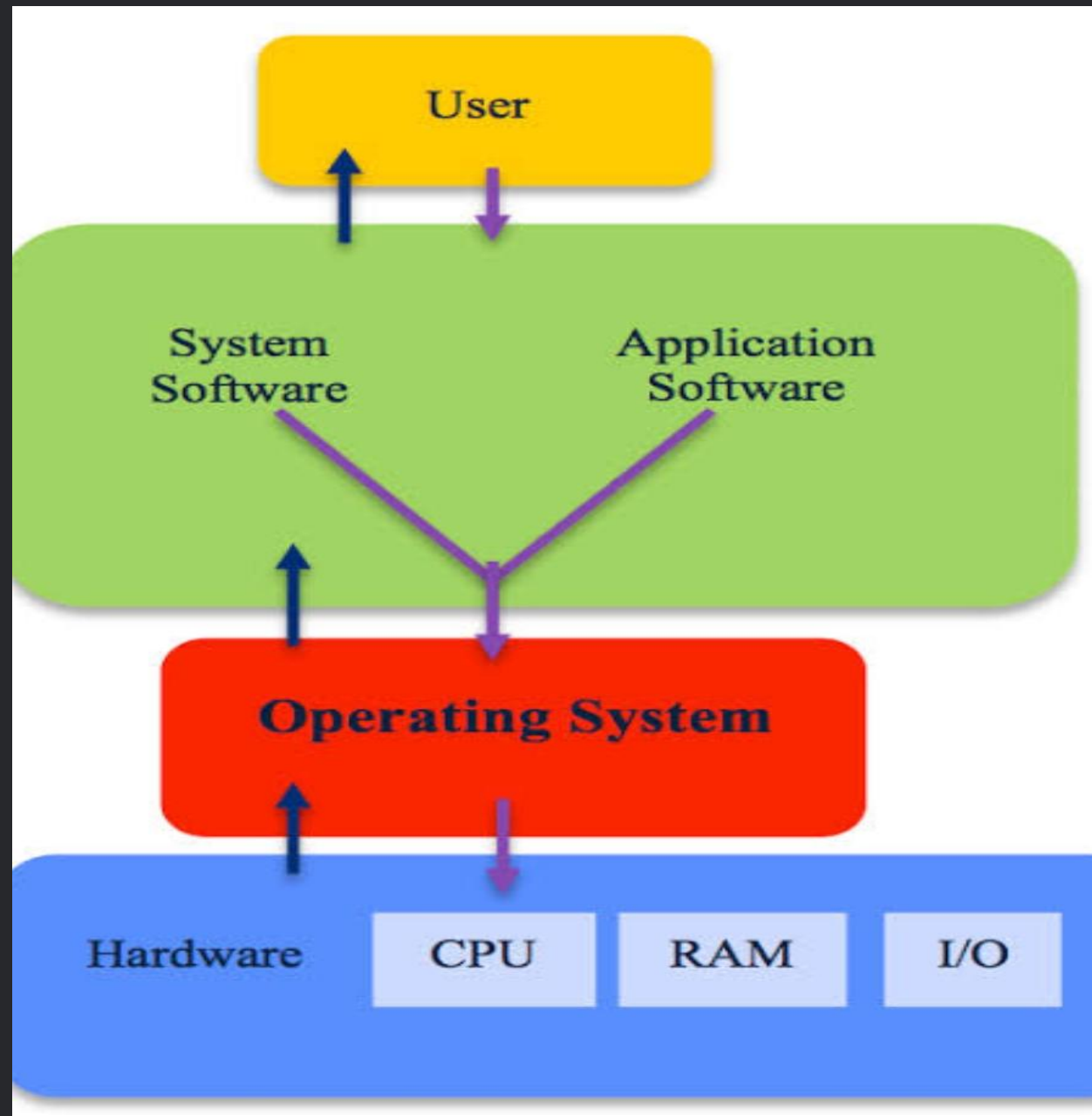


Operating System

An operating system (OS) is system software that manages computer hardware, software resources, and provides common services for computer programs. An Operating System (OS) is an interface between a computer user and computer hardware.

Some popular Operating Systems include Linux Operating System, Windows Operating System, VMS, OS/400, AIX, z/OS, etc.



