TeamPortal: Providing Team Awareness On the Web

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ABSTRACT
Working on a team that is geographically split is more than personally annoying; it has been shown both to cause delay and introduce errors due to communications difficulty and to lower inter-team levels of trust and hence cooperation. Tools to combat this problem are becoming more necessary with the evolving globalization of business. In this paper we demonstrate TeamPortal, a technology for building team awareness that is minimally intrusive, facilitates communication and leverages the growing public familiarity with instant messaging and web portals. TeamPortal is a web-based set of Java applets that monitor presence information deduced by the network, present the results to team members and allow them rapidly to initiate communication using a variety of media at the earliest convenient moment. We discuss TeamPortal's design considerations and implementation and highlight issues that are surfacing with respect to future research with this tool.

Keywords
Presence Awareness, Visualization, Collaboration, Teams, Java, Calendars, Web

INTRODUCTION
In the modern workplace, teams are increasingly made of people who are not physically proximate with one another. These teams are set up because of different locations of expertise, available work force, or other managerial reasons. These teams are often in different countries, which causes additional problems, above the normal problems of geographically separated work. Frequently, just finding out if a remote team member is available is a frustrating task, because of travel schedules, differing holidays, and different work hours. In extreme cases of geographical distribution, because of time zone differences, have no common work hours that overlap at all.

We have been part of a larger project looking at geographically distributed work. The project involves approximately 300 people, in six locations in the United States, Ireland, England, France, Germany and India, building software for various network elements in a wireless telecommunications system. As part of this project, we have used extensive surveys of the group, interviews with selected people, and observations of work habits in an attempt to understand how the team works, and ways to improve distributed work. Based on these observations, we have been working on tools, to help support this and similar teams in their efforts.

TeamPortal is an attempt to bring together many different pieces of data into simple, linked views. In the first version of TeamPortal, we have been emphasizing the general class of presence information. In TeamPortal, we take an expansive view of what kinds of information are useful for presence awareness; this includes things as simple as time of day at remote sites, holidays, and official deadlines. In addition, we also integrate personal presence information, including public calendar information, and fine-grained information gleaned from computer and telephony activity.

PRIOR WORK
Providing presence awareness has been an area of interest for CSCW for a long time. Early systems such as Portholes and Cruiser [Durish & Bly, Root] had presence-awareness functionality. These systems used video as a mechanism for presence awareness. However, in a web-based setting, video raises some problems. Although bandwidth is less dear than it once was, the requirements for video is still a problem, especially in trans-oceanic settings. Video also requires new hardware to be installed and properly configured on the client.

Due to some of the problems encountered in video, other approaches have been tried to support a more "lightweight" approach to collaboration and presence awareness. These approaches primarily use the computer's activity level as a proxy for presence. Many of these systems support some sort of textual chat. Examples of these systems include Internet Relay Chat and Zephyr [Ackerman], in addition to major commercial systems, such as AOL Instant Messenger [AOL].

The web is a natural place for collaborative systems – by its very design of fairly smart clients and centralized servers, it makes it easy to build infrastructures to share awareness information. Systems such as TeamScope [Steinfeld] have used these properties of the web: being a "lived-in" application and a setting for collaborative application to help build systems for teams to coordinate

work. TeamScope focuses on shared documents and the changes in documents as a basis for mutual awareness.

From a visualization viewpoint, presence-awareness is a non-standard application. Standard visualization research assumes that the user is fully engaged with the visual system, that the whole computer screen can be dedicated to visualization, and that the essential "task" is one of discovery. Shneiderman's often-quoted mantra "overview first, zoom and filter, then details-on-demand" [Shneiderman 96] characterizes this approach, requiring large screen space for overview, dedicated user control for zooming and filtering and leading to discovery in the details. These considerations have led to applications as monolithic programs, designed to be run for a short while, mined for information, and then closed. In contrast, a presence-awareness visualization needs to have minimal screen demands and needs not to require constant user interaction to display useful information. Details-on-demand is still a useful strategy, but general overviews of presence (which might give information such as "some people are present on some days this week") will not allow information to be deduced that is necessary for a task (e.g. "when is a good time for a meeting?"), a preferred technique is to use Details-in-Context methodology (e.g. Furnas, 86; Keahey, 98).

