



# Operating System Concepts



# Definition

- An **Operating System** (commonly abbreviated to either *OS* or *O/S*) is an interface between hardware and user; an OS is responsible for the management and coordination of activities and the sharing of the resources of the computer.
- The operating system acts as a host for computing applications that are run on the machine. As a host, one of the purposes of an operating system is to handle the details of the operation of the hardware. This relieves application programs from having to manage these details and makes it easier to write applications.



# Features of Operating system

- 1. Program execution:** The operating system acts as an interface between an application and the hardware. The user interacts with the hardware from "the other side". The operating system is a set of services which simplifies development of applications. Executing a program involves the creation of a process by the operating system.
- 2. Interrupts:** Interrupts are central to operating systems, since they provide an efficient way for the operating system to interact with and react to its environment. The alternative--having the operating system "watch" the various sources of input for events (polling) that require action—is a poor use of CPU resources.



### 3. Protected mode and supervisor mode:

Modern CPUs support something called dual mode operation. CPUs with this capability use two modes: protected mode and supervisor mode, which allow certain CPU functions to be controlled and affected only by the operating system.

**4. Memory management:** This ensures that a program does not interfere with memory already used by another program. Since programs time share, each program must have independent access to memory.

**5. Multitasking:** It refers to the running of multiple independent computer programs on the same computer, giving the appearance that it is performing the tasks at the same time.

## 6. Disk access and file systems:

Access to data stored on disks is a central feature of all operating systems. Computers store data on disks using files, which are structured in specific ways in order to allow for faster access, higher reliability, and to make better use out of the drive's available space.

**7. Device drivers:** A device driver is a specific type of computer software developed to allow interaction with hardware devices. Typically this constitutes an interface for communicating with the device, through the specific computer bus or communications subsystem that the hardware is connected to, providing commands to and/or receiving data from the device, and on the other end, the requisite interfaces to the operating system and software applications.



**8. Networking:** Currently most operating systems support a variety of networking protocols, hardware, and applications for using them. This means that computers running dissimilar operating systems can participate in a common network for sharing resources such as computing, files, printers, and scanners using either wired or wireless connections.

**9. Security:** A computer being secure depends on a number of technologies working properly. A modern operating system provides access to a number of resources, which are available to software running on the system, and to external devices like networks.



# Comparison of Desktop OS and Network OS

## **Desktop OS:**

- Designed to work on a single system

### **Single-User, Single-Task**

- At one time, only one task (application, program) can run on the computer
- Eg. DOS, Palm OS

### **Single-User, Multi-Task**

- Most common type on desktops
- E.g. Microsoft Windows, Apple's MacOS



# Comparison of Desktop OS and Network OS

## Network Operating Systems

- Designed to work on network servers
- Such machines often have multiple processors and fault-tolerance built into them
- High level of reliability is required
- Eg. Windows NT Server, Windows Server 2003, Unix/Linux for servers,  
Novell Netware  
Multi-tasking





# Booting

**Booting (booting up)** is a bootstrapping process that starts operating systems when the user turns on a computer system. A **boot sequence** is the initial set of operations that the computer performs when power is switched on. The **bootloader** typically loads the main operating system for the computer.



# Types of Operating Systems

**Multi-user and Single-user Operating Systems:** The operating systems of this type allow a multiple users to access a computer system concurrently. Time-sharing system can be classified as multi-user systems as they enable a multiple user access to a computer through the sharing of time. Single-user operating systems, as opposed to a multi-user operating system, are usable by a single user at a time.

**Multi-tasking and Single-tasking Operating Systems:** When a single program is allowed to run at a time, the system is grouped under a single-tasking system, while in case the operating system allows the execution of multiple tasks at one time, it is classified as a multi-tasking operating system.



**Distributed Operating System:** An operating system that manages a group of independent computers and makes them appear to be a single computer is known as a distributed operating system.

**Embedded System:** The operating systems designed for being used in embedded computer systems are known as embedded operating systems. They are designed to operate on small machines like PDAs(Personal Digital Assistant) with less autonomy. They are able to operate with a limited number of resources. They are very compact and extremely efficient by design. Windows CE, FreeBSD and Minix 3 are some examples of embedded operating systems.