Operating System as a resource manager

Operating system also known as the resource manager means operating system will manage all the resources those are attached to the system means all the resources like memory and processor and all the input-output devices those are attached to the system are known as the resources of the computer system

Functions of Operating System

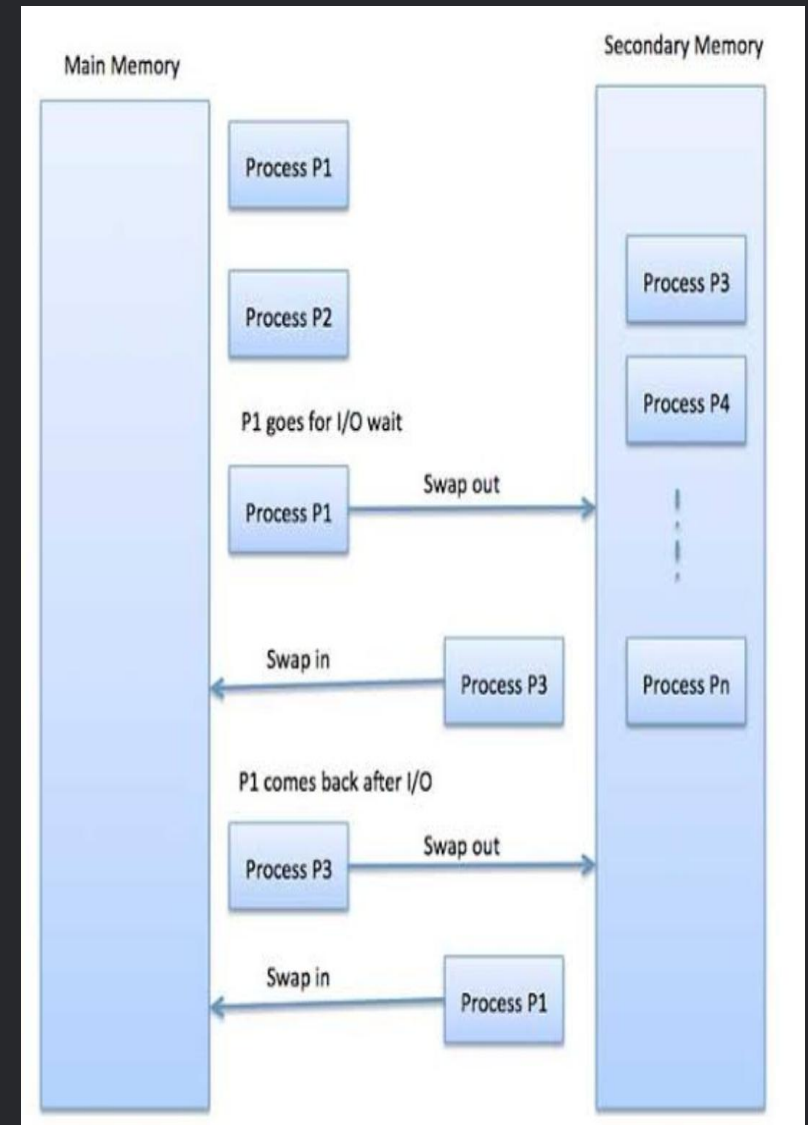
- ☐ Memory Management
- ☐ Process Management
- ☐ Storage Management
- ☐ Security
- ☐ Other functions are I/O System Management, job accounting, device management.

Memory Management

It is the management of the main or primary memory. There can be more than one program present at a time. Hence, it is required to manage the memory. Allocates and deallocates the memory.

The following are the three key memory management techniques used by an operating system:

- Segmentation
- Paging
- Swapping



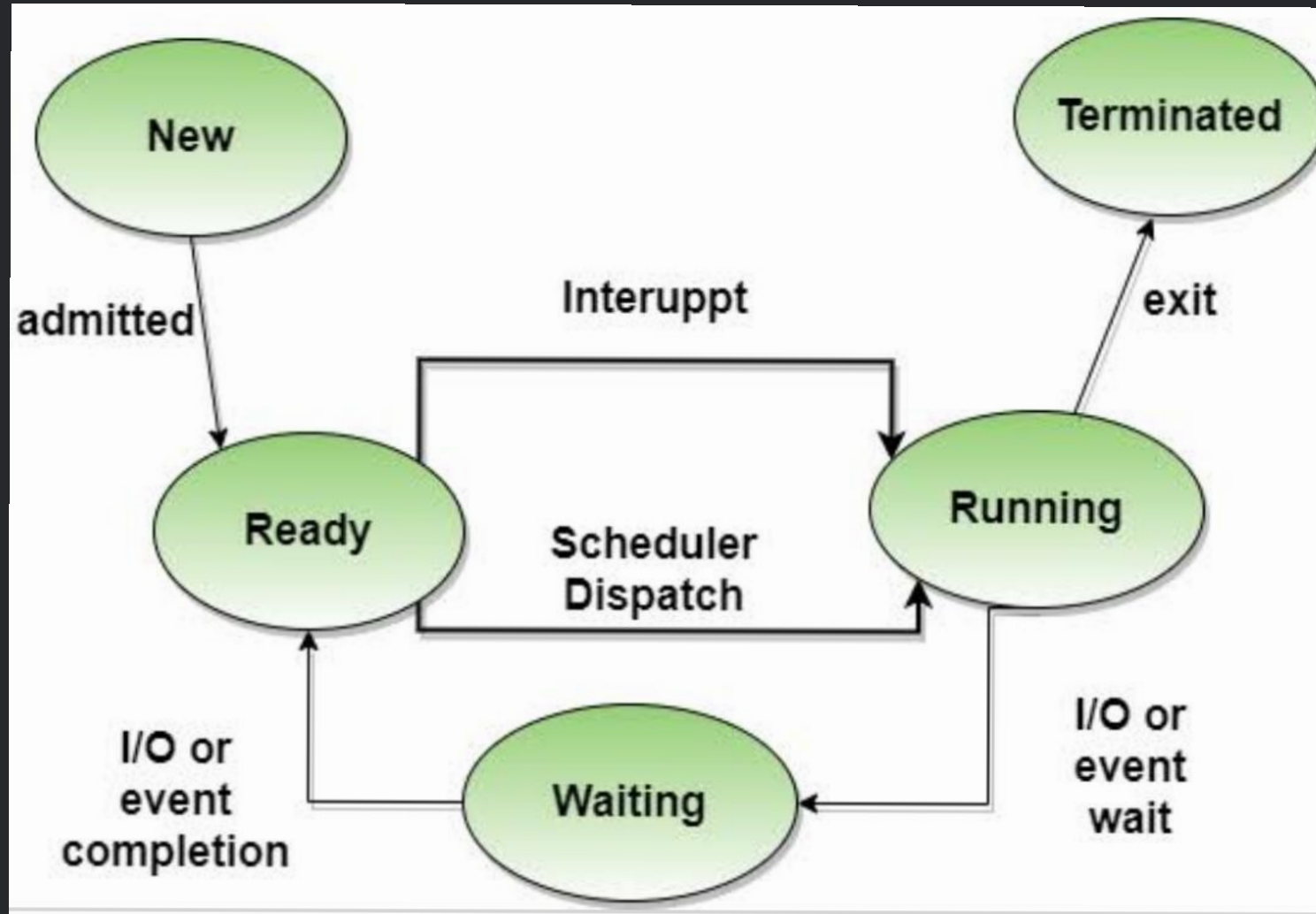
Process Management

Process management involves various tasks like creation, scheduling, termination of processes, and a dead lock. A process is basically a program in execution. The execution of a process must progress in a sequential order.

The sequence are:-

- Process State
- Process Control Block (PCB)
- Process Operations
- Process Scheduling
- Process Synchronization
- Interprocess Communication
- Deadlock

Process state



Process Control Block

Process Id
Process state
Program counter
Register information
Scheduling information
Memory related information
Accounting information
Status information related to I/O

1. Process Id: A unique identifier assigned by the operating system
2. Process State: Can be ready, running, etc.
3. Program counter :-cpu register or Program Counter holds the address of the next instruction to be executed for that process.
5. Accounts information: It includes the amount of CPU and time utilities like real time used, job or process numbers, etc.
6. I/O status information: For example, devices allocated to the process, open files, etc
7. Memory Management information: For example, page tables or segment tables.
8. CPU scheduling information: For example, Priority (Different processes may have different priorities, for example a short process may be assigned a low priority in the shortest job first scheduling)

Process Scheduling

When there are two or more runnable processes then it is decided by the Operating system which one to run first then it is referred to as Process Scheduling.

Types of Schedulers

There are three types of schedulers available:

1. Long Term Scheduler

a. job scheduler

b. Speed less

No time sharing

2. Short Term Scheduler

Speed fast

Time sharing

Ready to running


enhance CPU performance and increase process execution rate.

3. Medium Term Scheduler

a. swapping.

