Problem Set 15

CS 411

Due at the beginning of class on the first class day of the following week.
Sections 10.6–11

1. Consider a demand-paging system with the following time-measured utilizations:

   CPU utilization: 20%
   Paging disk: 97.7%
   Other I/O devices: 5%

   For each of the following, say whether it will (or is likely to) improve CPU utilization. Explain your answers.

   (a) Install a faster CPU.
   (b) Install a bigger paging disk.
   (c) Increase the degree of multiprogramming.
   (d) Decrease the degree of multiprogramming.
   (e) Install more main memory.
   (f) Install a faster hard disk or multiple controllers with multiple hard disks.
   (g) Add prepaging to the page fetch algorithms.
   (h) Increase the page size.

2. Consider the parameter Δ used to define the working-set window in the working-set model. What is the effect of setting Δ to a small value on the page fault frequency and the number of active (non-suspended) processes currently executing in the system? What is the effect when Δ is set to a very high value?

3. The slab allocation algorithm uses a separate cache for each different object type. Assuming there is one cache per object type, explain why this doesn't scale well with multiple CPUs. What could be done to address this scalability issue?