Chapter 3.12
Secure Agent Roaming for Mobile Business

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ABSTRACT

M-commerce, a new way to conduct business, is gaining more and more popularity due to the wide use of the Internet. Despite its rapid growth, there are limitations that hinder the expansion of m-commerce. The primary concern for online shopping is security. Due to the open nature of the Internet, personal financial details necessary for online shopping can be stolen if sufficient security mechanism is not put in place. How to provide the necessary assurance of security to consumers remains a question mark despite various past efforts. Another concern is the lack of intelligence in locating the correct piece of information. The Internet is an ocean of information depository. It is rich in content but lacks the necessary intelligent tools to help one locate the correct piece of information. Intelligent agent, a piece of software that can act intelligently on behalf of its owner, is designed to fill this gap. However, no matter how intelligent an agent is, its functionality is limited if it remains on its owner's machine and does not have any roaming capability. With the roaming capability, more security concerns arise. In response to these concerns, SAFE, Secure roaming Agent For E-commerce, is designed to provide secure roaming capability to intelligent agents.

INTRODUCTION

The introduction of the Internet is probably one of the most significant revolutions of the 20th century. With a simple click, one can connect to almost every corner of the world thousands of kilometers away. This presents a great opportunity for mobile commerce (m-commerce). Despite its many advantages over traditional commerce, m-commerce has not taken off successfully. One of the main hindrances is security.

When it comes to online transactions, security becomes the primary concern. The Internet was developed without too much security in mind. Information flows from hubs to hubs before it reaches the destination. By simply tapping into wires or hubs, one can easily monitor all traffic transmitted. For example, when Alice uses her

VISA credit card to purchase an album from Virtual CD Mall, the information about her card may be stolen if it is not carefully protected. This information may be used maliciously to make other online transactions, thus causing damage to both the card holder and the credit card company.

Besides concerns on security, current m-commerce lacks intelligence. The Internet is like the world's most complete library collections unsorted by any means. To make things worse, there is no competent librarian that can help readers locate the book wanted. Existing popular search engines are attempts to provide librarian assistance. However, as the collection of information is huge, none of the librarians are competent enough at the moment.

The intelligent agent is one solution to providing intelligence in m-commerce. But having an agent that is intelligent is insufficient. There are certain tasks that are unrealistic for agents to perform locally, especially those that require a large amount of information. Therefore, it is important to equip intelligent agents with roaming capability.

Unfortunately, with the introduction of roaming capability, more security issues arise. As the agent needs to move among external hosts to perform its tasks, the agent itself becomes a target of attack. The data collected by agents may be modified, the credit carried by agents may be stolen, and the mission statement on the agent may be changed. As a result, transport security is an immediate concern to agent roaming. SAFE transport protocol is designed to provide a secure roaming mechanism for intelligent agents. Here, both general and roaming-related security concerns are addressed carefully. Furthermore, several protocols are designed to address different requirements. An m-commerce application can choose the protocol that is most suitable based on its need.

Background on Agents

There has been a lot of research in the area of intelligent agents. Some literature only proposes certain features of intelligent agents, some attempts to define a complete agent architecture. Unfortunately, there is no standardization in the various proposals, resulting in vastly different agent systems. Efforts are made to standardize some aspect of agent systems so that different systems can inter-operate with each other. In the area of knowledge representation and exchange, one of the most widely accepted standards is KQML (Knowledge Query and Manipulation Language) (Finin & Weber, 1993), developed as part of the *Knowledge Sharing Effort*. KQML is designed as a high-level language for runtime exchange of information between heterogeneous systems. Unfortunately, KQML is designed with little security considerations because no security mechanism is built to address common security concerns, not to mention specific security concerns introduced by mobile agents. Agent systems using KQML will have to implement security mechanisms on top of KQML to protect them. In an attempt to equip KQML with 'built-in' security mechanisms, Secret Agent is proposed by Thirunavukkarasu, Finin, and Mayfield (1995).

Secret Agent defines a security layer on top of KQML. Applications will have to implement some special message format in order to make use of Secret Agent. Secret Agent has a number of shortcomings and is handicapped by the design of KQML. Firstly, one requirement of Secret Agent is that every agent implementing the security algorithm must possess a key (master key). This master key is either a symmetric key or based on PKI. If the key is based on a symmetric key algorithm, it requires each agent to have a separate key with every other agent it corresponds with. If the agent intends to communicate with another agent that it has no common pre-established master

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