Time sharing use

Speed fast

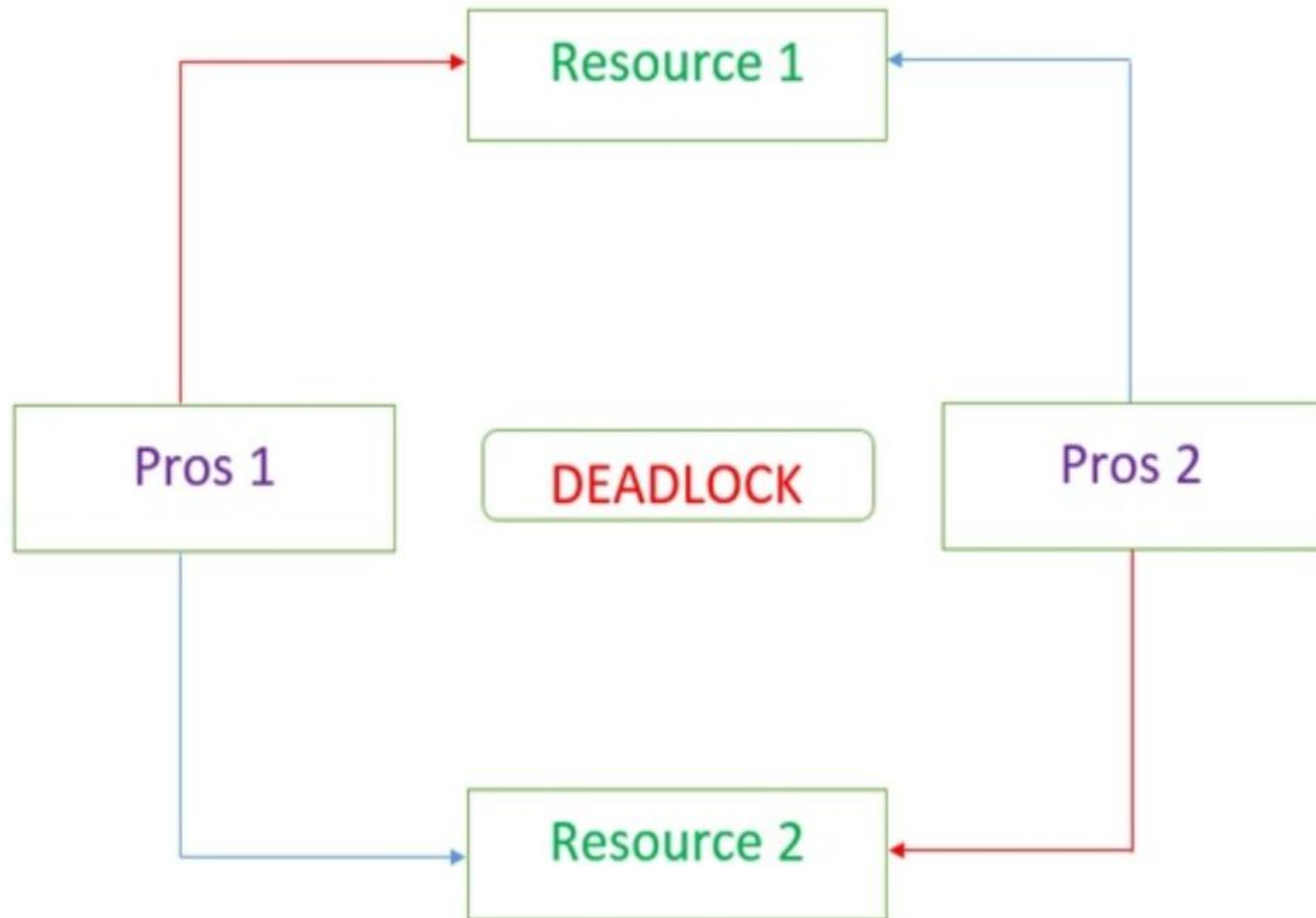
The background features several overlapping triangles in shades of green, orange, and purple on a dark grey background. The green triangles are in the upper left, the orange triangles are in the lower left, and a purple triangle is also in the lower left area.

Process Synchronization

It is the task phenomenon of coordinating the execution of processes in such a way that no two processes can have access to the same shared data and resources.

Deadlock

- Deadlock is a situation that occurs in OS when any process enters a waiting state because another waiting process is holding the demanded resource.
- Circular Wait
- Mutual exclusion: resource use only one process at a time
- Hold & wait
- Problem of multi programmed system





Storage Management

The operating system also controls all the storage operations means how the data or files will be stored on the computers and how the files will be accessed by the users etc.

These are given below:

1. Performance
2. Reliability
3. Recoverability
4. Capacity

Security

The operating system uses password protection to protect user data and similar other techniques. It also prevents unauthorized access to programs and user data.

