



OPERATING SYSTEM DESIGN

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Department of Computer Applications

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OS Structures & Kernel Programming

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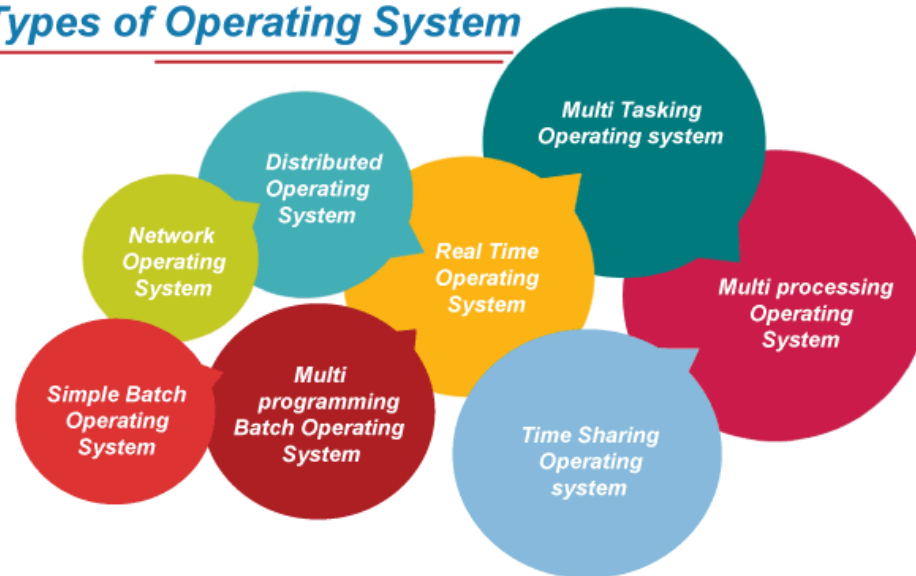
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Different Types of OS for Different Computing Environments

- Batch Operating System
- Multiprogramming System
- Multiprocessing System
- Multitasking System
- Time sharing system
- Distributed OS
- Network OS
- Real Time OS

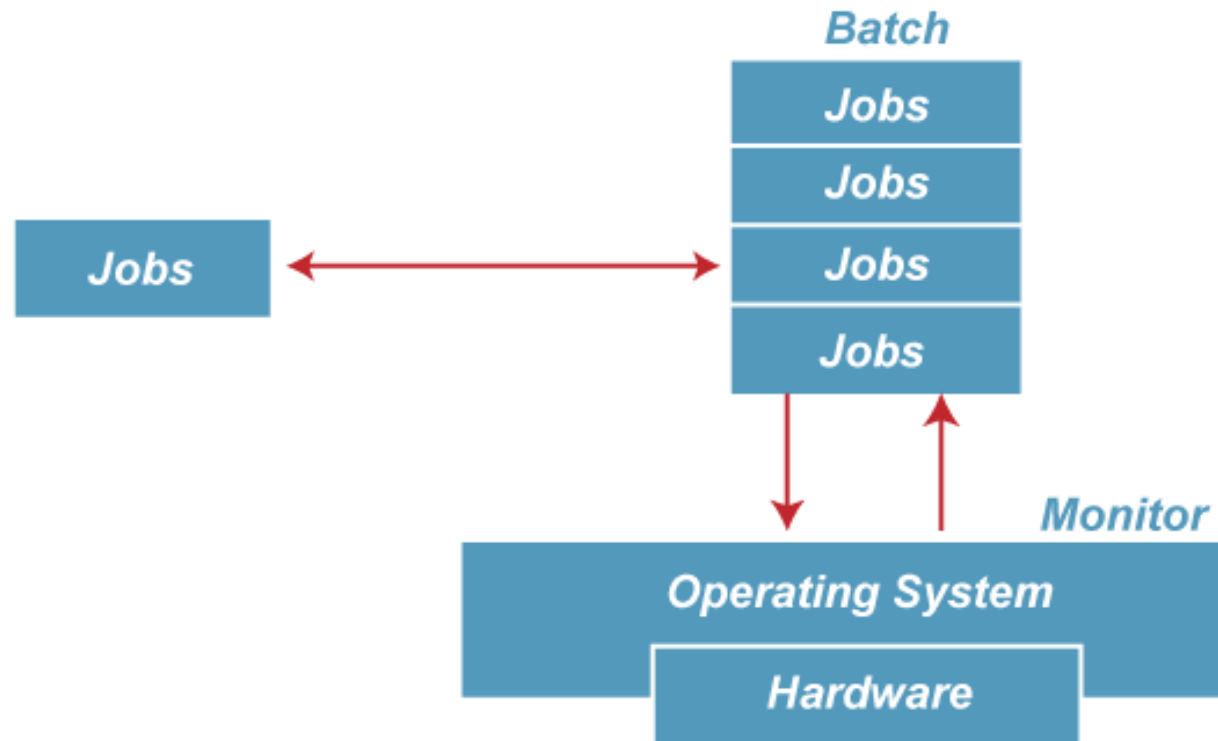
Types of Operating System



- Similar jobs are grouped into batches
- Batches are given to CPU for execution
- Example: Bank transaction updates, payroll system
- Advantages
 - Multiple users can share the same batch
 - Idle time is very less
 - Suitable for repeated large work
- Disadvantages
 - Difficult to estimate the time of completion of job
 - Hard to debug
 - If any of the job fails, the others has to wait for indefinite time

