Operating Systems Concepts

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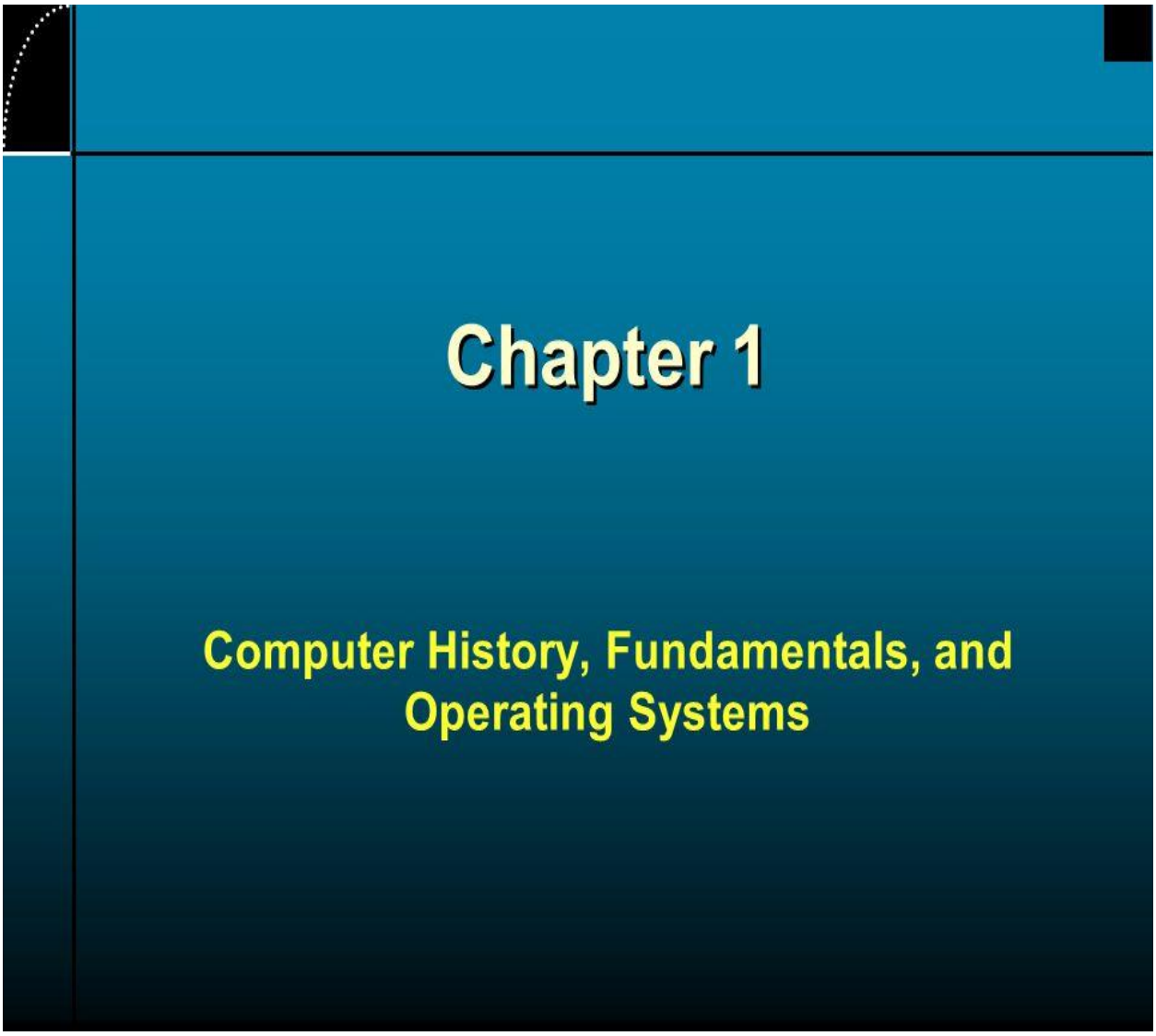
Chapter 1

Introduction to O . S



1. Introduction to O/S.

1.1 O/S Definitions:

1- An operating system is **software** that acts as an interface between the user and the computer hardware and controls the execution of all kinds of programs.

