

MAPS: A SOFTWARE TOOL FOR MOBILE AGENT TO PROVIDE PLATFORM SECURITY IN DISTRIBUTED SYSTEM USING DIGITAL SIGNATURE

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As a recently emerging distributed computing paradigm, mobile-agent technology attracts great interests because of its salient merits. However, it also brings significant security concerns, among which the security problems between a mobile agent and its platforms are of primary importance. While protecting a platform can benefit from the security measures in a traditional client-server system, protecting a mobile agent has not been met in traditional client-server systems and is a new area emerging with mobile-agent technology. Mobile-agent security is also believed to be the most difficult in the security areas of a mobile-agent system. Several methods are proposed to provide protection or detection mechanisms for mobile-agent security. However, many of them either lack an intuitive formal approach to formally model and analyze the system or lack security consideration for mobility—the most distinct characteristic of a mobile agent. In this paper, we extended the original elementary object system (EOS), which applies object-oriented technology to Petri nets, in several aspects because the original EOS cannot fully support the features of mobile-agent system and security modeling. Based on the extended EOS (EEOS), we developed a formal model for a generic secure mobile-agent system. This model supports not only strong mobility but also secure mobility of a mobile agent. Mutual authentication between a mobile agent and its hosting platform is accomplished in this model. Meanwhile, a security mechanism is presented for the detection of malicious platform attacks to mobile-agent code or execution flow during the mobile agent execution. Using an intuitively graphical formal method to model, simulate, and analyze a secure mobile-agent system distinguishes this paper from other works on mobile-agent security. This paper also introduces how to translate our EEOS model to a colored Petri net (CPN) model and presents the simulation of a sample mobile-agent system model in Design/CPN. Different from the mathematical or theorem-proving analysis methods used by other mobile-agent system and mobility models, we used simulation-based analysis to verify several characteristics including boundedness, liveness, concurrence, and security of the system. Compared with other analysis methods, simulation-based analysis is generally more intuitive and more widely used in industry to solve real problems.

Index Terms—EOS, Petri net, EEOS