Chapter 9

Recovery of Ubiquitous Multimedia Content Discovery Mobile Agent

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ABSTRACT

Multimedia content is ubiquitous; therefore it is very difficult to bring all the hidden contents to the every one of universe. Mobile agent technology is the efficient technique to discover and bring the multimedia content to the universe with the help of dynamic itinerary movement. While mobile agent is roaming to discover the ubiquitous content, it has to go and visit multiple servers with different character in nature (that is server may be legitimate or hostile; hostile intention is to disturb the agent functionalities either by killing the agent or modifying the agent functionalities). Whenever the agent is disturbed (agent is altered or killed) by the hostile servers while roaming to discover the content, we should have the recovery mechanism to rollback the agent. This chapter adopts the K-response recovery model to rollback the original agent even then it is cracked or killed by the malicious servers while discovering the multimedia content.

INTRODUCTION

In recent years, a mobile agent is used in many applications like Data mining (Klusch et al., 2003), Grid computing (Kuang et al., 2002), P2P networks (Lu and Fu, 2006), Network routing (Manvi and Venkatram, 2007) etc. The key reasons for incorporating the mobile agent concept in various applications are Reduction of the network load, Reduce network latency, Dynamic Adaption, Robust and fault-tolerant and Client Customization.

In the multimedia environment, content discovery is the major aspect to bring the content to every user. For this, mobile agent can play a
strategic role to discover the content and bring this information to the client. For the mobile agent based multimedia content discovery following are the entities involved.

- **Client:** The person who will send his agent to discover the multimedia content around the world. It is not possible to send the single agent to roam around the universe to discover the content. Hence, we need multiple agents and if possible we can frame cluster for every particular area and send the respective cluster agent to discover the content after that we will aggregate all the discovered content of the agent to bring the world wide discovery.

- **Remote server (Multimedia Remote Server):** It will receive the agent and its requirements then process the requirement or allow the agent to process and provide the required information. At the end, remote server will decide the next remote server where the agent has to move that is based on the conditions (based on query of the agent or next known server which is multimedia content information). In this DIDO based mobile agent, we cannot expect that the mobile agent will only visit the multimedia server because the agent is roaming without any itinerary so the remote server has to forward the agent to the next remote server based on its consideration of the agent query (that is the current remote server will assume that this remote server will have the information for the agent so we can forward the agent to that location).

- **Mobile Agent:** The function of the mobile agent is to get the information provided by the various remote servers or it will process on the remote servers based on the client requirements and it will get the information.

To discover the multimedia contents from all over the universe, single mobile agent is not enough and also it will give some of issues like increase in agent size, lot of time required to gather information and security issues. To overcome this, we can form the cluster with a set of servers or a server in the specific region and the agent should roam only within the cluster. The data collected from the \( n \) number of clusters are forwarded to the client or universal multimedia contents index at the end through the agent as shown in Figure 1.

Even though the efficient clustering based mobile agent technology is there to discover the ubiquitous multimedia content information, the security is the critical aspect to implement the technology in the content discovery.

The reason for the security issue is mobile agent is visiting the remote server which may be friendly (honest) server or hostile (malicious) server. It is very difficult to know the characteristics of the remote machines. The malicious host may alter the agent code or agent information or agent state or agent itinerary or it may kill the agent. To rollback the agent after this kind of malicious host attack, we need a recovery mechanism. The agent failure in the multi-hop mobile agent environment is a serious issue. The agent at the \( n^{th} \) host will have the collected information of the preceding \((n-1)\) hosts. The problem occurs when the \( n^{th} \) host is malicious and has killed the agent or the \( n^{th} \) host is genuine but has failed after receiving the agent. The data collected so far is lost along with the agent and this situation is not known to the agent originator.

Apart from identifying this attack or fault, the recovery of the mobile agent is most important in the mobile agent environment, because an agent destroyed in the \( n^{th} \) remote host will lose all the preceding \((n-1)\) remote hosts multimedia contents information, and also, the agent originator should once again send the agent to collect the multimedia contents information from all the \( N \) remote hosts, but there is no guarantee that the agent will return to the originator in the second