CSCI 3323 (Principles of Operating Systems), Fall 2012
Homework 5

Credit: 10 points.

1   Reading

Be sure you have read Chapter 3, sections 3.4 through 3.9.

2   Problems

Answer the following questions. You may write out your answers by hand or using a word processor or other program, but please submit hard copy, either in class or in my mailbox in the department office.

1. (5 points)   Consider (imagine?) a very small computer system with only four page frames. Suppose you have implemented the aging algorithm for page replacement, using 4-bit counters and updating the counters after every clock tick, and suppose the R bits for the four pages are as follows after the first four clock ticks.

Time	R bit (page 0)	R bit (page 1)	R bit (page 2)	R bit (page 3)
after tick 1	0	1	1	1
after tick 2	1	0	1	1
after tick 3	1	0	1	0
after tick 4	1	1	0	1

   What are the values of the counters (in binary) for all pages after these four clock ticks? If a page needed to be removed at that point, which page would be chosen for removal?

2. (5 points)   A computer at Acme Company used as a compute server (i.e., to run non-interactive jobs) is observed to be running slowly (turnaround times longer than expected). The system uses demand paging, and there is a separate disk used exclusively for paging. The sysadmins are puzzled by the poor performance, so they decide to monitor the system. It is discovered that the CPU is in use about 20% of the time, the paging disk is in use about 98% of the time, and other disks are in use about 5% of the time. For each of the following, say whether it would be likely to increase CPU utilization (i.e., the percentage of time the CPU is in use) and why.

   (a) Installing a faster CPU.
   (b) Installing a larger paging disk.
   (c) Increasing the number of processes (degree of multiprogramming).
   (d) Decreasing the number of processes (degree of multiprogramming).
   (e) Installing more main memory.
   (f) Installing a faster paging disk.