2- O/S is **resources manager**, where the main resource it manage is computer H/W (processor, storage, I/O devices, communication devices, etc), and data.

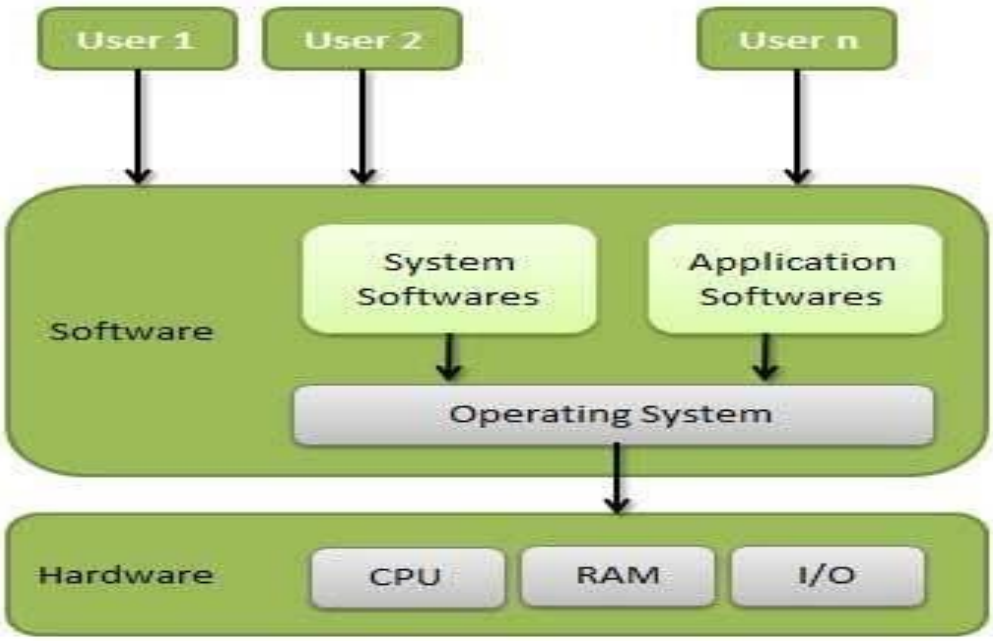
1.2 Computer System Components:

1- The **Hardware** (CPU, Memory, I/O devices).

2- Operating System (O/S).

3- **Application Programs** (Assembler, Data base, Compilers, Text Editor).

4- The **user** (People, Machines, Other Computers).


User 1
User 2
User n
Software
System Softwares
Application Softwares
Operating System
Hardware
CPU
RAM
I/O

