Chapter IX
Multi–Agent Patterns for Deploying Online Auctions

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ABSTRACT

Today, a high volume of goods and services is being traded using online auction systems. The growth in size and complexity of architectures to support online auctions requires the use of distributed and cooperative software techniques. In this context, the agent software development paradigm seems appropriate for their modeling, development, and implementation. This article proposes an agent-oriented pattern analysis of best practices for online auctions. The patterns are intended to help both IT managers and software engineers during the requirement specification of an online auction system while integrating benefits of agent software engineering.

INTRODUCTION

The emergence and growing popularity of electronic commerce in general and online auctions in particular has raised the challenge to explore scalable global electronic market information systems, involving both human and automated traders (Rachlevsky-Reich, Ben-Shaul, Tung Chau, Lo, & Poggio, 1999).

Online auctions are a particular type of Internet-based electronic markets (i.e., worldwide open markets in which participants buy and sell goods and services in exchange for money). Most online auctions rely on classical auction economics (Bikhchandani, de Vries, Schummer, & Vohra, 2001; Beam & Segev, 1998). In the

economics literature, "an auction is an economic mechanism for determining the price of an item. It requires a pre-announced methodology, one or more bidders who want the item, and an item for sale" (Beam & Segev, 1998). The item usually is sold to the highest bidder. An online auction can be defined as an auction that is organized using an information system (IS) and is accessible to auction participants exclusively through a Web site on the Internet.

Recently, online auctions have become a popular way to trade goods and services. In 2002, eBay. com, the leading online marketplace, provided a trading platform for 638 million items of all kinds. The value of all goods that were traded amounted to nearly $15 billion, which represented, at the time, a third of all online sales in the U.S. This trend results from specific advantages of online auctions over traditional ones (as discussed in the section "Current State of Online Auctions") as well as the fact that people are becoming increasingly comfortable with online shopping, which is reflected in strong growth of online sales on both auction-based and other e-commerce platform types (e.g., fixed-price marketplaces such as Amazon.com).

Today, with the increasing number of online auctions being organized, there is a need for distributed, large-scale, dynamic IS architectures to support online auction marketplaces (Rachlevsky-Reich, Ben-Shaul, Tung Chau, Lo, & Poggio, 1999). From the IS development perspective, multi-agent systems (MASs) are a powerful new software engineering paradigm for designing and developing complex ISs (Yu, 1997). The use of agents as intentional, autonomous, social entities that act according to their self interests (Yu, 2001) provides advantages in both the modeling of an online auction system and its implementation using an agent-oriented IS.

In this article, we propose agent-oriented analysis patterns for deploying an online auction information system (OAIS). These patterns are intended to help both IT managers and software engineers during the analysis of OAIS. We develop the social dimension of patterns on the basis of the analysis of leading existing OAISs.

Our motivation stems from the fact that auction mechanisms for exchanging goods and services will become more and more popular with both consumers and companies (Resnick & Zeckhauser 2002). Providing agent-oriented patterns for such systems can reduce their development cost and time while integrating benefits of agent-orientation in software development. Patterns of current best practices in the online auction domain facilitate the development of new auction systems by showing clearly the functionalities that are particularly valued by auction participants. These should be included in any auction system, if it wishes to attract both consumers and corporate users.

The rest of this article is organized as follows. The second section gives an overview of the core concepts and of their relevance in the context of online auctions. The third section describes our analysis method and identifies existing online auction systems on which we base our analysis. The fourth section describes the patterns of a basic OAIS. The fifth section describes best practices in the domain of OAIS. The sixth section concludes the text and discusses the limitations of our approach.

ONLINE AUCTIONS, AGENTS, AND AGENT PATTERNS

Our work revolves around three main concepts: online auctions, agents, and patterns. In the following subsections, we present each one and discuss reasons why agent orientation is appropriate for modeling, design, and implementation of OAIS.

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