PEPA models of Internet worm attacks

Jane Hillston
Laboratory for Foundations of Computer Science
The University of Edinburgh
Edinburgh
Scotland

September 5, 2005

Abstract

In this talk I will discuss some recent joint work with Jeremy Bradley and Stephen Gilmore on modelling Internet worms. We use the PEPA stochastic process algebra to express our models, but solution is based on continuous approximation rather than the usual mapping to a Markov process. This means that we assume populations are large and state variables are expressed as a set of ordinary differential equations.

The models are variations of susceptible-infected-recovered (SIR) models in which we assume that infection is transmitted via a medium, in this case the network, rather than through direct contact. This has an interesting impact on the dynamics of an attack and suggests a trade-off between connectivity and ability to limit the impact of an attack.