Modeling and Stability Analysis of Viral Propagation in Wireless Mesh Networking

Authors : Haowei Chen, Kaiqi Xiong

Abstract : This paper aims to answer how malware will propagate in Wireless Mesh Networks (WMNs) and how communication radius and distributed density of nodes affects the process of spreading. The above analysis is essential for devising network-wide strategies to counter malware. We answer these questions by developing an improved dynamical system that models malware propagation in the area where nodes were uniformly distributed. The proposed model captures both the spatial and temporal dynamics regarding the malware spreading process. Equilibrium and stability are also discussed based on the threshold of the system. If the threshold is less than one, the infected nodes disappear, and if the threshold is greater than one, the infected nodes asymptotically stabilize at the endemic equilibrium. Numerical simulations are investigated about communication radius and distributed density of nodes in WMNs, which allows us to draw various insights that can be used to guide security defense.