1.3 O/S Goals:

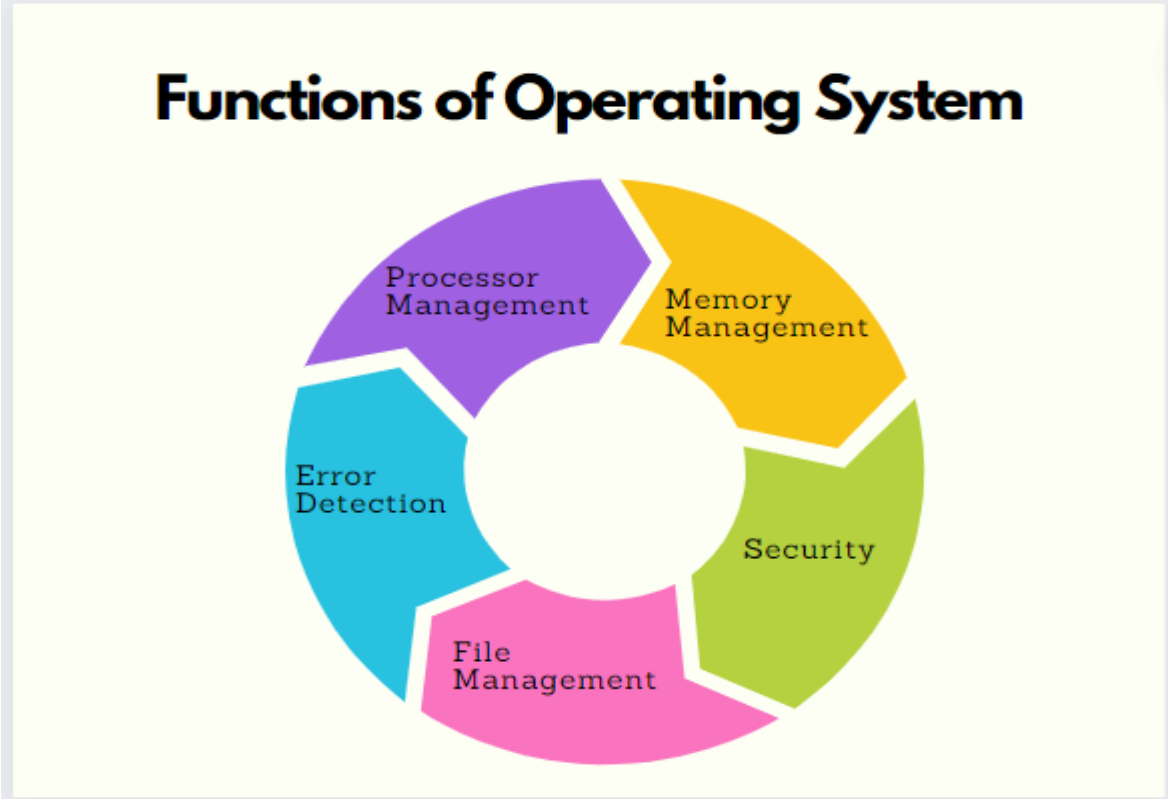

Objectives of
Operating System

1- Make computer system convenient to use.

2- Use the computer H/W in an efficient manner.

3- Execute programs.

1.4 The O/S Functions:



1- Implementing the user interface.
2- Scheduling resources among users.
3- INPUT/OUTPUT Management.
4- Memory Management.
5- Process Management.
6- Processor Management.
7- Recovering from errors.
8- Accounting.

1.5 The O/S development history:

1.5.1 The 1940's and 1950's

- The programs were entered on **punched cards**.
- The first O/S implemented in **1950's**, this system ran one job at a time.
- This type of O/S called **Batch processing system**.

1.5.2 O/S 1960'S

- Running several jobs at once.
- The O/S designers developed the concept of multiprogramming and software engineering.

1.5.3 O/S 1970'S

- Time-sharing system.
- Real-time application.

