

CSE 410 - Computer Systems Homework 5

Assigned: Wednesday, May 12, 2004

Due: Wednesday, May 19, 2004
At the start of class

Name:

Solution

DWJ 19-May-04

Student Number:

1. Briefly define the following terms and highlight the key differences.

a. program a file on disk with code that can be run.
Passive, not a dynamic entity.

b. process
An instance of a program in execution.
Dynamic entity. Several processes may be running the same program. Container for threads.

c. thread
Defines an execution path within a process.
A thread has a program counter and associated register state. Dynamic entity.

2. Of the many thread-specific variables or values that change when a process switches from one thread to another, name two of them and describe what they represent.

Program counter - address of next instruction
Registers - current contents of registers
Stack pointer - current top of stack for this thread

3. Of the many process-specific variables or values that change when the operating system switches from one process to another, name two of them and describe what they represent. Do not repeat your answer from 2.

address space in memory - page tables
associated user name
access privileges

4. Consider the slide labeled "One Thread Three Threads" on page 11 of the Threads lecture.

a. Given what you know about 32-bit virtual address spaces, describe how you might allocate heap space to the various threads in a process.

Can allocate all heap data mixed in together for all the threads. The initial data on the heap is allocated at link time, then additional data is allocated at runtime when requested. Collisions are not a problem because the allocation can be managed by the OS.

b. Does the fact that the stacks and the heap all grow various amounts during execution cause a problem? Why or why not?

It can be a problem if any one of the stacks grows large enough to collide with the base of another stack or with the growing heap. However, there is a lot of room before that happens.

5. Describe one advantage and one disadvantage of preemptive scheduling.

+ \Rightarrow The OS can take control of the scheduling process and fairly distribute the available CPU time.

- \Rightarrow There is overhead ~~and~~ required to implement the regular clock tick management.

6. Describe one advantage and one disadvantage of non-preemptive scheduling.

+ \Rightarrow The application can manage the exact timing of when various threads run. More control

- \Rightarrow ~~All~~ All threads must be well designed and cooperate in order for the overall system to work well. One misbehaving thread can cause problems for the entire system.

7. In the following snapshots of the Windows Task Manager the list on the left shows the "user applications" and the list on the right shows all the running processes in the system.

| Windows Task Manager | |
|--|---------|
| File Options View Windows Help | |
| Applications Processes Performance | |
| Task | Status |
| Microsoft Word - hw5-r0.doc | Running |
| w2k-scheduling | Running |
| Folding@home Display | Running |
| Adobe Acrobat - [opr09B9F.pdf] | Running |
| Google Search: ebrt.exe - Opera | Running |
| X-Root | Running |

The list of applications above accounts for the images (or program files) marked in the list of processes at right. Pick another one of the image names at right, and using Google or any other information resource, find out what purpose the process serves. Describe the purpose of the process you selected:

