OPERATING SYSTEM (OS)

Q. What is Operating System ? (2021)

Q. What are the various objectives and functions of Operating System ? (2021)

OR

Expalin Various Components of Operating Systems. (2023)

Q. Characteristics/Feature of Operating System

Q. Advantage and Disadvantage of Operating OS

Q. Define Operating System and its types. (2022/2024) .

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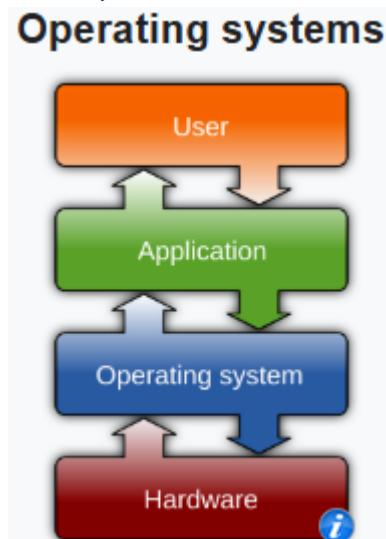
Q. What is Operating System ? (2021)

→ An Operating System (OS) is an interface between the computer user and the computer hardware.

Or

An operating system is a program that acts as an interface between the user and the computer hardware and controls the execution of all kinds of programs.

- It is a type of System Software.
- Every computer system must have at least one operating system to run other programs.
- A program which controls the execution of all other programs (applications).
- Acts as an intermediary between the user(s) and the computer.
- Applications like Browsers, MS Office, Notepad Games, etc., need some environment to run and perform its tasks.
- Example of Some popular Operating Systems → Windows, Android, MacOS, IOS, Linux, Unix, DOS,…..

Q. What are the various objectives and functions of Operating System ? (2021)

OR
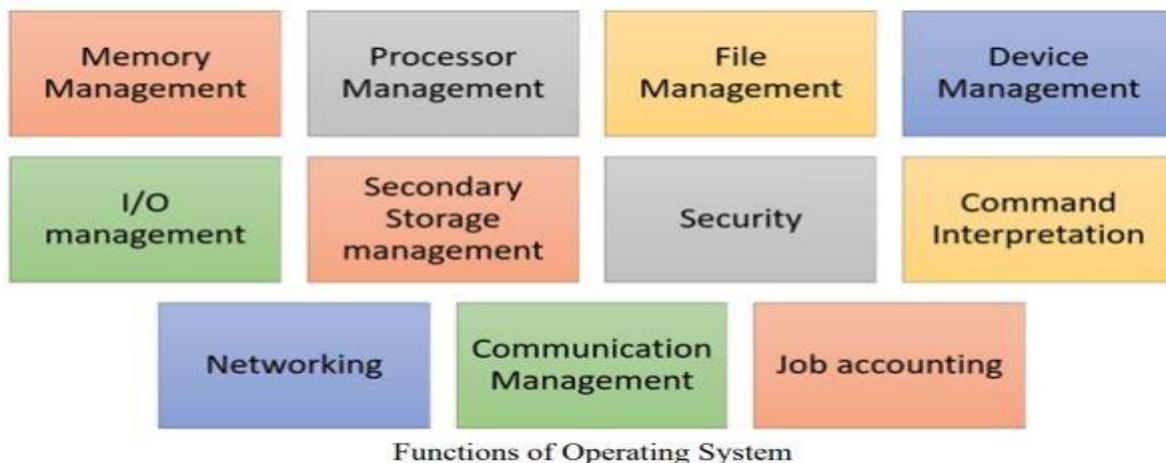
Expalin Various Components of Operating Systems. (2023)

→ Objectives/goals of OS

- Execute user programs and make solving user problems easier.
- Make the computer system convenient/facility to use.
- Use the computer hardware in an efficient manner.

Some of important functions of an operating System.

- Memory Management
- Processor Management
- Device Management / I/O Management
- File Management
- Security Management
- Control overall system performance
- Job accounting
- Error detecting aids
- Coordination between other software and users
  - Network Management

Functions of Operating System

i.   Memory Management

- Memory management refers to management of Primary Memory or Main Memory.
- Main memory is a large array of words or bytes where each word or byte has its own address.
- Main memory provides a fast storage that can be accessed directly by the CPU. For a program to be executed, it must be in the main memory.
- In multiprogramming, the OS decides which process will get memory

when and how much.

