Quicksilver: A Novel Publish and Subscribe Clinical Messaging Platform

William T. Lester, MD, MS, Ryan Norris, Henry C. Chueh, MD, MS
Laboratory of Computer Science, Massachusetts General Hospital Boston, MA

Abstract
The authors introduce and describe the features of Quicksilver, a novel clinical messaging platform deployed in a multidisciplinary academic primary care clinic. The system follows a publication-subscription messaging paradigm employing dynamic role-based addressing. Quicksilver leverages the open-source XMPP, a powerful and extensible protocol for efficient asynchronous and synchronous communication commonly used in instant messaging applications.

Introduction
Electronic clinical messaging can be defined as the effective communication of clinical data between care providers to coordinate patient care. This is particularly relevant in the day-to-day management of patients in a large academic practice comprising part-time physicians, rotating nurses, and temporary support staff. To support a clinical staff that may vary from day-to-day, we employed novel publication-subscription based messaging model and dynamic role-based addressing suitable for a flexibly staffed multidisciplinary clinical office setting.

Quicksilver: Publication-Subscription Messaging
Unlike traditional e-mail where messages are addressed and delivered to one or more individual users, Quicksilver messages, once created, are “published” to role-based mailboxes to which one or more users may “subscribe.” In a classical “point-to-point” messaging model, messages risk languishing without action if delivered to an absent individual’s mailbox. With a publication-subscription messaging model, instead of messages being addressed to a particular individual, messages are distributed to a role-based publication to which one or more users may subscribe. A “role” is defined by a combination of professional credentials (such as ‘nurse’) and clinical care unit (such as ‘Pod 6’).

Quicksilver: Dynamic Role-Based Addressing
Authors may send Quicksilver messages to either individual users or role-based mailboxes. The actual destination of the message is automatically resolved by the Quicksilver system. In the case where a user sends a message to an individual, the message is automatically published to a role-based “safety-net” mailbox as determined by the intended recipient’s stored credentials and the care unit of the patient in question. In this way, a message’s author need not consider human resource issues, such as flexible staffing or coverage. For example, all nursing-related messages related to a patient who receives care in Pod 6 would be delivered to the “Pod 6 Nurse” publication, regardless of whether addressed to an individual nurse or only to the generic “Nurse” role.

Technical Description and Workflow
Quicksilver was written in Java using Adobe FLEX to create a FLASH-based rich-internet messaging client. Quicksilver uses an Extensible Messaging and Presence Protocol (XMPP) framework, an open, XML-based protocol commonly used in instant messaging clients such as Jabber and GoogleTalk, that supports a near-real-time, extensible instant messaging environment.

After proper authentication into a hospital workstation, a user’s presence and credentials are passed to the Quicksilver application where he or she may subscribe to one or more publications defined by his or her credentials. Threaded series of messages for all subscribed publications are then made available for action.

The Quicksilver “pub-sub” messaging model supports N number of users to be simultaneously subscribed to any particular publication, facilitating co-operation on practical tasks and helping alleviate workflow issues related to redundancy and alternative-staffing. Priority-based message locking disallows multiple users from working on the same clinical issue and protects against message concurrency problems.

Conclusion
Quicksilver is a useful communication tool that was developed and deployed in a primary care practice currently using an EHR. Through dynamic role-based messaging, presence notification, and a publish-subscribe messaging paradigm, Quicksilver offers a powerful platform for efficient asynchronous or synchronous communication in support of an advanced event-driven clinical information system.