myUnity: A new platform to support communication in the modern workplace

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ABSTRACT

Modern office work practices increasingly breach traditional boundaries of time and place, making it difficult to interact with colleagues. To address these problems, we developed myUnity, a software and sensor platform that enables rich workplace awareness and coordination. myUnity is an integrated platform that collects information from a set of independent sensors and external data aggregators to report user location, availability, tasks, and communication channels. myUnity's sensing architecture is component-based, allowing channels of awareness information to be added, updated, or removed at any time. Our current system includes a variety of sensor and data input, including camera-based activity classification, wireless location trilateration, and network activity monitoring. These and other input channels are combined and composited into a single, high-level presence state. Early studies of a myUnity deployment have demonstrated that use of the platform allows quick access to core awareness information and show its utility in supporting communication and collaboration in the modern workplace.

Categories and Subject Descriptors

H5.m Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Human Factors

Keywords

Awareness, workplace studies, mobile communication

1. INTRODUCTION

A shift is taking place in the modern office: being "at work" no longer implies being physically at a desk in an office building. Workers are increasingly mobile, on both a small and large scale. Work is more frequently conducted outside the conventional "9-to-5" Monday through Friday work schedule. This shift is a result of factors such as pressures from globalization, soaring

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transportation costs, environmental concerns, technological advancement, and desire for a healthy work-life balance. At the same time, the volume of peer-to-peer interactions necessary to successfully perform work tasks remains high in most professional domains. With assumptions about a colleague's location and availability more uncertain than ever, breakdowns are becoming more frequent and costly.

While there has been work in building systems to address this challenge, much of the existing work addresses a previous generation of technology and work practices. New design challenges have emerged; the critical importance of mobile devices in the day-to-day lives of workers and the explosion of communication tools used in the office are just a few examples.

myUnity is a new communication platform to address the challenges of this new landscape. In particular, myUnity seeks to provide an ongoing, easy-to-understand awareness of workers' presence and availability. It is the first system that supports both information collection and dissemination across multiple platforms (desktop and mobile), aggregating data from automatic sensors and existing systems (e.g., calendars, IM). Below we describe the components of the myUnity platform and discuss the value each component provides to the modern worker.

2. THE MYUNITY PLATFORM

myUnity's major platform components include client applications, sensor and data aggregators, and a central server.

2.1 Client Applications

The clients provide users with quick access to awareness information. myUnity can provide a user's presence information, approximate location, current status message, and links to phone numbers, IM, and email (see Figure 1). Users can independently select which information is reported on their behalf. In addition, myUnity provides facilities that assist in coordinating communication with peers. For example, clicking on a link launches the application to communicate over that channel.

Figure 1 shows the dashboard (the main visual display) for the desktop and mobile clients. It features an array of tiles, each representing an individual in the organization. The tile's border and/or background color reflects the individual's current state:

Green physically in office, alone

Purple in office with at least one other person

Yellow in office building, but not in office

Blue using computer from remote location (not office)

Orange not in office building (if person is using mobile client)

Grey system has no current information

Figure 1. The desktop (left) and mobile (middle) dashboards. In addition to presence state, the desktop dashboard displays location from phone (A) or Bluetooth/Wi-Fi (C) as well as calendar information (B). The detail views for the mobile client (far right) and desktop (popup over dashboard) show presence data (D), status messages (E), contact information (F), and IM client status (G).

The desktop dashboard (Figure 1) is configurable. As the application window is enlarged, the tile size expands and can include additional information (e.g., full name, a description of presence state, and calendar data). Users can choose to represent individual tiles in one of three sizes, allowing users to customize the visual representation to maximize the awareness details about specific individuals while minimizing details of others.

The dashboard allows users to determine the presence state of their colleagues at a glance. With quick access to presence states, users can efficiently acquire information useful in determining a channel and time to communicate with a colleague. For instance, one could quickly confirm that a peer is alone in his office before initiating a phone call or walking to his office.

Mobile clients provide the same awareness and communication options as the desktop client. This enables our users to stay in touch with co-workers while they are away from the office. At the same time, the mobile clients can provide information about the user's location and, in the Android client, the call status. The mobile clients use a background service to periodically determine location and then upload it to the server.

2.2 Sensors and External Data Aggregators

myUnity collects information from a bank of independent sensors and external data aggregators for presentation in the clients. Our aggregator architecture is component-based, allowing channels of awareness information to be added, updated, or removed at any time. We implemented six aggregators for the platform:

- *Vision-based office activity*. Using a video feed from a small wide-angle camera (mounted in the corner of personal offices), users can specify the physical space of their office that they typically occupy and the space occupied by visitors. When motion is detected in these spaces, the corresponding state is reported. Raw video is not shared.

- *Mobile phone location*. In addition to the mobile clients' reported location, Bluetooth and Wi-Fi access points installed throughout the office building can trilaterate the signal of a user's phone or other wireless device to provide a user's approximate physical location within the building.

- *Computer and network location software client*. The desktop client can report when a user is actively using the computer by detecting mouse and keyboard activity. It also uses the type of network connection (on a fixed or mobile computer inside a corporate network, remotely on VPN, or external).

- *Calendar*. Users can link information from various calendaring systems. This includes information from corporate calendars (e.g., vacation, sick, or travel day) and personal calendars (e.g., personal and professional meetings).

- *IM presence*. Users can report their status from IM protocols (e.g., Jabber, Google Talk, Skype, and Windows Live Messenger) by supplying their connection information.

- *Phone call status*. The Android mobile client and the IP-based office phones can report whether a person is in a call.

An important design characteristic of the myUnity aggregators is that users can independently select which ones report information on their behalf. Thus, people can customize data collection to conform to their own privacy concerns and requirements. This aspect of the architecture is different from most existing systems that control how data are *disseminated*, not *collected*.

2.3 Central Server

The central server is responsible for collecting information provided by the aggregators, fusing and summarizing this information, and streaming the result to client instances. myUnity takes a slightly different approach to fusion and summarization in that it does not infer or predict state (as is done by other systems), but rather degrades the data's resolution to convey only what it knows to be true. For example, if it receives data that a user is present in the building and is logged on to several IM protocols but no evidence from her office activity sensors, it will not infer that she is in her office, only that she is in the building. While degrading the state may produce less useful results, it avoids situations where the system is incorrect.