

BA Sem-III  
COMPUTER APPLICATION(VOCATIONAL)

Introduction to OS & its Types

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# What is an Operating System?

An Operating System (OS) is a collection of system programs that controls and coordinates the overall operation of a computer system. Operating system is the most basic program within the computer system. These programs act as an interface between the hardware, application programs, files and user.

# Objectives

- To describe the basic organization of computer systems
- To provide a grand tour of the major components of operating systems
- To give an overview of the many types of computing environments
- To explore several open-source operating systems.

# Operating System Definition

An integrated system of programs which supervises the operations of the CPU, controls the input/output and storage functions of the computer system and provides various support services as the computer executes the application programs of users.

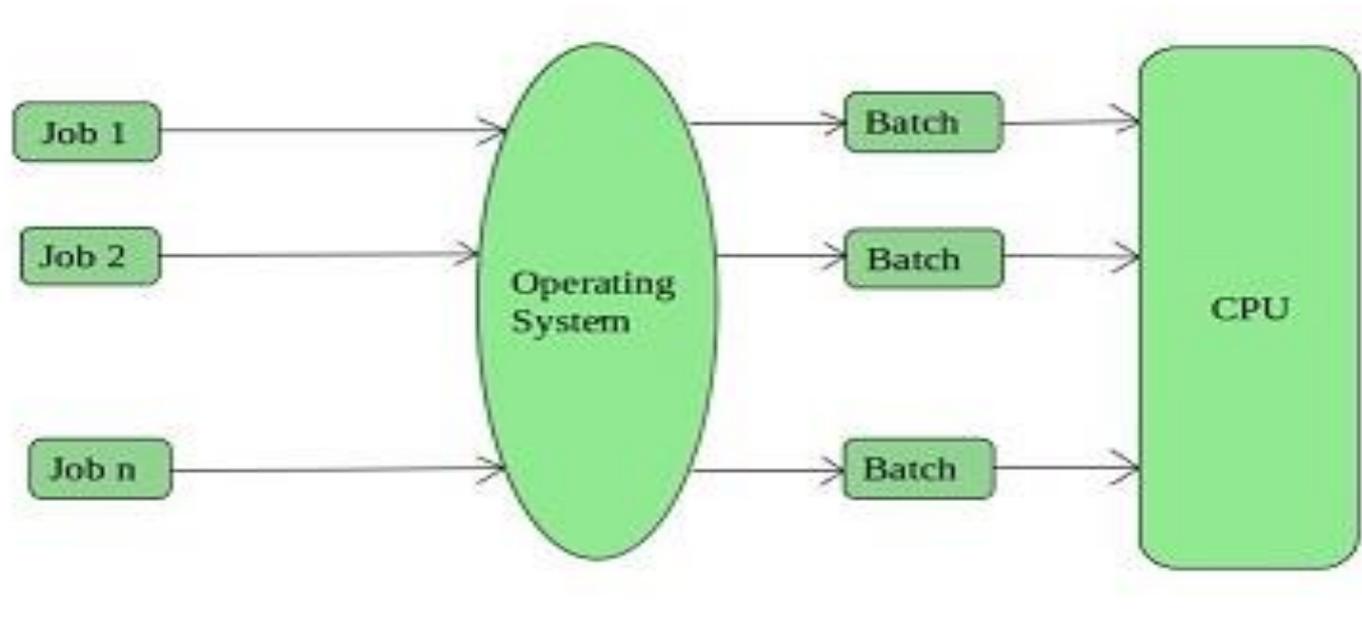
In other words, we can say that an operating system is a communication link between the user and computer and helps the user to run the application programs. The operating system manages the computer resources such as CPU, memory and I/O Devices. The smaller, part the nucleus or kernel of the operating system is memory resident and hence called the resident part of the operating system.

# Types of Operating Systems

An Operating System performs all the basic tasks like managing file, process, and memory. Thus operating system acts as manager of all the resources, i.e. **resource manager**. Thus operating system becomes an interface between user and machine.

## 1. Batch Operating System

This type of operating system does not interact with the computer directly. There is an operator which takes similar jobs having same requirement and group them into batches. It is the responsibility of operator to sort the jobs with similar needs.



## **Advantages of Batch Operating System:**

- It is very difficult to guess or know the time required by any job to complete. Processors of the batch systems know how long the job would be when it is in queue
- Multiple users can share the batch systems
- The idle time for batch system is very less

## **Disadvantages of Batch Operating System:**

- The computer operators should be well known with batch systems
- Batch systems are hard to debug
- It is sometime costly
- The other jobs will have to wait for an unknown time if any job fails.

