CSE 410 Assignment 6

Spring 2008

Due: Midnight, Friday 5/23/2008

Use electronic submission via the Catalyst tool:
https://catalysttools.washington.edu/collectit/dropbox/telmas/2218

1. (Silberschatz 3.1) Describe the differences among short-term, medium-term, and long-term scheduling.

2. (Silberschatz 4.1, 4.3)
   a. Provide two programming examples in which multithreading does *not* provide better performance than a single-threaded solution.
   b. Under what circumstances does a multithreaded solution using multiple kernel threads provide better performance than a single-threaded solution on a single-processor system?

3. Consider the following threads with given starting times, running times and the priority values. Assume threads are executed on a single processor. Starting from time 0 and until al the threads terminate, draw a time diagram for each scheduling method given below. Show which thread is executed when and how long. (Hint: More than one diagram is possible for some scheduling methods, give only one for each.)
   a. First come first served
   b. Round robin (with 30 ms quantum)
   c. Highest priority first (1:lowest, 5:highest)
   d. Shortest job first

	T1	**T2**	**T3**	**T4**	**T5**	**T6**
Starting time(ms):	**0**	**0**	**40**	**40**	**70**	**100**
Running time(ms):	**50**	**80**	**50**	**30**	**40**	**30**
Priority:	**1**	**2**	**5**	**1**	**3**	**4**

Example timing diagram (different kinds of diagrams are acceptable as long as it is clear which thread is running when):

0. sec: T1	5. ms: T2	30. ms: T3	50. ms: T4

4. Starvation is the situation in which a process waits infinitely to be scheduled for execution. Which scheduling methods in question 3 allow starvation? Describe a scenario with starvation for each method of scheduling you give. (Assume that each scheduling is implemented in a naïve way without any optimization to detect starvation)
5. Multitasking is a method for executing multiple processes on a single or multiple CPU(s) as if they are executing at the same time on different CPUs. Multithreading is a method for executing multiple threads of a single process on a single or multiple CPU(s). Compare both approaches (similarities and/or differences) for the following aspects:
    a. Actions taken at each context switch
    b. Components of program state (register, heap, stack etc.) shared between processes/threads and differ for each process/thread
    c. Memory overhead of managing processes/threads
    d. Being implement-able in the kernel/user level
    e. Operations performed on threads/processes (creating, terminating, scheduling etc.) transparent to/hidden from the programmer

6. **[Extra credit]** Consider the following application types. For each application, describe an example of how multithreading can be exploited to improve performance in some feature. (Hints: 1. Give a scenario in which at least two threads are running and performing different jobs in parallel. 2. You can assume a reasonable feature of the application to set up your answer.)
    a. A text editor
    b. A compiler
    c. A chat application
    d. An mp3 player application
    e. An FTP server