CSC470 Fall, 2000

Computer System Modelling And Analysis

Laboratory #3
October 17th/19th and 24th/26th, 2000

Purpose

In this lab, you are asked to create MAP models based on two different sets of measurement data. You should validate the accuracy of the models you build against the baseline performance data provided (i.e., X, R, and U_k's). In the lab assignment, you will be asked to use these models to make various performance projections.

The MAP commands *center, class, loading, type, avg_mpl, arrival, online, plevel, schedule* and *think* can be used to define the model, the *list* command will show the model currently defined, and the *performance* command will display the major results, while the *utilization, residence* and *qlength* commands show the results for individual centers.

Preparation

1. Single Class System

Here is measurement data over a **60 minute (3600 seconds)** interval from a system that is to be modelled with a **single class** queueing network model:

Quantity	Total
observation interval (T)	3600
completions (C)	570
number active (N)	100
number ready ($N_{central}$)	5.0
think time (Z)	600
cpuA busy time (B_{cpuA})	2851
*dA*1 busy time (B_{dA1})	1710
*dA*2 busy time (B_{dA2})	1140
throughput (X)	.158
response time (R)	31.4

(a). What is the *service demand*, D_k, at each center?

(b). The *type* of the single class might be made any of *transaction*, *terminal*, or *batch*. Consider each possibility in turn, an build and evaluate the corresponding model.

(i). If the type *transaction* is used, find the appropriate *arrival_rate*.

(ii). If the type *terminal* is used, find the appropriate values for *online_users* and *think_time*?

(iii). If type *batch* is used, find the appropriate *avg_mpl*?

Save each of the three models for possible use in the assignment portion of the lab.

2. Three Class System

Here is some measurement data taken from a system with three classes of customers in a measurement interval of **two hour (7200 seconds)**:

Quantity	warehouse	development	inventory	Overall
observation interval (T)				7200
completions (C_c)	41	851	324	1234
number active (N_c)	2.0	12.0	---	14.0
number ready ($N_{c,central}$)	2.0	7.3	1.5	8.8
think time (Z_c)	---	40.0	---	40.0
priority at CPU (pri_c)	5	5	5	---
cpuB busy time ($B_{c,cpuB}$)	2482	3406	648	6536
Disk dB1 busy time ($B_{c,dB1}$)	0	5108	648	5757
Disk dB2 busy time ($B_{c,dB2}$)	0	4257	972	5229
Disk dB3 busy time ($B_{c,dB3}$)	993	0	324	1317
Disk dB4 busy time ($B_{c,dB4}$)	744	0	324	1068
throughput (X_c)	.0057	.1182	.0450	.1689
response time (R_c)	348.2	61.5	32.4	63.4

(a). View the system (incorrectly) as homogeneous, and construct a *single–class* model from the data in the "overall" column of the measurement data. Derive the service demand of the single class at each center. Specify the workload intensity for whichever *type* of class you feel it is appropriate to use.

(b). Now view the system as having three distinct workload components, and build a three class MAP model of the system. Validate your model against the throughputs and utilizations observed for the three classes.

Save both these models for use in the assignment portion of the lab.

3. Assignment Preview

In the assignment portion of this lab, you will be asked to use these five MAP models, and variations of them, to predict the effects on performance of some anticipated or contemplated changes to the respective systems and their workloads.

NOTE: In using the *graph* exec, the context must be set correctly. For *response* and *throughput*, the class context must be set. For *qlength, residence*, and *utilization*, both the class context and the center context must be set. (When a model is *save*d and then *read*, the class and center contexts are both (unfortunately) left as *every*.)