CSC470 Fall, 2000

Computer System Modelling And Analysis

Laboratory #4
Oct. 31st/Nov. 2nd and Nov. 7th/9th, 2000

Purpose

In this laboratory session, you will be asked to make some capacity planning recommendations based on a model for a system with three workload components. The system to be modelled involves some new aspects such as limited memory space, priority scheduling, and the use of model types for processors and disks.

The additional MAP commands that you will need in this assignment (beyond those covered in the course handbook) are summarized in the "Advanced MAP Commands" document, and full detailed documentation is available in the "MAP Reference Manual". (There are links to each of these documents on the course Web page.)

Creating and Validating a Model

From the system description information and the measurement data given below, create and validate a three class model of the system, including priorities at both the cpu and at memory, memory constraints, and model types for all centers.

System Description

Processor model	SPARK
Disks model	BRONZE
Memory size	256 MB
Domain capacity	8
Classes in Domain	ACC, MNT, DSN
Processor scheduling	priority
Disks scheduling	normal
Memory scheduling	priority
CPU Priority order	ACC > MNT > DSN
Memory Priority order	ACC > MNT > DSN
# of processors	1
# of disks	4
# of domains	1

For the sake of consistency, I suggest using the following choices of class types:

Design	(DSN)	batch	Compute-intensive computer-aided design application
Accouting	(ACT)	transaction	Credit / debit accounting activities
Maintenance	(MNT)	terminal	Software maintenance activities

Measurement Data for two-hour hour period (7200 seconds)

Quantity	DSN	ACC	MNT
completions (C)	35	720	638
number active (N)	2.0	1.92	12.0
number ready ($N_{central}$)	2.0	1.92	3.14
think time (Z)	0	---	100
CPU utilization (U_{CPU})	0.1964	0.200	0.443
Disk d1 utilization (U_{d1})	0.0098	0.400	0.266
Disk d2 utilization (U_{d2})	0.0196	0.200	0.266
Disk d3 utilization (U_{d3})	0.0393	0.000	0.177
Disk d4 utilization (U_{d4})	0.0589	0.000	0.177
throughput	.0049	.1000	.0886
memory wait	0.000	0.114	0.661
response time	407.4	19.3	35.5

Moving from Validation Phase to Projection Phase

In advanced MAP models, such as the one you are using in this assignment, it is necessary to use a special command, called `setsystem`, to signify passage from the validation phase to the projection phase of model building and use. This is necessary in order to allow MAP to know whether the purpose of a particular change to the model is (i) to modify the model to achieve better validation, or (ii) to predict performance that would occur in some interesting scenario about the future. Remember that `setsystem` must be `off` during model validation, but must be set to `on` before attempting projections. Several of the commands to be used in this assignment have no effect on model results when `setsystem` is `off`, but they do have an effect when `setsystem` is on. For example, when `setsystem` is `off`, the Map command:

```
center PROC model FLAME
```

will be interpreted as a correction to prior information about the actual current model type of the processor. Once `setsystem` is `on`, however, the same command is interpreted as asking Map to project the performance of the system with the current SPARK processor upgraded to model type FLAME. To do that, Map will modify the PROC service demand for each class to reflect the fact that the service demand will be lower on the faster processor.

In addition to the `performance`, `utilization`, `qlength`, and `residence` commands, the command `memreport` may also be useful.

Some Experiments To Try

(1). Change the *avg_mpl* of the design class.
(2). Try different priority settings and scheduling and admission policies to see the effect on performance of the different classes.
(3). Change the domain capacity.
(4). Change the processor model to FLAME, BLAZE, TWIN or QUAD.
(5). Change the disk model to SILVER or GOLD.