- Allocates the memory when a process requests it to do so.
- De-allocates the memory when a process no longer needs it or has been terminated

ii. Process Management

- In multiprogramming environment, the OS decides which process gets the processor when and for how much time.
- This function is called process scheduling.
  - ➢ An Operating System does the following activities for processor management –
- Keeps tracks of processor and status of process. The program responsible for this task is known as Process Scheduler.
- Allocates the processor (CPU) to a process / Operating System acts as a Resource Manager of CPU, Memory, I/O devices and files.
- De-allocates processor when a process is no longer required.

iii. Device Management

- An Operating System manages device communication via their respective drivers.
  - ➢ It does the following activities for device management –
- Keeps tracks of all devices.
- The part of Program of OS responsible for this task is known as the device driver.
- Decides which process gets the device when and for how much time.
- Allocates the device in the efficient way.
- De-allocates devices

iv. File Management

- A file system is normally organized into directories for easy navigation and usage.
- These directories may contain files and other directories.
  - ➢ An Operating System does the following activities for file management –
- Keeps track of information, location, uses, status etc.
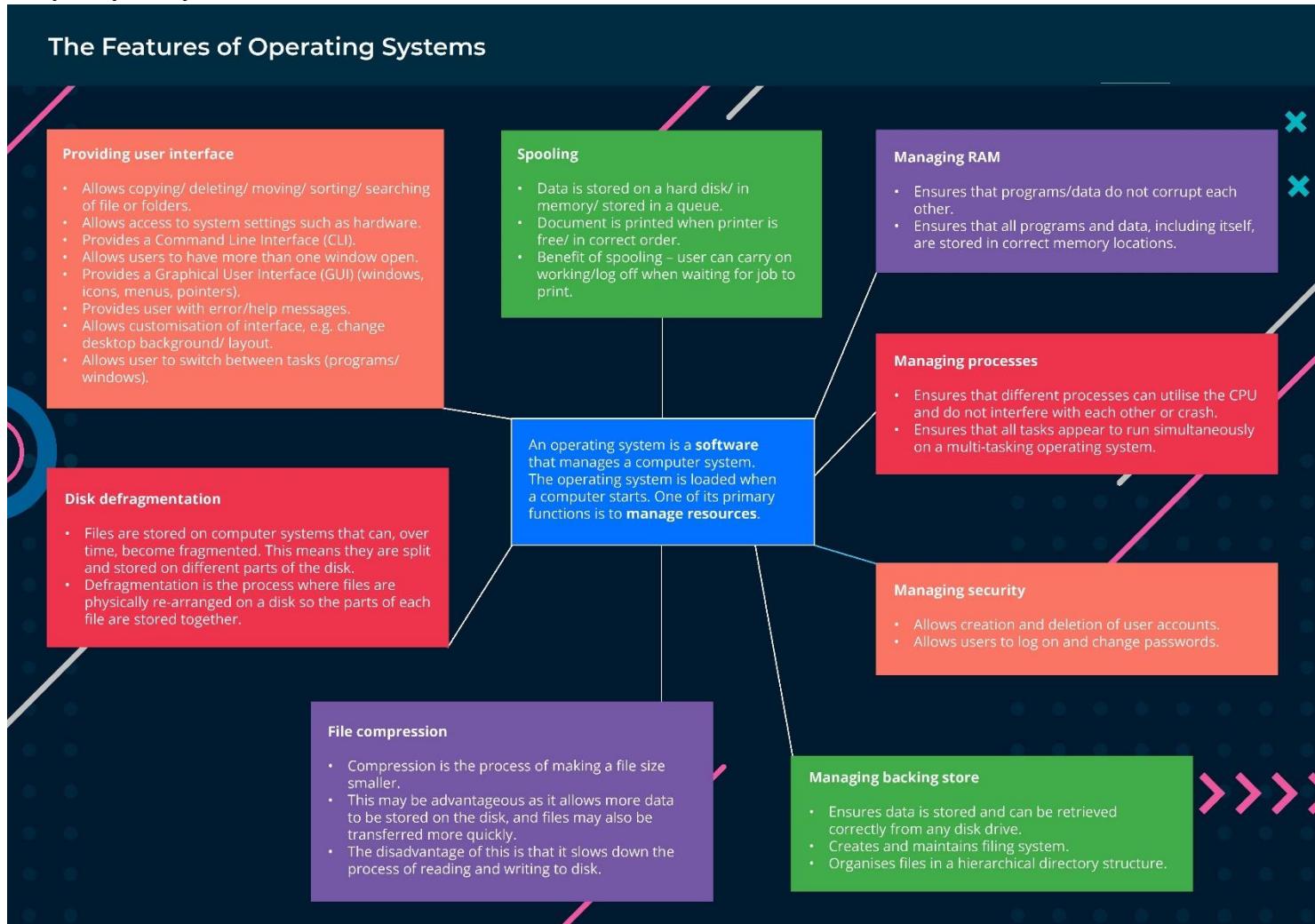
- The collective facilities are often known as file system.
- Decides who gets the resources.
- Allocates the resources.
- De-allocates the resources.

