Operating Systems
Semester 2, 2003
Eike Ritter

The University of Birmingham
12 November, 2003

Exercise sheet 3

Deadline: Tuesday, 26 November, 12 noon in pigeonhole

1. Consider a demand-paged computer system where the degree of multiprogramming is currently fixed at four. The system was recently measured to determine utilisation of CPU and paging disk. The results are one of the following alternatives. For each case, what is happening? Can the degree of multiprogramming be increased to increase the CPU-utilisation? Is the paging helping?

   - CPU-utilisation 13%, disk utilisation 97%
   - CPU-utilisation 87%, disk utilisation 3%
   - CPU-utilisation 13%, disk utilisation 3%

2. (i) Describe the LOOK-algorithm for disk scheduling.

   (ii) All modern operating systems maintain a disk cache in main memory containing the data of some disk block entries in main memory. Describe the effects of a sudden loss of power on such a system.

   (iii) Describe the effect on performance of balancing filesystem I/O among the disks in a multitasking environment.

3.

4. (i) Explain the role of interrupts in handling I/O-requests in an operating system.

   (ii) Consider the following I/O-scenarios:

   - A disk drive containing operating system files;
   - A tape drive on a multitasking operating system;
   - A graphics card with direct bus connection, accessible through memory-mapped I/O;
   - A mouse used with X-windows

   For each of these I/O-scenarios, would you design the operating system to use buffering, spooling, caching or a combination? Justify your answer.

   (iii) Why is it necessary to use kernel memory for data transfer from I/O-devices in an operating system which implements swapping?