CSCI 8530: Computer Science
Advanced Operating Systems
Spring 2020
Homework 1

Due on February 4, 2020

Please keep answers short. You may either type your answers or write them by hand, but you must bring a hard copy to the class. Note that a "good effort" on the homework includes that all answers are in your own words (short sentences). DO NOT SHARE YOUR ANSWERS WITH OTHER STUDENTS OR ATTEMPT TO OBTAIN ANSWERS FROM OTHERS.

Questions

1. It has been noted that our job in computer science is "to build beautiful new abstractions between ugly hardware and users."
    a) Please identify at least *two* major beautiful abstractions of significance to operating systems provided by the Multics operating system.
    b) Also, indicate if these abstractions are still being used in today's operating systems.
2. Please list at least five significant features usually provided by an operating system.
3. Please identify at least five features that advertising would have you believe are parts of an operating system, but which are really application-level tools.
4. Please briefly describe and explain six stages of Linux boot process.
5. The acronym API is used for many things these days.
    a) With respect to an operating system, what do we mean by the API?
    b) What's another term that's often used for the operating system's API?
6. Most operating systems (certainly things like MS Windows, Apple OS X, and Linux) use separate processor modes for user code and operating system code.
    a) What are typical names for these modes?
    b) How do these modes differ from each other?
7. To get from the mode where user applications normally execute to the mode where the kernel code is executed is usually done with a special instruction associated with the particular system architecture being used. Please identify at least one instruction that can accomplish this transition on the Intel x86 architecture and one the ARM architecture.
8. Compare the facilities in Linux and Microsoft's Windows operating systems. Does either one support functionality that is not available in the other?
9. Please list the two basic categories of multitasking systems and state the characteristics of each.
10. Xinu development links all application code together with the operating system code and library code to produce a "monolithic" executable file. This file is loaded once, after which loading of additional code is not required. However, there may be a variable number of processes in execution, even given this fixed collection of code. How is that possible?