v. **Security Management** – By means of password and similar other techniques, it prevents unauthorized access to programs and data.

vi. **Control over system performance** – Recording delays between request for a service and response from the system.

vii. **Job accounting** – Keeping track of time and resources used by various jobs and users.

viii. **Error detecting aids** – Production of dumps, traces, error messages, and other debugging and error detecting aids.

ix. **Coordination between other softwares and users** – Coordination and assignment of compilers, interpreters, assemblers and other software to the various users of the computer systems.

x. **Network Management -** Operating systems help computers talk to each other and the internet. They manage how data is packaged and sent over the network, making sure it arrives safely and in the right order.

Q. Characteristics/Feature of Operating System

→ Important features of OS:

1. User Friendly :- Easy to use interface with menus,icons and windows.
2. Multitasking :- Can run multiple program at the same time.
3. Multi-user Support :- Allows more than one user to use the system.
4. Fast and Efficient :- Uses hardware resources efficiently.
5. Reliable :- Stable operation with fewer system crashes.
6. Secure :- Protects data and system from unauthorized access.
7. Portability – Can run on different hardware plateforms.

8. Scalable :- Works well on both small and large systems.

9. Automatic Resource allocation :- Automatically allocates system resources.

10. Error Handling Capability - Detects and handles system errors properly.

The Features of Operating Systems

Providing user interface
- Allows copying/ deleting/ moving/ sorting/ searching of file or folders.
- Allows access to system settings such as hardware.
- Provides a Command Line Interface (CLI).
- Allows users to have more than one window open.
- Provides a Graphical User Interface (GUI) (windows, icons, menus, pointers).
- Provides user with error/help messages.
- Allows customisation of interface, e.g. change desktop background/ layout.
- Allows user to switch between tasks (programs/ windows).

Spooling
- Data is stored on a hard disk/ in memory/ stored in a queue.
- Document is printed when printer is free/ in correct order.
- Benefit of spooling – user can carry on working/log off when waiting for job to print.

Managing RAM
- Ensures that programs/data do not corrupt each other.
- Ensures that all programs and data, including itself, are stored in correct memory locations.

Managing processes
- Ensures that different processes can utilise the CPU and do not interfere with each other or crash.
- Ensures that all tasks appear to run simultaneously on a multi-tasking operating system.

An operating system is a **software** that manages a computer system. The operating system is loaded when a computer starts. One of its primary functions is to **manage resources**.

Disk defragmentation
- Files are stored on computer systems that can, over time, become fragmented. This means they are split and stored on different parts of the disk.
- Defragmentation is the process where files are physically re-arranged on a disk so the parts of each file are stored together.

Managing security
- Allows creation and deletion of user accounts.
- Allows users to log on and change passwords.

File compression
- Compression is the process of making a file size smaller.
- This may be advantageous as it allows more data to be stored on the disk, and files may also be transferred more quickly.
- The disadvantage of this is that it slows down the process of reading and writing to disk.

Managing backing store
- Ensures data is stored and can be retrieved correctly from any disk drive.
- Creates and maintains filing system.
- Organises files in a hierarchical directory structure.

Q. Advantage and Disadvantage of Operating OS

→ Advantage

- Offers an environment in which a user may execute programs/applications.
- The operating system must make sure that the computer system convenient/easy to use.
- Operating System acts as an intermediary among applications and the hardware components.
- It provides the computer system resources with easy to use format.
- Acts as an intermediary between all hardware's and software's of the

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system.

Disadvantage

- If OS fails, entire system may stop working.
- OS software can be expensive (e.g., Windows).

Q. Define Operating System and its types. (2022/2024)

➔ **Operating System** → An operating system is a program that acts as an interface between the user and the computer hardware and controls the execution of all kinds of programs.