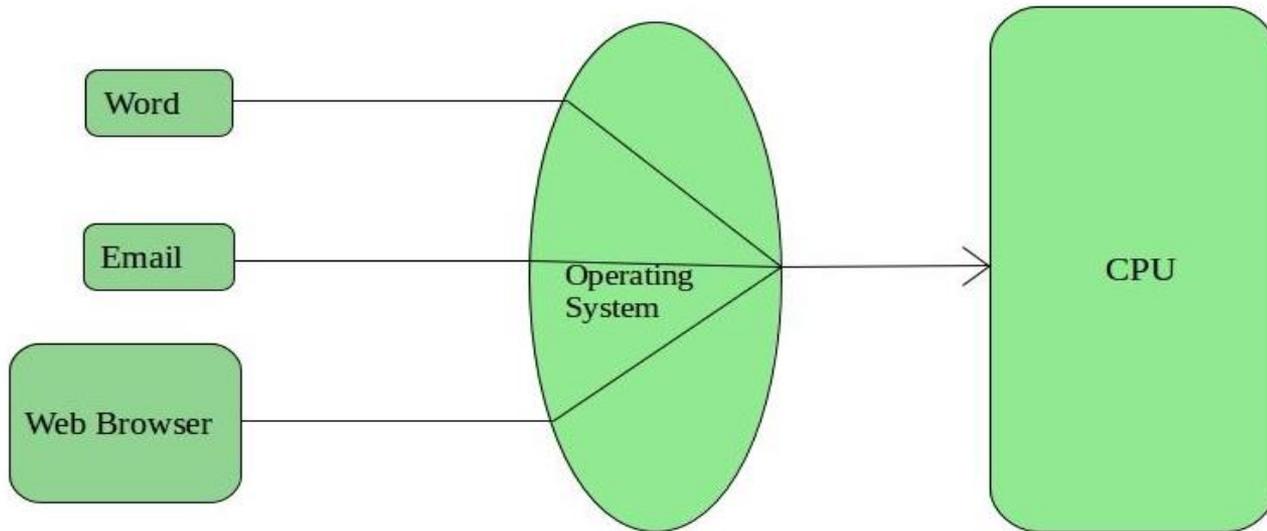
## **Examples of Batch based Operating**

**System:** Payroll System, Bank Statements etc.

## 2. Time-Sharing Operating Systems

Each task is given some time to execute, so that all the tasks work smoothly. Each user gets time of CPU as they use single system.

These systems are also known as **Multitasking Systems**. The task can be from single user or from different users also. The time that each task gets to execute is called quantum. After this time interval is over OS switches over to next task.



## Advantages of Time-Sharing OS:

- Each task gets an equal opportunity
- Less chances of duplication of software
- CPU idle time can be reduced

## **Disadvantages of Time-Sharing OS:**

- Reliability problem
- One must have to take care of security and integrity of user programs and data
- Data communication problem

## **Examples of Time-Sharing OSs**

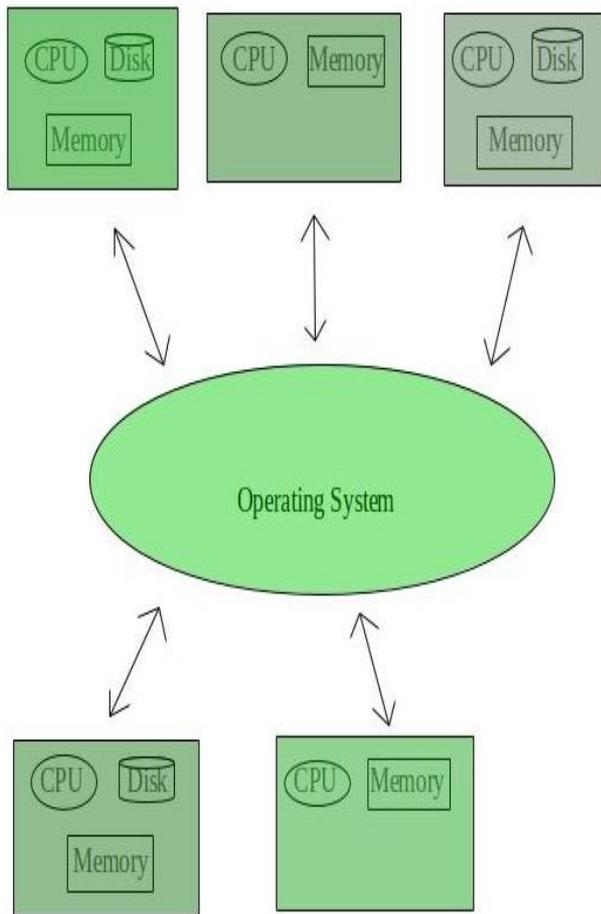
**are:** Multics, Unix etc.

