Chapter XIII

Multi-Agent Patterns for Deploying Online Auctions

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ABSTRACT

Today 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 both for their modelling, development and implementation. This chapter proposes an agent-oriented patterns analysis of best practices for online auction. 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
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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 is usually sold to the highest bidder. An online auction can be defined as an auction which 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. During 2002, the leading online marketplace, eBay.com provided a trading platform for 638 million items of all kinds. The value of all goods that were actually traded amounted to nearly $15 billion, which represented, at the time, a third of all online sales in the US. This trend results from specific advantages of online auctions over traditional ones 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 and 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, and social entities which act according to their self-interest (Yu, 2001) provides advantages in both the modelling of an online auction system, and in its implementation using an agent-oriented IS.

In this chapter, we propose agent-oriented analysis patterns for deploying 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 OAIS.

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 (see e.g., 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 clearly showing 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 chapter is organized as follows. Section 2 gives an overview of the core concepts and of their relevance in the context of online auctions. Section 3 describes our analysis method and identifies existing online auction systems on which we base our analysis. Section 4 describes the patterns of a basic OAIS. Section 5 describes best practices in the domain of OAIS. Section 6 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 we discuss reasons why agent-orientation is appropriate for modelling, design, and implementation of OAIS.