

Chapter 6.14

Mobile Agents in E-Commerce

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INTRODUCTION

A *mobile agent* is a composition of computer program, data, and execution state, which is able to move from one computer to another autonomously and continue its execution on the destination computer. Mobile agents provide a new programming paradigm for building agile distributed systems. The ability to travel allows a *mobile agent system* to move computation to data source systems. This decentralized approach improves network efficiency since the processing is performed locally. For example, in an *e-commerce* application shown in Figure 1, mobile agents are used to search and purchase products. Once the *Buyer Server* receives a buyer's purchase request, it generates a mobile agent and sends it to the *Information Server* to search retailers who sell the product. Having a

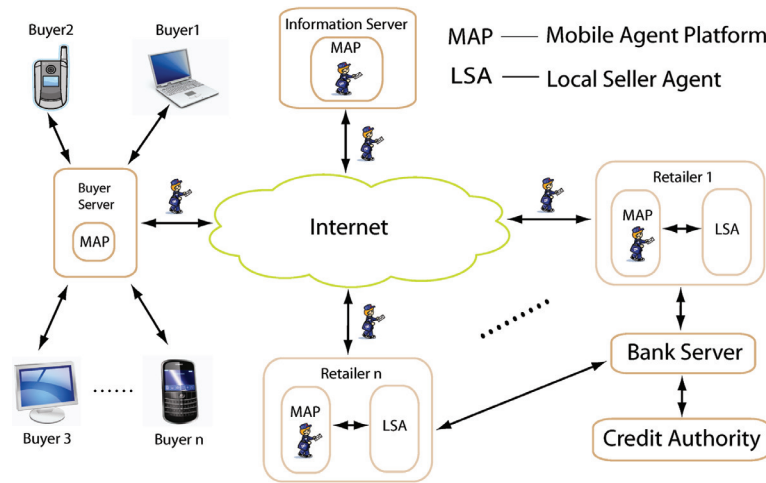
list of retailers, the *Buyer Server* dispatches a mobile agent visiting these retailers. The mobile agent negotiates with retailers' local seller agents and reports the offers to the *Buyer Server*. The *Buyer Server* evaluates all the offers, and sends a purchase mobile agent to the best offer retailer to make the final purchase.

Some advantages which *mobile agents* possess over conventional computing paradigms are follows.

- Reduce network traffic and overcome network latency. Mobile agents can move to remote computers that contain objects with which the mobile agents want to interact, and take the advantage of being at the same host.
- Work in heterogeneous network hosts if a run-time support environment is installed on these hosts.

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Figure 1. Mobile agents migrate over networks searching and purchasing products



- Tolerant to network failures and support disconnected operation. Mobile agents are able to operate without an active connection between the destination and the home host.
- Work autonomously.
- Flexible to change an agent's actions. Only the agent program rather than the computation hosts must be updated.
- Applications become in-situ reprogrammable using mobile code in mobile agents.

Mobile agents have received a diverse range of applications in information retrieval, network management, e-commerce, transportation systems, distributed control systems, and manufacturing. The advantages of mobile agents, such as reducing network traffic, supporting disconnected operation, overcoming network latency, and roaming ability in heterogeneous platforms, have great value to build ubiquitous e-commerce/m-commerce systems. Most *e-commerce* applications involve a large amount of information exchange and intensive data processing. Mobile agent approach scales effectively as the size of data to be processed and the number of data servers increase (Patel & Garg, 2005). Compared to

the conventional *client-server* paradigm, mobile agents provide fast and efficient interaction with remote services and save network bandwidth (Zhao & Blum, 2000).

M-commerce is an emerging e-commerce model, which conducts commerce using mobile devices such as mobile phones and PDAs (Personal Digital Assistant). Due to physical and network constraints (low CPU speed, small memory size, poor network connectivity, and limited bandwidth), the implementation of client/server approach in m-commerce systems faces significant challenges. The mobile agent paradigm offers an appropriate solution to reduce network traffic and tolerate poor network connectivity in m-commerce systems (Li, 2007).

This chapter attempts to highlight good features of the mobile agent paradigm for the applications in e-commerce. A number of selected mobile agent-based e-commerce systems and the agent platforms are introduced. The major security and privacy concerns in mobile agent-based e-commerce systems and the commonly used approaches to address these issues are discussed. The future research directions are recommended in the conclusions.

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