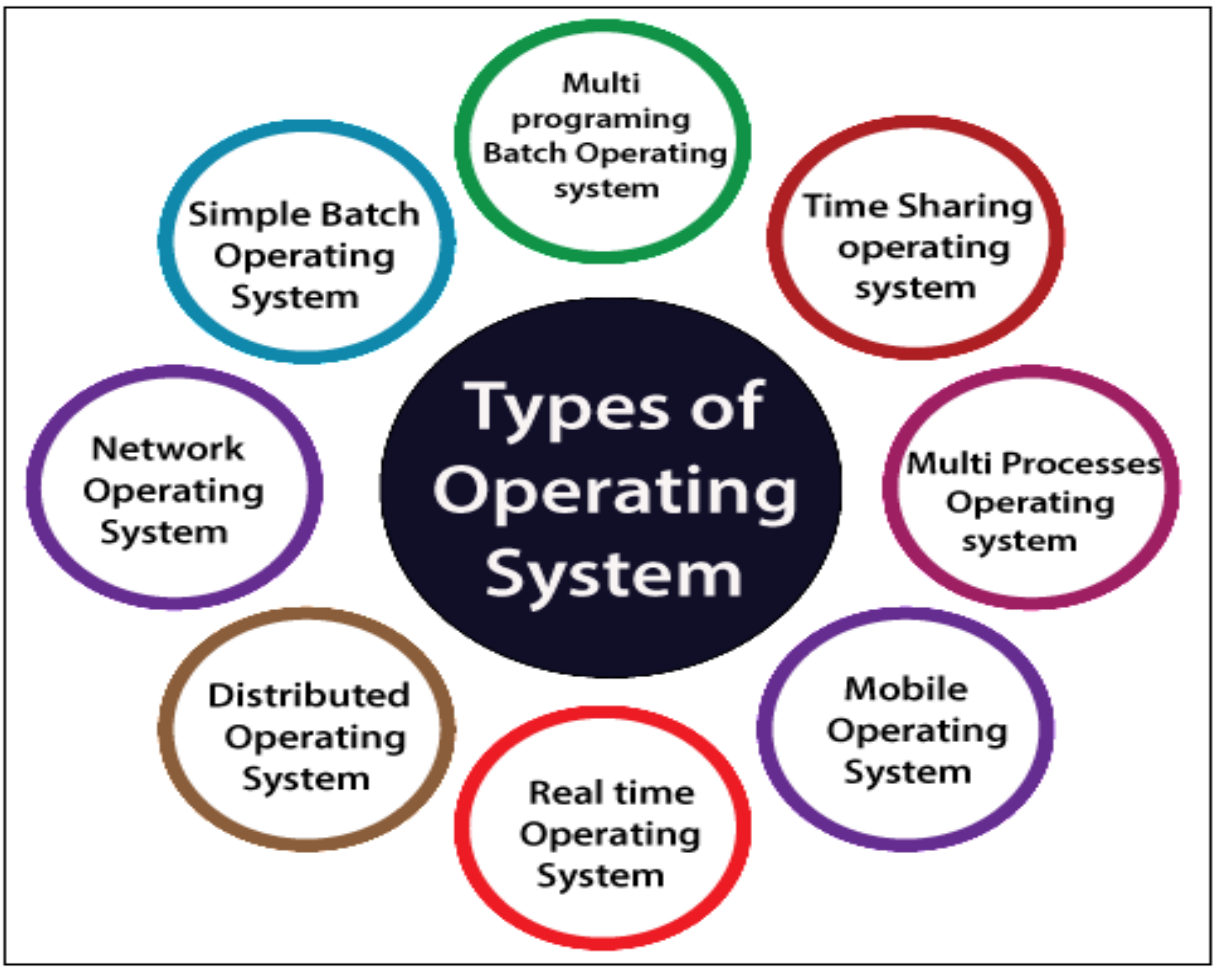
1.5.4 O/S 1980's

- Decade of PCs and workstation.
- Software Application is available such as: Word processing, database packages, and graphics
- E-mail.
- Client/ server model.

