

IBM Research Report

From Sametime Connect to TeamSpace: Evolution of a Pervasive Collaboration Environment

Thomas V. Frauenhofer, Werner Geyer

IBM T. J. Watson Research Center
P. O. Box 218
Yorktown Heights, NY 10598



Research Division

Almaden - Austin - Beijing - Haifa - T. J. Watson - Tokyo - Zurich

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From Sametime Connect to TeamSpace: Evolution of a Pervasive Collaboration Environment

Thomas V. Frauenhofer and Werner Geyer

IBM T. J. Watson Research Center, 30 Saw Mill River Road, Hawthorne, NY 10532
{tvf, wgeyer}@us.ibm.com

Abstract

This paper discusses an evolution in our understanding of how pervasive handheld devices can be used to increase awareness and interactivity in the workplace. We present two pervasive clients that demonstrate the evolution from simple instant messaging and awareness functionality to an approach that is more integrated with the way people work.

1. Introduction

Changes in society and corporate structures (such as mergers) have increased the need for people to work remotely with others [9]. Telecommuting, for example, is becoming increasingly popular with the work forces in many corporations. While technology has improved the ability of people to work in different locations, it has also had several unintentional consequences:

- Mobile workers use some combination of PDAs, laptops, cell phones, pagers, instant messaging, and e-mail to organize their life and work. Unfortunately, keeping the information on these devices synchronized offsets the timesaving they gain in using these devices.
- Workers find that they can cut down on interruptions in their day-to-day work by working at home but often feel that they may be missing out on some of the interactions that go on during the day. Other workers who do not elect to telecommute may feel that those who work at home are not producing as well as they would if they were in the office.

The goal of our current research project, *TeamSpace* (see [5], [10], [11]), is to develop an infrastructure to help improve the connectedness of remote team members. One portion of this project, *TeamSpace Connect*, is an attempt to increase awareness and interactivity of the TeamSpace virtual meeting environment by integrating the desktop

and handheld client connectivity, which we hope will better facilitate the transition between the wireless work mode and the desktop mode.

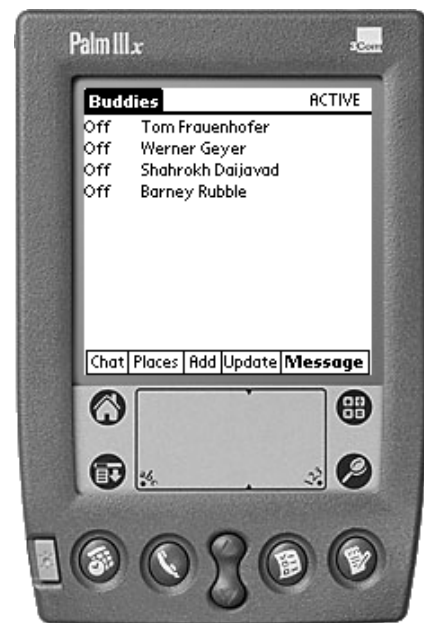


Figure 1. Sametime Connect buddy window.

2. Sametime Connect for Workpad

Our first prototype was a client to interface with the Lotus Sametime awareness and messaging infrastructure [8]. Lotus Sametime is a synchronous collaboration product that provides tools for instant messaging, awareness (as well as a shared whiteboard and application sharing using the T.120 protocol suite). The Sametime implementation consists of a stand-alone Windows client that acts as an instant messaging client (Sametime Connect), a set of Java applets to provide a user interface to the T.120 services, and a Server to manage these communications channels, provide user access and management, and to interact with other

Sametime servers to enable scaling from small to large enterprises.

The Workpad-based client is a straightforward implementation of the PC-based version, complete with buddy list awareness and chat. Figure 1 shows a sample screen of the Workpad client displaying the buddy list.

An early version of this software was used as part of a pilot for a standard Workpad user client in the IBM office of Business Transformation (BT/CIO's office), and is being used as part of the IGS ConnectMe Project to support Customer Service Leaders. Palm VII wireless support was added for use by IBM personnel at the Master's Golf Tournament and U.S. Open Tennis Tournament.