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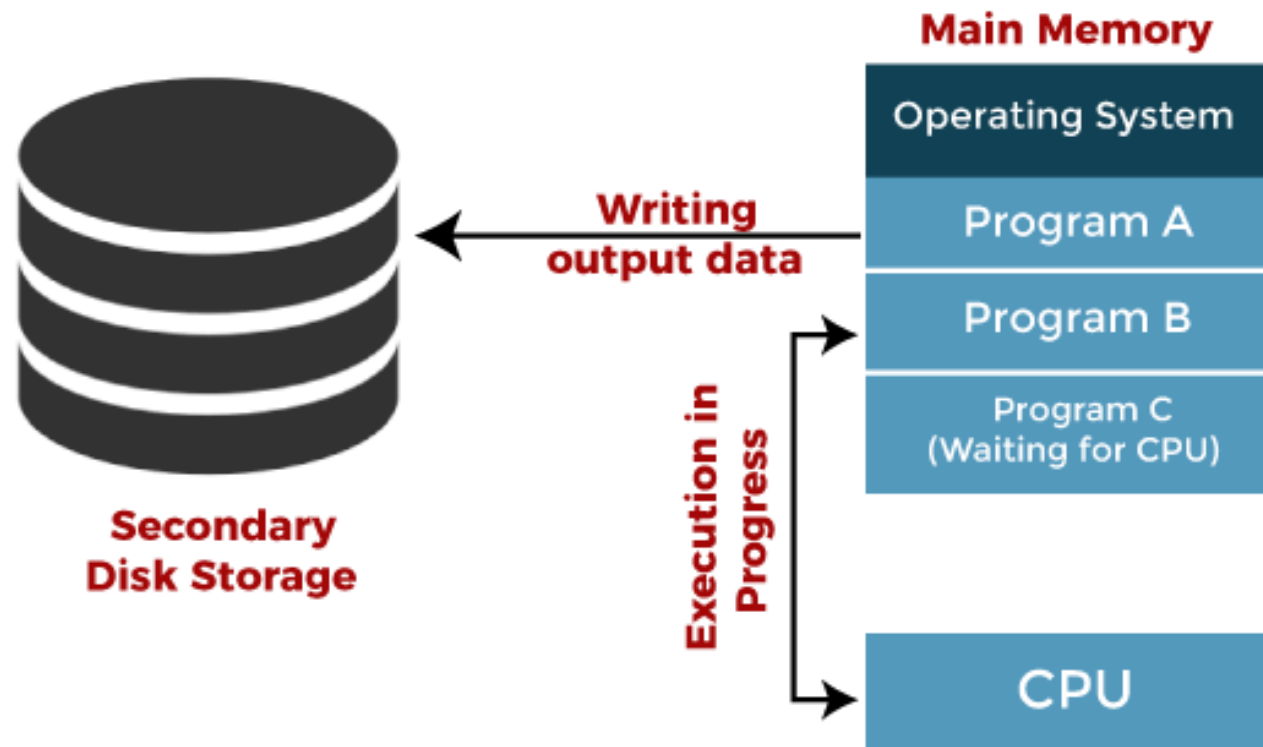
Batch System



- More than one program kept in memory
- Always one is kept ready for execution
- Attempt to keep the CPU busy / reduce its idle time
- Advantages
 - Increases throughput and reduces the response time
- Disadvantages
 - Too many programs may degrade the performance
 - No user interaction

