Chapter 2.27
A Mobile Intelligent Agent–Based Architecture for E–Business

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ABSTRACT

This article proposes a mobile intelligent agent-based e-business architecture that allows buyers and sellers to perform business at remote locations. An e-business participant can generate a mobile, intelligent agent via some mobile devices (such as a personal digital assistant or mobile phone) and dispatch the agent to the Internet to do business on his/her behalf. This proposed architecture promises a number of benefits: First, it provides great convenience for traders as business can be conducted anytime and anywhere. Second, since the task of finding and negotiating with appropriate traders is handled by a mobile, intelligent agent, the user is freed from this time-consuming task. Third, this architecture addresses the problem of limited and expensive connection time for mobile devices: A trader can disconnect a mobile device from its server after generating and launching a mobile intelligent agent. Later on, the trader can reconnect and call back the agent for results, therefore minimizing the connection time. Finally, by complying with the standardization body FIPA, this flexible architecture increases the interoperability between agent systems and provides high scalability design for swiftly moving across the network.

INTRODUCTION

Many people nowadays use mobile devices such as personal digital assistants (PDA) or mobile phones to access information through the Internet. In addition, they desire to have the ability to

participate in e-business anywhere and anytime via their mobile devices. Current e-business applications, such as business-to-consumer (B2C) or Internet-based shopping, are typically developed over the Web for human-computer interaction. These applications require that users must login the intended Web sites from their personal computers or public terminals. Also, users often need to visit lots of sites and are always involved in a time-consuming process. To address these challenges, several wired agent-based e-business systems have been proposed. Kasbah (Chavez & Maes, 1996), for example, is an electronic marketplace where buying and selling agents can carry out business on behalf of their owners. Nevertheless, these systems do not satisfy the users' mobile demand due to their lack of wireless channels.

This article proposes a feasible architecture that combines agent mobility and intelligence for consumer-oriented e-business applications. It allows a user to create a mobile, intelligent agent via a mobile device, and then launch the agent to the Internet to perform business on the user's behalf. The aspect of mobility enables our architecture to support the agent's migration and the user's mobility (the ability to conduct e-business via mobile devices anyplace and anytime). The mobile agent will migrate from market to market, communicating with different trading agents to find the most appropriate one. Once an appropriate agent is found, it will inform the user of the results. This architecture complements the current Web-based, Internet systems by adding the wireless channel of mobile agents. Our current work focuses on lightweight mobile agents which act on behalf of consumers and participate in consumer-to-consumer (C2C) e-business applications. However, the architecture can be extended to business-to-consumer (B2C) or business-to-business (B2B) applications, as discussed later in the article.

Since personal software agents essentially need to communicate with other agents (to ac-

complish their designated tasks), they have to comply with a set of standards concerning the agent communication language and the protocols to be used. Although there is currently no universally accepted set of standards for developing multi-agent systems, the Foundation for Intelligent Physical Agents (FIPA), which aims at providing one language commonly understood by most agent-based systems (FIPA, 2006), is obtaining a growing acceptance. With FIPA becoming a de facto standard in this field, the architectures such as JADE (Java Agent Development Environment) have become available to allow for the implementation of a FIPA-compliant multi-agent system such as our proposed architecture (Chiang & Liao, 2004).

It should be noted that mobile devices suffer not only from limited battery time, memory, and computing power, but also from small screen, cumbersome input, and limited network bandwidth and network connection (Wang, Sørensen, & Indal, 2003). The proposed architecture, by making use of mobile agent technology, offers a solution to those problems. That is, after creating and initializing a mobile agent to act on the user's behalf, a user can disconnect the mobile device from the server. The user only needs to reconnect later on to recall the agent for results, hence minimizing the use of resources. In addition, mobile agent technology also addresses such challenges as increased need for personalization, high latency, demand for large transfers, and disconnected operation (Kotz & Gray, 1999).

The remainder of this article is organized as follows: the second section introduces background knowledge and related work. The third section illustrates the proposed architecture. The fourth section shows an implementation of the proposed architecture. The fifth section discusses some existing problems and future works. The sixth section concludes the article.

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