### **3. Distributed Operating System –**

These types of operating system is a recent advancement in the world of computer technology and are being widely accepted all-over the world and, that too, with a great pace. Various autonomous interconnected computers communicate each other using a shared communication network. Independent systems possess their own memory unit and CPU.

## **DISTRIBUTED SYSTEM**

These are referred as loosely coupled systems or distributed systems. These system's processors differ in size and function. The major benefit of working with these types of operating system is that it is always possible that one user can access the files or software which are not actually present on his system but on some other system connected within this network i.e., remote access is enabled within the devices connected in that network.



## Advantages of Distributed Operating System:

- Failure of one will not affect the other network communication, as all systems are independent from each other
- Electronic mail increases the data exchange speed
- Since resources are being shared, computation is highly fast and durable
- Load on host computer reduces

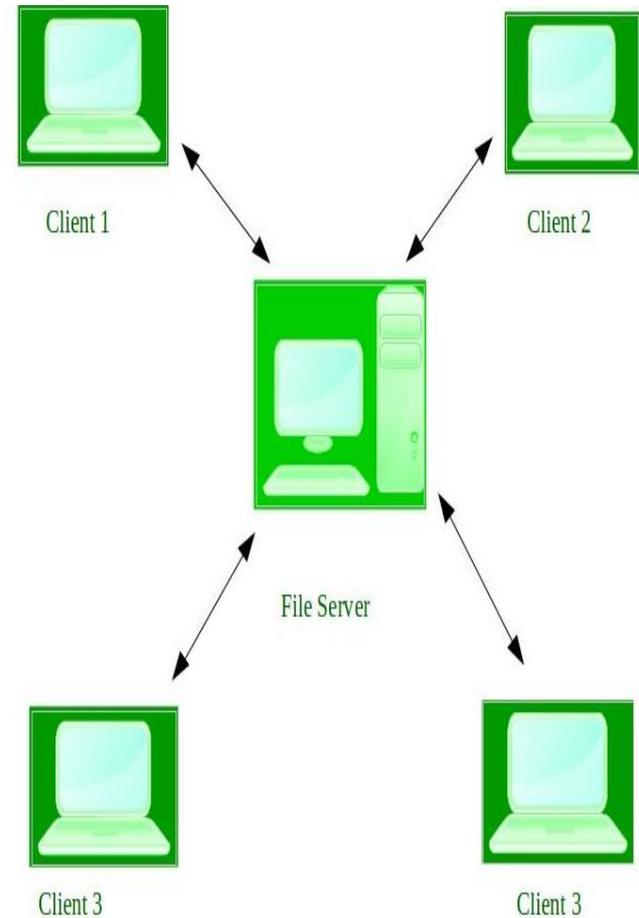
## **Disadvantages of Distributed O.S**

- Failure of the main network will stop the entire communication
- To establish distributed systems the language which are used are not well defined yet
- These types of systems are not readily available as they are very expensive. Not only that the underlying software is highly complex and not understood well yet

**Examples of Distributed Operating System are- LOCUS etc**

#### 4. Network Operating System –

These systems run on a server and provide the capability to manage data, users, groups, security, applications, and other networking functions. These type of operating systems allow shared access of files, printers, security, applications, and other networking functions over a small private network. One more important aspect of Network Operating Systems is that all the users are well aware of the underlying configuration, of all other users within the network, their individual connections etc. and that's why these computers are popularly known as **tightly coupled systems**.



## **Advantages of Network Operating System:**

- Highly stable centralized servers
- Security concerns are handled through servers
- New technologies and hardware up-gradation are easily integrated to the system
- Server access are possible remotely from different locations and types of systems

## **Disadvantages of Network Operating System:**

- Servers are costly
- User has to depend on central location for most operations
- Maintenance and updates are required regularly.

**Examples of Network Operating System are:** Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD etc.

## 5. Real-Time Operating System –

These types of OS's serves the real-time systems. The time interval required to process and respond to inputs is very small. This time interval is called **response time**.

**Real-time systems** are used when there are time requirements are very strict like missile systems, air traffic control systems, robots etc.

