

OPERATING SYSTEMS

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HOMEWORK 1

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2.12 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.

The services and functions provided by operating systems are divided based on

1. Services provided to the user to communicate in terms of User Interface

- Command Line Interface: Enables users to enter commands to perform operations
- GUI: Uses a pointing devices like mouse or keyboard to direct to menus and operations to perform tasks.
- Batch Systems: Commands and directives are entered into files and they are executed

2. Services and functions for efficient functioning of the operating systems.

- Program Execution: Loading and execution of programs. Loading of programs into main memory and executing them in an orderly fashion to achieve maximum throughput.
- IO Operation: providing access to IO devices in case any process requires IO devices to perform an operation.
- File System Manipulation: Search for a file, create and delete files, read and write to files.
- Communication: communication between processes. Two major sources of communications are Message passing and Shared Memory. Message passing includes sending and receiving messages. Shared memory includes a buffer where indirect communication of messages takes place.
- Error Detection: Error occurs in CPU and memory Hardware. For each type of error, the operating system should take the appropriate action to ensure correct and consistent computing.
- Resource Allocation : When multiple users are requesting access to resources as well as for execution, various scheduling algorithms like FIFO, SJF etc. are used for efficient utilization for memory
- Protection: When several separate processes execute concurrently, it should not be possible for one process to interfere with the others or with the operating system itself. Therefore, Protection must ensure that all access to system resources is controlled.
- Accounting: We want to keep track of which users use how much and what kinds of computer resources. This record keeping may be used for accounting (so that users can be billed) or simply for accumulating usage statistics. Usage statistics may be a valuable tool for researchers who wish to reconfigure the system to improve computing services.

2.13 Describe three general methods for passing parameters to the operating system.

- Parameters are passed to registers
- When there are more parameters in registers, parameters are stored in blocks and the block address is stored in registers
- Parameters are pushed and popped off the stack by the operating systems

2.15 What are the five major activities of an operating system with regard to file management?

The operating System performs the following activities related to file management

- Files can be created and deleted
- Directories can be created and deleted
- usage of primitives for file and directory manipulation
- Mapping the files to secondary storage
- Backing up of files in non-volatile storage media

2.18 What are the two models of interprocess communication? What are the strengths and weaknesses of the two approaches?

Two models of Interprocess communications are Message Passing and Shared Memory

1. Message Passing

Advantages

- It is simpler form of communication and we can scale up depending upon the size of messages.
- It provides great efficiency than Shared memory as as programmers can control the inter process communication
- Malicious Programs are blocked

Disadvantages

- It is slower when compared to shared memory as it uses system calls to communicate
- High degree of synchronization is required for sending and receiving messages

2. Shared Memory

Advantages

- It is faster when compared to message passing as system calls are only used to establish shared memory regions, after which the communications and data sharing can take place at memory speeds.

Disadvantages

- Malicious Programs can harm the Shared memory and there are less security mechanisms to prevent them.
- Difficult to manage Data Locality(keeping the data local to the processor so that it can save memory accesses)

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

Advantages of Microkernel Approach:

- Addition of new service will not modify the kernel
- More safe since user mode does the operation.
- Design of kernel is simple and working of OS is reliable.

User programs and system services interact with each other through message passing. Since they use message passing technique to communicate the system performance would be slow. Performance also suffers due to increased system-function overhead.