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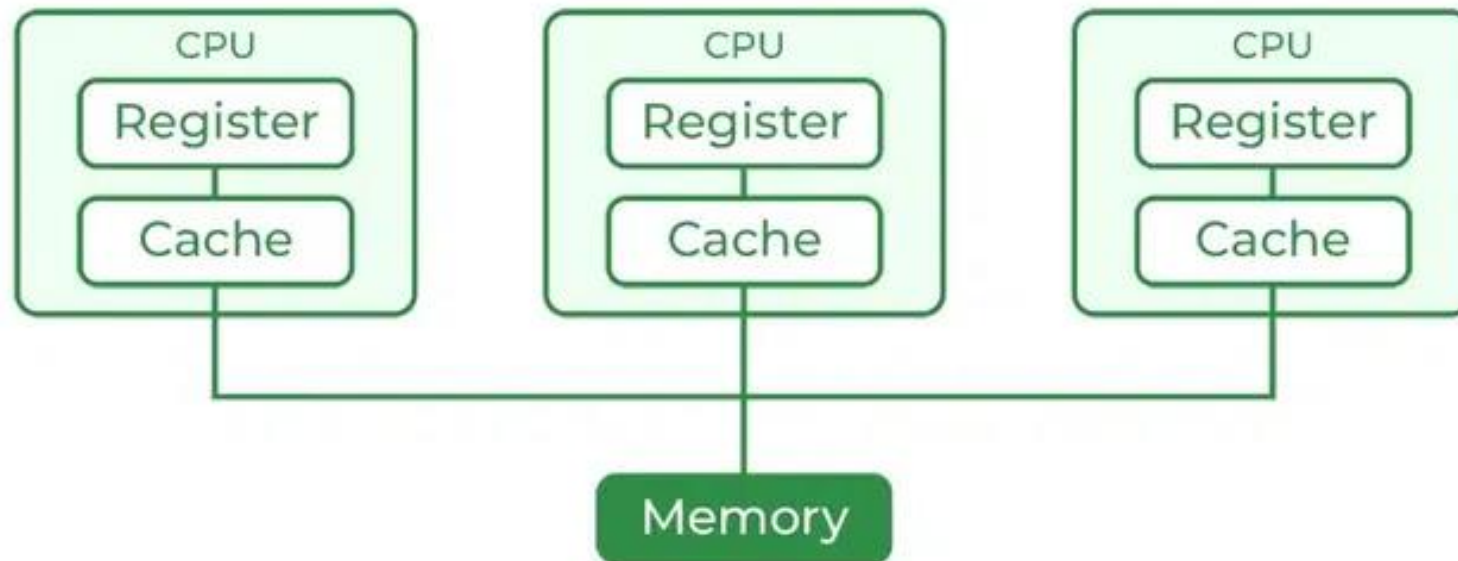
Multiprogramming System



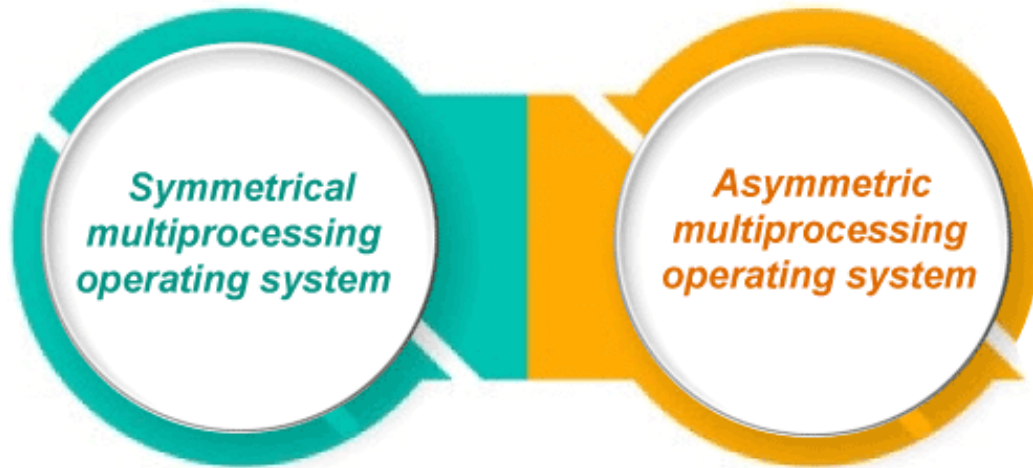
Jobs in multiprogramming system

- More than one CPU is used for execution of jobs
- i.e, Multiple processors are there to execute the programs/jobs
- Advantages
 - Increased throughput-more work done in less time
 - Economy of scale-Common bus, peripherals, memory, power etc.,
 - Increased reliability- Failure of one will not affect the functionality of the system
- Disadvantage
 - Complex system