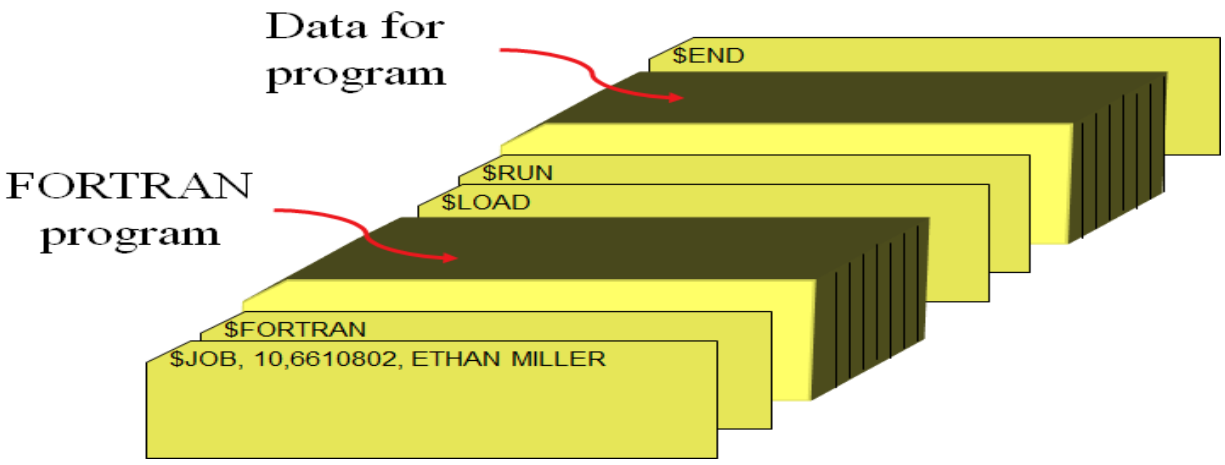
1.5.5 O/S 1990'S and beyond

- Distributed computing.
- Networks.

1.5.6 O/S Categories:



1- Batch System



In this type of O/S, users submit jobs on regular scheduling (daily, weekly, monthly) to a central place where the user of such system did not interact directly with C/S. The programs were entered on punched cards, and run one job at a time.

Advantages: Very simple.

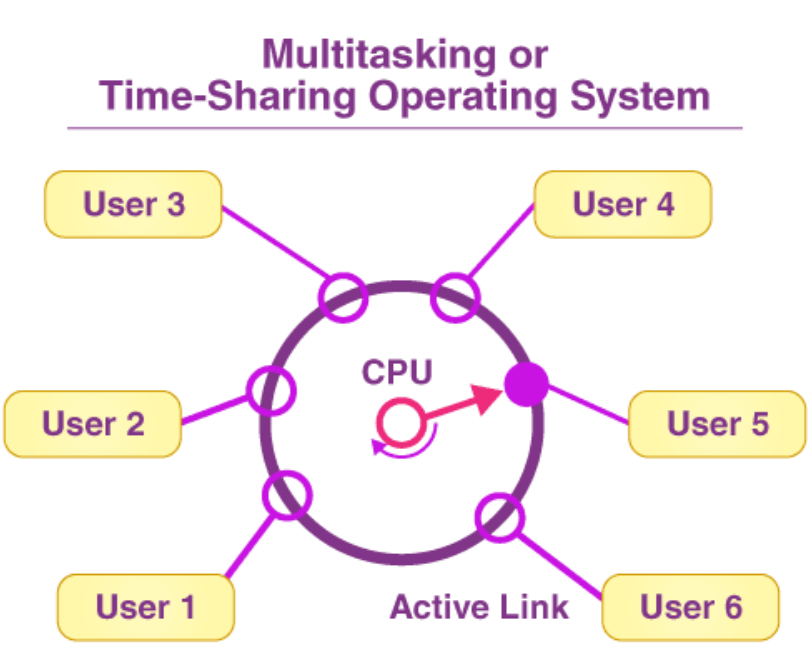
Disadvantages:

a. There is a delay between the job submission and the job completion (called **turnaround time**).

b. The CPU is often idle, because the speeds of the mechanical I/O devices are slower than those of electronic devices.

Example: slower CPU executes thousands of instruction per second, while fast card reader read 1200 cards per minute (20 cards per second).

2- Time sharing system (Multi tasking system), (Interactive system).

