Chapter 3.39
E–Commerce Services Based on Mobile Agents

Giancarlo Fortino
DEIS, University of Calabria, Italy

Alfredo Garro
DEIS, University of Calabria, Italy

Wilma Russo
DEIS, University of Calabria, Italy

INTRODUCTION

The Internet offers a unique opportunity for e-commerce to take central stage in the rapidly growing online economy. With the advent of the Web, the first generation of business-to-consumer (B2C) applications was developed and deployed. Classical examples include virtual shops, on-demand delivery of contents, and e-travel agency. Another facet of e-commerce is represented by business-to-business (B2B), which can have even more dramatic economic implications since it far exceeds B2C in both the volume of transactions and rate of growth. Examples of B2B applications include procurement, customer relationship management (CRM), billing, accounting, human resources, supply chain, and manufacturing

(Medjahed, Benatallah, Bouguettaya, Ngu, & Elmagarmid, 2003).

Although the currently available Web-based and object-oriented technologies are well-suited for developing and supporting e-commerce services, new infrastructures are needed to achieve a higher degree of intelligence and automation of e-commerce services. Such a new generation of e-commerce services can be effectively developed and provided by combining the emerging agent paradigm and technology with new Web-based standards such as ebXML (2005).

Agents have already been demonstrated to retain the potential for fully supporting the development lifecycle of large-scale software systems which require complex interactions between autonomous distributed components

(Luck, McBurney, & Preist, 2004). In particular, e-commerce has been one of the traditional arenas for agent technology (Sierra & Dignum, 2001). Agent-mediated e-commerce (AMEC) is concerned with providing agent-based solutions which support different stages of the trading processes in e-commerce, including needs identification, product brokering, merchant brokering, contract negotiation and agreement, payment and delivery, and service and evaluation. In addition, the mobility characteristic of peculiar agents (a.k.a. *mobile agents*), which allows them to move across the nodes of a networked environment, can further extend the support offered by the agents by featuring advanced e-commerce solutions such as location-aware shopping, mobile and networked comparison shopping, mobile auction bidding, and mobile contract negotiation (Kowalczyk, Ulieru, & Unland, 2003; Maes, Guttman, & Moukas, 1999).

To date, several agent- and mobile agent-based e-commerce applications and systems have been developed which allow for the creation of complex e-marketplaces—that is, e-commerce environments which offer buyers and sellers new channels and business models for trading goods and services over the Internet.

However, the growing complexity of agent-based marketplaces demands for proper methodologies and tools supporting the validation, evaluation, and comparison of: (1) models, mechanisms, policies, and protocols of the agents involved in such e-marketplaces; and (2) aspects concerned with the overall complex dynamics of the e-marketplaces.

The use of such methodologies and tools can actually provide the twofold advantage of:

1. analyzing existing e-marketplaces to identify the best reusable solutions and/or identify hidden pitfalls for reverse engineering purposes; and
2. analyzing new models of e-marketplaces before their actual implementation and

deployment to identify, *a priori*, the best solutions, thus saving reverse engineering efforts.

This article presents an overview of an approach to the modeling and analysis of agent-based e-marketplaces (Fortino, Garro, & Russo, 2004a, 2005). The approach centers on a Statecharts-based development process for agent-based applications and systems (Fortino, Russo, & Zimeo, 2004b) and on a discrete event simulation framework for mobile and multi-agent systems (MAS) (Fortino et al, 2004a). A case study modeling and analyzing a real consumer-driven e-commerce service system based on mobile agents within an agent-based e-marketplace on the Internet (Bredin, Kotz, & Rus, 1998; Wang, Tan, & Ren, 2002) is also described to demonstrate the effectiveness of the proposed approach.

BACKGROUND

In a broad sense, an agent is any program that acts on behalf of a (human) user (Karnik & Triphati, 1998). An agent can just sit there and interact with its environment and with other agents through conventional means, such as local/remote procedure calls and asynchronous messaging, or through more advanced coordination infrastructures such as *tuple* spaces and *event*-based systems. Agents that do not or cannot move are called "stationary agents." Conversely, a mobile agent is a program that represents a user in a computer network and can migrate autonomously from node to node to perform some computation on behalf of the user. Thus mobility is an orthogonal property of agents—that is, not all agents are mobile. Also mobile agents can interact with their environment and, notably, with other agents through mobility-aware and mobility-unaware infrastructures (Fortino & Russo, 2005). Indeed, the emergence of mobile agents was motivated by the benefits they provide for creating distributed systems. In

9 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:
www.igi-global.com/chapter/commerce-services-based-mobile-agents/26583

Related Content

A Taxonomy of Database Operations on Mobile Devices
Say Ying Lim, David Taniarand Bala Srinivasan (2009). *Mobile Computing: Concepts, Methodologies, Tools, and Applications (pp. 350-371).*
www.irma-international.org/chapter/taxonomy-database-operations-mobile-devices/26513

Managing Students' Attendance using NFC-Enabled Mobile Phones
Media Anugerah Ayu, Barroon Ismaeel Ahmadand Teddy Mantoro (2016). *Critical Socio-Technical Issues Surrounding Mobile Computing (pp. 184-203).*
www.irma-international.org/chapter/managing-students-attendance-using-nfc-enabled-mobile-phones/139564

DSOA: A Service Oriented Architecture for Ubiquitous Applications
Fabricio Nogueira Buzeto, Carlos Botelho de Paula Filho, Carla Denise Castanhoand Ricardo Pezzuol Jacobi (2011). *International Journal of Handheld Computing Research (pp. 47-64).*
www.irma-international.org/article/dsoa-service-oriented-architecture-ubiquitous/53856

Performance Evaluation of 2-Wavelength Cognitive Wireless Network for V2R and V2V Communication
Akira Sakuraba, Yoshitaka Shibata, Goshi Satoand Noriki Uchida (2020). *International Journal of Mobile Computing and Multimedia Communications (pp. 84-101).*
www.irma-international.org/article/performance-evaluation-of-2-wavelength-cognitive-wireless-network-for-v2r-and-v2v-communication/273170

Enabling Mobile Chat Using Bluetooth
A. Guedes, Jerônimo Silva Rocha, Hyggo Almeidaand Angelo Perkusich (2007). *Encyclopedia of Mobile Computing and Commerce (pp. 249-252).*
www.irma-international.org/chapter/enabling-mobile-chat-using-bluetooth/17084