Sprint 4 Deliverables CMS_360

Yet more light bulbs

$$\lambda = \frac{1}{E[x]} = \frac{1}{2000} = .0005$$

Use CCDF to find probability lightbulbs will last longer than 3000 hours

$$CCDF = e^{-\lambda x} = e^{-.0005(3,000)}$$

$= .223130$ or 22% one lightbulb lasts more than 3000 hours

to find two use joint Probability

$.223130^2 = .0497870683$ or approx 4%

Sprint 4 Quiz cheat sheet

Queueing theory

Parametrs:

$\bar{S}$ average service time

$M = 1/\bar{S}$ average service rate

σ_s^2 = variance of the service times

λ = the arrival rate

Forced flow law $\lambda_k = \lambda \cdot V_k$

- λ_k: The throughput or arrival rate of a resource
- λ: Arrival rate of the system
- V_k: visit count of a resource

Utilization Law $U = \lambda \cdot \bar{S}$

- U: Utilization
- λ: arrival rate
- $\bar{S}$: Average service time

Littles Law $\bar{N} = \lambda \bar{R}$

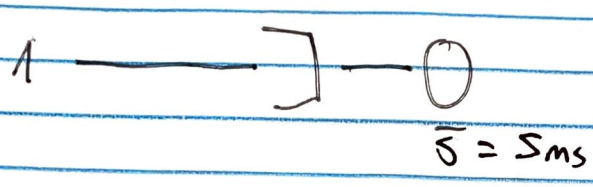
- $\bar{N}$: Average number of customers in the system
- λ: throughput
- $\bar{R}$: Average residence time

Conservation Law: Arrival rate and throughput are equal in a stable system

$\lambda = \frac{\text{Number being sent}}{\text{time taken}}$

Sprint 4 Deliverables CMS. 380

Check my Math



$$1 = \frac{\bar{N}}{\bar{R}} = \frac{120}{1}$$

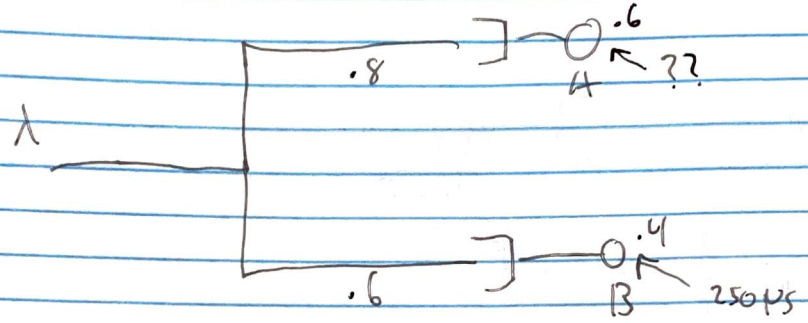
$$\angle = 120$$

$$V = \lambda \bar{\delta} = 120 \cdot .01$$

$$V = 1.2$$

Sprint 4 Deliverables CMS 380

Unbalanced Server loads



B is able to process one request at 250 μs on average

Calculate average service time at server A

Throughput of server B = $\frac{V}{S}$ $\frac{.6}{250}$ = .0024

Throughput of system = $\frac{\lambda_B}{V_B} = \frac{.0024}{.4} = .006$

$\lambda = .006$

$\lambda_A = V_A \lambda = .6 \times .006 = .0036$

$\bar{S} = \frac{U_A}{\lambda_A} = \frac{.8}{.0036} = 222\,\mu s$