Brief Announcement: A design of a protocol for detecting an agent clone in mobile agent systems and its correctness proof

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ABSTRACT

In this paper, we investigate the problems caused by mobile agent clones and we design a protocol, which detects agent clone executions and identifies the clone generating agent server.

Keywords

Mobile agents, security, clone, detection protocol.

1. INTRODUCTION

An agent server which receives a mobile agent can easily make a copy of that mobile agent, since it is just a program consisting of code and data. We define a mobile agent clone as a carbon copy of the agent, having the same code and data as the original agent in some state. We cannot distinguish between a mobile agent and its clone[1].

Mobile agent clone execution by a malicious agent server causes

- the unique agent authentication problem,
- the unexpected multiple transaction problem and
- the problem associated with disclosure of an agent's internal information by parallel execution of the agent.

Since it is not possible to control all the agent servers in a given distributed system, it is also not possible to prevent the generation of agent clones by any agent server. We can only detect an agent clone and identify the agent server which generated it, thereby preventing it from generating agent clones again.

2. PROBLEMS IN EXISTING SYSTEMS

A simple mobile agent application operating on Mole system[2] (a popular mobile agent system) was developed for purposes of investigation. Further, a simple malicious agent server which generates clones of incoming agents was also constructed. The experimental results show that a clone can be easily generated without any detailed knowledge about the Mole System.

3. CLONE DETECTION PROTOCOL

Clone detection protocol is an arrangement between agent servers and the coordinator. The coordinator receives messages from agent servers, and determines the existence of a clone by executing a clone detection algorithm. It tries to ensure the execution of the genuine agent in the agent server. On the other hand, if a clone is detected, the coordinator identifies the clone generating agent server and stops the protocol for that agent.

Figure 3.1 describes the clone detection protocol. The coordinator detects the clone by receiving RCT, RET, RMT, RDT messages from agent servers. The clone detection algorithm is based on a close scrutiny of the life cycle of the mobile agent. The coordinator knows the current state and the next state (derived from the messages), so that it knows which request must come next. If the next request is different from the coordinator's expectation, then it is regarded as a request for clone.

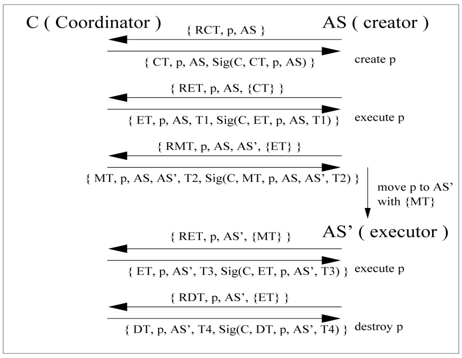

Figure 3.1 Clone Detection Protocol

A formal proof of the correctness of the protocol using Colored Petri Nets[3] can be found elsewhere[4].

4. CONCLUSIONS

This investigation assists in finding security weaknesses of any mobile agent system. Also, we expect that the protocol will contribute to the study of mobile agent security in a useful manner.

5. REFERENCES

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