

Performance Evaluation of Computer Networks

Project#1: Single Class, Open QN Models

Consider a web server consisting of one CPU and two identical disks. Assume that the arrival rate of transactions is 5 tps. Each transaction makes 3 I/O requests to disk1 and 6 to disk2. The average service times of transactions at CPU and disks are 2ms and 10ms, respectively.

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

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

Scenario1: Doubling the arrival rate of transactions

Assume that the arrival rate of transactions is being doubled. Obtain the percentage change of the performance metrics mentioned in part (a).

Scenario2: Using a Faster Resource

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

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

Scenario3: Adding a Third Disk

Assume that a new disk equivalent to the two existing disks is being added to the server and the I/O activity is being balanced on the three disks. Obtain the following:

- Service demand of transactions at disks
- Percentage change of system response time compared to the base scenario