**Example of Some popular Operating Systems** → Windows, Andriod, MAC-OS, IOS, Linux, Unix, DOS,.....
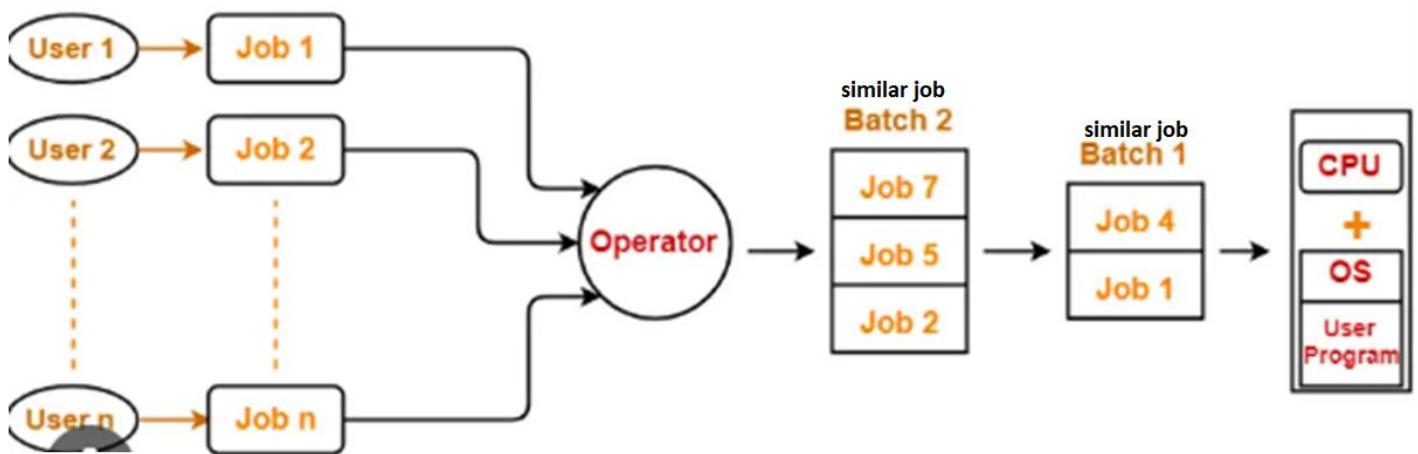
Types of Operating System / Evolution of OS

1. **Batch OS**
2. **Multi-Programming OS**
3. **Multi-tasking OS / Time – Sharing OS**
4. **Real Time OS**
   i. **Hard Real time OS**
   ii. **Soft Real time OS**
5. **Distributed OS**
6. **Embedded OS**
7. **Network OS**
8. **Multiprocess OS**

1. Batch OS

- This type of operating system does not interact with the computer directly.
- Batch processing is a technique in which an Operating System collects the programs and data together in a batch before processing starts.

- Each user prepares his job on an offline device like punch cards and submits it to the computer operator.
- To speed up processing, jobs with similar needs are batched together and run as a group. The programmers leave their programs with the operator and the operator then sorts the programs with similar requirements into batches.

Advantage

- Increased performance as it was possible for job to start as soon as previous job is finished without any manual intervention.
- Priorities can be set for different batches

Disadvantages

- Lack of interaction between the user and the job.
- CPU is often idle, because the speed of the mechanical I/O devices is slower than the CPU.
- Difficult to provide the desired priority.

2. Multi-Programming OS

- when two or more programs reside in memory at the same time, is referred to as multiprogramming.
- Multiprogramming assumes a single shared processor.
- Multiprogramming increases CPU utilization by organizing jobs so that the CPU always has one to execute.
- In non multiprogramming environment, during this time CPU sits idle. But in multiprogramming, the operating system switches to present job and executes another job.

