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Chapter XIX

Software Agent-Mediated Internet Trading Framework

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In recent years Internet trading has seen explosive growth and will have a major impact in shaping future markets. It will certainly be very advantageous if Internet trading can be made more automated and secure than is currently the case. This would dramatically reduce the time and energy spent by customers. This chapter focuses on applying software agent technology together with cryptographic technology towards automating and securing the processes of negotiation and payment, which are the principal and most time-consuming steps during Internet trading. A software agent-mediated Internet trading framework integrating negotiation and payment procedures is proposed.

INTRODUCTION

The Internet has revolutionized the computer and communications world like nothing before. It may be viewed as a worldwide broadcasting system, a mechanism for information dissemination, and a medium for collaboration and interaction between

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individuals and their computers without regard for geographic location.

In 1990, HTML, a hypertext Internet protocol that could be used to communicate graphic information on the Internet, was introduced. Individuals could create graphic pages (a Web site), which then became part of a huge, virtual hypertext network called the World Wide Web (WWW). The Web grew to reach 10 million users faster than any other communications medium in history, and is expected to penetrate 50 million homes in the U.S. alone by the year 2000.

As the Web grows ever larger and new users go on line daily, merchants are also rushing online. They set up shop on the WWW and make sales over the Internet. Some specialty operations exist that do all of their business on the Internet, such as Amazon.com (http://www.amazon.com), NECX Direct (http://www.necx.com), FirstAuction (http://www.firstauction.com) and others. Recent studies by analysts from Nielsen, Forrestor and IDC have shown that the number of Web buyers, sellers and transactions are growing at a rapid pace. The number of people buying on the Web is expected to increase from 18 million in December 1997 to 128 million in 2002, representing more than US$400 billion worth of commercial transactions.

The emergence of Internet trading represents one of the most important applications on the Internet, with the potential to revolutionize the whole structure of retail merchandising and shopping. By providing more complete information to purchasers and cutting transaction costs, it is reducing market friction and making markets more perfect.

With the development of trading on the Internet, the amount of business information available online has become so large that it is becoming infeasible for customers and merchants to manually visit each site on the Internet, to analyze all of the information available, and thereby make optimal business decisions regarding the trading of goods or services. In addition, electronic purchase transactions are still largely non-automated. While information about different products and vendors is more easily accessible and orders and payments can be dealt with electronically, a human buyer is still responsible for collecting and interpreting the information about merchants and products, making decisions about them and finally entering the necessary purchase and payment information.

Software agent technology offers a new paradigm for Internet trading. A software agent is a software program that uses agent communication protocols to exchange information for automatic problem solving. Unlike more traditional software, software agents are personalized (incorporating cooperation, negotiation and conflict resolution), continuously running and semi-autonomous (Maes, 1994). Software agent technologies can be used to automate several of the most time consuming stages of the buying process. A software agent might have service capabilities, autonomous decision making and commitment features. These qualities are conducive to optimizing the whole buying experience and revolutionizing commerce as we know it today (Moukas et al., 1999).

In spite of the fact that software agents are able to simulate the entire person to person trading process, customers are wary about employing them to trade on their behalf, largely because of concerns about unknown risks they may face. The key to alleviating many of these concerns—to mitigating the risk—is the security of agents. In order to run, a mobile agent has to expose its code and data to the host environment that supplies the means for it to execute. Thus the agents are at risk of being tampered with, scanned or even terminated by malicious servers.

In this chapter, software agent technology and cryptographic technology are combined with a view to automating and securing Internet trading. The chapter is organised as follows. Firstly, software agent technology is introduced. A new