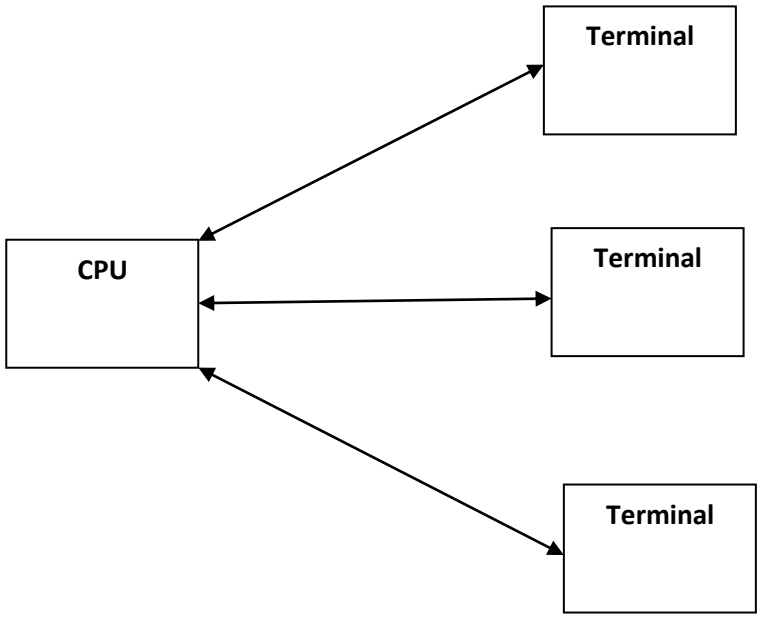


It is an on-line communication between the user and the system; it allows many users simultaneously **share** the computer system where **little** CPU time is needed for each user.

Advantages:

1. Reduce the CPU idle time.
2. Minimize Response time.

Disadvantages: More complex, difficult and expensive to build.



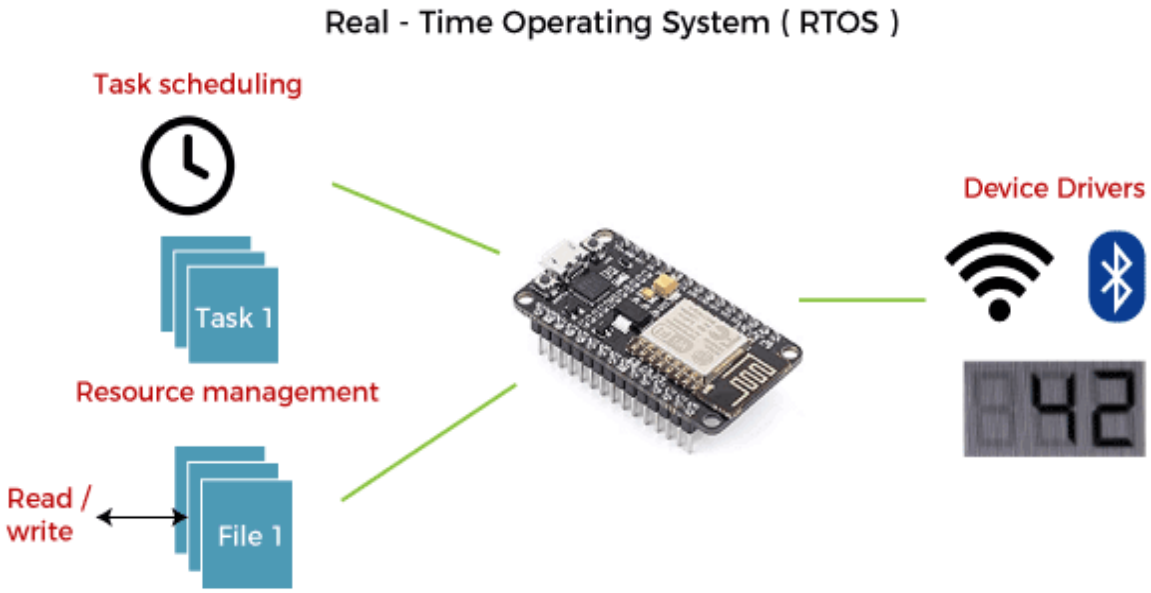
Time-sharing system

3- Real-Time Systems:

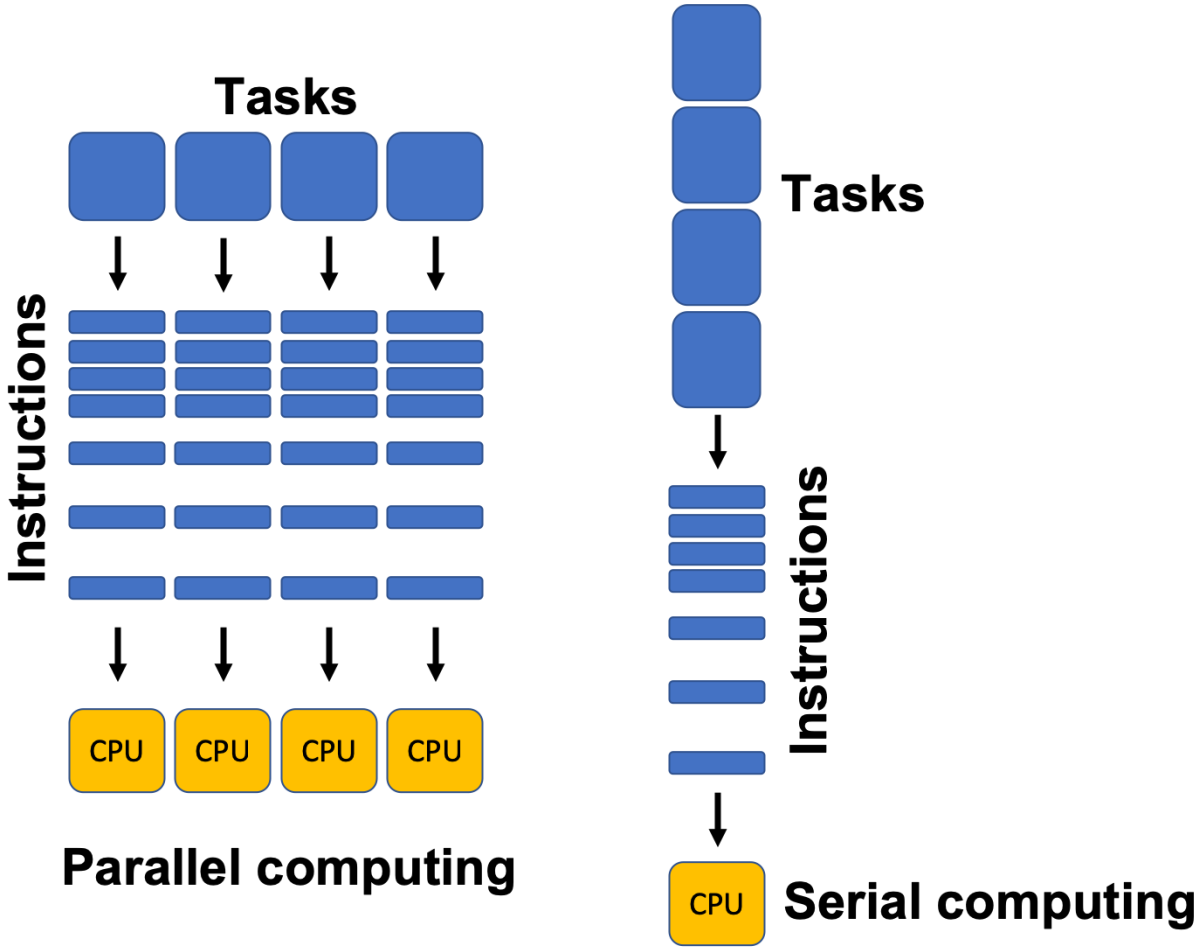
Often used as a control device in a dedicated application such as controlling scientific experiments, medical imaging systems, industrial control systems, and some display systems.

