Lista Filas — Eliseu Elias

1. Carros

Poisson taxa 3 carros a cada 5 min

$\lambda = 3/5$ $\quad \rho = \frac{3}{5}$

$\mu = 1$

a) 2 min e 30s

b) Nº médio de carros na fila é de 3/2 carros.

$$E[q] = \frac{3/5}{1 - 3/5} = 3/2$$

$$E[t_q] = \frac{1}{\mu - \lambda} = (1 - 3/5)^{-1} = 2{,}5 \text{ min}$$

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2. Comutador de pacotes

$\lambda = 40$ pct/s $\quad E[t_s] = \frac{L}{C} = \frac{5}{500} = 0{,}01$s

a) $E[t_q] = 16{,}6$ ms

b) $E[t_w] = 6{,}67$ ms

$L = 5$ Kbits

$C = 500$ Kbps

$$\rho = \lambda E[t_s] = 40 \cdot 0{,}01 = 0{,}4$$

$$\rho = \frac{\lambda}{\mu} \Rightarrow \mu = \frac{\lambda}{\rho} = \frac{40}{0{,}4} = 100$$

$$E[t_q] = \frac{1}{\mu - \lambda} = \frac{1}{100 - 40} = 1/60 = 16{,}66 \text{ ms}$$

$$E[t_w] = E[t_q] - E[t_s] = 16{,}66\text{m} - 0{,}01 = 6{,}67 \text{ ms}$$

$$E[t_s] = \frac{L}{C}$$

$$\mu = E[t_s]^{-1} = \frac{C}{L}$$

3- Comutador (Repetir o processo p/ os outros tamanhos de buffer)

$\lambda = 200$ pct/s

$L = 128$ bytes $= 128 \cdot 8 = 1024$ bits

$C = 256$ Kbps

$N = 4 + 1 = 5$

$E[T_s] = \frac{1024}{256K} = 4$ ms

$\rho = \lambda E_{Ts} = 200 \cdot 4_m = 0,8$

$\mu = \frac{\lambda}{\rho} = \frac{200}{0,8} = 250$

$$P_b = \rho^N \frac{1-\rho}{1-\rho^{N+1}} = \frac{1-0,8}{1-0,8^6} \cdot 0,8^5 = 0,0889 = 8,89\%$$

$$E[q] = \frac{\rho}{1-\rho} - \frac{(N+1)\rho^{N+1}}{1-\rho^{N+1}} = \frac{0,8}{0,2} - \frac{6 \cdot 0,8^6}{1-0,8^6} = 1,87 \text{ pcts}$$

$$E[t_q] = \frac{E_q}{(1-P_b)\lambda} = \frac{1,87}{(1-0,0889) \cdot 200} = 10,26 \text{ ms}$$

4- Rede de PC

$L = 2000$ bits

$C = 10000$

$E[t_0] = L/C = \frac{2k}{10k} = 1/5 = 0,2$ s

$\mu = E[t_0]^{-1} = 5$

$\lambda = 1$

$\rho = \lambda/\mu = 0,2$

$$E[t_q]|_{etc} = \frac{1}{\mu - \lambda} = \frac{1}{4} L$$

$$E[t_w] = \frac{\lambda E(t_0^2)}{2(1-\rho)} + E[t_0] = \frac{1 \cdot 0,2^2}{2(1-0,2)} + 0,2 = 0,225$$