SYSTEM DESIGN

The goal of TeamPortal is to gather information available in different locations, and bring it together in simple, easy-to-understand views for the user. Most of the information that TeamPortal aggregates is available to the users in other places—some of it is also on the web, some of it can be obtained from other users, and some of it is stored in on-line, but not in web accessible databases. TeamPortal brings the information into one location, and provides the views necessary to be able to link and understand the data. The underlying architecture has been designed to allow linkages to happen between a wide range of possible data sources

TeamPortal integrates data from different sources using an extension of the relational database model. Full details of this 'linking paradigm' used can be found in Wills (2000), but the essential concept is to associate additional attributes with data from each source. These attributes encode graphical representation and the user's "degree of interest (DofI)" for each source element. The system designer specifies how these attributes are propagated through the graph of relations between data and thus defines a model of how the data are linked. The data sources can then be visualized individually or in small combinations, using relatively simple, intuitive views. The linking mechanism then automatically ensures that changes in one view (for example, selecting an entry) propagate to the other views via the linking mechanism and cause the other views to reflect the changes. Figure 1 shows a screenshot of TeamPortal, with the data sources and linkings to the left of figure.

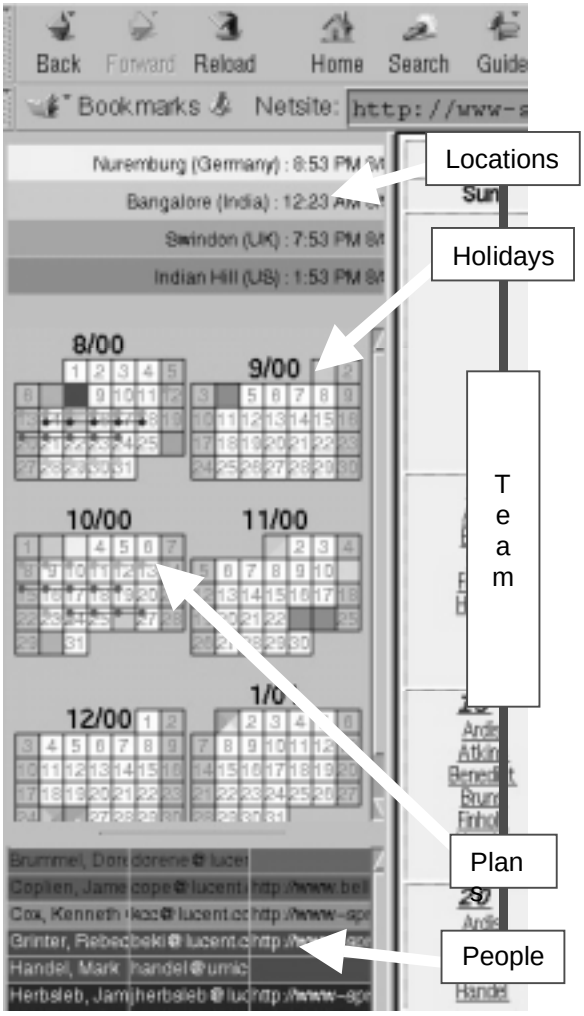

Figure 1. TeamPortal and Internal Data Linkings

The defined linkings ensure that when the user chooses a team to visualize, only those locations at which any of the team are present are "of any interest" in the location data source and hence are made visible in the top section of the view. Those location DofI's propagate to the holidays data and ensure that in the middle (calendar) view, only holidays for the specified countries are visible. The graphic attribute of color is also propagated so that the user can see that the holiday on 9/1/2000 is relevant for India.

In a similar way, the calendar also shows plans extracted from an on-line calendaring application only for those people in the team. The plans are shown in the calendar view as a set of linked circles, again with colors propagated from the 'people' data source.

This design is robust, extensible and modular. If a data source is not present (either by design or because of failure), the three views in the TeamPortal environment shown above will simply show less information. For example, if there were no data source available that

defined teams, the user would define a team to use, and a set of locations. The views themselves would be unaffected. Alternatively, if the 'plans' calendar source were off-line for maintenance, the only effect would be for the plans not to be seen in the calendar view.

The design is extensible by nature in a way that monolithic systems are not; new views can easily be added. If they depict existing data sources, no further work is necessary. If they use new sources, one need only define how those sources link to existing ones.