Multiprocessing



Types of Multiprocessing systems

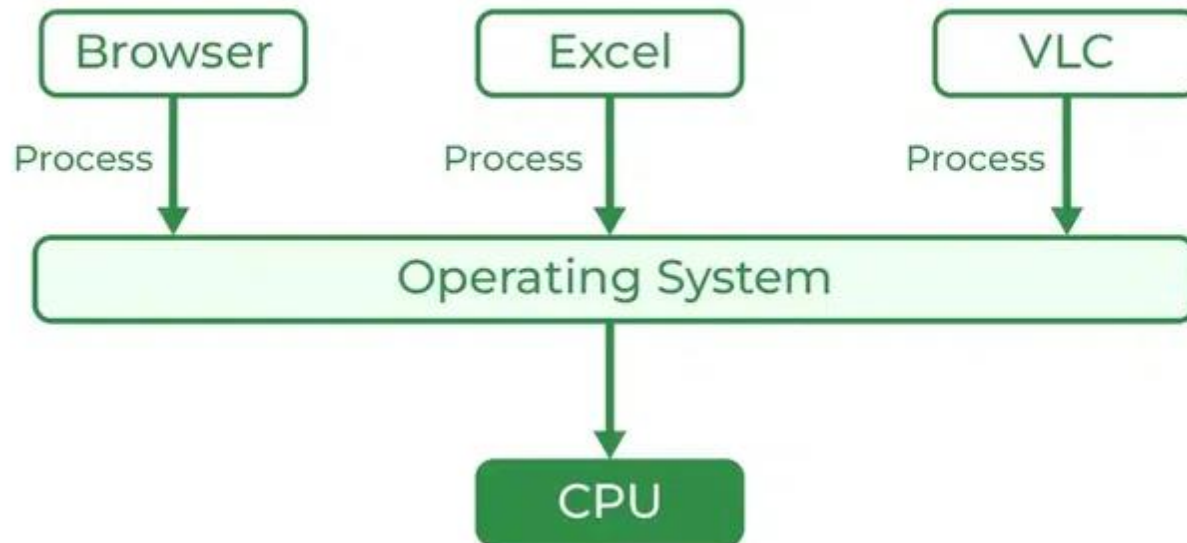


Asymmetric multiprocessing- All processors not treated equally. So each processor is assigned a specific task

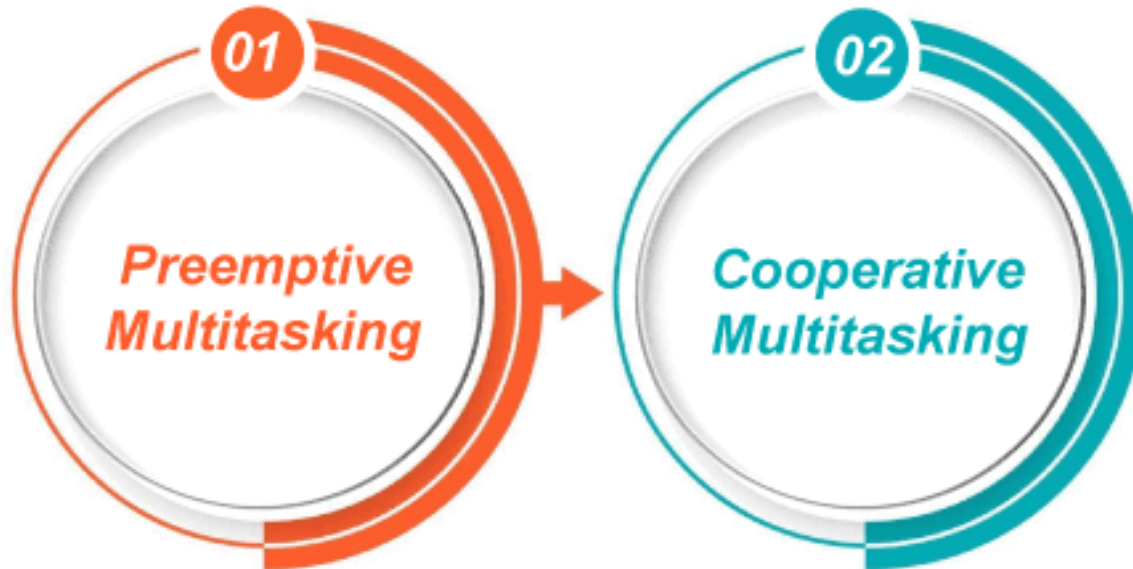
Symmetric multiprocessing- All processors are treated equally in which each processor performs all tasks within the operating system.

- It is a logical extension of multi programming system
- It can run multiple programs at the same time and complete at the same time

Multitasking



Types of Multitasking



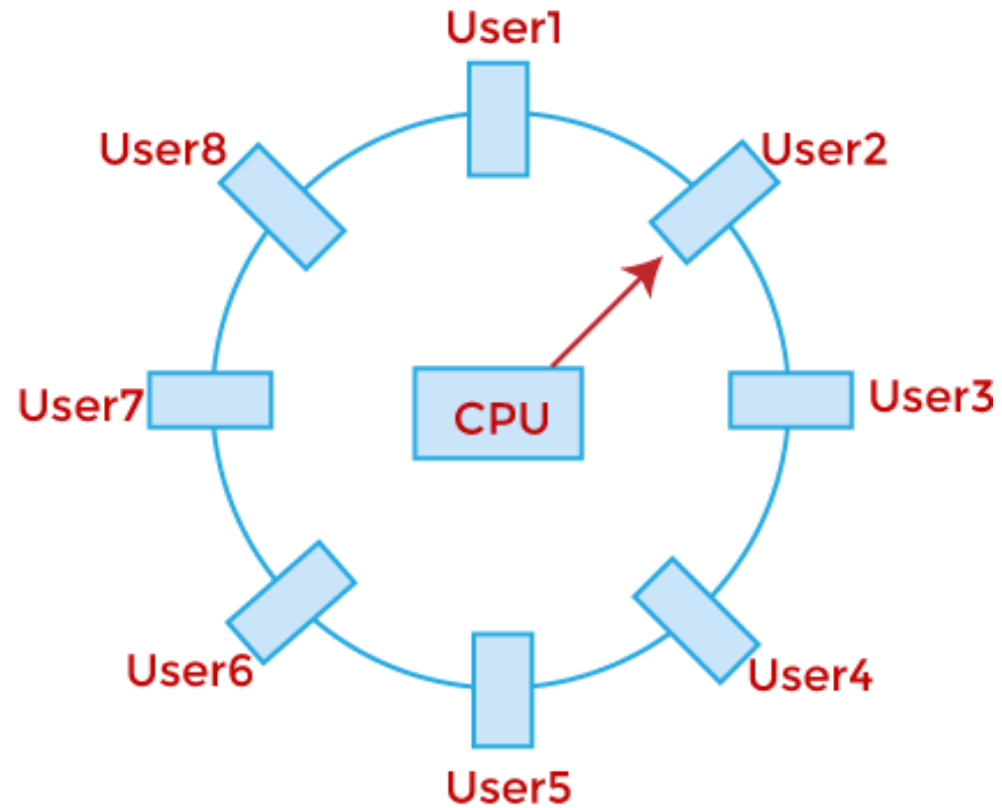
Preemptive multitasking involves the use of an interrupt mechanism which suspends the currently executing process and invokes a scheduler to determine which process should execute next