| Windows Task Manager | | | | |
|--|------|-----|----------|-----------|
| File Options View Help | | | | |
| Applications Processes Performance | | | | |
| Image Name | PID | CPU | CPU Time | Mem Usage |
| FahCore_65.exe | 1684 | 99 | 5:30:34 | 11,292 K |
| System Idle Process | 0 | 00 | 0:02:10 | 16 K |
| mcshield.exe | 576 | 00 | 0:00:28 | 13,964 K |
| System | 8 | 00 | 0:00:26 | 220 K |
| explorer.exe | 1244 | 00 | 0:03:13 | 4,124 K |
| opera.exe | 472 | 00 | 0:00:11 | 25,148 K |
| CSRSS.EXE | 172 | 00 | 0:00:11 | 4,404 K |
| winFAH.exe | 356 | 00 | 0:00:07 | 7,836 K |
| WINWORD.EXE | 1128 | 00 | 0:03:07 | 11,580 K |
| WinMgmt.exe | 988 | 00 | 0:00:03 | 200 K |
| spoolsv.exe | 452 | 00 | 0:00:01 | 6,664 K |
| TASKMGR.EXE | 1520 | 00 | 0:00:01 | 1,368 K |
| SERVICES.EXE | 220 | 00 | 0:00:01 | 6,852 K |
| lMonitor.exe | 1508 | 00 | 0:00:01 | 4,644 K |
| Acrobat.exe | 1732 | 00 | 0:00:01 | 17,296 K |
| FrameworkServic | 508 | 00 | 0:00:01 | 8,744 K |
| WINLOGON.EXE | 168 | 00 | 0:00:00 | 688 K |
| xwin32.exe | 1572 | 00 | 0:00:00 | 3,700 K |
| SMSS.EXE | 104 | 00 | 0:00:00 | 376 K |
| LSASS.EXE | 232 | 00 | 0:00:00 | 1,192 K |
| ssh_accession.e | 400 | 00 | 0:00:00 | 6,648 K |
| UpdaterUI.exe | 1376 | 00 | 0:00:00 | 396 K |
| svchost.exe | 420 | 00 | 0:00:00 | 5,372 K |
| shstat.exe | 1456 | 00 | 0:00:00 | 516 K |
| svchost.exe | 484 | 00 | 0:00:00 | 9,064 K |
| nvsvc32.exe | 820 | 00 | 0:00:00 | 1,752 K |
| LogiTray.exe | 1448 | 00 | 0:00:00 | 2,172 K |
| svchost.exe | 1024 | 00 | 0:00:00 | 5,396 K |
| SOUNDMAN.EXE | 1460 | 00 | 0:00:00 | 2,156 K |
| LVCComS.exe | 1408 | 00 | 0:00:00 | 3,108 K |
| mdm.exe | 724 | 00 | 0:00:00 | 2,936 K |
| naPrdMgr.exe | 636 | 00 | 0:00:00 | 1,100 K |
| rundl32.exe | 1516 | 00 | 0:00:00 | 1,684 K |
| mstask.exe | 880 | 00 | 0:00:00 | 3,228 K |
| OSA.EXE | 1540 | 00 | 0:00:00 | 2,988 K |
| point32.exe | 1404 | 00 | 0:00:00 | 2,712 K |
| AcroTray.exe | 1388 | 00 | 0:00:00 | 1,268 K |
| stisvc.exe | 956 | 00 | 0:00:00 | 1,660 K |
| vstskmgr.exe | 592 | 00 | 0:00:00 | 384 K |
| EBRR.exe | 948 | 00 | 0:00:00 | 5,216 K |
| SAGENT.exe | 916 | 00 | 0:00:00 | 1,788 K |
| regsvcs.exe | 860 | 00 | 0:00:00 | 900 K |

csrss.exe Client/Server Runtime Server Subsystem.

Windows client server runtime subsystem handles Windows & graphics functions for all subsystems.

smss.exe Session Manager Subsystem Start, manage, delete user sessions or client sessions under Terminal Server

ssh-accession Desktop authentication agent for handling all private-key and sign-on operations for the workstations users.

SSH Secure Shell for

8. The top image on the next page shows various performance parameters during system activity during 1.5 minutes of recording. The heavy line at the top is the total percentage of CPU time utilized. The light line in the middle is the percentage of CPU time used by thread 2 of FahCore (basic calculation), and the light line at the bottom is the percentage of CPU time used by thread 0 of winFAH (draw image). The two FAH processes implement the Folding@Home distributed application that runs in the background on my machine only when no other process is ready to run.

a. Is Folding@Home a multi-process application? Yes No

b. Is Folding@Home a multi-threaded application? Yes No

c. Describe one possible advantage of this design for Folding@Home.

multiprocess allowed designers to separate the overall management of the job (winFAH) from the specific work unit being performed (FahCore)

multithreading allows each process to perform displays and calculations while listening for user input.

d. Eclipse is an Integrated Development Environment that I use to develop Java programs. I started Eclipse running during the recording period. Explain what happened to each of the 3 recorded values during the time when Eclipse was loading and say why you think that happened.

