Distributed Groupware and Web Services

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INTRODUCTION

Groupware applications would seem to have a lot to benefit by leveraging off of web service standards. The very nature of groupware is one of integration (connecting people, applications, and activities) and many (if not most) groupware applications depend on network communication to coordinate users who may be working on a variety of platforms.

In this context, two other trends in groupware applications also impact this discussion. First, there is a desire to support both mobile and diverse computing devices. The platform on which a person interacts with group resources might be a laptop, a handheld computer, or, more abstractly, a web browser. This suggests the need to support changing location, disconnected operation, and different modes of interaction.

A second and related interest is in accessing and taking advantage of resources "at the edge of the network." That is, many of the resources or applications of interest to group participants may reside not on centralized servers, but on the computers (or network devices) of other group members. This has implications for how we think about locating and making use of those services. The impact of this approach may perhaps be political as much as it is architectural in that it implies decentralized ownership and control of resources.

Why Web Service Protocols?

Arguably the most successful internet scale applications are based on (relatively) simple, platform independent protocol standards. Electronic mail, network news, and the world-wide-web (WWW) are strong examples of the success of this approach. Proposed web service protocols are more sophisticated, supporting more complex data organizations, but the underlying principles are the same. These protocols provide a simple mechanism for establishing interoperability and easing integration. Further, open standards provide a visibility that allows transport mechanisms to control and optimize interactions. For example, the visibility of the HTTP protocol used by the WWW allows proxies to improve network performance and corporate firewalls to filter activity based on the underlying semantics of the protocol.

CONSIDERATIONS IN SUPPORTING GROUPWARE WITH WEB SERVICE PROTOCOLS

In the context of these related goals of supporting mobile and diverse devices and incorporating resources from throughout the network of group members, the remainder of this discussion attempts to address various issues that might influence the use of standardized web protocols to support groupware applications.

Appropriate Levels of Centralization and Decentralization

There has been significant interest of late in "peer-to-peer" architectures for groupware applications, reducing the dependence on central servers to manage shared information, communication activities, and application events between group participants [1]. This makes each device belonging to a participant a "peer" providing controlled access to available resources and applications on the device. In addition to broadening the capabilities of groupware systems and perhaps improving scalability, users may have easier access to and management of their own resources than they would if those resources were maintained on a central server. Some resources and applications, however, are still more appropriately centralized for reasons such as authority, efficiency, or availability. Because of this, a number of groupware systems have adopted "hybrid" approaches, centralizing some capabilities and decentralizing others.

Notions of Identify Independent of Location

For conventional web servers, network location has been sufficient to consistently access a resource. The Domain Name Service (DNS) provides enough flexibility for the actual network addresses of resources such as web pages to change over the long term. For groupware applications however, user locations (and thus any services or resources they provide) may change far more frequently and, because of network topologies such as private networks, may not be directly reachable. While the mechanism for reaching a user, obtaining a resource, or accessing a service might change (or even fail), the identification of those entities should remain consistent.

Managing Shared Resources

In addition to integrating applications in a distributed environment, collaboration activities require effective management of shared resources. Multiple group participants accessing and editing information creates possibilities for conflict or difficulty in determining authoritative versions of a resource. A candidate for supporting these kinds of activities is the WebDAV protocol [2] and the subsequent DeltaV addition. Together these standards provide support for managing collections of shared resources, locking, meta-data, and resource versioning.

Awareness Mechanisms for Group Activity

Indicators of the presence of other group members, their availability, and what they are doing play a significant role in groupware. These indicators support opportunities for ad-hoc communication and collaboration with other group members and provide context for individual work activities. These include such things as simple direct indications of a user's activity (on-line, active, etc.) as well as indications that the state of resources underlying the system have changed. For example, if a group is collaboratively working on a document, the editor may want to know when all the elements are complete. Applications, of course, may also benefit from awareness mechanisms, taking advantage of users, resources, or services becoming available.

Balancing Consistency Against Performance and Flexibility

With distributed group resources, services, and views, there can be a significant cost in maintaining the consistency of each user's view over time. For this reason, groupware applications often have difficulty scaling beyond support for small groups. Constraints may vary considerably with the character of the groupware application, but underlying protocols for web services should support mechanisms that assist applications in determining whether information needs to be updated.

Performance can stand in conflict with providing the current awareness information mentioned above. For example, some groupware systems may inundate a user with activity when they come back on-line either because a large number of transactions must be processed to bring the user up to date with the state of the group space or because other systems react opportunistically to the user becoming available.

Managing Trust: Security and Access Control

The collaborative nature of groupware applications brings particular importance to managing and authenticating the identities of group participants and supporting clear notions of access control on available resources and services. Underlying protocols should support secure mechanisms for identifying users, not just for interactions with centralized authoritative servers, but also for direct interaction with each other.

There is a trade-off between the need for secure authentication and the support of open text based protocols. The transparency of web protocols discussed above is lost if the protocol stream is encrypted from source to destination. Security concerns also complicate integration because new applications have the added task of providing credentials to verify their identity.

Integrating Notions of Device Capability

Groupware applications extend well beyond the desktop computer. A laptop may provide similar capabilities but is more likely to be operating on a low-bandwidth network connection. A handheld computer will have less capability and a cellular phone even less. All of these devices may potentially need to integrate with web services to provide groupware functionality to their users. By incorporating descriptions of device capabilities into web service protocols groupware applications can tailor behavior to the device. This is somewhat analogous to web-browsers communicating to web-servers what sort of content the browser can accept and process or what sort of content the browser prefers.

CONCLUSION

Building on notions of web services, protocols for groupware can be developed to support common functionalities across applications, allowing users to interact without sacrificing their preferred interfaces. The web service approach also provides the possibility of composing groupware applications based on user needs and devices. A common protocol based interface to groupware capabilities may allow other applications to be more easily integrated into the groupware infrastructure and their capabilities shared among participants.

REFERENCES

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2. Whitehead, E.J., Jr. and Wiggins, M. WebDAV: IETF standard for collaborative authoring on the Web. *IEEE Internet Computing*, *2* (5). 34-40. (see also http://www.webdav.org)