Cooperative multitasking, also known as non-preemptive multitasking, is a style of computer multitasking in which the operating system never initiates a context switch from a running process to another process

- Each task is given some time to execute
- All tasks can work smoothly
- The task may come from single user or multiple user
- The time each task gets to execute is called as quantum
- After the time, the OS switches to next task
- Advantages
 - Each task gets equal opportunity
 - CPU idle time is reduced
 - Resource is shared and Productivity is improved
- Disadvantages
 - Data Communication problem
 - High overhead because of scheduling, context switching
 - Security risks

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Timesharing System

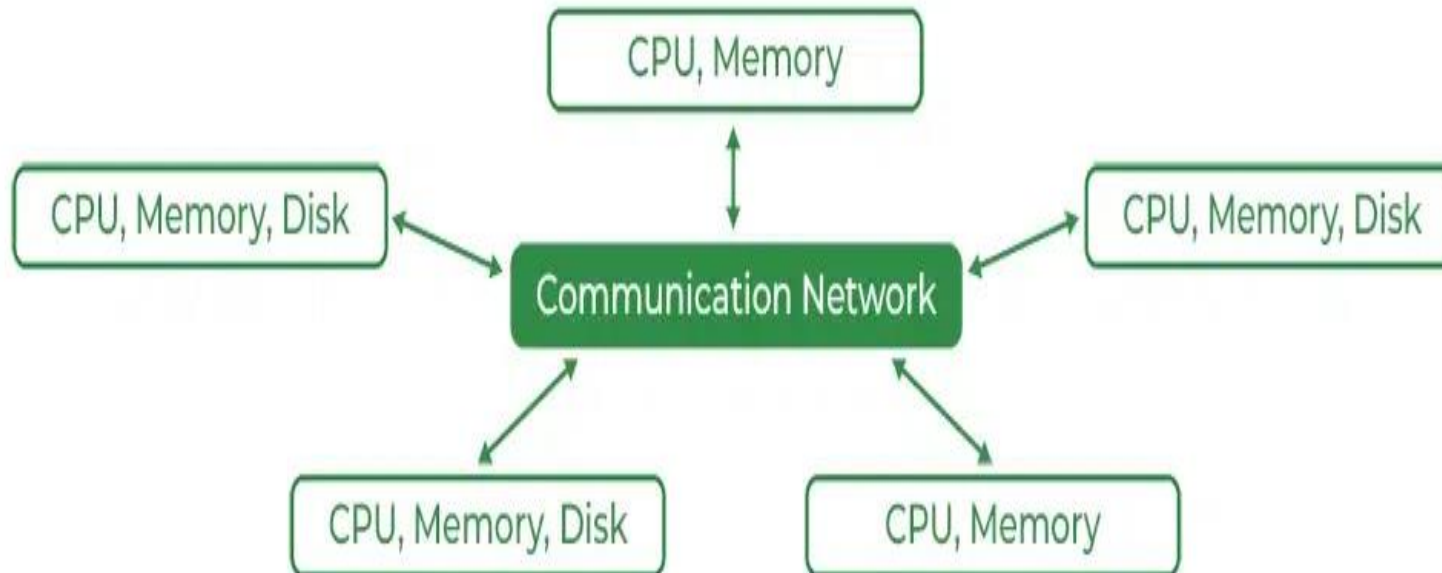


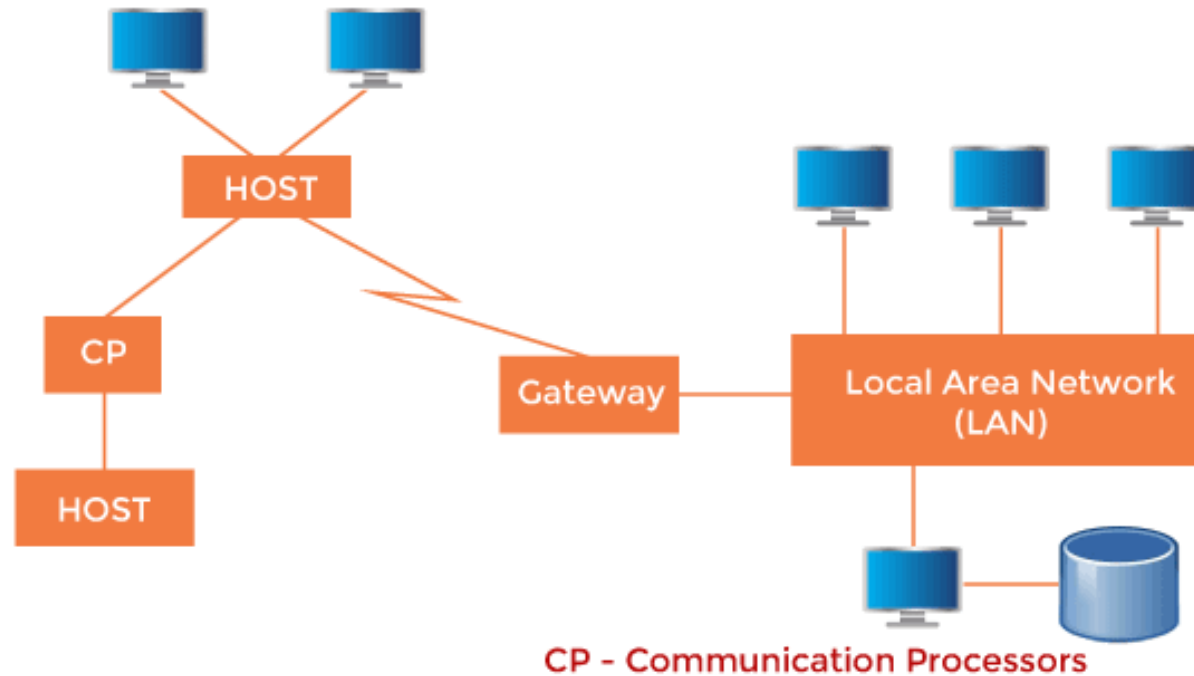
Timesharing in case of 8 users

- Various autonomous interconnected computers communicate with each other using a shared communication network.
- Independent systems possess their own memory unit and CPU. i.e loosely coupled systems
- These systems' processors differ in size and function
- remote access is enabled within the devices connected in that network
- i.e, user can access the files or software which are not actually present on his system

- Advantages
 - Failure of one does not affect the other
 - Since resources are being shared, computation is highly fast and durable.
 - easily scalable
 - Delay in data processing reduces
- Disadvantages
 - Failure of the main network will stop the entire communication
 - Systems are not readily available & very expensive