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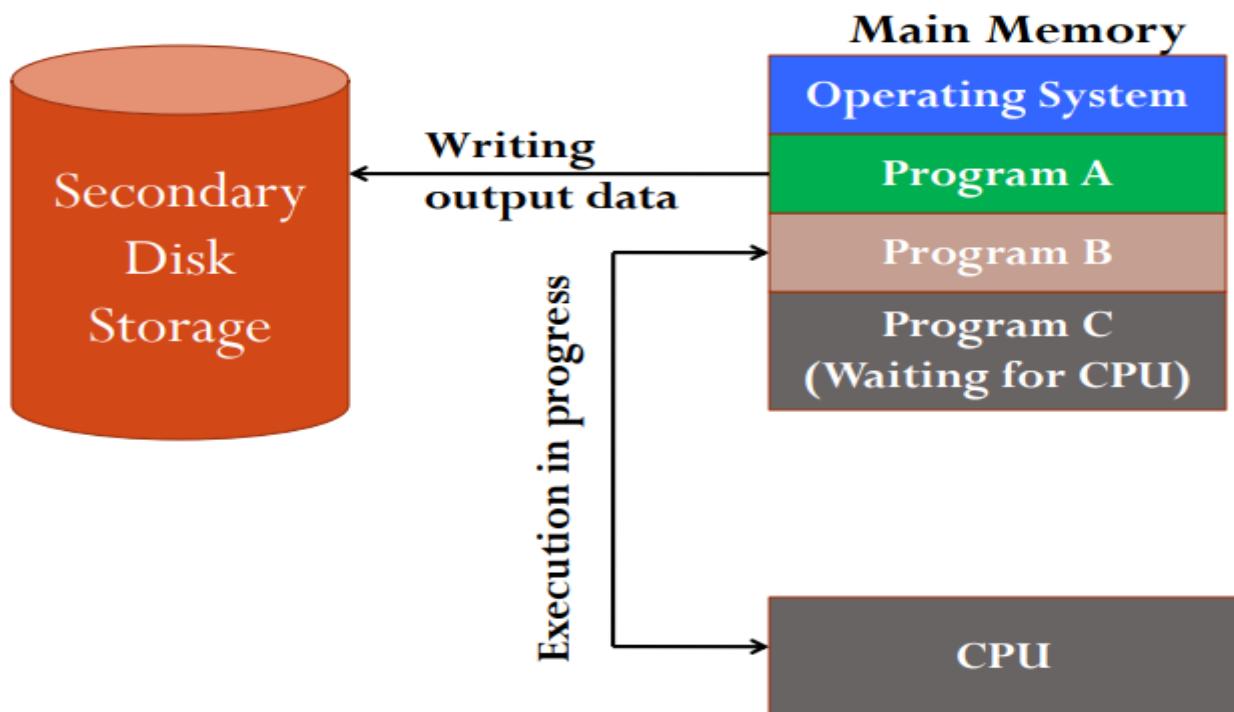
- When that job waits for some task, CPU is switched to another job and so on

Advantages

- Increase CPU utilization by eliminating idle time of CPU.
- Multiple jobs can execute simultaneously.

Disadvantage

- User cannot interact with his program during execution, i.e., it does not support interactivity

Multiprocessing	Multiprogramming
Multiprocessing refers to processing of multiple processes at same time by multiple CPUs.	Multiprogramming keeps several programs in main memory at the same time and execute them concurrently utilizing single CPU.
It utilizes multiple CPUs.	It utilizes single CPU.
It permits parallel processing.	Context switching takes place.
Less time taken to process the jobs.	More Time taken to process the jobs.
It facilitates much efficient utilization of devices of the computer system.	Less efficient than multiprocessing.
Usually more expensive.	Such systems are less expensive.

❖ Functions of Operating System in Multiprogramming

(a) Job Scheduling
(b) CPU scheduling
(c) Memory Management

3. Multi-Tasking OS / Time Sharing OS

- Time-sharing is a technique which enables many people, located at various terminals, to use a particular computer system at the same time.
- These systems are also known as Multitasking Systems.
- Time-sharing or multitasking is a logical extension of multiprogramming
- The task can be from a single user or different users also Each task is given some time to execute so that all the tasks work smoothly.
- The time that each task gets to execute is **called quantum**.
- After this time interval is over OS switches over to the next task.
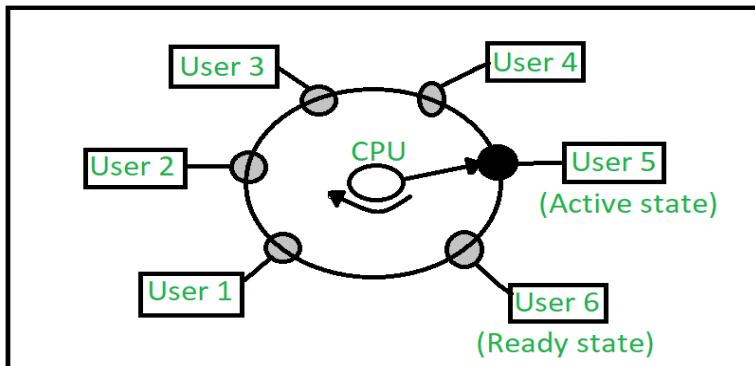
Advantages

- Provides the advantage of quick response.

