

# CS 6378-501: Project II

Instructor: Ravi Prakash

Assigned on: November 5, 2002

Due date: December 3, 2002

You are required to simulate the sender-initiated and receiver-initiated load sharing strategies under varying system load. This is an individual project and you are expected to demonstrate its operation either to the instructor or the TA.

## 1 System Description

1. There are twenty identical servers that can execute tasks.
2. Jobs arrive at each server with the following characteristics:
  - The inter-arrival time of jobs is exponentially distributed with mean  $t_\lambda$ .
  - The service time of jobs is exponentially distributed with mean  $t_\mu$ .
  - If a job is to be migrated from one server to another, the time to transfer the job (in addition to the one-way message propagation delay) is exponentially distributed with mean  $t_\delta$ .
3. Only non pre-emptive task transfers are permitted.
4. If sender-initiated strategy is being employed, a server  $X$  tries to transfer tasks to idle server(s) only if the number of tasks in  $X$ 's queue (including the one being currently serviced) is two or higher.
5. If receiver-initiated strategy is being employed, a server  $X$  tries to obtain a task from other server(s) only if  $X$ 's queue is empty. On receiving a probe from  $X$ , another server  $Y$  will transfer a job to  $X$  only if the number of jobs in  $Y$ 's queue (including the one being currently serviced) is two or higher.
6. The probe limit for both sender- and receiver-initiated strategies is four.

## 2 Experiment Parameters

- For every run, the value of  $t_\lambda$  should be set to 10 seconds.
- Execute one run each of the no load sharing approach, and the sender- and receiver-initiated approaches with the values of  $t_\mu$  being 1, 3, 5, 7 and 9 seconds. So, there will be a total of fifteen runs.
- Let  $t_\delta$  be equal to 3 seconds.
- In your experiments all probes should be performed using IP datagram sockets.
- Execute your experiment until a total of 1000 jobs have serviced by the system.
- For the experiments report the following:
  1. Average and standard deviation of job latency. Job latency is the elapsed time between its initial creation and its completion.

2. For the sender- and receiver-initiated job transfer experiments report the following:
  - (a) The number of times job transfer was attempted.
  - (b) The number of jobs that were transferred.
  - (c) The average number and standard deviation of probes per transfer attempt.
- Based on your experimental results, what inferences can you draw about the impact of inter-arrival time, service time, task transfer time, and probe limit on the usefulness of the sender- and receiver-initiated load sharing strategies? Please describe.

### 3 Point Distribution

**Report (10%):** A spell-checked description of what features of this program you have implemented. Describe all major design decisions with respect to data, program structure, and message formats. Keep your description within 1000 words (does not mean that you are required to write a thousand words).

**Implementation (40%):** Source code of your well structured and well documented program. You may write your code in C, C++ or Java.

**Correctness (50%):** Output that your program produces and the statistical analysis of the results.

### 4 Submission Information

Submit through WebCT.