IMPLEMENTATION

Data definition and the relationships between the data sources are part of the design process. Conceptually, any views that display all the data sources of interest to the user can be used. From the considerations discussed in prior sections, our implementation was guided by the need to provide:

1. *Real-time visualization*; we need to represent data as it changes and ensure that small data changes do not induce large visual changes
2. *Compact and easy to use views*; views must not dominate the user's desktop and the user must be able to glance at the view and immediately gain knowledge. User interaction should be to initiate action, not to discover information
3. *Range of Presence Information*; Presence awareness needs to cover several levels of granularity, including long-term scheduling, holidays to lunch times and coffee breaks.

The initial TeamPortal implementation consists of three views, the *TimesView*, the *CalendarView* and the *PeopleView*. In line with consideration (2) above, it was decided that each of the views should be capable of being made relatively narrow; 200 pixels should be thought of as a reasonable width. In the preferred layout, given in the figure above, the TeamPortal applets are arrayed in a navigation bar on the left of the page (possibly with other navigation / team tools), leaving the rest of the window available for team pages to be loaded.

The *TimesView* applet displays a string comprised of the location and country of each row in the data source and attaches a string representation of the current time, updated regularly. A drop-down menu is shown when the view is right-clicked on which allows the user to define which locations are shown (and hence which holidays are shown in the *CalendarView*). The *PeopleView* applet on the bottom of the figure is a spreadsheet-like representation of the people on the team the user is focusing on. Each column in the table represents an attribute of a person in the 'People' data source. The figure uses Name, Email and Homepage, but the implementation we use at Lucent allows any of thirty variables to be shown. These entries can be sorted by any column, allowing us to use location or any other variable to group people. Left-Clicking on a row selects that entry and 'greys out' the other entries. The selection defines a degree of interest that is propagated to the *CalendarView* and results in only the plans for the selected individual(s) being displayed.

One important variable in the list is presence information. The calendar already provides some presence information (it defines what the intended presence is), but the TeamPortal system can provide a finer-grained level of data. People can use a TeamPortal menu to report their own status, such as present, busy, meeting, or other common states. This data is stored in the Presence data source. The user can also install a small application on their machine that regularly reports on the presence or absence of mouse and keyboard activity on the machine. This provides automatic presence awareness; based on user trials, it is a highly desired feature. One interesting problem in gathering presence information from multiple sources is the issue of conflicts. For instance, in one situation a person's calendar indicated they were out for the day, but the person was at the office. How these situations should be presented is an open issue. In a more encompassing experiment, a project at Lucent Technologies is testing a system where users can register multiple telephones and messaging services, including email, fax, pager and SMS. The presence data source uses information on use of these services to deduce the presence of the user both at locations (home, work) and tasks (reading email, listening to voice messages).

The *CalendarView* shows a view of each month, with holidays "of interest" shown as colored backgrounds in each day. Where there are two or more holidays on the same day, the square is shared amongst the different holidays (see 1/1/2001 for example). Plans "of interest" are shown as circles connected by lines, colored according to the color of the person whose owns the plan. The view is highly customizable, allowing variable numbers of months to shown and dynamically changed, allowing different fonts and sizes to be displayed and so on. As the user moves the mouse over the view, a 'tool tip' style pop-up gives a description of the holiday(s) and/or plan(s) moused over. If the user clicks or clicks and drags to define a set of days, those plans which occur on those days are deemed "of interest" and are displayed. Right-clicking brings up a context-sensitive menu that includes an action to view the calendar for the specified day.

FUTURE DIRECTIONS

TeamPortal will be deployed within the software development group in the next three months. Although it has been used within the research team, we anticipate there will be additional feedback from the users about desirable features, and ways to improve the visualizations. In addition, we hope to build visualizations for other forms of presence data. The current implementation of TeamPortal relies on primarily physical presence information, such as location, last login, and keyboard or mouse activity. We would like to extend TeamPortal to provide information about work processes as well. One area we are especially looking into is to provide close links between TeamPortal and the source code control system being used by the development team. In addition, as already mentioned, we are actively pursuing integration with other communications systems, such as cellular phones and wireless devices.

As more resources are mined for presence information—smart appliances, cell phones, PDAs, there is more potential for conflicting information and for a privacy infrastructure. As part of our work in adding additional types of devices (both physical and virtual, such as web monitoring), we are investigating methods to reconcile these two issues.

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