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- Avoids duplication of software.
- Reduces CPU idle time.

Disadvantages

- Problem of reliability.
- Question of security and integrity of user programs and data.
- Problem of data communication

| Sr. No.	Time sharing OS	Multiprogramming OS
1.	It enables execution of multiple tasks and processes at the same processes to increases CPU performance.	Multiple programs reside in the main memory simultaneously to improve CPU utilization.
2.	It is based on the concept of time sharing.	It is based on the concept of context switching.
3.	The idea is to allow multiple processes to run simultaneously via time sharing.	The idea is to reduce the CPU idle time for as long as possible.
4.	It takes less time to execute the task allocation.	It takes more time to execute the process.
5.	Principle objective is minimize response time.	Principle objective is maximize processor use.

4.   Real Time OS
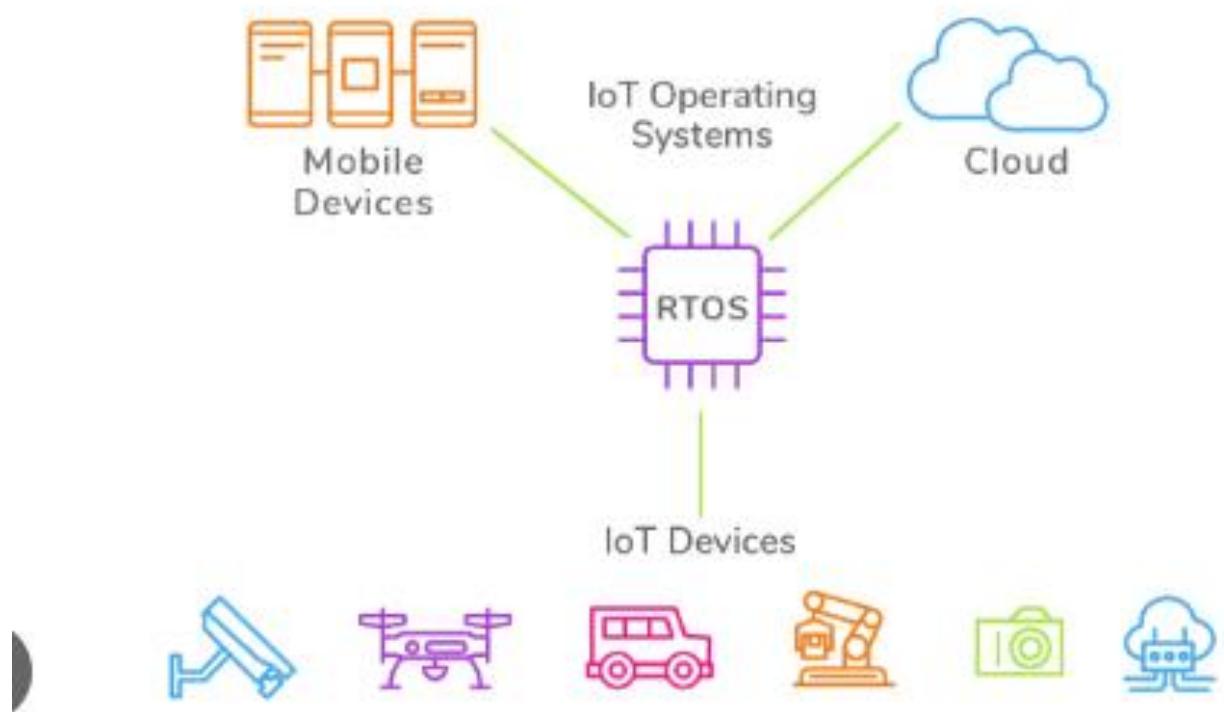
- These types of OSs serve real-time systems.
- The time interval required to process and respond to inputs is very small.
- This time interval is called response time.
- Real-time systems are used when there are time requirements that are very strict like missile systems, air traffic control systems, robots, etc.

Two types of Real-Time Operating System

✓ **Hard Real-Time Systems:-** These OSs are meant for applications

where time constraints are very strict and even the shortest possible delay is not acceptable.

