Chapter V

Software Agents in Electronic Commerce: An Overview

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ABSTRACT

The explosive growth of Internet-based electronic commerce has increased the consumer's choices of goods and merchants. To find a suitable good and merchant with acceptable sales terms is a very tedious task. Agent technologies promise to simplify these tasks for consumers. This chapter presents an overview of electronic commerce systems based on software agent technology. A survey of current existing and prototype systems are presented. One of essential requirements of a successful e-commerce system is security measurement. This paper also discusses security issues related to implementing agent-based e-commerce.

INTRODUCTION

Electronic commerce stems from the demand within business and government to make better use of computer technology to improve customer interaction, business processes and information exchange both within an enterprise and across enterprises. In the early days of electronic commerce, the emphasis was placed more on information exchanges within and across enterprises or business-to-business electronic commerce through the use of EDI. There have been some reservations expressed by the business community, especially small businesses, regarding EDI solutions in electronic commerce. The main reservations result from the high costs associated with developing EDI and limited interaction with customers. The latter point shows that there is little support for customer-to-business electronic commerce. In order to support the customer-to-business model, a different technology is required. Such an alternative technology is provided by the Internet technology.

The maturity of Internet technology has opened opportunities for businesses to develop customer-to-business electronic commerce. Indeed, this type of commerce has grown rapidly in the last few years. Forrester Research estimates that Internet-generated transactions will grow exponentially from a combined worth of about US $14 billion in 1997 to US $327 billion within five years (Ma, 1999). This figure shows that there is still around

US $313 billion worth of unrealized potential transactions to date. Electronic purchases are still largely non-automated. While information about different products and vendors are readily available, and orders and payments can be dealt with electronically, human involvement is still required in all stages of the buying process. A human buyer is still responsible for collecting and evaluating information on products and merchants before making decisions on buying a product from a particular merchant and entering the purchase and payment stage. To exploit the full potential of electronic commerce, some of the tasks need to be automated. This automation is made possible by the introduction of software agents to electronic commerce.

The software agent is a new computing paradigm that allows a piece of program to act as an agent to perform a task on behalf of a human. The field is far from mature but it has great potential in automating customer-to-business electronic commerce. Indeed, there are some research organizations which have launched their prototypes of software agents for electronic commerce in the Internet in the last few years. In this paper, we present and discuss the current trend and challenges in developing electronic commerce based on the software agent paradigm. We have organized this paper as follows: Section Two introduces the reader to the definition and properties of software agents. Specifically, the properties that benefit electronic commerce will be highlighted. Section Three discusses how software agents can be used in different stages of buying activities according to the Mercantile model (Kalakota & Whinston, 1996). Examples of existing systems or prototypes to this model will be presented. Section Four discusses the existing technologies that can support the development of agent-based systems. These technologies include programming languages, and human computer interaction. Security is an important issue in implementing agent-based e-commerce systems. Section Five discusses the security requirements of such systems and the possible mechanism and/or technologies to meet these requirements. As a new technology, agent based e-commerce has not reached its full potential due to limited support of the existing technologies. Section Six discusses research challenges to deliver the full potential of agent-based e-commerce. Finally, in Section Seven, we provide a conclusion.

SOFTWARE AGENTS

Definition and Properties

Before we can discuss the properties of software agents, we first have to define what we mean by the term 'software agent.' In doing this, we immediately run into difficulties, as some key definitions in this field lack universal acceptance. Some of these definitions are as follows:

"An agent is a computer system, *situated* in some environment, that is capable of *flexible autonomous* action in order to *meet its design objective* … by flexible we mean the system is *responsive, proactive, and social*" (Jennings, Sycara, & Wooldrige, 1998).

"Software agents are programs to which one can *delegate* (aspect of) a task. They differ from "traditional" software in that they are *personalized*, *continuously running,* and *semiautonomous*" (Maes, 1994).

"…we define an agent as referring to a component of software and/or hardware which is *capable of acting* exactly in order *to accomplish tasks on behalf* of its user" (Nwana, 1993).

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