

# Secure Agent Fabrication, Evolution, and Roaming

**Sheng-Wei Guan**

*National University of Singapore, Singapore*

## BACKGROUND

Agent-based e-commerce is a promising novelty that performs tasks such as payment, mediation, interaction, and sales promotion in simple and intelligent manners. The agents can be endowed with attributes such as mobility, intelligence, and autonomy.

Constructing appropriate architecture for agent systems in e-commerce is a fundamental consideration in facilitating agent-based transactions (Lee, Kang, & Lee, 1997). A practical way is to provide sites with methods to fabricate various agents according to the requirements of the clients. Due to the nature of e-commerce and the Internet, agents should be able to adapt to a changing environment automatically. Agents should therefore be able to evolve in terms of intelligence and also be able to roam so as to utilize the power of network computing (Guan & Yang, 1999; Yang & Guan, 2000). In order to meet the requirements discussed and to provide an environment for an in-depth research in e-commerce, this chapter proposes secure agent fabrication, evolution and roaming (SAFER) for e-commerce.

## DESCRIPTION OF SAFER

Secure Agent Fabrication Evolution and Roaming (SAFER) is an infrastructure to serve agents in e-commerce and

establish the necessary mechanisms to manipulate them. The goal of SAFER is to construct open and evolutionary agent systems for e-commerce. The SAFER architecture comprises different communities, as are described in Figure 1. Each community consists of the following components: Owner, Butler, Agent, Agent Factory, Community Administration Center, Agent Charger, Agent Immigration, Clearing House and Bank, which are illustrated in Figure 2. Each component will be elaborated in the following subsections.

## Community

As is shown in Figure 1, we divide agents into SAFER communities and non-SAFER communities. Each SAFER community possesses a set of facilities and individuals as described in Figure 2. The local community administration center will approve an applicant as a SAFER community member and issue it a digital certificate.

Agents can also migrate within communities. Therefore, in addition to permanent residence in a community, an agent can carry out its tasks in a foreign community. Visiting agents can register with the foreign community administration center as guests and obey migration rules. Figure 2 illustrates the concept of SAFER agent community.

A community is therefore the basic unit in SAFER e-commerce. It offers factories and evolution vehicles to

*Figure 1. SAFER architecture (1)*

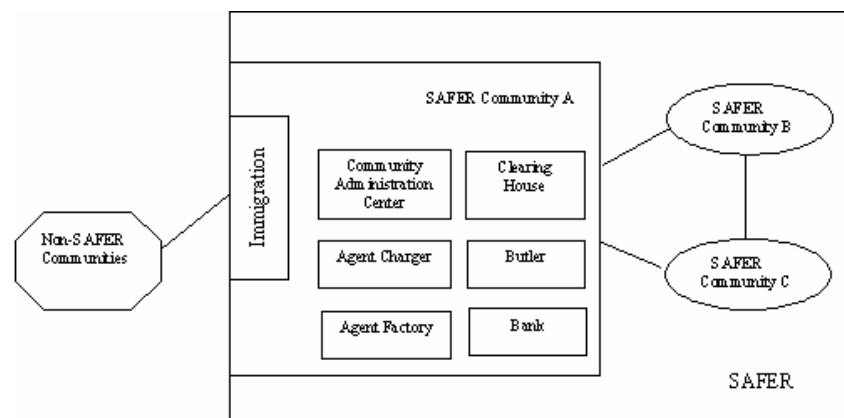
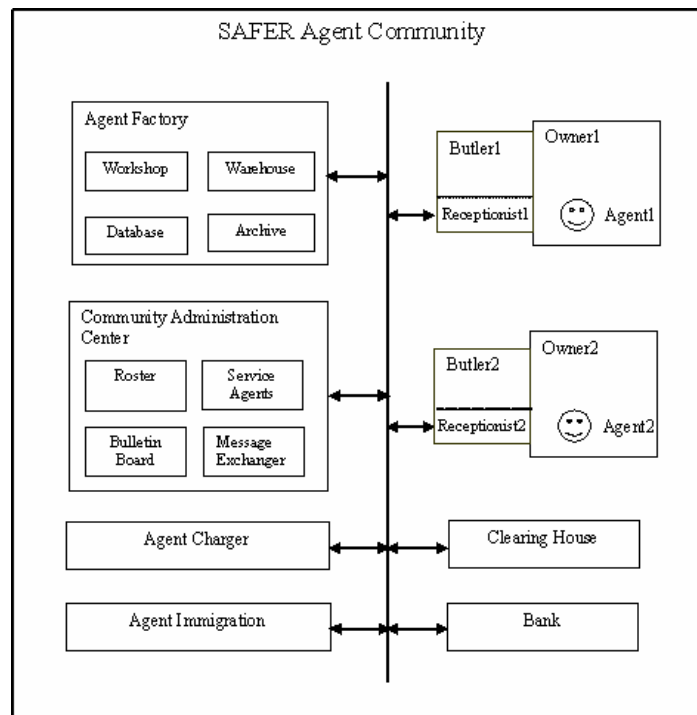


Figure 2. SAFER architecture (2)



fabricate e-commerce agents. Agents can therefore be regulated in order to perform their tasks more efficiently and their security enhanced.

## Owner

Agents act on behalf of their owners. The owner therefore has the priority and responsibility for all his agents. The owner therefore has the responsibility for all his agents and controls them from creation to termination. Owners should register in the community administration center before having the access to the facilities of the community. The owner can authorize a butler to handle most of his tasks and reduce his burden.

## Butler

An agent butler will, in the absence of the owner, make decisions on his behalf. As agents are dispatched for certain missions, the agent owner will issue authorization to them. The agent butler takes on the role of enforcing these authorizations when necessary. The butler is also involved when making payments during transactions with external parties and in keeping track of the agent's activities and its location.

Butlers can also detect agent loss or abduction. In order to ensure that an agent is "alive," critical agents are required to send a "heartbeat" signal back to the agent butler at fixed intervals. If the butler does not receive heartbeats from an agent after the fixed interval, the butler will immediately alert the agent owner and appropriate actions can be taken to either recover the agent or issue new agents to continue the mission.

Butlers also act as receptionists in agent roaming (Yang & Guan, 2000), coordinating agent transport, and servicing incoming and outgoing agents.

## Agent

The SAFER e-commerce is based on agents. Each agent has a unique identification (in the form of owner-issued digital certificates) and belongs to one specified owner. According to the tasks assigned by the owner, we can classify agents into categories such as negotiation agents, payment agents, mediation agents, and so forth. Agents can be resting in the owner's computer when they are idle, or roaming from one host to another, or executing a task in a foreign host.

As an agent acts on behalf of its owner, it should have certain degree of intelligence. For example, an agent

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