✓ **Soft Real-Time Systems:-** These OSs are for applications where for time-constraint is less strict. For example, multimedia, virtual reality, Advanced Scientific Projects like undersea exploration and planetary rovers, etc.

5.   Distributed OS

- In distributed system, the different machines are connected in a network and each machine has its own processor and own local memory.
- In this system, the operating systems on all the machines work together to manage the collective network resource.
- These are referred as **loosely coupled systems or distributed systems.**
- Processors in a distributed system may vary in size and function.. These processors are referred as sites, nodes, computers,, and so on.

Advantages
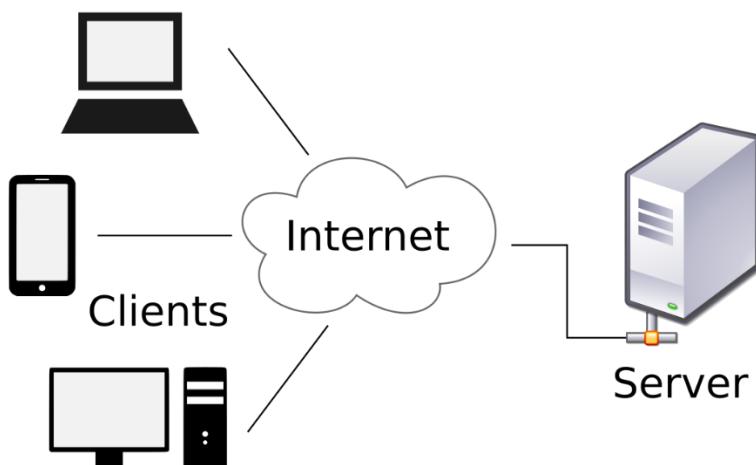
- With resource sharing facility, a user at one site may be able to use

the resources available at another.
- Speedup the exchange of data with one another via electronic mail.
- If one site fails in a distributed system, the remaining sites can potentially continue operating.
- Better service to the customers.
- Reduction of the load on the host computer.
- Reduction of delays in data processing.
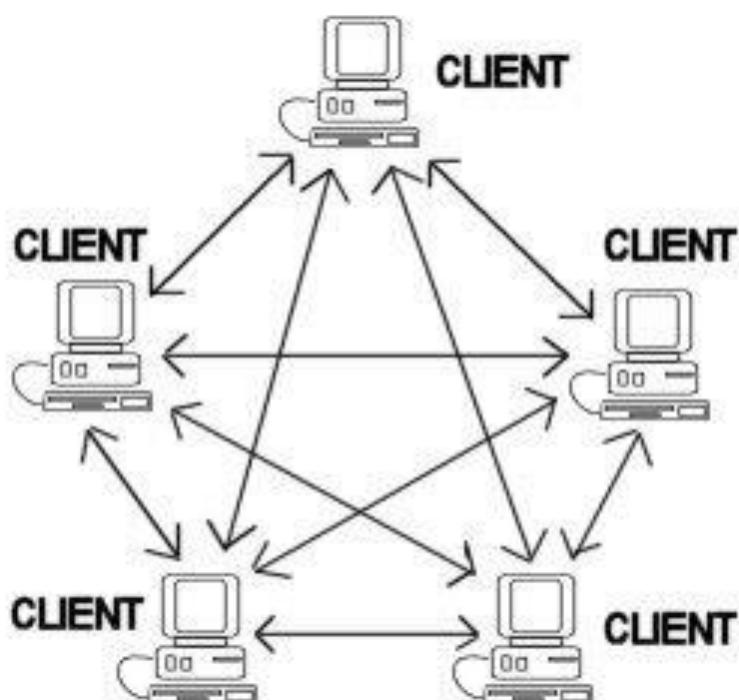
It can be classified into two categories:

1. **Client-Server systems**

2. **Peer-to-Peer systems**

6. Embedded OS

- IT is alos called dedicated OS. An embedded operating system is a specialized operating system (OS) designed to perform a specific task for a dedicated device.

