CS 423/523 Assignment 1

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Due: Feb. 11, 2016 (11:59pm)

Total: 30 points

Please upload your solutions to classes*v2. To do so, please enter classes*v2, then click the “Assignment” button on your left-hand toolbar, and finally click “Assignment1” to upload your assignment.

If you know you are going to submit your assignment late, please let us know in advance (send an email to cs423ta@cs.yale.edu). Solutions will be posted 10 days after the deadline.

Any and all resources may be used as long as you cite them, with the exception of collaborating with other people. Please do not copypasta your definitions from Wiki. We do not really care if you do this, but you are not really learning anything.

If you have ANY questions, please do not hesitate to let us know (email, office hours, etc.)
Part 1: OS definitions (1-3 line answers, 5 x 2 points each = 10 points)

1. Operating system
2. Kernel
3. Interrupt
4. Real-time OS
5. System call

Part 2: Multiple choice (7 x 2 points each = 14 points)

1. Which of the following is not among the goals of an OS:
   a. Make the computer system convenient to use
   b. Use the hardware efficiently
   c. Enhance the capability of computer hardware
   d. Execute user programs and make solving user problems easier

2. Advantages of a multiprocessor OS include:
   a. Increased throughput
   b. Increased memory space
   c. None of the above
   d. Both (a) and (b)

3. Which of these is/are not within the scope of OS security:
   a. Access control
   b. Denial-of-Service (DoS) defense
   c. Worm detector
   d. None of the above

4. Advantages of using a microkernel include:
   a. Less code is running in kernel mode
   b. Services are better isolated - if one crashes, the others remain unaffected
   c. None of the above
   d. Both (a) and (b)

5. A real-time OS
   a. Must start up very quickly
   b. Must be able to reboot without losing any information
   c. None of the above
   d. Both (a) and (b)

6. Memory management systems should:
   a. Track which blocks of memory are being used
   b. Allocate memory space
   c. Decide which processes should be moved into memory
   d. All of the above
7. When an interrupt occurs, an OS should:
   a. Preserve the state of the CPU
   b. Determine the interrupt type
   c. None of the above
   d. Both (a) and (b)

**Part 3: A longer question (6 points)**

The above figure shows a simple but illustrative cloud service scenario. A user, Alice, rents a virtual machine, VM1, on Amazon (e.g., via EC2). If Alice wants to access her application, App1, the request should go through the following “path”:

Alice → Internet → Amazon firewall → Machine → VM Monitor → VM1 → OS1 → App1.

Please answer the following questions:

1. Why does Amazon need a firewall?
2. Assume that OS1 is a normal linux system (e.g., Ubuntu 12.04). What types of system calls would you expect such a system to have?
3. Another user, Bob, rents another virtual machine, VM2, running on the same physical machine as Alice. What problems might affect both Alice and Bob (i.e., their applications) simultaneously?