Architecture of Distributed OS





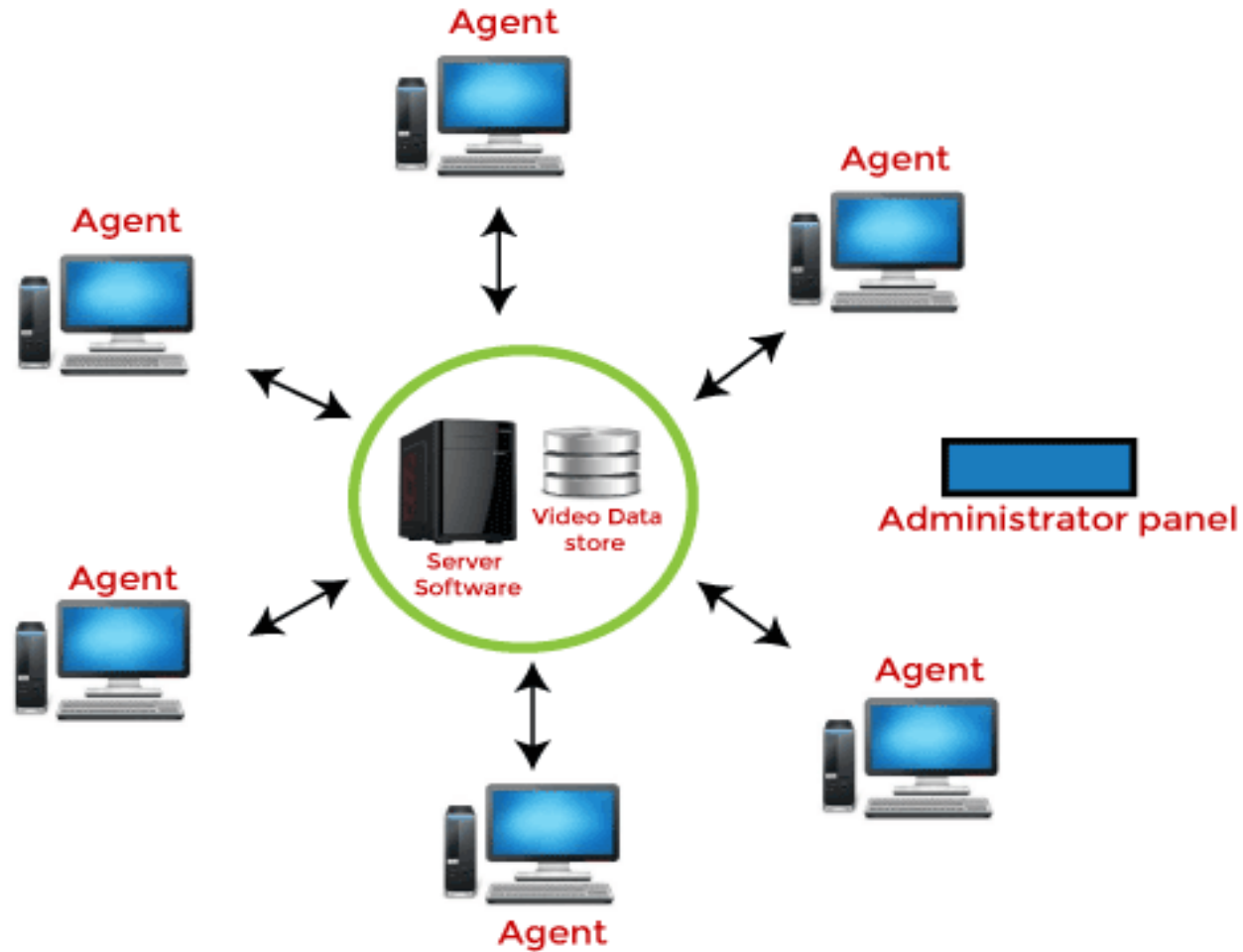
A Typical View of a Distributed System

- These systems run on a server and provide the capability to manage data, users, groups, security, applications, and other networking functions
- Operating systems allow shared access to files, printers, security, applications, and other networking functions over a small private network
- All the users are well aware of the underlying configuration, of all other users within the network, their individual connections
- Tightly coupled systems

- Advantages
