

## Preface

Computer systems have evolved from early centralized computing systems into distributed computing systems. Distributed computing paradigms have also experienced a development from client-server paradigm to current mobile agent paradigm. Traditionally, *Remote Procedure Call (RPC)* is used in client-server paradigm. A client sends data to its server to invoke the execution of a remote static procedure on the server side and receives the results from the server after the computation is finished. RPC normally requires great amounts of data to be transferred across the network. Although the rapid growth of the Internet, especially the World Wide Web, provides an astounding amount of interconnected computing resources, most users' access to Internet resources are primarily restricted by the available network bandwidth. Compared to the speed of CPUs, the speed of network is still far behind. This fact stimulates seeking alternatives for moving data across a network to improve the computing efficiency.

The mobile agent paradigm is an extension to distributed computing paradigms. A mobile agent is a software program with mobility which can be sent out from a computer into a network and roam among the computer nodes in the network. Mobile agent systems are currently being developed by industry, government, and academia. The application areas include, but are not restricted to the following: telecommunications systems, personal digital assistants, information management, on-line auctions, service brokering, contract negotiation, air traffic control, parallel processing, and computer simulation. Although mobile agent technology has many notable advantages to be

applied to a wide range, it also brings significant new security threats because the mobile code generated by one party will transfer to and execute in an environment controlled by another party. Several security issues arise in various areas for mobile agent computing, including authentication, authorization (or access control), intrusion detection, etc. This book introduces the basic concept and structure of mobile agent systems. We discuss various attacks and countermeasures, and present the security modeling and analysis of mobile agent systems. Our emphasis is on the formal modeling and analysis of a secure mobile agent system. Experiments were conducted to show the usability of the presented formal model. The book also studies two cases in electronic commerce and in E-auction using the model.

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