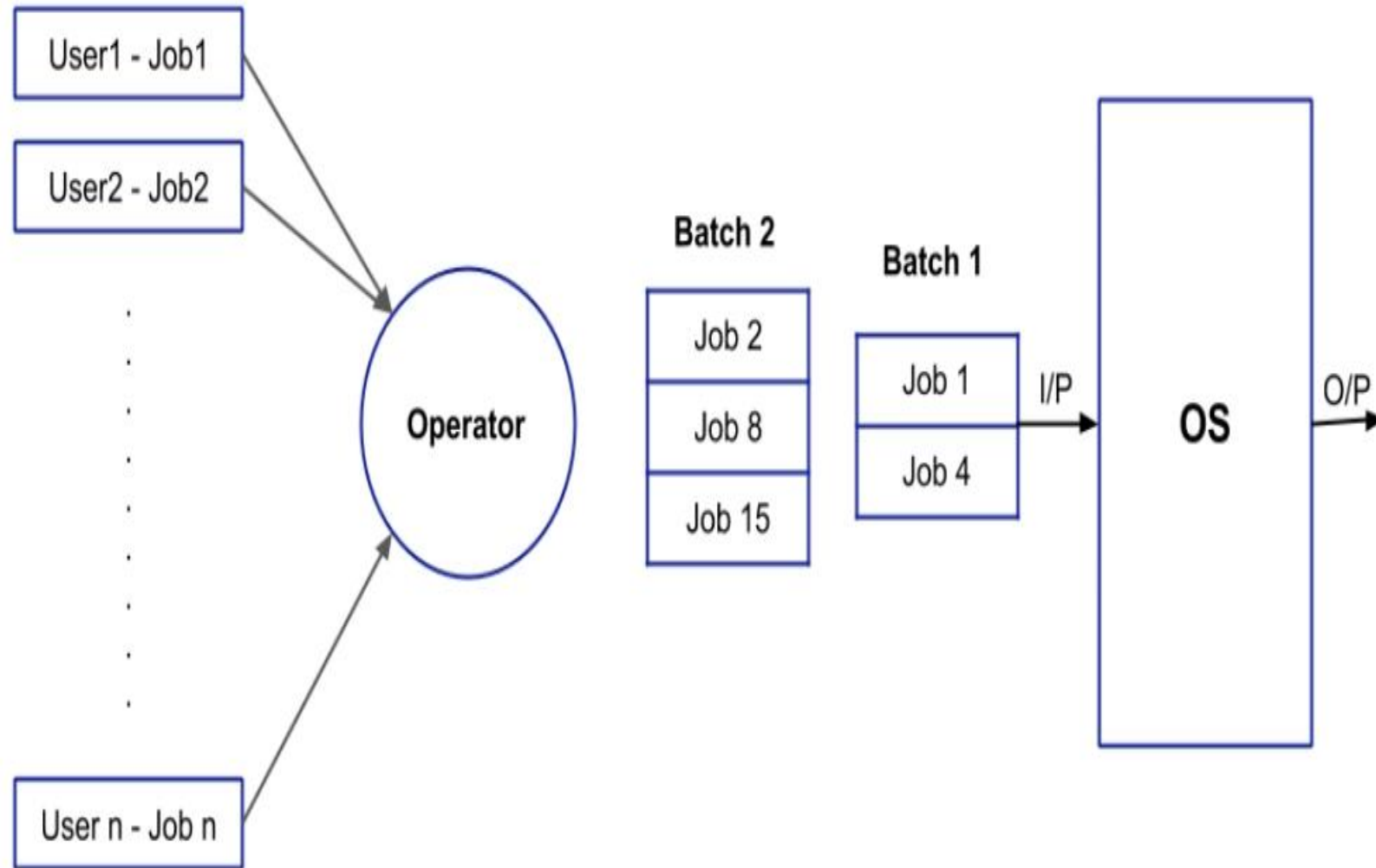
Types of Operating System

- ◆ Batch Operating System
- ◆ Real time Operating System
- ◆ Distributing Operating System
- ◆ Multiprocessing Operating System
- ◆ Network Operating System
- ◆ Time sharing Operating System
- ◆ Multiprogramming Operating System

Batch Operating System

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In a Batch Operating System, the similar jobs are grouped together into batches with the help of some operator and these batches are executed one by one.



Advantages and disadvantages

es

Advantages:

1. The overall time taken by the system to execute all the programmes will be reduced.
2. The Batch Operating System can be shared between multiple users.

Disadvantages

- Dependency of each other job.
- If job fails so waiting until repair.

Real Time Operating System

The Real-time Operating Systems are used in the situation where we are dealing with some real-time data. So, as soon as the data comes, the execution of the process should be done and there should be no delay.