 - High stable centralized servers
 - Upgradation of hardware is easily possible
 - Server access from remote location is possible
- Disadvantages
 - Servers are costly
 - User has to depend on central location for most operations
 - Systems are not readily available & very expensive
 - Maintenance and updates should be done of regular basis

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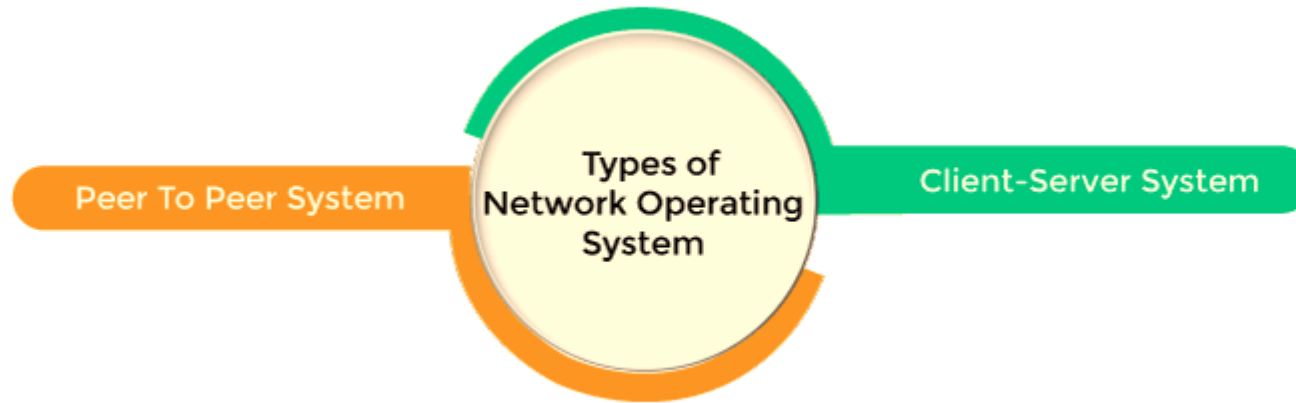
Network OS



Network Operating Systems

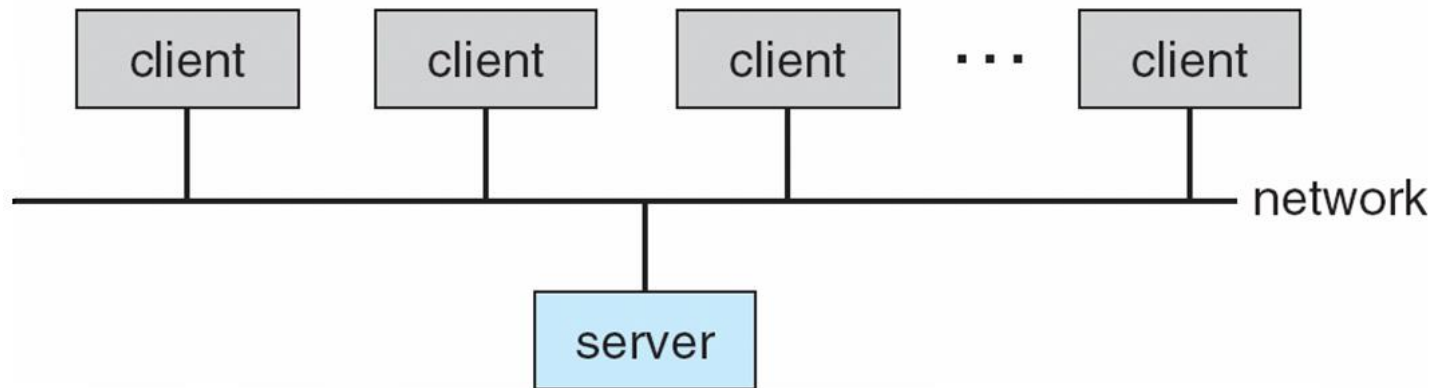
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Network OS