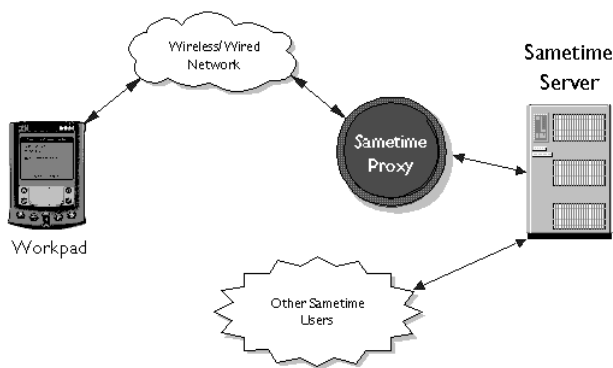


Figure 2. Sametime Connect for Workpad communications architecture.

2.1. Infrastructure

The Workpad Sametime client communicates with the Sametime Server via a proxy written in Java². This is illustrated in Figure 2. The proxy intermediates between the Workpad client and the Sametime server to provide:

- A mapping between the protocol used by the Workpad client and the Sametime API.
- Persistence of a user's session if the wireless link should be temporarily dropped. This is a big win for a mobile client, where short periods of connection loss are quite common.
- An interface for an operator on the proxy workstation to do simple management of mobile users logged in through the proxy.

¹ This software is available for download from IBM's AlphaWorks site (<http://www.alphaworks.ibm.com>).

² At the time of implementation only a Java based API was available.

The performance of this proxy is quite reasonable. Experiments have shown that over 100 sessions could be active through a single proxy at one time.

2.2. UI Design Issues

The Workpad user interface represents one of the most challenging design points. The small screen and limited color (160 by 160 pixels, 2-bit gray scale) are offset somewhat by the touch screen and the convenient form factor. The Windows Sametime client displays several windows for information and makes use of color and shapes to distinguish information (green letters indicate buddies that are currently online, with a green square to the left of the buddy's name for active users, a red ball for inactive users or for users who are away, etc.). Given the color and screen limitation, the Workpad client uses abbreviations for buddy states (Act=active, Off=offline, Inac=inactive, etc.). The state of the Workpad client is shown in the title line of the Buddy and Place forms.

We developed a navigation bar at the bottom of the screen to facilitate going from one form to the next. The buttons on the left-hand side of the bar take you to other forms, whereas those on the right-hand side are for functions related to the current form. In Figure 1, for example, the two left-most buttons take you to the chat and places forms, whereas the right three buttons provide access to the more commonly performed functions on the current form (such as sending a message to a buddy).

2.3. Communications Issues

The first version of the Workpad client was implemented as a traditional TCP client. While the response time was very good, and messages could flow freely in both directions, it did not handle temporary disconnects at all. This needed to be address when we added support for the Palm VII organizer. The native wireless capabilities of the VII (provided by the Palm Internet Library, or INetLib) use an HTTP-like, connectionless protocol over a pager network. An intermediary server maps this into true HTTP messages. All requests are initiated by the client, which means there is no way to push data from the server to the client. We worked around these constraints in the following manner:

- All messages are converted to an ASCII format before being transmitted in either direction. The handheld client and the proxy were enhanced to handle the encoding and decoding responsibilities.

- The proxy was rewritten to handle session context management. We enhanced the protocol to add a token to the message header. The token maps the user's message to the appropriate session handler. The proxy establishes this token at login time and tells the client to use this for all messages for this session.
- INetLib is single threaded; it can only handle one network request at a time. Queuing was added to the Workpad client, and multiple requests are packaged together and unpacked by the Proxy.

3. TeamSpace and TeamSpace Connect

The TeamSpace project is a joint effort between IBM and Boeing to develop an environment to support virtual meetings among multi-enterprise teams (see [5], [10], [11]). In the TeamSpace environment, geographically distributed cross-enterprise teams are able to work together as colocated single enterprise teams. The environment supports teamwork by enabling people to meet and see each other and their work. It supports team interaction through capabilities for information sharing, communication, coordination, and awareness.

