

# Virtual Marketplace for Agent-Based Electronic Commerce

**Sheng-Wei Guan**

*National University of Singapore, Singapore*

## INTRODUCTION

Information overload has become a real problem with the ever-increasing amount of available online resources. One possible solution is the application of software agents in e-commerce. Intelligent agents are already on the Web, freeing people from some of the drudgework of searching and automatically keeping them up to date. There are now many examples of software agents currently available on the Web. Shopping agents like BargainBot, Excite's Jango and Andersen Consulting's BargainFinder are but a few. They have their shortcomings, however, such as a lack of purchasing capability and a 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 in and conduct e-commerce. There are currently several agent-based marketplace systems that have been developed for the purpose of e-commerce, and these include Kasbah (Chavez & Maes, 1996), MAGMA (Tsvetovatyy & Gini, 1996) and MAGNET (Collins, Youngdahl, Jamison, Mobasher, & Gini, 1998). These systems have certain limitations, however, and shortcomings that make them questionable for e-commerce applications. An example is the Kasbah system architecture that 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 my research is to build a new virtual marketplace prototype whereby producers and consumers can meet and conduct e-commerce in the cyberspace with the help of software agents.

## DESCRIPTION OF MARKETPLACE ARCHITECTURE

A marketplace is 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: the Control Center, Business Center, and Financial Center (see 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 (see 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

*Figure 1. Virtual market architecture overview*

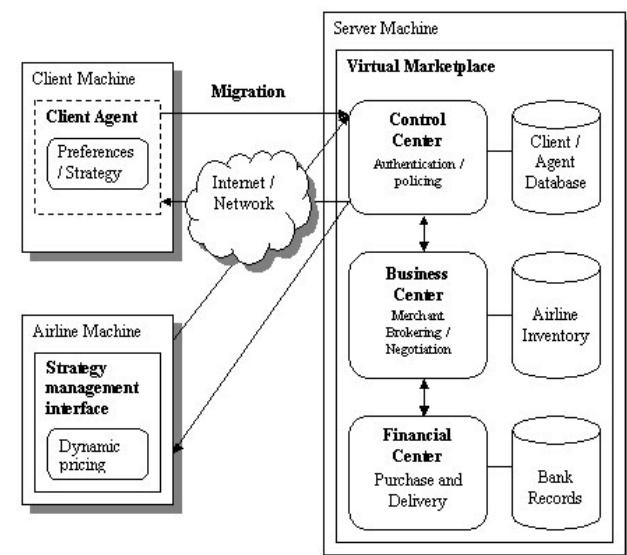


Figure 2. Architecture of financial center

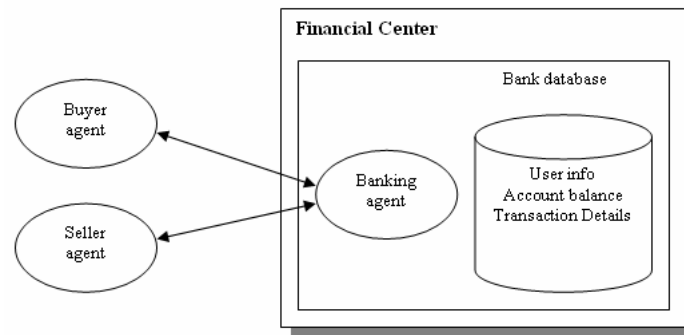
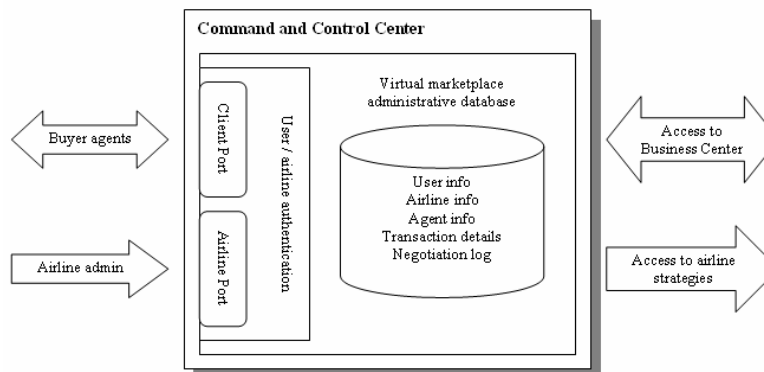


Figure 3. Control center architecture



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.

### Control Center

The control center (see Figure 3) acts as the administrative center of the virtual marketplace and is the main gateway 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, to be 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 keeps a list of all active buyer agents 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 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

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