22516 Operating System

Unit - I Overview of Operating System

1.1 Operating System - Concept, Components of operating system, operations of OS: Program Management, Resource management, Security and protection. Views of OS: User view, System View

Operating System

An operating system (OS) is system software that manages computer hardware, software resources, and provides various services for computer programs. Time-sharing operating systems schedule tasks for efficient use of the system and may also include accounting software for cost allocation of processor time, mass storage, printing, and other resources.

Here are some of the key roles of an operating system:

1. **Process Management**: The OS manages processes in the system, which includes the execution of processes, switching between them, synchronization, and deadlock handling.
2. **Memory Management**: The OS is responsible for managing the computer's memory, including the system's RAM and sets of I/O devices. It keeps track of each and every memory location, regardless of whether it is allocated to some process or it is free.
3. **File System Management**: The OS manages files on the computer, which includes file creation and deletion, support for multiple views of files, mapping files onto secondary storage, and backup of files on stable storage media.
4. **Device Management**: The OS manages device communication via their respective drivers. It does the job of an intermediary between your computer's hardware components and its software.
5. **Security and Access Control**: The OS is also responsible for ensuring that unauthorized users do not access the system.
6. **Job Accounting**: Keeping track of time and resources used by various jobs and users.

Commonly used operating systems include Microsoft's Windows, Apple's macOS, and various versions of Unix (like Linux distributions: Ubuntu, Fedora, etc.), among others. Each of these OSes can have dramatically different user interfaces and ways of dealing with software and hardware, but they all provide these basic functions.

Components of operating system and operations of OS

An operating system (OS) consists of several key components:

1. **Kernel**: The kernel is the core component of an operating system. It interacts directly with the system's hardware and manages resources like memory, CPU time, disk space, and peripheral devices. The kernel also handles system calls from software applications, translating them into instructions for the hardware.
2. **Process Scheduler**: This component manages how processes are allocated CPU time. It determines the execution sequence of processes based on their priority and scheduling policies.
3. **Memory Manager**: This component oversees the system's physical and virtual memory. It's responsible for keeping track of each byte in a system's memory and which processes are using which memory.
4. **Device Drivers**: These are small helper programs that allow the OS to interact with hardware peripherals like keyboards, mice, printers, and disk drives.

5. **File System**: This manages files and directories on the disk. It keeps track of which regions of the disk are free, which are reserved, and organizes files on the disk for efficient access and storage.
6. **User Interface**: This could be a command line (CLI) or a Graphical User Interface (GUI). This component allows users to interact with the system.
7. **System Utilities**: These are additional software provided by the OS to help manage, maintain, and control the computer's operation. Examples include system performance monitors, security management tools, and file system management utilities.

Operations of an Operating System:
The primary operations of an OS are:

1. **Process Management**: The OS handles the creation, scheduling, termination, and synchronization of processes.
2. **Memory Management**: The OS manages the allocation and deallocation of memory to programs when they start and finish executing.
3. **Storage Management**: The OS manages the storage and retrieval of files on a disk drive, and manages access to them.
4. **Device Management**: The OS manages device communication via their respective drivers.
5. **Security & Access Control**: The OS ensures that unauthorized users do not access the system.
6. **Error detection and handling**: The OS needs to constantly check for possible errors. This could be internal (like a memory leak), or external (like a failure of an I/O device).

The exact functions and components of an operating system can vary based on whether the OS is designed for mainframes, desktops, real-time systems, or smaller devices like smartphones.

1.2 Different Types of Operating systems- Batch operating system, Multi Programmed, Time Shared OS, Multiprocessor Systems, Distributed Systems, Real time systems. Mobile OS (Android,iOS).

Different Types of Operating systems Batch operating system, Multi Programmed, Time Shared OS, Multiprocessor Systems, Distributed Systems, Real time systems. Mobile OS (Android,iOS).
ChatGPT
There are various types of operating systems designed to serve different needs. Here's a brief overview:

1. **Batch Operating System**: The users of a batch operating system do not interact with the computer directly. Each user prepares his job on an offline device like a punch card and submits it to the computer operator. The system can choose to process jobs without manual intervention.
2. **Multi-programmed Operating Systems**: This type of OS is designed to have multiple programs loaded into main memory at once. The OS switches among the programs for efficient use of the processor and to provide reasonable response times for interactive user programs or tasks.
3. **Time-Sharing Systems (Multitasking)**: Time-sharing is a logical extension of multiprogramming. Here, the CPU switches jobs so frequently that users can interact with

each job while it is running. This creates the illusion of multiple CPUs, as each user and their jobs get a "slice" of time from the CPU.

4. **Multiprocessor Systems (Parallel systems or Multicore)**: These systems have more than one processor in close communication, sharing the computer bus, the clock, and sometimes memory and peripheral devices. They can be used to increase throughput, improve reliability, or both.
5. **Distributed Systems**: Distributed systems distribute the computation among several physical processors. The processors in a distributed system may vary in size and function. They can be located within the same building or spread across a global network.
6. **Real-Time Systems**: Real-time systems are usually dedicated, embedded systems. They can be either hard real-time systems (where a few microseconds can result in a catastrophe) or soft real-time systems (where latencies of a few microseconds or milliseconds can still be tolerated).
7. **Mobile Operating Systems**: Mobile operating systems are designed to control a mobile device such as a smartphone, tablet, or a wearable device. Android (developed by Google) and iOS (developed by Apple) are examples of mobile operating systems.

Each of these types of operating systems have their own strengths and weaknesses, and they are chosen based on the specific needs of what they will be used for.

1.3 Command line based OS - DOS, UNIX GUI based OS -WINDOWS, LINUX.

Operating systems can come with either a command-line interface (CLI) or a graphical user interface (GUI), or sometimes both. Here are brief descriptions of the OSes you mentioned:

1. **DOS (Disk Operating System)**: DOS was a command-line operating system that was widely used in the 1980s and 1990s. MS-DOS (Microsoft DOS) is probably the most well-known version. DOS did not have a graphical user interface, instead, users had to type commands to perform tasks like navigating the file system or launching applications.

2. **UNIX**: Originally developed in the 1970s, UNIX is a powerful, multi-user and multitasking operating system. It is command-line based but also has GUIs like the X Window System. UNIX is the predecessor to many modern operating systems, including Linux, macOS, and BSD.

3. **Windows**: Microsoft Windows started as a graphical extension for MS-DOS in the 1980s. Modern versions of Windows like Windows 10 provide a rich graphical user interface and are primarily interacted with through the GUI, though they also have command-line interfaces like Command Prompt and PowerShell.

4. **Linux**: Linux is a UNIX-like operating system that can be interacted with via both a command line and a graphical user interface. The GUI for Linux may vary depending on the distribution and the desktop environment. For example, Ubuntu uses the GNOME desktop environment by default, while other distributions may use KDE, Xfce, or others.

While GUIs are often more intuitive for beginners, command-line interfaces can provide more powerful and flexible interactions, which is why many system administrators, programmers, and other power users often prefer to use them.


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