

CS 736 Software Performance Engineering Homework Assignment #2

Assigned: Thursday, September 23, 2010

Due: Thursday, September 30 at the beginning of the class (HARD COPY)

No assignments will be accepted after 12:30 pm on Tuesday, October 5, 2010

1. A DB server receives request from 50 clients. Each request to the DB server requires that five records be read on average from the server's single disk. The average read time per record is 9 msec. Each DB request requires 15 msec of CPU to be processed. What is the throughput of the server, average time spent at the CPU and the disk by each request, average number of requests at the CPU and disk, and the average response time of requests as a function of the number of request ($1 \leq N \leq 10$) concurrently being executed at the server? (20 points)
2. Consider a system with a CPU and two disks. The following measurement data was obtained by monitoring the system:

Length of the measurement interval $T = 900$ seconds

CPU busy	$B_1 = 400$ seconds
Slow disk busy	$B_2 = 100$ seconds
Fast disk busy	$B_3 = 600$ seconds

Completed jobs	$C = 200$ jobs
Slow disk operations	$C_2 = 2,000$
Fast disk operations	$C_3 = 20,000$

Think time $Z = 15$ seconds

- a) Determine the visit counts (V_k), service times per visit (S_k), and service demand (D_k) at each device. (5 points)
- b) Estimate the optimistic bound on throughput for 5, 10, 20, and 40 active terminals. (5 points)

Consider the following modifications to the system:

1. Replace the CPU with one that is twice as fast.
 2. Shift some files from the faster disk to the slower disk, balancing their demands.
 3. Add a second fast disk (device 4) to handle half the load of the busier existing disk.
 4. The three changes made together: the faster CPU and a balanced load across two fast disks and one slow disk.
- c) For the original system and for modifications 1 through 4, graph optimistic asymptotic bounds on throughput as functions of the number of active terminals ($1 \leq N \leq 40$). Explain the results. (20 points)