TCSS 343 - Week 4

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Homework 1

1.4 Keeping in mind the various definitions of operating system, consider whether the operating system should include applications such as web browsers and mail programs. Argue both that it should and that it should not, and support your answers.

Answer: My argument for an operating system with an email client and web browser built in would be that larger more involved environments benefit in some functional way by including such features. Windows and Ubuntu, for example, are served by including such applications because they are desktop environments.

My argument for an operating system without an email client and web browser built in would be for smaller environments typically not used on the desktop. These would include smaller embedded devices such as printers and LeapFrog computers for kids. These embedded devices are smaller and have more focused devices for specific tasks.

1.6 Which of the following instructions should be privileged?

a) Set value of timer. ANSWER: **Privileged** From page 26 and 27. Before turning over control to the user, the operating system ensures that the timer is set to interrupt. If the timer interrupts, control transfers

automatically to the operating system, which may treat the interrupt as a fatal error or may give the program more time. Clearly, instructions that modify the content of the timer are privileged.

b) Read the clock. ANSWER: **Unprivileged** Not mentioned in the text but it should be obvious that every process should be able to read the clock because otherwise every process would be a mess and no process could get anything done.

c) Clear memory. ANSWER: **Privileged** Not mentioned in the text but it should be obvious that memory is sacred and requires privileged access. If a process does not have access to a piece of memory then the OS needs to deny access to that process.

d) Issue a trap instruction. **Unprivileged** I can't find this in the text but it would seem obvious to me from lecture that all processes need some way to terminate themselves.

e) Turn off interrupts. **Privieleged** From page 52. Various instructions are privileged and can be executed only in kernel mode. Examples include the instruction to switch to kernel mode, I/O control, timer management, and interrupt management.

f) Modify entries in device-status table. **Privileged** From page 52. Various instructions are privileged and can be executed only in kernel mode. Examples include the instruction to switch to kernel mode, I/O control, timer management, and interrupt management.

g) Switch from user to kernel mode. **Privileged** From page 52. Various instructions are privileged and can be executed only in kernel mode. Examples include the instruction to switch to kernel mode, I/O control, timer management, and interrupt management.

h) Access I/O device. **Privileged** From page 52. Various instructions are privileged and can be executed only in kernel mode. Examples include the instruction to switch to kernel mode, I/O control, timer management, and interrupt management.

1.8 Some CPUs provide for more than two modes of operation. What are two possible uses of these multiple modes?

Answer: Supervisor mode and privileged mode, both of which allow for more varied types of access through a varying hierarchy protection of domains.

1.12 In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems.

a) What are two such problems? Identity theft and theft of service often security problems that arise in multiprogramming and time-sharing engironments.

b) Can we ensure the same degree of security in a time-shared machine as in a dedicated machine? Explain your answer. We cannot ensure the same degree of security in a time-shared environment than dedicated enviornment because cannot lock down that system in the same way. By it's nature a time-shared machine is more complicated than a dedicated machine. More complexity means a higher propensity for the possibility of bugs and less likely that resources will be allocated fairly. This is not a given that this will be the case but it is the obvious answer to me.

1.14 Under what circumstances would a user be better off using a timesharing system than a PC or a single-user workstation?

An Amazon S3 server with multiple virtual machines is an instance of a time sharing system. Often times the economics of renting time on a large machine is better than owning your own hardware.

1.19 What is the purpose of interrupts?

Answer: Assuming the question means hardware interrupt, this is a signal raised by a process or a external piece of hardware to disturb a process running on piece of hardware. Interrupts are asynchronous and may occur at any time.

How does an interrupt differ from a trap?

Traps are raised by user programs to invoke some functionality in the OS.

Can traps be generated intentionally by a user program? If so, for what purpose?

Answer: That's the whole point of a trap is to invoke some functionality of an operating system or catch arithmetic errors(depending on the hardware). So yes, a trap can be generated intentionally by a user program.

1.25 Describe a mechanism for enforcing memory protection in order to prevent a program from modifying the memory associated with other programs.

Answer: Virtual memory is one of the most used mechanisms for enforcing memory protection in order to prevent a program from modifying the memory associated with other programs.

1.26 Which network configuration—LAN or WAN—would best suit the following environments?

a) A campus student union Answer: LAN because student unions are held in one building.

b) Several campus locations across a statewide university system Answer: WAN because the distance between computers in the network are vast.

c) A neighborhood Answer: WAN because the distances between houses can be greater than 300 feet which is about the limit of the distance for most ethernet cables.

1.27 Describe some of the challenges of designing operating systems for mobile devices compared with designing operating systems for traditional PCs.

Answer: Power consumption is the most obvious challenge for mobile devices because batteries are a deficient technology. Most desktop PCs assume they have access to infinite power, mobile devices cannot make these assumptions. Most medical environment don't talk on even local networks inorder to lockdown the system from outside attack, while traiditional PCs see this as a feature most of the time. Operating systems on traditional PCs had at

one time a greater expection of features than mobile operating systems, but has changed with the advent of the smart phone but is true (mostly).