

Integrating Object-Oriented Technology and Security Technology: A Panel Discussion

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OVERVIEW

This panel will discuss issues on integrating object-oriented technology and security technology. It addresses two aspects. One is to incorporate security into object-oriented systems to produce secure object-oriented systems and the other is to use object modeling techniques to design secure applications. In this position paper we discuss the issues on both aspects and provide an overview of the discussion by the panelists. Following this discussion, a position paper by each of the four panelists is given.

MANDATORY AND DISCRETIONARY SECURITY FOR OBJECT-ORIENTED SYSTEMS

Recently several efforts have been reported on incorporating mandatory security into object-oriented systems. The earliest known work on investigating multilevel security issues in object-oriented database systems was by Keefe et al. in January 1988. Since then others (for example (i) Millen and Lunt, (ii) Thuraisingham, (iii) Jajodia, Kogan, and Sandhu, (iv) Morgenstern, and (v) Rand Africaans University) have continued to investigate security issues in object-oriented database systems. Furthermore, at MITRE, an effort has begun on designing a multilevel object-oriented database system.

In addition to developments in mandatory security, much work has been done on incorporating discretionary security into object-oriented systems. With discretionary security, users are granted access to the objects based on their identification. Many prototypes have incorporated sophisticated discretionary access control techniques. Commercial products also enforce some discretionary access control measures. Recently the work by Ting and Demurjian at the University of Connecticut has investigated the object-oriented design model for user role-based access control. Such discretionary access control measures are becoming increasingly useful not only for military and commercial applications, but also for new generation systems such as collaborative computing systems.

OBJECT-ORIENTED APPROACH FOR DESIGNING SECURE APPLICATIONS

While progress has been made on applying security to object-oriented systems, object-oriented technology is also being applied to design secure applications. Many of the multilevel applications are complex. In order to successfully design the multilevel database and the automated system, the entities and the activities of the

application have to be represented. Tools have to be designed which utilize the classification guide and specification of the application and generate the multilevel database schema. In addition, a multilevel database application design tool must also consider the dynamic aspects of the application. The tool must analyze the various operational scenarios and determine whether there could be potential security vulnerabilities. Also, a design tool needs to analyze the application in order to detect possible errors in referencing classified information and well as potential unauthorized inference. During the design of a complex application, the designer must be alerted to mistakes such as these.

Although some of the researchers (for example, Burns, Smith, Wiseman, and Sell) have examined entity-relationship-based approaches, the recent work of Sell et al. on applying the Rumbaugh et al's Object Modeling Technique (OMT) methodology has shown much promise. They are investigating ways of adapting this methodology for designing secure applications and pointing out potential security problems to the designer. It is envisaged that CASE tools will be developed based on the OMT approach for secure applications.

In addition to designing secure applications, the oriented approach is also being investigated for developing auditing tools and specifying security policies.

THE PANELISTS AND THE POSITION PAPERS

There are four panelists who are all experts in security and object-oriented systems. T.C. Ting, has worked on an object-oriented model for capturing the security requirements of medical applications. His position paper describes modeling security requirements for applications. Peter Sell has conducted research and development activities on applying object-oriented modeling techniques for designing multilevel database applications and his position paper describes this research. Ravi Sandhu has developed a secure object-oriented model in which the messages exchanged between objects are controlled. His position paper describes issues on integrating security and object-oriented technologies. T. F. Keefe has developed the SODA security model and his position paper describes the essential aspects of this model.

BIOGRAPHY

Bhavani Thuraisingham is a lead engineer at the MITRE Corporation and has initiated work on integrating object-oriented technology and security technology. She is currently leading an effort on designing a multilevel secure object-oriented database system. She is also conducting research on applying object-oriented techniques for designing secure database applications. She has published extensively including articles in the Journal of Object-Oriented Programming and the Proceedings of the OOPSLA Conference.