Network Performance Evaluation: Summary of results for specific cases

M/M/1

Probability of k in system=P[K=k] = $\rho^k(1-\rho)$

Probability of system busy = utilization= ρ

Probability of system empty = $1-\rho$

$$Average\ Number\ in\ System = E[K] = \frac{\rho}{1-\rho}$$

$$\text{Variance of } Number\ in\ System = \text{Var}[K] = \frac{\rho}{(1-\rho)^2}$$

$$\text{Average Delay} = E[D] = \frac{E[T_H]}{1-\rho} = \frac{E[L]/R_{out}}{1-\rho} = \frac{1}{\mu-\lambda}$$

M/M/1/S

$$P[K=k] = \frac{(1-\rho)\rho^k}{1-\rho^{S+1}} \text{ for } k \le S$$

$$P[K=k] = 0 \text{ for } k > S$$

$$P_{Blocking} = P[K=S] = \frac{(1-\rho)\rho^S}{1-\rho^{S+1}}$$

Table to be provided on test and Excel spreadsheet provided on class web site see http://www.ittc.ku.edu/~frost/EECS_563/M-M-1-K-Blocking%20cal.xls

M/M/S/S

$$P[K=k] = \frac{\frac{\rho^k}{k!}}{\sum_{n=0}^{S}\frac{\rho^n}{n!}}$$

$$P[K=k] = 0 \text{ for } k > S$$

$$P_{Blocking} = P[K=S] = \frac{\frac{\rho^S}{S!}}{\sum_{n=0}^{S}\frac{\rho^n}{n!}}$$

Erlang B blocking Formula

Tabulated and there are web calculators see:

http://www.erlang.com/calculator/index.htm

http://www.ittc.ku.edu/~frost/EECS_563/LOCAL/erlang-table.pdf

$$\text{Load} = \rho = R_{in}/R_{out} = \lambda E[T_H] = \lambda(E[L]/R_{out}) = \lambda/\mu$$