CO327 – Operating Systems

Assignment – 2

E/14/017

1. What is the purpose of system calls?
   System calls allow user-level processes to request services of the operating system.

2. What is the purpose of command interpreter? Why is it separate from the kernel?
   It reads commands from the users or from a file of commands and executes them, usually by turning them into one or more system calls. It is not part of the kernel since the command interpreter is subject to changes.

3. What is the purpose of system programs?
   System programs can be thought of as bundles of useful system calls. They provide basic functionality to users so that users do not need to write their own programs to solve common problems.

4. What is the main advantage of layered approach to system design? What are the disadvantages of layered approach?
   Advantage
   The main advantage is simplicity of construction and debugging.
   Disadvantages
   It can be difficult to precisely assign a function to the right layer, and the appropriate layers.
   Performance of the system can be degraded, as there are too many layers in the system.
   The more layers you have, the more risks you have for things to break down or data to get lost.
   Various issues regarding Higher layer Vs Lower layer.

5. Why do some systems store the operating system in firmware, while others store it on disk?

   In certain devices such as handheld PDAs, and cellular telephones, a disk with a file system may not be available for the device. In this situation the operating system must be stored in firmware.

6. The services and functions provided by an operating system can be divided into two main categories. Briefly describe the two categories, and discuss how they differ?

   One class of services provided by an operating system is to enforce protection between different processes running concurrently in the system. Processes are allowed to access only those memory locations that are associated with their address spaces. Also, processes are not allowed to corrupt files associated with other users. A process is not allowed to access devices directly without operating system intervention.

   The second class of services provided by an operating system is to provide new functionality that is not supported directly by the underlying hardware. Virtual memory and file systems are two such examples of new services provided by an operating system.

7. Describe three general methods for passing parameters to the operating system?
   a. Pass parameters in registers.
   b. Registers pass starting addresses of blocks of parameters.
   c. Parameters can be placed, or pushed, onto the stack by the program, and popped off the stack by the operating system.

8. What are the advantages and disadvantages of using the same system call interface for manipulating both files and devices?

   Each device can be accessed as though it was a file in the system. Since most of the kernel deals with devices through this file interface, it is relatively easy to add a new device driver by implementing the hardware-

specific code to support this abstract file interface. Therefore, this benefits the development of both user program code, which can be written to access devices and files in the same manner. And device driver-code, which can be written to support well-defined API.

The disadvantages with using the same interface is that it might be difficult to capture the functionality of certain devices within the context of the file access API, thereby resulting in either a loss of functionality or a loss of performance.

9. What are the two models of inter process communication? What are the strengths and weaknesses of the two approaches?

Shared-memory model
Strength:
shared-memory communication is faster than message-passing model when the processes are on the same machine.
Weaknesses:
different processes need to ensure that there are not writing to the same memory location simultaneously.
Processes that communicate using shared memory need to address problem of memory protection and synchronization.

Message-passing model
Strength:
Easier to implement than the shared-memory model.
Weakness:
Communication using message passing is slower than shared memory because of the time involved in connection setup.

10. Why is the separation of mechanism and policy desirable?

Mechanism and policy must be separate to ensure that the systems are easy to modify. No two system installations are the same. So each installation may want to tune the operating system to suit its needs. With

mechanism and policy separate, the policy may be changed at while the mechanism stays unchanged. This arrangement provides a more flexible system.

11. What is the main advantage of the microkernel approach to system design? How do user programs and system services interact in a micro controller architecture? What are the disadvantages of using microkernel approach?

Benefits typically include the following:

Adding a new service does not require modifying the kernel.

It is more secure as more operations are done in user mode than in kernel mode.

A Simpler kernel design and functionality typically results in a more reliable operating system.

User programs and system services interact in a microkernel architecture by using inter process communication mechanism such as messaging. These messages are conveyed by the operating system.

The primary disadvantages of the microkernel architecture are the overheads associated with inter process communication and the frequent use of the operating system's messaging functions in order to enable the user process and the system service to interact with each other.

12. What are the advantages of using loadable kernel modules?

An operating system would have to include all the systems that provided all anticipated functionalities in the base kernel if there were no loadable modules. This would lead to wastage of memory as most of those systems would not be used often.

Also, the users would need to rebuild and reboot the base kernel every time they would require a new functionality.

13. Explain why Java programs that running on Android systems do not use the standard Java API and virtual machine

It is because the standard API and virtual machine are designed for desktop and server systems, not for mobile devices. Google developed a separate API and virtual machine for mobile devices.