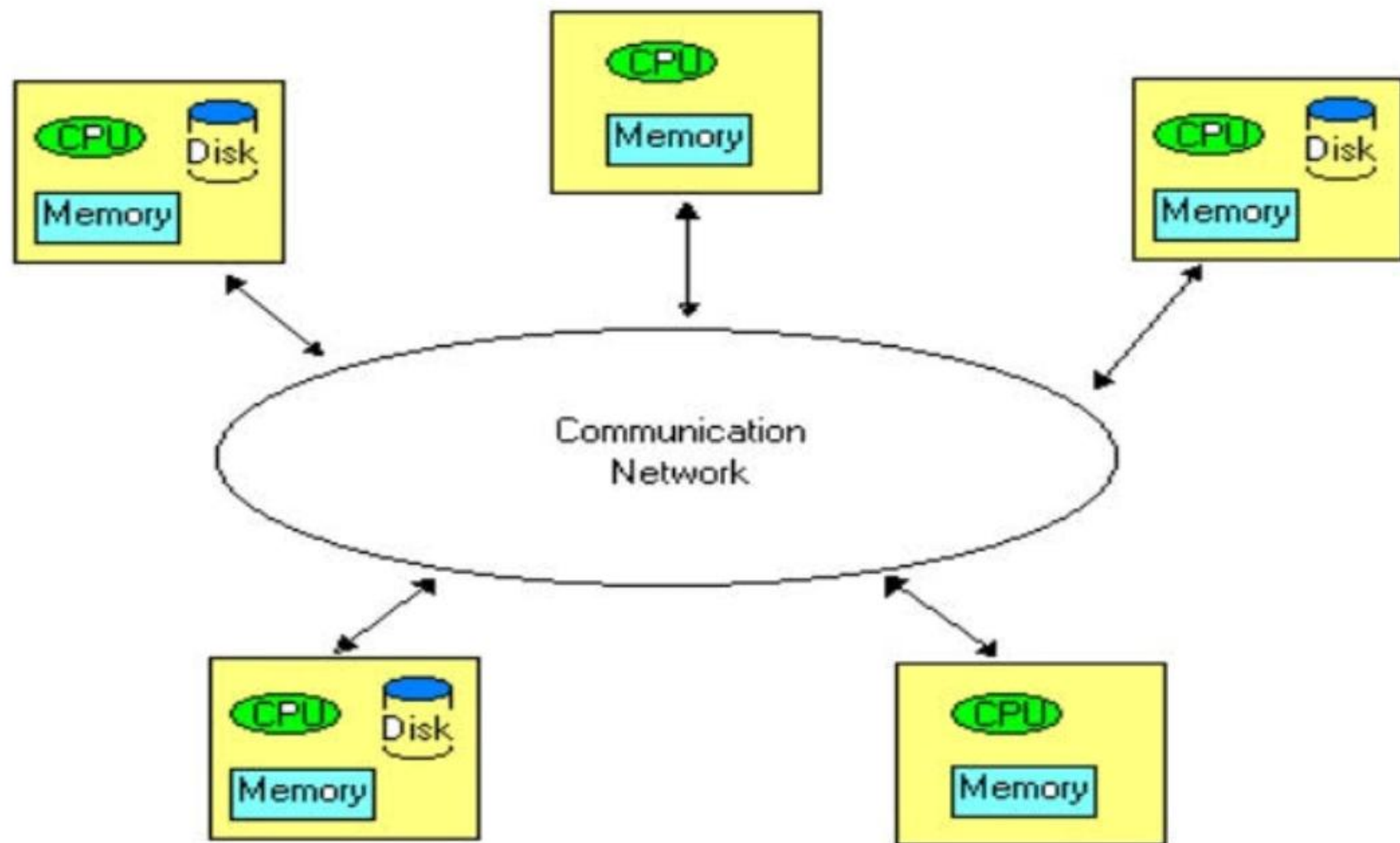
There are two types of Real-time Operating System:

Hard Real-time: In this type, a small delay can lead to drastic change. So, when the time constraint is very important then we use the Hard Real-time.

Soft Real-time: Here, the time constraint is not that important but here also we are dealing with some real-time data.

Distributing Operating System

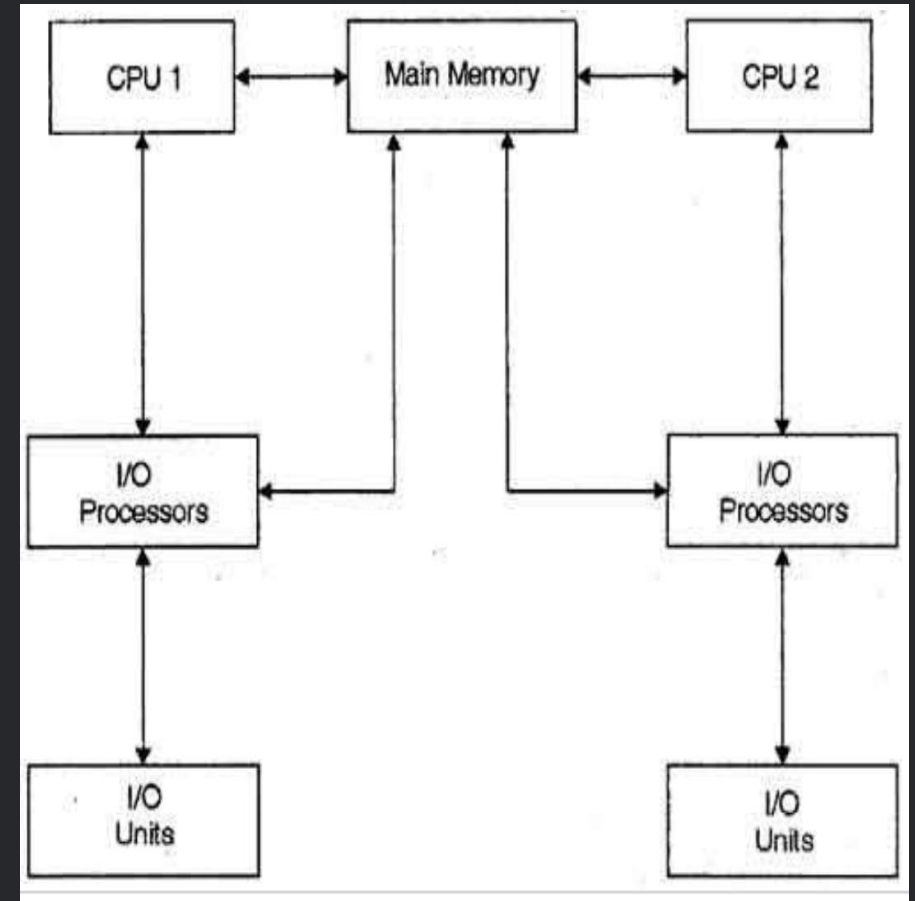
In a Distributed Operating System, we have various systems and all these systems have their own CPU, main memory, secondary memory, and resources. These systems are connected to each other using a shared communication network. Here, each system can perform its task individually. The best part about these Distributed Operating System is remote access i.e. one user can access the data of the other system and can work accordingly. So, remote access is possible in these distributed Operating Systems



