Performance Evaluation of Computer Networks

Project#2: Single Class, Closed QN Models

Consider an interactive system consisting of one CPU and two disks. The system has 30 terminals and the average think time of users is 5 seconds. The average service demand of user interactions at CPU is 50 ms and average service times at disk1 and disk2 are 20ms and 10ms, respectively. Each user interaction makes 5 I/O requests to disk1 and 8 to disk2.

a) Use JMT and find the following performance metrics:
   - Service demand of user's interactions at each resource
   - System throughput
   - Throughput of each resource
   - Utilization of each resource
   - Residence time of user's interactions at each resource
   - System response time
   - Number of user's interactions in the system
   - Number of user's interactions in each resource

b) Use the results from previous part and obtain the following:
   - Number of transactions is being served in CPU and disks
   - Number of transactions is being served in the system
   - Queue length of each resource
   - Number of requests is waiting to be served in the system
   - Waiting time of requests at each resource
   - Waiting time of requests at system
   - Number of users that have submitted their request to the system and are waiting a response from system
   - Number of users that want to submit their request to the system

c) Consider the following scenarios and answer the questions associated with each scenario.

Scenario1: Doubling the number of terminals

Assume that the number of terminals is being doubled. Obtain the percentage change of the performance metrics mentioned in part (a).

Scenario2: Decreasing the think time of users by 50%

Assume that the think time of users is decreased by 50%. Obtain the percentage change of the performance metrics mentioned in part (a).

Scenario3: Using a faster resource

Consider that the bottleneck resource is replaced by one that is two times faster. Obtain the followings:

- Service demand of user's transactions at the new resource
- Percentage change of system response time compared to the base scenario