Chapter 4.26
An Electronic Auction Service Framework Based on Mobile Software Agents

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INTRODUCTION

Electronic Auction Overview

With electronic commerce revolutionizing the traditional way of doing business, electronic auction service has been one of the many business models that were proven to be a success. The existence and development of numerous auction Web sites, such as eBay (www.ebay.com) and OnSale Inc. (www.onsale.com) have demonstrated the survivability of electronic auctions in online transactions. Considering some of the new forms of electronic auctions currently on the Internet, such as the "Get it together" network (www.accompany.com), where group bidding and negotiation is applied, it could be said that the definition of auctions is no longer restricted to that of its traditional meaning but also has been extended electronically. An auction may be an ideal way for a business to sell excess inventory and goods because it has attracted many of the

common people that do not really participate in the real-world counterpart. However, current Web-based auction (e-auction) systems suffer from shortcomings in the following aspects:

- **Fairness and Friendliness:** Different conditions of Internet connections, such as varying speeds, introduce unfairness among participating bidders.
- **Security and Privacy:** The messages transmitted via the Internet are exposed to malicious attacks and may incur security problems. Also, in an auction, users may wish to be guaranteed privacy, for example, a bidder may not want to disclose his or her real identity until the auction closes and he or she is declared the winner.
- **Intelligence and Flexibility:** It is important for an e-auction service to be intelligent to cater to the needs of potential auction customers who are not into the Internet. However, current Web-based auction sys-

tems require too much user intervention. Because the process can be tedious and risky for these users, they may not want to engage in e-auction services. Thus, it would be commercially profitable if intelligent assistance is provided.

Software Agents: A Paradigm for Mobile Computing

The popularity of the Internet as the platform of electronic commerce not only brings opportunities but also challenges in organizing information and facilitating its efficient retrieval (Pham & Karmouch, 1998). Many researchers believe that the mobile software agent paradigm could propose attractive solutions to deal with such challenges and problems.

Mobile agents refer to self-contained and identifiable computer programs that can move within the network and act on behalf of the user (Pham & Karmouch, 1998). Despite the current differences in definition, the mobile agent paradigm as reported in the literature has two general goals: reduction of network traffic and asynchronous interaction. Research on agent-based e-commerce is still underway (Franklin & Reiter, 1996; Maes, Guttman, & Moukas, 1999; Poh & Guan, 2000; Subramanian, 1998; Yi, Wang, Lam, Okamoto, & Hsu, 1998). Mobile agents have demonstrated tremendous potential in conducting transactional tasks in e-commerce. The architecture we are proposing here, compared to most of the current practices on the Internet, is based on mobile agents. Specifically, the features of our system will be as follows:

- **Fairness:** The deficiency of excessive network traffic will be overcome.
- **Autonomy:** Based on the preferences of a user, agents can be fully automated to participate in the auction with little or even

no intervention from the user. The bidding strategies are self-contained in the agents and can be changed dynamically. Users can still control the behavior of the agents by remote monitoring.

- **Security and Privacy:** We are introducing third-party involvement to enhance the security and privacy throughout the auction. By security, we mean that agents are protected from malicious attacks during transportation and bidding. By privacy, we mean that with the assistance of the coordinator and the encryption mechanism, the real identity of each participating bidder is protected.
- **Flexibility:** The architecture we have proposed will serve as a unified framework for various auction types, for example, English auctions, Dutch auctions, and so forth, as long as the bidding strategies and competing rules are well defined.

RELATED WORK

Background

Auctions are more complex than people can realize (Agorics, n.d.). There are different ways to classify auctions. There are open auctions as well as sealed-bid auctions. Generally, there are five major auction formats: English, Dutch, First-Price Sealed-Bid, Vickrey (uniform second-price), and Double auctions (see Table 1). One difficulty is the lack of commonality in naming conventions.

Related Research

While electronic auctions are complex, they are also equally popular and desirable. Consequently, much research has been conducted in the area of electronic auctions and in particular agent-based auction systems.

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