C. (2001). *Messaging vendors rally around SIMPLE protocol*. Network World. www.nwfusion.com/archive/2001/123534_08-06-2001.html

Marsan, C. (2002). *IETF tames IM*. Network World. http://www.nwfusion.com/news/2002/1021simple.html

MMS: Multimedia Messaging Service. Ericsson Mobile Communications AB (2001). http://www.ericsson.com/products/white_papers.shtml

Nardi, B., Whittaker, S., et al. (2000). *Interaction and Outeraction: Instant Messaging in Action*. CSCW'2000, ACM Press.

Odigo Messanger. Odigo Inc. http://corp.odigo.com/products/clients

PAM (2002). *About the PAM Forum*. PAM Forum. www.pamforum.org/SubNav/background.html

PAM (2002). *PAM Specification Document: version 1.0.* PAM Forum. www.pamforum.org

Peretz, M. (2002). *IM 101: Different Wireless Messaging Flavors*. Instant Messaging Planet. www.instantmessagingplanet.com/wireless

Pulver.com (2001). *The marriage of SMS and Instant Messaging*. http://pulver.com/reports/smsim.html

Reffell, J. and Eklund, S. (2002). *Instant Messaging in Project-Based Learning*. CSCW Seminar.

Scott, P. and Eisenstadt, M. (2000). Exploring telepresence on the Internet: the KMi Stadium Webcast experience. *The Knowledge Web*. M. Eisenstadt and T. Vincent. London, Kogan Page.

Snyder, R. (2002). *Wireless Instant Messaging: Opportunities, Challenges and Requirements for Carrier-Scale Success*. Wireless Agenda 2000, Austin, Cellular Telecommunications & Internet Association.

Tulloch, J. (2002). Communication Breakdown. *Mobile Communications International*, Telecoms.com. **01**.

Ulfelder, S. (2001). Showdown over Instant Messaging. *M-Business*: 68.

Weiss, S. (2002). *Handheld Usability.* Chichester, John Wiley & Sons, Ltd.

Wiral (2001). Wireless Instant Messaging: Market Opportunity and Business Models.

Wiral (2001). Overcoming the two major barriers to Wireless IM adoption: Interoperability and usability.

Wireless Village: The Mobile IMPS Initiative. Ericsson, Motorola, Nokia (2002). www.wireless-village.org

Woods, B. (2002). *SMS Still Not Picking UP in U.S. - Study*. Instant Messaging Planet. www.instantmessagingplanet.com/wireless

XMPP. (2002). *Extensible Messaging and Presence Protocol (xmpp)*. IETF. http://www.ietf.org/html.charters/xmpp-charter.html