Examples of Embedded Systems
www.TheEngineeringProjects.com

7. Network OS

- These systems run on a server and provide the capability to manage data, users, groups, security, applications, and other networking functions.
- These types 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.
- Examples of network operating systems include Microsoft Windows Server 2003 Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD.
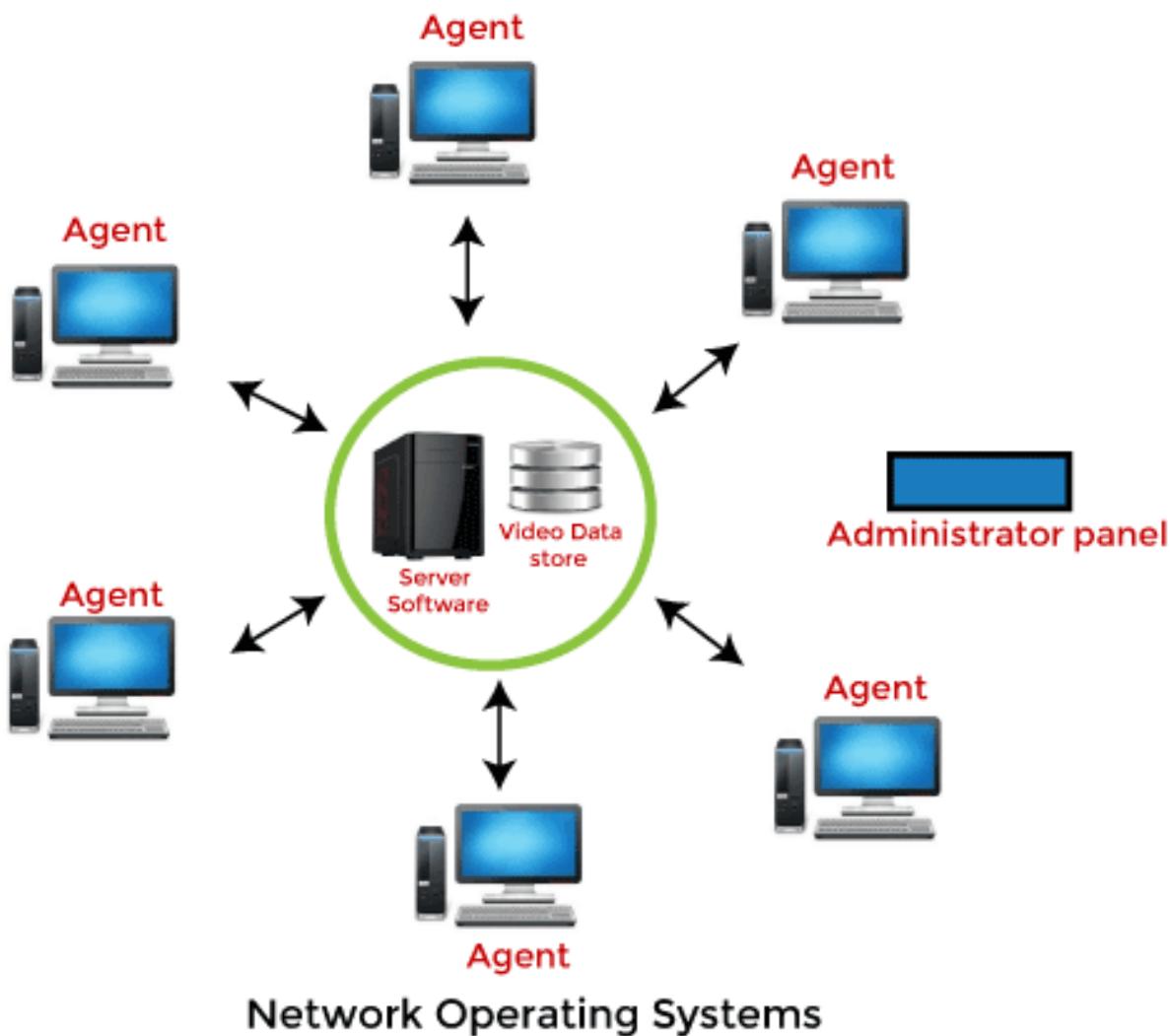
Advantages

- Centralized servers are highly stable.

- Security is server managed.
- Upgrades to new technologies and hardware can be easily integrated in to the system.
- Remote access to servers is possible from different locations and types of systems.

Disadvantages

- High cost of buying and running a server.
- Dependency on a central location for most operations.
- Regular maintenance and updates are required.

Network Operating Systems

8.   Multiprocessor OS

- The multiprocessors system need special types of operating systems.
- The main feature of such operating system is that they allow many processes (बहुत सारे cpu) to run simultaneously without a significant lack of performance.

- These also provide a better way to ensure, that in I/O operation data is coming and reaching to the appropriate CPU.
- Example – Windows NT, Solaris, Linux etc.

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