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Effect of Anti-Malware Software on Infectious Nodes in Cloud Environment

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Highlights

- introduce a novel approach to study fast propagation of malware in the cloud.
- develop a dynamic mathematical model to analyze the effect of self-defending VMs.
- predict whether the number of infected nodes in cloud decrease to zero or not.
- calculate how many self-defended VM could clean the infrastructure of the cloud.

Abstract

A primary challenge of cloud computing is securing a virtualized environment. Virtual machine migration plays an important role in cloud infrastructure by enabling dynamic resource allocation and optimizing power consumption. However, it may adversely affect the security of the environment by facilitating the malware propagation process. In this paper, we introduce a novel approach to study fast propagation of malware in the virtualized cloud environments. We develop Susceptible-Protected-Infected (SPI) cloud malware propagation model, a dynamic mathematical model to analyze the effect of self-defending VMs in the cloud environment with variable VM population and migration patterns. We analyze the proposed model using stability theory of differential equations and use epidemic modeling of malware propagation to evaluate strategies for malware propagation control. Finally, the experimental results confirm the validity of our analytical results.

Keywords: Cloud Computing Security, Virtualization, Epidemic Models, Malware Propagation, Stability

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