Virtual Marketplace for Agent-Based Electronic Commerce

Sheng-Uei Guan
National University of Singapore, Singapore

INTRODUCTION

With the ever-increasing amount of available online resources in general, information overload has become a very real problem. One possible solution is the application of software agents in e-commerce. Intelligent agents are already on the Web, freeing us from some of the drudgework of searching and automatically keeping us up to date. There are now many examples of software agents currently available on the Web. Shopping agents such as BargainBot, Excite's Jango, and Andersen Consulting's BargainFinder are but a few. However, they have their shortcomings, such as lack of purchasing capability and limited range of product selection. Furthermore, the current Web front end to an online storefront is not conducive to autonomous browsing by search agents.

A more comprehensive solution would therefore be to build a virtual marketplace whereby producers and consumers can come together, and with the help of software agents, actively participate and conduct e-commerce. There are currently several agent-based marketplace systems that have been developed for purposes of electronic commerce, and these include Kasbah (Chavez & Maes, 1996), MAGMA (Tsvetovatyy & Gini, 1996), and MAGNET (Collins, Youngdahl, Jamison, Mobasher, & Gini, 1998). However, these systems have certain limitations and shortcomings which make them questionable for e-commerce applications. An example is the Kasbah system architecture which did not include any form of payment mechanisms. Another is MAGMA which is felt to be rather expensive on network bandwidth and the system performance is heavily reliant on network latencies as it communicates through socket connections.

The objective of our research is to build a new virtual marketplace prototype whereby producers and consumers can meet and conduct e-commerce in cyberspace with the help of software agents.

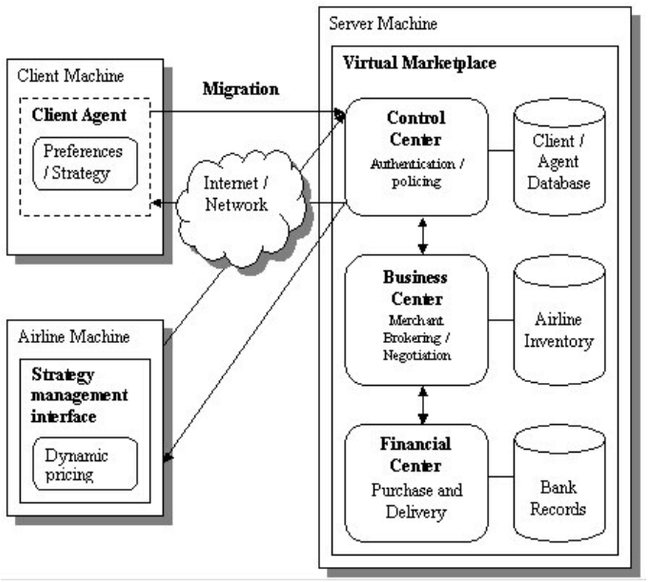
GENERAL MARKETPLACE ARCHITECTURE

A marketplace is a place where buying and selling agents meet to negotiate transactions. It is important, therefore, that the architecture of the virtual marketplace is designed to facilitate interactions between agents by providing a secure and reliable environment for the conduct of electronic commerce. A business-to-consumer model has been adopted for implementation in the virtual marketplace. The architecture of the virtual marketplace can be divided into three separate elements. These are the Control Center, Business Center, and Financial Center (Figure 1). Specialist agents reside in each module and work independently as well as collaboratively with the other agents in the virtual marketplace to achieve their goals and objectives.

Financial Center

If a marketplace is to become anything more than a toy, it needs to provide the necessary banking and financial services that are required by the transacting agents (Tsvetovatyy & Gini, 1996). The Financial Center (Figure 2) is aimed at achieving these objectives by housing within it various authorized banks, which are able to provide these services. It is a virtual financial hub that handles all necessary payment activities within the virtual marketplace. The individual banks themselves are represented by their own agents. These agent representatives handle such tasks as verification of legal transactions and assisting in fund transfers from the parties involved in the transaction. They also manage their clients' bank accounts and help carry out the necessary paperwork involved in marketplace transactions. Communication within the Financial Center, especially those between agent-to-bank or bank-to-bank, needs to be encrypted and secure.

Figure 1. Virtual market architecture overview



Control Center

The Control Center's (Figure 3) role is to act as the administrative center of the virtual marketplace. This is the main gateway that is used by all agents roaming to and from the marketplace. For reasons of security, all potential users of the virtual marketplace will first have to register an account with the Control Center before its agents are allowed to participate in marketplace activities. Once registered, important user information will then be stored in the market database, and these are later retrieved for various purposes such as user authentication and user alert notifications. Besides clients, the airlines themselves can also log into the marketplace for purposes of viewing and updating their own customized negotiation strategies. The Control Center accepts airline connections on a different port to distinguish between client and airline access. To gain access to the server, the airlines will still have to be authenticated.

The Control Center also keeps a list of all active buyer agents that are currently residing within the virtual marketplace, and it also acts as the policing authority within the virtual marketplace. The agent and transaction monitoring capability is the most important function of the Control Center. From the time a buyer agent enters the marketplace until the time it returns home to the client machine, the Control Center keeps a record of all its activities. Details such as the time the agent entered and left the marketplace, the duration of stay, and the owner of the agent are all noted and recorded into the database. If a successful transaction was completed by the buyer agent, the Control Center will also keep a record of the exact details of the item in question, in this case, details such as flight times, number and cost of each ticket

Figure 2. Architecture of financial center