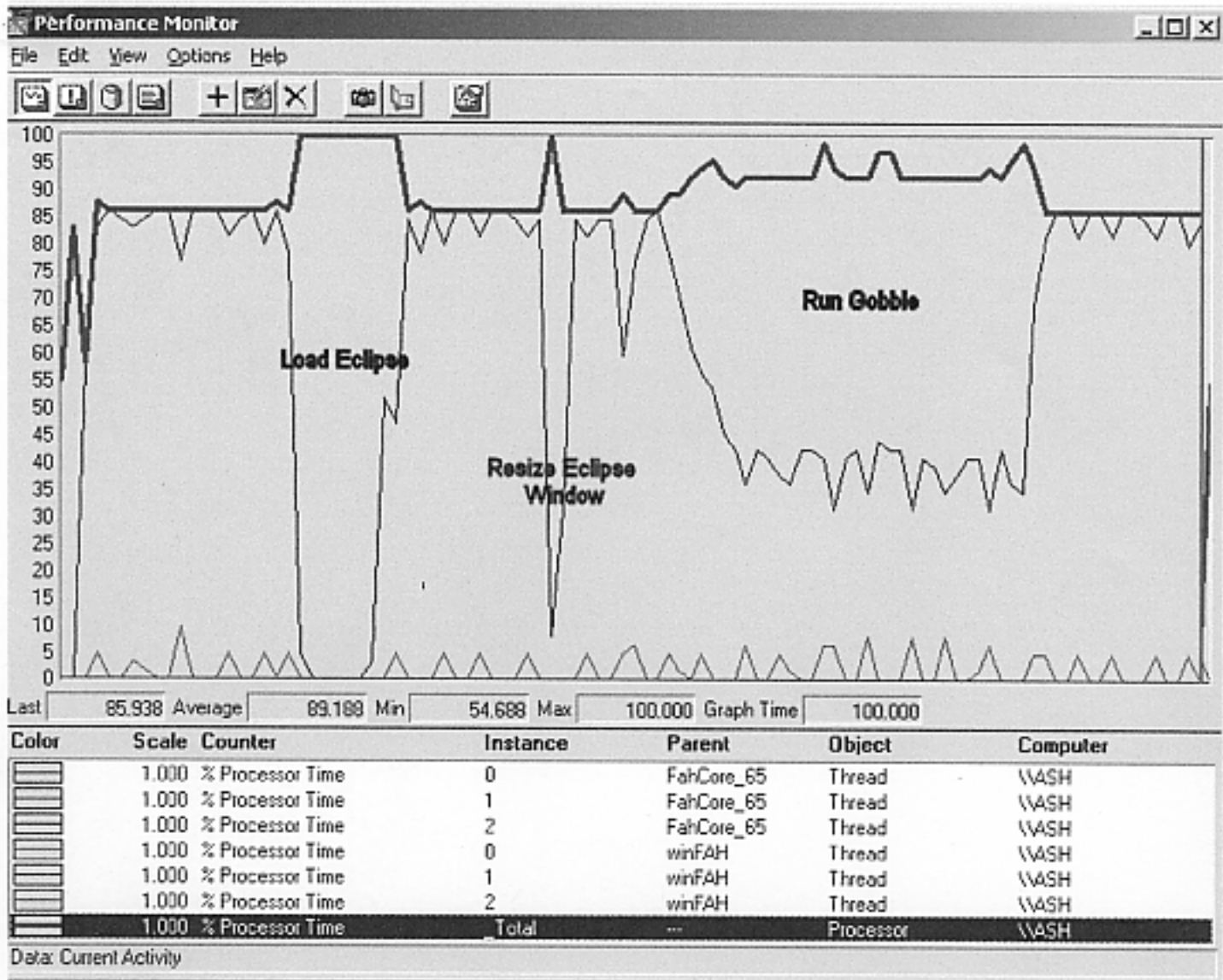
Total CPU usage went to 100% → the CPU was very busy.

Both FAH threads went to 0% → all background work ceased.

Conclusion → Loading Eclipse is a CPU intensive task that requires all available cycles for a period of time

e. Gobble is a simulation program that I wrote as a Java project skeleton for CSE 142. Considering the graph in the figure, do you think it likely that I can extend this simulation to do more work per frame without impacting the performance of the simulation? Justify your answer based on information in the graph.

Yes there is more time available for Gobble. During the time that Gobble was running, the background threads of FAH were still getting about 35% of the CPU time available. That time could be made available to the simulation instead.



BugWorld View (v2.1)

Java - Gobble.java - Eclipse Platform

File Edit Source Refactor Navigate Search

readme.txt elf-stop.bat

```

/**
 * Run the Gobble program
 */
public class Gobble (

```

Folding@home Display

Folding@home

Username
finson

Team Number:
0

Working on:
p634_L939_wt_ext

WU progress:
267/400
(66 percent)