

Operating System (OS) Questions & Answers

Chapter 1: Introduction

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

Answer:

- To provide an environment for a computer user to execute programs on computer hardware in a convenient and efficient manner.
- To allocate the separate resources of the computer as needed to solve the problem given. The allocation process should be as fair and efficient as possible.
- As a control program it serves two major functions: (1) supervision of the execution of user programs to prevent errors and improper use of the computer, and (2) management of the operation and control of I/O devices.

2. What are the main differences between operating systems for mainframe computers and personal computers?

Answer:

Generally, operating systems for batch systems have simpler requirements than for personal computers. Batch systems do not have to be concerned with interacting with a user as much as a personal computer. As a result, an operating system for a PC must be concerned with response time for an interactive user. Batch systems do not have such requirements. A pure batch system also may have not to handle time sharing, whereas an operating system must switch rapidly between different jobs.

3. List the four steps that are necessary to run a program on a completely dedicated machine.

Answer:

- i. Reserve machine time.
- ii. Manually load program into memory.
- iii. Load starting address and begin execution.
- iv. Monitor and control execution of program from console.

4. What is the main difficulty that a programmer must overcome in writing an operating system for a real-time environment?

Answer:

The main difficulty is keeping the operating system within the fixed time constraints of a real-time system. If the system does not complete a task in a certain time frame, it may cause a breakdown of the entire system it is running. Therefore when writing an operating system for a real-time system, the writer must be sure that his scheduling schemes don't allow response time to exceed the time constraint.

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

Answer:

The distinction between kernel mode and user mode provides a rudimentary form of protection in the following manner. Certain instructions could be executed only when the CPU is in kernel mode. Similarly, hardware devices could be accessed only when the program is executing in kernel mode. Control over when interrupts could be enabled or disabled is also possible only when the CPU is in kernel mode. Consequently, the CPU has very limited capability when executing in user mode, thereby enforcing protection of critical resources.

6. Which of the following instructions should be privileged?

- a. **Set value of timer.**
- b. Read the clock.
- c. **Clear memory.**
- d. Issue a trap instruction.
- e. **Turn off interrupts.**
- f. **Modify entries in device-status table.**

g. Switch from user to kernel mode.

h. Access I/O device.

The rest can be performed in user mode.

7. Is the Internet a LAN or a WAN?

Answer:

The Internet is a WAN as the various computers are located at geographically different places and are connected by long distance network links.

Chapter 2: Operating System Structure

1. What is the purpose of system calls?

Answer:

System calls allow user-level processes to request services of the operating system.

2. What are the five major activities of an operating system in regard to process management?

Answer:

1. The creation and deletion of both user and system processes
2. The suspension and resumption of processes
3. The provision of mechanisms for process synchronization
4. The provision of mechanisms for process communication
5. The provision of mechanisms for deadlock handling

3. What are the three major activities of an operating system in regard to memory management?

Answer:

- i. Keep track of which parts of memory are currently being used and by whom.
- ii. Decide which processes are to be loaded into memory when memory space becomes available.
- iii. Allocate and deallocate memory space as needed.

4. What are the three major activities of an operating system in regard to secondary-storage management?

Answer:

- i. Free-space management.
- ii. Storage allocation.
- iii. Disk scheduling.

5. What is the purpose of system programs?

Answer:

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.

6. What is the main advantage of the layered approach to system design? What are the disadvantages of using the layered approach?

Answer:

As in all cases of modular design, designing an operating system in a modular way has several advantages. The system is easier to debug and modify because changes affect only limited sections of the system rather than touching all sections of the operating system. Information is kept only where it is needed and is accessible only within a defined and restricted area, so any bugs affecting that data must be limited to a specific module or layer.

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Chapter 14: Protection

1. What are the main differences between capability lists and access lists?

Answer:

An access list is a list for each object consisting of the domains with a nonempty set of access rights for that object. A capability list is a list of objects and the operations allowed on those objects for each domain.

2. What protection problems may arise if a shared stack is used for parameter passing?

Answer:

The contents of the stack could be compromised by other process(es) sharing the stack.

3. Capability lists are usually kept within the address space of the user. How does the system ensure that the user cannot modify the contents of the list?

Answer:

A capability list is considered a “protected object” and is accessed only indirectly by the user. The operating system ensures the user cannot access the capability list directly.

Chapter 22: Windows XP

1. What type of operating system is Windows XP? Describe two of its major features.

Answer:

A 32/64 bit preemptive multitasking operating system supporting multiple users.

- i. The ability automatically to repair application and operating system problems.
- ii. Better networking and device experience (including digital photography and video).

2. List the design goals of Windows XP. Describe two in detail.

Answer:

Design goals include security, reliability, Windows and POSIX application compatibility, high performance, extensibility, portability and international support.

- i. Reliability was perceived as a stringent requirement and included extensive driver verification, facilities for catching programming errors in user-level code, and a rigorous certification process for third-party drivers, applications, and devices.
- ii. Achieving high performance required examination of past problem areas such as I/O performance, server CPU bottlenecks, and the scalability of multithreaded and multiprocessor environments.

3. What are the responsibilities of the I/O manager?

Answer:

The I/O manager is responsible for file systems, device drivers, and network drivers. The I/O manager keeps track of which device drivers, filter drivers, and file systems are loaded and manages buffers for I/O requests. It furthermore assists in providing memorymapped file I/O and controls the cache manager for the whole I/O system.

4. How does NTFS handle data structures? How does NTFS recover from a system crash? What is guaranteed after a recovery takes place?

Answer:

In NTFS, all file-system data structure updates are performed inside transactions. Before a data structure is altered, the transaction writes a log record containing redo and undo information. A commit record is written to the log after a transaction has succeeded. After a crash the file system can be restored to a consistent state by processing the log records, first redoing operations for committed transactions and undoing operations for transactions that did not successfully commit. This scheme does not guarantee that user file contents are correct after a recovery, but rather that the file-system data structures (file metadata) are undamaged and reflect some consistent state that existed before the crash.