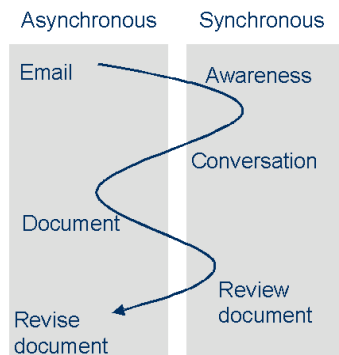


Figure 3. A typical workflow.

TeamSpace recognizes that people work in various modes, shifting between individual, asynchronous tasks, such as reading email or editing a section of a document, and more social and group-oriented synchronous tasks, such as a hallway conversation or a document review meeting (see Figure 3). A failing of many existing technologies is that they do not facilitate this work flow; typically they handle either asynchronous or synchronous work items, but not both.

3.1. TeamSpace Connect Functionality

An early TeamSpace prototype developed at Boeing

used Sametime to implement a virtual room metaphor. We wanted to improve the integration of the Sametime client into the rest of the TeamSpace view, and we felt that we could also use a pervasive client to enhance the effort³.

A limitation of the Workpad and PC based Sametime clients is independence – the clients are independent of each other (you cannot move from one device to the other without re-logging in on the other) and they are independent of work items (you cannot associate a message easily with a document, for example).

TeamSpace Connect is an attempt to address these concerns. TeamSpace Connect will build upon the Sametime Connect functionality to provide the following features:

- *Contextual awareness* – Sametime Connect has a small set of states that allow you to specify whether you are away from your desk or in “do not disturb” mode. This awareness information is available from the buddy list, which is a textual display. TeamSpace Connect uses a more graphical approach to indicate the state of various users on a project team. You are no longer just “on-line”; you are now in Joe’s virtual office, working on a common task or group of tasks [6].
- *Opportunistic communication* – TeamSpace Connect allows for associating documents with co-workers and ask it to alert you when the co-worker is available. For example, you get an e-mail message from Joe that contains a document. You can associate the document with Joe and play a distinctive tone when Joe is available [3].
- *Transparent hand-off* – you might be using a PC based client one minute and a handheld client the next. Current solutions require a log-off/log-on procedure that is not transparent to the user, and the two clients do not share state information (such as messaging connections with buddies). TeamSpace Connect provides support via a combination of wireless technology and protocol design.
- *Capability knowledge* – the Sametime Connect for Workpad client looks just like any other Sametime Connect client, yet you are limited by device constraints (such as screen size,

³ [1] is an interesting case study of using technology to enable mobile workers in a product design setting similar to the target TeamSpace audience.

available applications, etc.). TeamSpace Connect can determine what kind of device you are using and can adjust the information exchange accordingly (such as transcoding a document for the smaller footprint).

3.2. Technologies Involved

TeamSpace Connect has both a desktop and a Workpad client that communicate state information over the wireless connection. The new desktop client provides the current functionality of the Windows Sametime Connect client with hooks to integrate it into the TeamSpace environment. This new client is also “handheld-aware” in that it can share information (state and document data) with the user’s handheld client. It can be used as a stand-alone client or as an applet inside of a browser window.

The desktop and the handheld detect each other via a wireless connection (such as Bluetooth [2]). We assume that the handheld is a personal device and imbue upon it the identity master. When it comes within range of an approved desktop⁴, the desktop is logged into TeamSpace; when it leaves range, the desktop reverts to an “available” state. In effect, the handheld acts as a “Smart Card” to access the TeamSpace environment and defines a user’s identity in the system.

4. TeamSpace Connect Usage Scenarios

4.1. Scenario 1 – Project Management Meeting

Dan is the manager for a large multi-department software project to develop a new business-to-business parts ordering and tracking system for use by his company. He is currently working with Ken in the Networking department on connecting to several vendors. There has been a problem with the connection to the Frabbis company access point.

