Chapter 1.16
A Generic Internet Trading Framework for Online Auctions

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ABSTRACT

In this chapter, we introduce a generic Internet trading framework for online auctions. We present the requirements and service of the framework. A generic OR/XOR bidding language that can express different OR/XOR combinations is adopted for Web interfaces. The framework is implemented with free open-source technologies already successfully tested in industries. Researchers can use the platform to implement different electronic-market mechanisms, simulate the market behavior of their interests, and experiment with it. We also provide future directions for the framework design.

INTRODUCTION

Due to its distinguishing characteristics such as lower operational cost, long duration, and no geographical limitation, online auction has been a rapidly growing success of Internet technology (Ariely & Simonson, 2003). According to Forrester Research, online auction will account for $54 billion or around 25% of total online retail sale by 2007, and will reach $65 billion by 2010. There are different categories for online auction. For example, Bapna, Goes, and Gupta (2001) categorized online auction into three dimensions: business-to-consumer (B2C), consumer-to-consumer (C2C), and business-to-business (B2B); Based on the number of sellers and buyers, Pinker, Seidmann, and Vakrat (2003) further categorize

online auction into four segments, namely bilateral negotiations, Web-based procurements, Web-based sales auctions, and Web-based exchange. The most well-known online auction site may be E-bay, where all different types of products can be auctioned; among them are books, apparel, electronics, computers and software, and more.

It is almost impossible to solve a real online auction problem theoretically due to the complexity of problems. For example, bid award criteria could be multidimensional, not only just the price, but also the other attributes such as quality, lot size, and transportation service. Especially for perishable items such as sports ticketa, or flowers, a decision should be made in very short time. Therefore, many researchers turn to experiments or simulations for online auction study. For example, McCabe, Rassenti, and Smith (1991) tested traditional Vickrey's and other simultaneous multiple-unit versions of the English auction. Ba and Pavlou (2002) examined the data from online experiment and online-auction market to test the trust issue in electronic markets. Banks, Olson, Porter, Rassenti, and Smith (2003) ran an experiment on the simultaneous multiround auction (SMA) to assign spectrum licenses used by FCC, reported SMA's several defects, and compared SMA's results with combinatorial auction. Bapna, Goes, and Gupta (2003) presented a simulation approach to study the decision spaces for both auctioneers and bidders. Their simulation was demonstrated for Yankee auction with the objective to optimize the bidder's revenue. Rafaeli and Avi (2005) used a lab experiment to find the social presence (virtual presence and interpersonal information) has significant effects on online English and Dutch auctions. Vragov (2005) used experiments to study E-bay's online-auction procedures and found that collusive behavior exists among buyers that decrease prices and lower efficiency. Gopal, Thompson, Tung, and Whinston (2005) introduced auction options that enable the sellers and buyers to manage their risks respectively, and they adopted simulation approach for

the seller to assess the impacts of these auction options on the online-auction market. Gregg and Walczak (2006) developed an auction advisor agent system to help collect data and make decisions. They used simulation and experiment to validate the auction-advisor-agent system.

A potential problem of these experiments and simulations is that customized auction software has to be developed for each of them. A reusable auction software platform is needed for researchers to quickly design a prototype and develop different auction mechanisms to test and experiment with different ideas. So far, some research auction software has been developed on the Internet. For example, FM 96.5 (Rodriguez-Aguilar, Noriega, Sierra, & Padget 1997) is an electronic auction house that is a complete implementation of the trading conventions of the fish market, which allows for a real-time concurrent operation of the complete fish-market auction process. The Michigan Internet AuctionBot (Wurman, Wellman & Walsh, 1998) is a configurable auction server, where classic auctions such as English auctions, Dutch auctions, Vickery auctions, and sealed auctions can be implemented by different configurations. eAuctionHouse (Sandholm, 2002) is an auction server based on the eMediator server developed by CMU. Instead of implementing the classic auctions, eAuctionHouse focuses more on combinatorial auctions. It also implements the XOR of OR bidding language and includes CABOB algorithm to solve the winner determination problem. Other researchers focus on how to solve the problems that could happen during the auction processes such as those involving security, privacy, trust, and fraud. Secure auction marketplace (SAM) architecture (http://www.ece.cmu.edu/~adrian /projects SAM/ a2.html) is a framework to address such issues.

However all the above products limit users to the auction mechanism that can support. Auction designers cannot define auctions as they want with current auction software. To this end, we introduce a reusable software auction framework

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