**Two types of Real-Time Operating System which are as follows:**

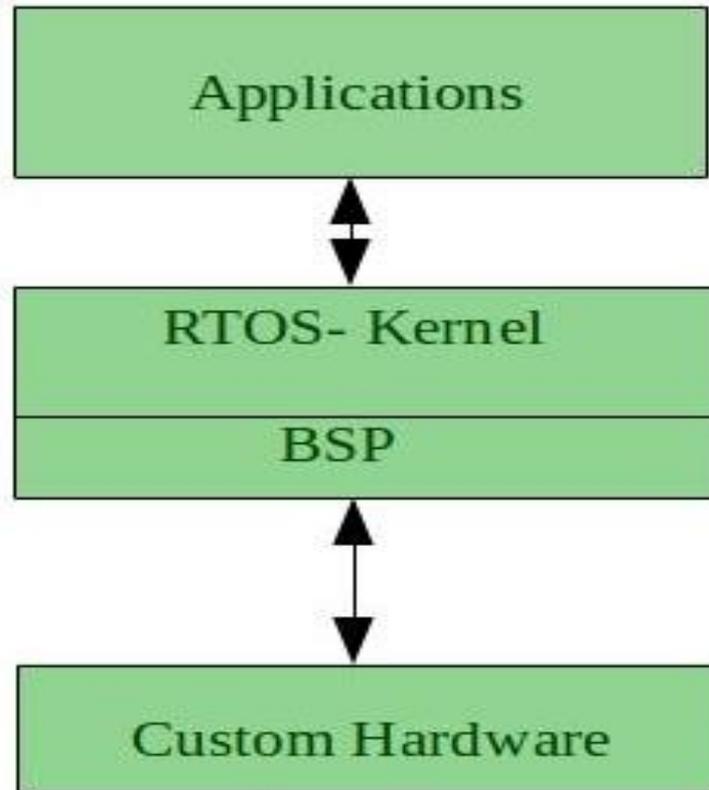
**Hard Real-Time Systems:**

These OSs are meant for the applications where time constraints are very strict and even the shortest possible delay is not acceptable. These systems are built for saving life like automatic parachutes or air bags which are required to be readily available in case of any accident. Virtual memory is almost never found in these systems.

**Soft Real-Time Systems:**

These OSs are for applications where for time-constraint is less strict.

# Real-Time Operating System



## Advantages of RTOS:

- **Maximum Consumption:** Maximum utilization of devices and system, thus more output from all the resources
- **Task Shifting:** Time assigned for shifting tasks in these systems are very less. For example in older systems it takes about 10 micro seconds in shifting one task to another and in latest systems it takes 3 micro seconds.

## Advantages of RTOS:

- **Focus on Application:** Focus on running applications and less importance to applications which are in queue.
- **Real time operating system in embedded system:** Since size of programs are small, RTOS can also be used in embedded systems like in transport and others.
- **Error Free:** These types of systems are error free.

## Disadvantages of RTOS:

- **Limited Tasks:** Very few tasks run at the same time and their concentration is very less on few applications to avoid errors.
- **Use heavy system resources:** Sometimes the system resources are not so good and they are expensive as well.
- **Complex Algorithms:** The algorithms are very complex and difficult for the designer to write on.
- **Device driver and interrupt signals:** It needs specific device drivers and interrupt signals to response earliest to interrupts.
- **Thread Priority:** It is not good to set thread priority as these systems are very less prone to switching tasks.

# Examples of Real-Time Operating Systems

Scientific experiments, medical imaging systems, industrial control systems, weapon systems, robots, air traffic control systems, etc.

# I/O Subsystem

One purpose of OS is to hide peculiarities of hardware devices from the user I/O subsystem responsible for

- Memory management of I/O including buffering (storing data temporarily while it is being transferred), caching (storing parts of data in faster storage for performance), spooling (the overlapping of output of one job with input of other jobs)
- General device-driver interface
- Drivers for specific hardware devices

## Protection and Security

**Protection** – any mechanism for controlling access of processes or users to resources defined by the OS.

**Security** – defense of the system against internal and external attacks

Huge range, including denial-of-service, worms, viruses, identity theft, theft of service.

Systems generally first distinguish among users, to determine who can do what

- User identities (**user IDs**, security IDs) include name and associated number, one per user
- User ID then associated with all files, processes of that user to determine access control
- Group identifier (**group ID**) allows set of users to be defined and controls managed, then also associated with each process, file
- **Privilege escalation** allows user to change to effective ID with more rights

# Open-Source Operating Systems

Operating systems made available in source-code format rather than just binary **closed-source**  
Counter to the **copy protection** and **Digital Rights Management (DRM)** movement

Started by **Free Software Foundation (FSF)**, which has “copyleft” **GNU Public License (GPL)**  
Examples **Linux** and **UNIX**

**THANK YOU**