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Chapter XVII

Agents and Payment Systems in E-Commerce

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Since the 1990s, the World Wide Web has brought about innumerable changes to the ways enterprises do business. Electronic commerce is emerging as one of the most important applications on the Internet. The use of agents in e-commerce is a new research area. Agents can provide effective, fast, and cheap ways to make deals and execute transactions in cyberspace. Abstract representations of value have been developed from metal, paper notes, and bank checks to savings cards, credit cards, and now electronic forms. This chapter presents a brief survey of existing different types of payment systems and focuses on mobile agent-based computing trends in e-commerce. By combining software agent technology with cryptographic techniques, an agent-based e-payment scheme built for the SAFER e-commerce architecture is proposed, which is aimed to provide a flexible and secure financial infrastructure for Internet commerce.

INTRODUCTION

Electronic commerce and payment systems have flourished within less than half a decade. It is an emerging outcome of the popularization of Internet, which has presented great opportunities and potential for businesses and enterprises. Electronic commerce can reduce transaction costs from the traditional financial world, and provide faster transaction turnaround time by streamlining and integrating operations. Customers now can stay at home and use a Web browser to search for items and related product databases that they may be interested in.

An essential problem to be solved, before widespread commercial use of the Internet can take place, is to provide a trustworthy solution for transferring monetary value over the Internet securely. From the early 1990s, many pilot projects have been devoted to designing different types of secure payment systems for open networks. Quite a number of protocols have been proposed for these systems including NetBill, NetCheque, Open Market, iKP, Millicent, SET (Sherift, 1998), E-Cash (Brands, 1995), NetCash, CAFÉ

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(Mjolsnes, 1997), etc. These systems are designed to meet diverse requirements, each with particular attributes. All of these protocols have made contributions to this research area.

The requirements of electronic payment systems vary, depending both on their features and the assumptions placed on their operations. Security is always considered as the prime issue in the process of system design. Different aspects of security include integrity, authorization, confidentiality, and reliability.

Besides the security issue, there are still some factors restraining the development of e-commerce, which pose a new dimension of challenges in this area. One of them is lack of intelligence. Electronic trading is still non-automated. Sometimes, it will be hard for customers to locate specific items when there are so many available. Additionally, in most cases, buyers have to be involved in the loop of all stages of the process, which would increase transaction cost. The lack of intelligent tools to help streamline and integrate the whole procedure is the cause of the above challenges.

Agent technology has been incorporated into the area of e-commerce to provide intelligence and automation for the e-trade process. In the future, where computing power is cheap and abundant, powerful and flexible e-commerce applications can be built allowing potential buyers to run agents on merchant hosts where they have full and fast access to product information, prices, etc. In this kind of system, agents play very important roles. Agents can move between shops, looking for best deals, report back to their owners, or autonomously place orders and execute payment actions provided they have been authorized for such activity.

Generally, an agent is an intelligent software program, which is capable of accomplishing tasks in an autonomous manner on behalf of its user. Agent-based systems have gained popularity because they ease the application design process by giving software engineers and agent owners greater flexibility. Agents must provide highly trustworthy consistency and fault tolerance if they want to be truly useful in an electronic environment such as the open net where eavesdropping and fraud may happen without expectation. Besides security, it is desirable for agents to have roaming capability. Roaming extends the agent's capability well beyond the limitations imposed by its owner's computer. In order to meet the requirements discussed above and provide an environment for an in-depth research in e-commerce, especially in the area of payment, the chapter will discuss some related components in SAFER architecture (Secure Agent Fabrication, Evolution & Roaming) (Zhu and Guan, 2000), and propose an agent-based payment scheme for SAFER. While roaming, mobile agents can be endowed with attributes such as mobility, intelligence, autonomy, and a small amount of credits or electronic cash.

The rest of this chapter is organized as follows. A brief survey of current electronic payment systems is presented in the next section. Then, the following sections focus on mobile agent computing trends in e-commerce by introducing concepts and attributes of agents and by comparing several agent-based solutions available today to the proposed agent-based e-payment scheme built for SAFER. The final section presents the conclusions of the chapter and discusses several open issues for further work.

CURRENT ELECTRONIC PAYPENT SYSTEM

A robust payment infrastructure will inspire the widespread commercial use of the Internet. Information technology has created many new possibilities for value-exchange. The purpose of this section is to provide brief background knowledge to