Client-Server Computing

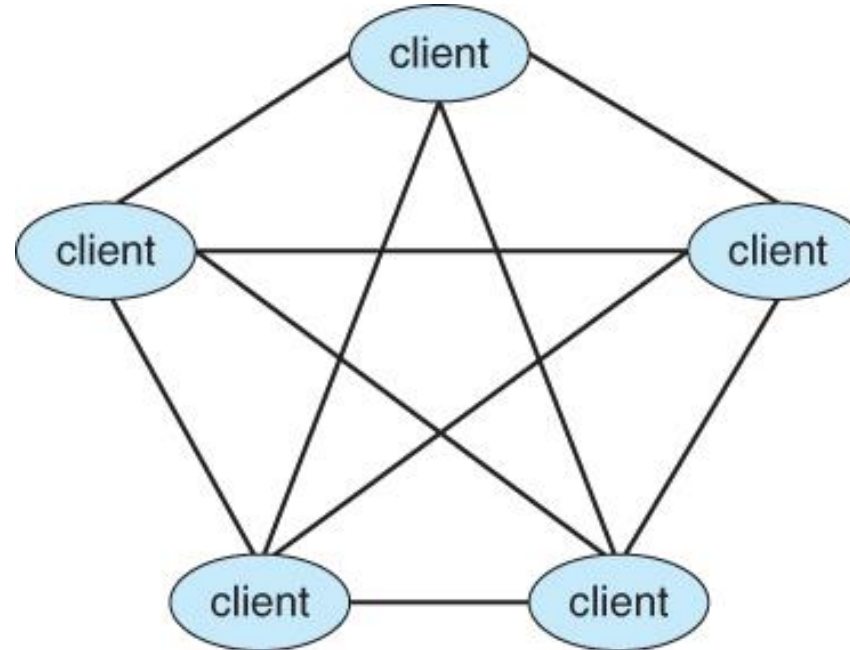
- A server is a central node that services many client nodes
- **Compute-server** provides an interface to client to request services (i.e., database)
- **File-server** provides interface for clients to store and retrieve files



General structure of a client-server system

Peer-Peer Computing

- Does not distinguish clients and servers
- Instead all nodes are considered peers
- May each act as client, server or both
- Node must join P2P network
- Registers its service with central lookup service on network, or
- Broadcast request for service and respond to requests for service via discovery protocol

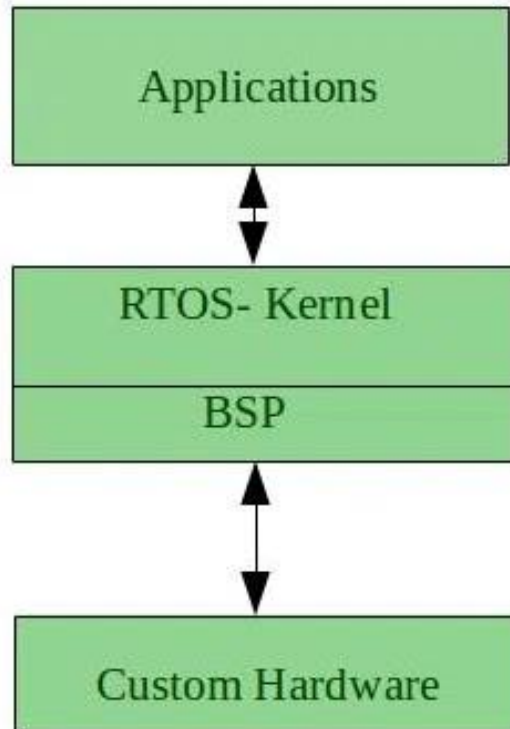


- OS used in real-time systems
- The time interval required to process and respond to inputs is very small
- i.e, the response time is highly reduced.
- This OS is always online and has fixed time constraint
- Example: Missile systems, air traffic control systems, robots, etc
- It is of two types: **Hard-real time systems** and **Soft-real time systems**
- Hard real time systems are restrictive for timing whereas soft real time systems are less restrictive.
- The utility of soft real time systems is limited in comparison to hard real time systems.

- Advantages
 - Maximum consumption of resources
 - Increased utilization of resources
 - Error free
- Disadvantages
 - Limited tasks
 - Use heavy system resources
 - Complex Algorithms

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Real time Operating System





THANK YOU

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