Multiprocessing Operating System

Multiprocessor Operating System refers to the use of two or more central processing units (CPU) within a single computer system. These systems are referred to as tightly coupled systems.

These types of systems are used when very high speed is required to process a large volume of data. These systems are generally used in environment like satellite control, weather forecasting etc.



Network Operating System

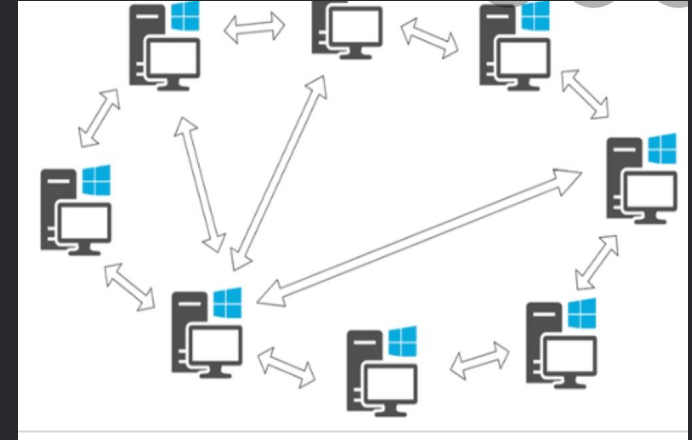
Network Operating System is a computer operating system that facilitates to connect and communicate various autonomous computers over a network. An Autonomous computer is an independent computer that has its own local memory, hardware, and O.S. It is self capable to perform operations and processing for a single user. .



Network Operating System

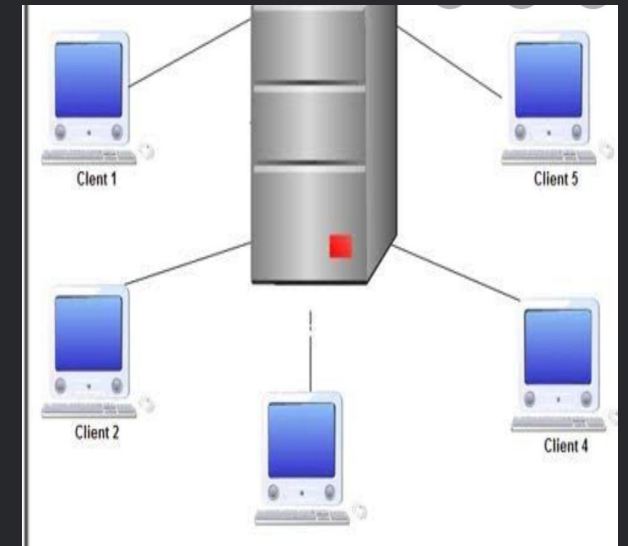
Peer to peer

Peer-to-Peer Network Operating System is an operating system in which all the nodes are functionally and operationally equal to each other.



