**Operating System Principle (DKT 221)**

**Tutorial 2**

1. Describe two general methods for passing parameters to the operating system.

Answer:

a. Passing 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

2. States five major activities of an operating system with regard to file management.

Answer:

• The creation and deletion of files

• The creation and deletion of directories

• The support of primitives for manipulating files and directories

• The mapping of files onto secondary storage

• The backup of files on stable (nonvolatile) storage media

3. Discuss the advantages and disadvantages of using the same system call interface for manipulating both files and devices.

Answer:

Advantages

Each device can be accessed as though it was a file in the file system.

- Since most of the kernel deals with devices through this file interface, it is easy to add a new device driver by implementing the hardware-specific code to support this abstract file interface.

- This benefits the development of both :-

a. User program code, which can be written to access devices and files in the same manner, and

b. Device-driver code, which can be written to support a well-defined API.

Disadvantages

It might be difficult to capture the functionality of certain devices within the context of the file access API, thereby resulting in either:-

- Loss of functionality or a loss of performance.

- Some of this could be overcome by the use of the ioctl operation that provides a general-purpose interface for processes to invoke operations on devices.

4. Describe whether it is possible for the user to develop a new command interpreter using the system-call interface provided by the operating system. Explain your answer.

Answer:

It is possible

- The command interpreter allows a user to create and manage processes and also determine ways by which they communicate (such as through pipes and files).

- All of this functionality could be accessed by a user level program using the system calls; it should be possible for the user to develop a new command-line interpreter.

5. Explain the reason of separation between mechanism and policy in operating system.

Answer:

To ensure that 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 will while the mechanism stays unchanged.

-It provides a more flexible system.

6. It is sometimes difficult to achieve a layered approach if two components of the operating system are dependent on each other. Identify a scenario in which it is unclear how to layer two system components that require tight coupling of their functionalities.

Answer:

- The virtual memory subsystem and the storage subsystem are typically tightly coupled and require careful design in a layered system due to the following interactions.

- Many systems allow files to be mapped into the virtual memory space of an executing process. On the other hand, the virtual memory subsystem typically uses the storage system to provide the backing store for pages that do not currently reside in memory.

- Also, updates to the file system are sometimes buffered in physical memory before it is flushed to disk, thereby requiring careful coordination of the usage of memory between the virtual memory subsystem and the file system.

7. a. Describe the main advantage of the microkernel approach to system design.

Answer:

a. i. Adding a new service does not require modifying the kernel,

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

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

b. Discuss how user programs and system services interact in micro kernel architecture.

Answer:

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

c. State the disadvantages of using the micro kernel approach.

Answer:

c. 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.

8. a. Discuss in what ways the modular kernel approach similar to the layered approach.

b. Discuss in what ways the modular kernel approach differ from the layered approach.

Answer:

a. The modular kernel approach requires subsystems to interact with each other through carefully constructed interfaces that are typically narrow (in terms of the functionality that is exposed to external modules). The layered kernel approach is similar in that respect.

b. However, the layered kernel imposes a strict ordering of subsystems such that subsystems at the lower layers are not allowed to invoke operations corresponding to the upper-layer subsystems. There are no such restrictions in the modular-kernel approach, wherein modules are free to invoke each other without any constraints.

9. a. State the main advantage for an operating-system designer of using virtual-machine architecture.

b. State the main advantage for an operating-system designer of using virtual-machine architecture for user.

Answer:

a. The system is easy to debug, and security problems are easy to solve.

b. Virtual machines also provide a good platform for operating system research since many different operating systems can run on one physical system.

10. a. Describe the relationship between a guest operating system and a host operating system in a system like VMware.

b. Discuss factors need to be considered in choosing the host operating system.

Answer:

a. A guest operating system provides its services by mapping them onto the functionality provided by the host operating system.

b. A key issue that needs to be considered in choosing the host operating system is whether it is sufficiently general in terms of its system-call interface in order to be able to support the functionality associated with the guest operating system.