Secure Information Sharing within a Collaboratory Environment

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Summary

Under collaborative environments, the information sharing tends to be very dynamic and often ad hoc. Hence, the traditional centralized management approach is not appropriate to such environments because the workload a group of their security officers will be overwhelming. Since the very goal of our research is to enable users to access and selectively share resources in distributed database systems, we assume that users can be trusted to exercise their discretions on resources. We also consider enhancing the scalability of information sharing. We have recently proposed a new role-based delegation model to resolve the above-mentioned issues. In addition, we demonstrated how our model and system architecture provide a selective information sharing, ensuring information assurance requirements in a collaboratory environment.

1. Project Overview

The Internet is uniquely and strategically positioned to address the needs of a growing segment of population in a very cost-effective way. It provides tremendous connectivity and immense information sharing capability which the organizations can use for their competitive advantage. Several organizations have transited from their old and disparate business models based on ink and paper to a new, consolidated ones based on digital information on the Internet. However, information sharing on the Internet usually occurs in broad, highly dynamic network-based environments, and formally accessing the resources in a secure manner poses a difficult challenge.

Balancing the competing goals of collaboration and security is difficult because interaction in collaborative systems is targeted towards making people, information, and resources available to all who need it, whereas information security seeks to ensure the integrity of these elements while providing it only to those with proper authorization. Protection of contextual information and resources in such systems therefore entails addressing several requirements not raised by traditional single-user environments in part due to the unpredictability of users and the unexpected manners in which users and applications interact in collaborative sessions. Our collaborative environment includes the Internet-based infrastructure covering wired and wireless communications as shown in Figure 1.

Under collaborative environments, the information sharing tends to be very dynamic and often ad hoc. Hence, the traditional centralized management approach is not appropriate to such environments because the workload on such an officer (or a small group of security officers) will be overwhelming. Since the very goal of our research is to enable users to access and selectively share resources in distributed database systems, we assume that users can be trusted to exercise their discretions on resources. We also consider enhancing the scalability of information sharing. We believe that one of promising approaches is through delegation. In general, it is referred to as the process whereby one active entity in a system authorizes another entity to act on behalf of the former by transferring a set of rights. Through delegation, individual user is trusted and empowered to share resources to which they have access.

2. Current Status and Results

We have investigated how to enhance the information sharing in collaborative environments through role-based access control and delegation and have recently proposed a new delegation model. We also attempted to implement a proof-of-concept prototype of our framework (see Figure 2). In addition, we have been studying on identity management and

proactive protection of collaborative environments as well as the privacy issues in information sharing.

3. Publications

The following research papers have been published based on the research results and each paper has acknowledged the support of Department of Energy.

1. **Gail-J. Ahn** and Badrinath Mohan, "Secure Information Sharing Using Role-based Delegation," *Journal of Network and Computer Applications*, Elsevier Science, 2005.
2. Dongwan Shin and **Gail-J. Ahn**, "Role-based Privilege and Trust Management," *Computer Systems Science & Engineering Journal*, CRL Publishing, 2005.
3. B. Tolone, **Gail-J. Ahn**, T. Pai, "Access Control in Collaborative Systems," *ACM Computing Surveys*, ACM, 2005.
4. Karsten Sohr, **Gail-J. Ahn** and Lars Migge, "Articulating and Enforcing Authorization Policies with UML and OCL," Proc. of *ACM ICSE Workshop on Software Engineering for Secure Systems* (SESS05), St. Louis, Missouri, May 15-16, 2005 and also in ACM *SIGSOFT Software Engineering Notes*.
5. Lawrence Teo and **Gail-J. Ahn**, "Supporting Access Control Policies Across Multiple Operating Systems," Proc. of *43rd ACM Southeast Conference*, Atlanta, GA, March 18-20, 2005.
6. Dongwan Shin and **Gail-J. Ahn**, "Role-based Trust Assignment in Trust Management Systems," Proc. of *17th International Conference on Parallel and Distributed Computing Systems* (PDCS 04), San Francisco, USA, September 15-17, 2004.
7. **Gail-J. Ahn**, Dongwan Shin and Longhua Zhang, "Role-based Privilege Manage-ment Using Attribute Certificates and Delegation ," Proc. of *International Con-ference on Trust and Privacy in Digital Business*, Lecture Notes in Computer Science (LNCS3184), August 30 - September 3, 2004.
8. Lawrence Teo and **Gail-J. Ahn**, "Towards the Specification of Access Control Policies on Multiple Operating Systems," Proc. of *5th Annual IEEE Information Assurance Workshop*, United States Military Academy, West Point, New York, June 10-11, 2004.
9. Dongwan Shin, **Gail-J. Ahn** and Prasad Shenoy, "Ensuring Information Assurance in Federated Identity Management," Proc. of the *23rd IEEE International Performance Computing and Communications Conference* (IPCCC), Phoenix, Arizona, April 14-17, 2004.
10. Lawrence Teo, Yu-An Sun and **Gail-J. Ahn**, "Defeating Internet Attacks Using Risk Awareness and Active Honeypots," Proc. of *IEEE International Information Assurance Workshop*, Charlotte, NC, April 8-9, 2004.
11. **Gail-J. Ahn** and Badrinath Mohan, "Secure Information Sharing Using Role-based Delegation," Proc. of *IEEE International Conference on Information Technology: Coding & Computing* (ITCC), Las Vegas, NV, April 5-7, 2004.

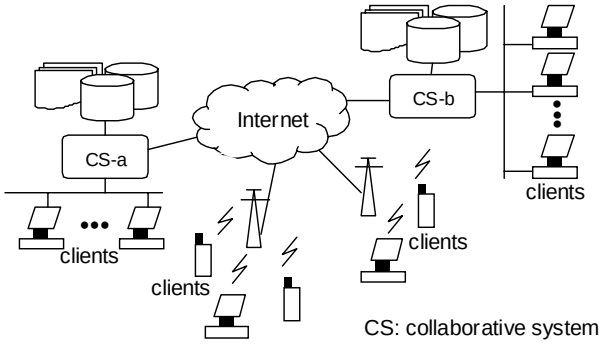

Figure 1. Collaborative Environment

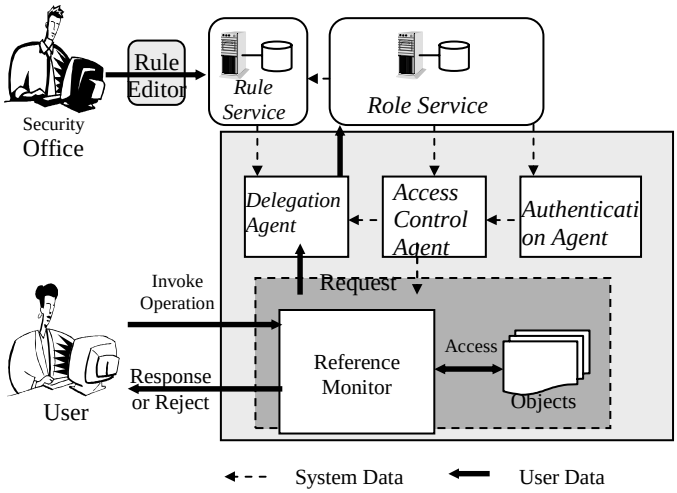

Figure 2. Proposed Architecture