While Dan is walking towards his office he checks his Workpad. He is automatically connected to the TeamSpace environment. He sees Ken is online but working from home (his son, Alex, must be sick again). As he walks into his office, his workstation detects the Workpad, authenticates Dan, and logs him onto his TeamSpace desktop. Dan goes to Ken’s virtual office on

the TeamSpace desktop. He looks over the work items related to Frabbis and discovers that a key router patch is late. He sends Ken a message asking the status of the patch. Ken says he’ll call the supplier and get back to him.

TeamSpace pops up – it is his project management meeting in 5 minutes – just enough time for Dan to get coffee. He picks up his handheld and sees Ken’s last message (“I’ll call the vendor.”). He looks at the calendar – the meeting has moved to the small conference room.

He pulls out his handheld after getting his coffee – there’s a message from Ken (“It was delayed in transit, it will arrive today by 10:30”). Dan goes to the small conference room. Darla and George are there. The agenda is on the screen (the conference room system detected Dan’s entrance, compared it with his schedule, and put up the agenda on a SmartBoard or equivalent). The participant list includes Dan, Darla, and George as well as Ken and Ilene (Ilene is in the computer room working on some router issues). It also notes that Henry isn’t there. Darla and George also see this on their TeamSpace desktops – in fact, George and Ilene are discussing the final resolution of a critical action item.

The meeting starts. When it’s time to go over the action items, Dan pulls it up the list of overdue items on his PDA. He also directs it to the screen. He notices that the router patch is not on the list – Ilene received it during the meeting and checked it off.

At this point, Henry enters the room. He automatically pops onto the participant list (his PDA communicated with the TeamSpace system in the meeting room). Ken and Ilene both say hello to him.

When the meeting is over, Dan and Darla discuss how it went as they leave together. The TeamSpace system detects their leaving. Dan says bye to Darla and goes back to his office.

Dan’s PDA beeps. He picks it up – Ilene sent a note telling him that the router patch is installed and working. He enters his office. The message from Ilene appears on his desktop as he is automatically re-logged on.

4.2. Scenario 2 – The Rendezvous

Dan (at his desk) sees Ilene’s office appear in his TeamSpace Connect viewer. There is an e-mail attached – she has included a couple of different router configurations and needs some help deciding which alternative to use. George messages him – “Want to go

⁴ An “approved” desktop list is associated with every user in the TeamSpace environment. This list provides additional protection against unauthorized access.

to lunch?” Dan clicks on the “Rendezvous” button in the e-mail, grabs his PDA, and leaves. The e-mail is pushed to the PDA (along with a link to the attachments), and the TeamSpace server notes that Dan is now watching for Ilene.

When Dan enters the building his PDA beeps. He pulls it out. The Rendezvous feature has detected that Ilene is in and pops up the beginning of her e-mail. He sends Ilene a quick message (“I’ll be right there”). She responds (“I’m in the cafeteria”), so Dan goes there to meet her. He pulls up the e-mail on the PDA and taps on the link to the attachments (which have been transcoded into a format compatible with a program such as Desktop-to-go [4] and forwarded to his PDA). They discuss the alternatives and choose the second. Dan now marks the Rendezvous complete, which removes the e-mail and slides from the PDA.

5. Conclusion

The Sametime Connect client for the Workpad provided us with proof that there is interest in using a handheld device for awareness and messaging. What was lacking in that client was a holistic view of a user’s work environment. TeamSpace Connect, and its integration into a larger workplace tool, is an attempt to provide a more seamless and satisfying user experience. Key to this is to provide simple and minimal user interactions to make the TeamSpace Connect client easy to use.

Another important issue is the concept of personal identity. The above scenarios will only work if the system can accurately identify the user no matter which device they are using, with no requirement for a complicated validation procedure every time. Think of the handheld client as providing a wireless “Smart Card” that can also perform other functions. This “Smart Card” approach brings with it interesting security issues and privacy concerns that we are beginning to look into.

We are planning to use the TeamSpace Connect as a part of several TeamSpace pilots over the next year. Our desire is that we can find the right combination of functionality and technology that will make this an invaluable tool in the workplace.

Trademarks

Workpad is a trademark of IBM. Sametime is a trademark of Lotus Development Corporation. Palm is a trademark of Palm, Incorporated.

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