CS433 Written Homework 1

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(45 points) All question numbers refer to exercises in the textbook (10th edition). Make sure you use the right textbook and answer right questions. Students must complete written questions individually. Type your answers and steps clearly.

1. (5 points) 1.14 What is the purpose of interrupts? What are the differences between a trap and an interrupt? Can traps be generated intentionally by a user program? If so, for what purpose?

The purpose of an interrupt is to signal the CPU that another event needs to be treated, so it transfers control to an interrupt service routine, where it's processed. Traps are exceptions generated by users, they switch the operating system mode to kernel mode, therefore, software-generated; interrupts are hardware-generated. Yes, traps can be generated intentionally by user programs with the purpose of catching user programs exceptions.

2. (5 points) 1.19 Rank the following storage systems from slowest to fastest: a. Hard-disk drives b. Registers c. Optical disk d. Main memory e. Nonvolatile memory f. Magnetic tapes g. Cache

Storage Systems Rank from slowest to fastest:

f. Magnetic Tapes (slowest)
c. Optical Disk
a. Hard-disk Drives
e. Nonvolatile Memory
d. Main Memory

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g. Cache
b. Registers (fastest)

3. (5 points) 1.20 Consider an SMP system similar to the one shown in Figure 1.8. Illustrate with an example how data residing in memory could in fact have a different value in each of the local caches.

A logical-paradigm-based program could have, for instance, a processor to access the main memory and make an inference over the data, but this inference would be stored only in its local cache, while another process could use such output as a clause to another inference. It means that changes made could end up not having effect on other processes' changes, which would lead to a difference in what is stored in each processes' local cache.

4. (5 points) 1.24 Describe some of the challenges of designing operating systems for mobile devices compared with designing operating systems for traditional PCs.

Mobile devices have limited resources, such as memory and processors, therefore, operating systems must manage them carefully, including the fact that they also have to take power consumption into the account.

5. (5 points) 1.27 Identify several advantages and several disadvantages of open-source operating systems. Identify the types of people who would find each aspect to be an advantage or a disadvantage.

Open-source Operating systems are good learning tools, this approach would to a lot of corrections in the source code that would result on improvements. As there a lot of interest in the system, there tends to be a lot of people studying the code; with that, bad-intentions code can easily be spotted and changed, which leads to a more secure system. A disadvantage would be that support would not be guaranteed, the user would need to rely on the community or pay some service to fix his problems. Students and researchers would see open-source Operating Systems as an advantage, where they would be able to work on improvements to the system as well as learning and testing with it. Software Companies would see it as a disadvantage, because it would open doors to people to improve their product or make a similar product based on the source with some improvements, also the company may not have control over phony copies of their product that could

harm their clients.

6. (5 points) 2.10 Describe three general methods for passing parameters to the operating system.

One approach is to pass the parameters to registers, the value is stored on the registers for the operating system to use. There is the block approach, where a block of data is stored in memory and the address of the block is passed as a parameter in the registers. The parameters may also be passed onto a stack and removed from it by the operating system. There may be operating systems using a combination of these approaches.

7. (5 points) 2.20 What are the advantages of using loadable kernel modules?

One Advantage is that additional services can be linked to the core components and another one is that, because of that, any module can communicate, via protected interfaces, to other modules. By using this approach, the kernel doesn't need to be recompiled each time a module is loaded into the system, as it would if it wasn't for this this approach.

8. (5 points) 2.21 How are iOS and Android similar? How are they different?

Both operating systems were developed in C and were inspired in Unix. They diverge when it comes to open-source, being IOS a closed-source system and Android an Open-source system. They are both layered stacks software that provide sets of frameworks for graphics and hardware features. The IOS is restricted to only apple products whereas Android is on multiple hardware devices.

9. (5 points) For each of the following Unix system calls, give a condition that may cause it to fail: open, read, fork, execve, unlink. (Hint: you can explore the error semantics of these system calls online or using man on the linux server, e.g., man 2 fork.)

Open: When the system limit on the total number of files opened has been reached.
Read: When the buffer is outside its accessible address space.
Fork: The system may return a failure on fork call if there is no memory left.
execve: When executable is opened by one or more files.
unlink: It will return an error if the path name refers to a directory.