

Fall 2009
CSC 4103 – Operating Systems
Homework Assignment #1

The due date is: September 15th, Tuesday, before the class. Late submission is **not** allowed.

Problem 1:

What is the main advantage of the microkernel approach to system design? How do user programs and system services interact in a microkernel architecture? What are the disadvantages of using the microkernel approach?

Problem 2:

What are context switches used for and what does a typical context switch involve? Compare processes versus threads in terms of context switch operation and overhead associated with it.

Problem 3:

Consider a multiprocessor system and a multithreaded program written using the many-to-many threading model. Let the number of user-level threads in the program be more than the number of processors in the system. Discuss the performance implications of the following scenarios.

- a. The number of kernel threads allocated to the program is less than the number of processors.
- b. The number of kernel threads allocated to the program is equal to the number of processors.
- c. The number of kernel threads allocated to the program is greater than the number of processors but less than the number of user-level threads.

Problem 4:

Discuss the tradeoffs between user and kernel threads.

- (a) What are the advantages and disadvantages of each?
- (b) Assume we can make system calls as fast as procedure calls using some new hardware mechanism. Would this make one kind of thread clearly preferable over the other? Explain briefly.

Problem 5:

Provide two programming examples in which multithreading does *not* provide better performance than a single-threaded solution

Can a multithreaded solution using multiple user-level threads achieve better performance on a multiprocessor system than on a single-processor system?