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Homework 1

CSC 4103 – Operating Systems

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1) What are the three main purposes of an operating system?

An operating provides an environment for users to run programs in an efficient way.
Operating Systems allocate computer resources to solve problems in a fair and efficient manner.
Operating Systems manage operating and control of I/O devices.

2) How does the distinction between kernel mode and user mode function as a rudimentary form of protection (security) system?

Only certain instruction are executed whenever the CPU is in kernel mode. This goes for hardware and control over interrupts as well. Kernel mode must be executed whenever hardware decided need to be accessed. The CPU is very limited in capabilities when executing in user mode, providing protection of resources.

3) Which instructions should be privileged?

Set Value of Timer
Clear Memory
Turn off interrupts
Modify entries in device-statue table
Access I/O device

4) Describe the differences between symmetric and asymmetric multiprocessing. What are three advantages and one disadvantage of multiprocessor systems?

Symmetric Multiprocessing – Each processor runs and identical copy of the OS
Asymmetric Multiprocessing – Each processor is assigned a specific task.

With multiprocessor systems, work can be done in parallel, its cheaper than single-processor systems, jobs can fail over to the survived processors, and they can execute programs more quickly.
A disadvantage of a multiprocessor system is that it requires additional CPU cycles to manage.

5) What is the purpose of interrupts? What are the differences between a trap/exception and an interrupt? Can a user program generate traps intentionally? If so, for what purpose?

Interrupt's are calls to the CPU that informs the system of other system programs. Traps are a software generated interrupt caused by a request from a user program. Interrupts come from hardware and don't happen at predictable places. Traps are software generated and the handling is synchronous, in which they do happen in predictable places.

6) What is the purpose of system calls?

System calls allow user-level processes to request services to the Operating System.

7) Describe three general methods for passing parameters to the operating system?

- Pass parameters in registers
- Registers pass starting addresses of blocks of parameters
- Parameters can be places, or pushed, onto the stack, and popped off by the Operating system.

8) Why is the separation of mechanism and policy desirable?

This is to ensure that systems are easily modified. With mechanism and policy separate, the policy may be changed at will while the mechanism stays unchanged, making the system more flexible.

9) What are the main advantages of the microkernel approach to system design? How to user programs and system services interact in micro-kernal architecture? What are the disadvantages of using the microkernel approach?

The structure of the OS removes all non-essential components from the kernel and implements them as system and user-level programs. Micro kernel provides minimal process and memory management with communication facility. The communication is done indirectly via the method called Message passing. Micro kernel provides more security and reliability.
The disadvantage is the fact that is suffers a decrease in performance due to overhead.

10) What are the two models of interprocess communication? What are the strengths and weaknesses of the two approach?

The two models are Message passing and Shared memory models.

Message passing – Messages can be exchanged between the processes either directly or indirectly through a common mail box. The disadvantage is that it can handle only small amounts of data.

Shared memory – Two or more processes can exchange information by reading and writing data in shared locations. Max speed, convenience, etc.
Disadvantage – Problems exist in areas of protection and synchronization.