Solutions to Problem Set 9

Problem 9.1

(a) If the server never checks the validity of the stamps, what will its goodput be?

A. On average, every other job is legitimate. Thus, the server serves one legitimate job every 2×0.01 seconds. The goodput is $\frac{1}{0.02} = 50$ job/sec.

(b) Assume that $x = y = 0.01$ seconds. How often should the server validate stamps if it wants to maximize its goodput? Should it validate every job? every other job? never validate?

A. Never. Since the validation time is as much as the service time, the server is better off serving all jobs. It cannot gain anything by validating the jobs. Validation will actually reduce the goodput because now every legitimate job takes 0.02 second to validate and serve. Illegitimate jobs take 0.01 seconds with and without validation.

(c) If the server validates the stamp of every job before executing it, what will its average goodput be as a function of x?

A. On average the server will receive an equal number of bad jobs and good jobs. Thus, on average, for every unit of useful work the server generates (i.e, for every legitimate job) the server spends x seconds validating the legitmate job, 0.01s serving the legitmate job, and x seconds validating a bad job. The goodput is $\frac{1}{2x+0.01}$.

(d) Consider the following two policies: "always validate" and "never validate". Which one achieves better goodput when $x = 0.008$? How about $x = 0.001$? What is the value of x at which the server should switch policy?

A. We just need to substitute in the goodput equation from the previous question. For $x = 0.001$, the goodput is $\frac{1}{2\times0.001+0.01} > 50$. Thus the server should validate the jobs. For $x = 0.008$, the goodput is $\frac{1}{2\times0.008+0.01} < 50$. Thus the server should serve the jobs without trying to validate them. The switching point happens at $\frac{1}{2\times x+0.01} = 50$, i.e, at $x = 0.005$.

Problem 9.2

(a) Describe the attack that is going on.

A. syn flooding of mit.edu using random addresses some of which fall within Ben's IP space

(b) What is the current rate of attack?

A. $(600/min)/(60\ min/sec) \times \frac{2^{32}}{2^{24}} = 256 \times 10 = 2560\ probes/sec$