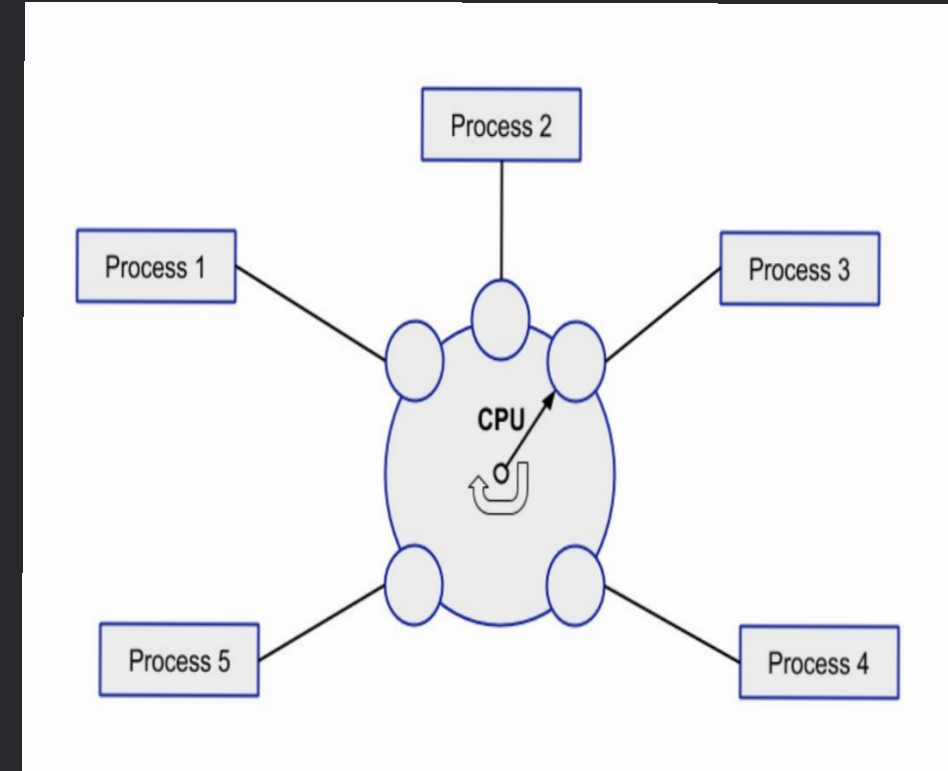
Client server

The Client-Server Networking Operating System operates with a single server and multiple client computers in the network.



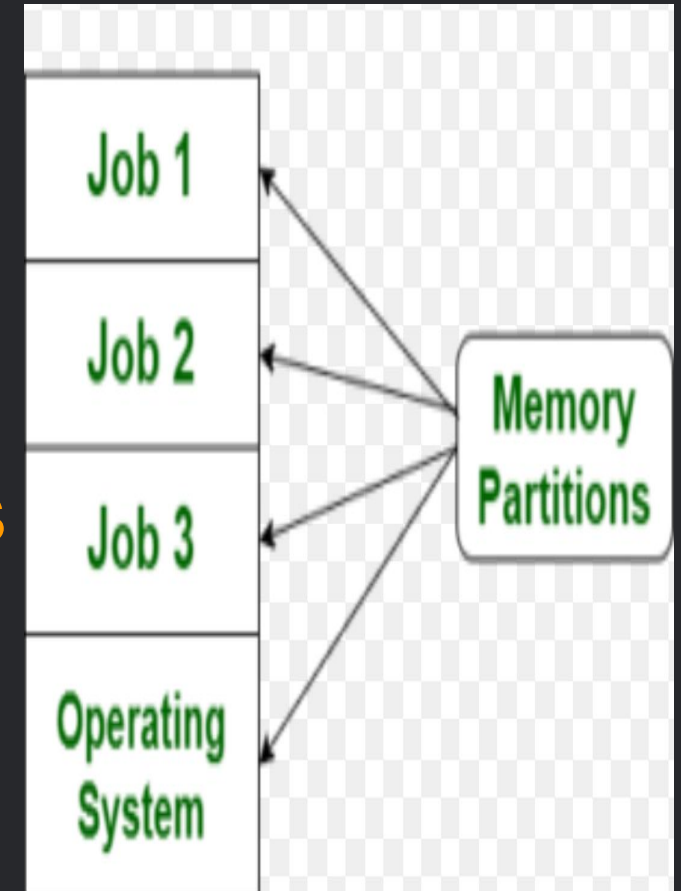
Time sharing Operating System

In a Multi-tasking Operating System, more than one processes are being executed at a particular time with the help of the time-sharing concept.



Multiprogramming Operating System

Multiprogramming operating system has ability to execute multiple programs with using of only one processor machine . One example is User can use MS-Excel , download apps, transfer data from one point to another point, Firefox or Google Chrome browser, and more at a same time.



File System

A file is a collection of related information that is recorded on secondary storage. file system keeps track of where a file is actually resident on a disk.

A disk (hard disk, floppy, optical disk) is subdivided into directories or folders.

Attributes of a File

Following are some of the attributes of a file:

Name. It is the only information which is in human-readable form.

Identifier. The file is identified by a unique tag(number) within the file system.

Type. It is needed for systems that support different types of files.

Location. Pointer to file location on device.

Size. The current size of the file.

Protection. This controls and assigns the power of reading, writing, executing.

Time, date, and user identification. This is the data for protection, security, and usage monitoring.

Directories

Information about files is maintained by Directories. A directory can contain multiple files. It can even have directories inside of them. In Windows, we also call these directories as folders. Following is the information maintained in a directory:

- Name The name visible to the user.

- Type: Type of the directory.

- Location: Device and location on the device where the file header is located. etc

File Management System Objective

S: -

- Meet the data management needs of the user

- Optimize performance

- Provide I/O support for a variety of storage device types

- Minimize the potential for lost or destroyed data

- Provide I/O support for multiple users in the case of multiple user systems



Thank you