

ASYMPTOTICS OF EPIDEMIC-LIKE MODELS WITH APPLICATIONS TO PEER-TO-PEER NETWORKS

A. Shwartz, Technion

E. Altman, INRIA,

P. Nain, INRIA,

Y. Xu, INRIA

In a peer-to-peer network, an individual may acquire a copy of a file from another individual that has the file. Contact between individuals happens according to a (continuous time) random Markovian mechanism. The number of file owners grows through this copying mechanism, and may diminish as individuals leave the system. This is similar to an epidemic model. We study several variations of the model in the limit as population size increases. Of particular interest are the proportion of users who own a copy of the file, the probability that all copies of the file disappear from the network, etc. It turns out that the asymptotics change sharply near some critical values of the parameters. The results have implications on the ability of network owners to influence the unauthorized distribution of electronic material over the internet.