Chegada: Poissoniana

Taxa: λ clientes / u. tempo

População $= \infty$

Fila máxima $= \infty$

Tempo atendimento: exponencial negativo

Taxa: μ clientes / u.tempo e servidor

Nº servidores: 1

$\rho = \frac{\lambda}{\mu}$, com $\rho < 1$

Taxa de ocupação $= \rho$

Taxa de desocupação $= 1 - \rho$

$$L_q = \sum_{n=1}^{\infty} (n-1) P_n = \frac{\lambda^2}{\mu(\mu - \lambda)}$$

$$L = \sum_{n=0}^{\infty} n P_n = L_q + \frac{\lambda}{\mu} = \frac{\lambda}{\mu - \lambda}$$

$$W_q = \frac{L_q}{\lambda} = \frac{\lambda}{\mu(\mu - \lambda)}$$

$$W = W_q + \frac{1}{\mu} = \frac{L}{\lambda} = \frac{1}{\mu - \lambda}$$

$$P_0 = 1 - \rho$$

$$P_n = \rho^n P_0$$

$$P(n > k) = \rho^{k+1}$$

$$P(W > t) = e^{-\mu(1-\rho)t}, \ t \geq 0$$

$$P(W_q > t) = \rho \, e^{-\mu(1-\rho)t}, \ t \geq 0$$

$$P(W_q = 0) = P_0$$

Chegada: Poissoniana

Taxa: λ clientes / u. tempo

População $= \infty$

Fila máxima $= \infty$

Tempo atendimento: exponencial negativo

Taxa: μ clientes / u.tempo e servidor

Nº servidores: S

$\rho = \frac{\lambda}{S\mu}$, com $\rho < 1$

Taxa de ocupação $= \rho$

Taxa de desocupação $= 1 - \rho$

$$L_q = \sum_{n=S}^{\infty} (n - S) P_n = \frac{P_0 \left(\frac{\lambda}{\mu}\right)^S \rho}{S!(1-\rho)^2}$$

$$L = \sum_{n=0}^{\infty} n P_n = L_q + \frac{\lambda}{\mu}$$

$$W_q = \frac{L_q}{\lambda}$$

$$W = W_q + \frac{1}{\mu} = \frac{L}{\lambda}$$

$$P_0 = \frac{1}{\displaystyle\sum_{n=0}^{S-1} \frac{\left(\frac{\lambda}{\mu}\right)^n}{n!} + \frac{\left(\frac{\lambda}{\mu}\right)^S}{S!} \frac{1}{1-\rho}}$$

$$P_n = \begin{cases} \dfrac{\left(\frac{\lambda}{\mu}\right)^n}{n!} P_0, & \text{se } 0 \leq n \leq S \\ \dfrac{\left(\frac{\lambda}{\mu}\right)^n}{S! S^{n-S}} P_0, & \text{se } n \geq S \end{cases}$$

$$P(W > t)_{t \geq 0} = e^{-\mu t} \left(1 + \frac{P_0 \left(\frac{\lambda}{\mu}\right)^S}{S!(1-\rho)} \frac{1 - e^{-\mu t (S - 1 - \lambda/\mu)}}{S - 1 - \frac{\lambda}{\mu}} \right)$$

$$P(W_q > t)_{t \geq 0} = [1 - P(W_q = 0)] e^{-S\mu(1-\rho)t}$$

$$P(W_q = 0) = \sum_{n=0}^{S-1} P_n$$