Name: MISHAL NADEEM

Registration number: 2023-bs-ai-020

Operating System

Understanding Operating Systems

An Operating System (OS) is a crucial software component that serves as a bridge between computer hardware and users. It manages hardware resources and provides essential services for application programs. The OS is vital for the operation of a computer system, enabling the execution of applications and overseeing hardware components.

Fundamental Concepts of Operating Systems

1. Core Functions of an Operating System:

- Process Management: The OS is responsible for creating, scheduling, and terminating processes. It ensures that each process receives adequate CPU time and manages the concurrent execution of multiple processes.

- Memory Management: The OS oversees the computer's memory, including RAM and cache. It tracks every byte in memory and allocates space to processes as required.

- File System Management: The OS organizes and manages files on storage devices, allowing users to create, read, write, and delete files. It structures files into directories for easier access.

- Device Management: The OS facilitates communication between the computer and its hardware through device drivers, acting as a mediator between applications and hardware.

- User Interface: The OS provides a user interface (UI), which can be either command-line or graphical, enabling users to interact with the computer system.

2. Key Components of an Operating System:

- Kernel: The central part of the OS that manages system resources and facilitates communication between hardware and software.

- Shell: The interface that allows users to interact with the OS, which can be command-line based or graphical.

- File System: The organizational structure the OS uses to manage files on storage devices.

- Device Drivers: Specialized software that enables the OS to communicate with various hardware devices.

Categories of Operating Systems

Operating systems can be classified based on different criteria, including their design, functionality, and intended applications. Here are the primary types of operating systems:

1. Batch Operating Systems:

- Overview: These systems execute jobs in groups without user interaction. Jobs with similar requirements are processed sequentially.

- Example: Early mainframe systems like IBM's OS/360.

2. Time-Sharing Operating Systems:

- Overview: These systems allow multiple users to access the computer at the same time. CPU time is divided among users, creating the illusion of dedicated resources.

- Example: UNIX, Linux.

3. Distributed Operating Systems:

- Overview: These systems manage a collection of independent computers, making them appear as a single cohesive system to users. They facilitate resource sharing and communication between machines.

- Example: Google's Android OS, which operates across multiple devices.

4. Network Operating Systems:

- Overview: These systems provide services to computers connected to a network, managing network resources and enabling file sharing and communication between devices.

- Example: Windows Server, Novell NetWare.

5. Real-Time Operating Systems (RTOS):

   - Overview: These systems are designed to process data as it arrives, typically without delays. They are used in environments where timing is critical.

   - Example: VxWorks, QNX.

6. Embedded Operating Systems:

   - Overview: These are specialized OS designed for embedded systems, which are dedicated to specific tasks. They are commonly found in devices like appliances, vehicles, and medical equipment.

   - Example: FreeRTOS, Embedded Linux.

7. Mobile Operating Systems:

   - Overview: These systems are specifically designed for mobile devices, focusing on touch interfaces and energy efficiency.

   - Example: Android, iOS.

8. Cloud Operating Systems:

   - Overview: These systems manage cloud resources and services, allowing users to access applications and data over the internet.

   - Example: Google Cloud Platform, Microsoft Azure.