Advantages: Critical tasks complete on time.

Example: Airline Reservation system.



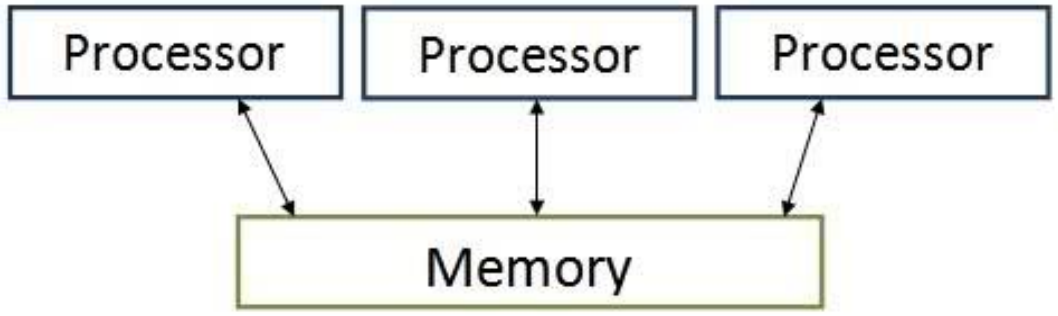
4- Parallel systems:

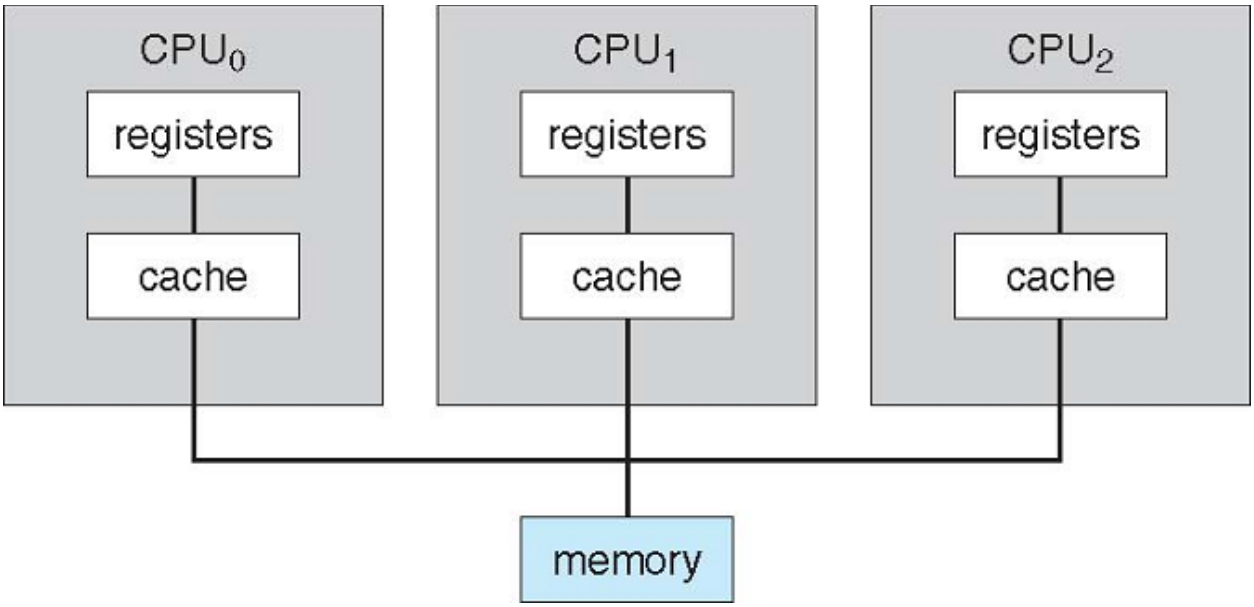


It is **multi processor** system, where such systems have more than one processor in close communication sharing the computer Bus, the Clock, Memory, and peripheral devices.

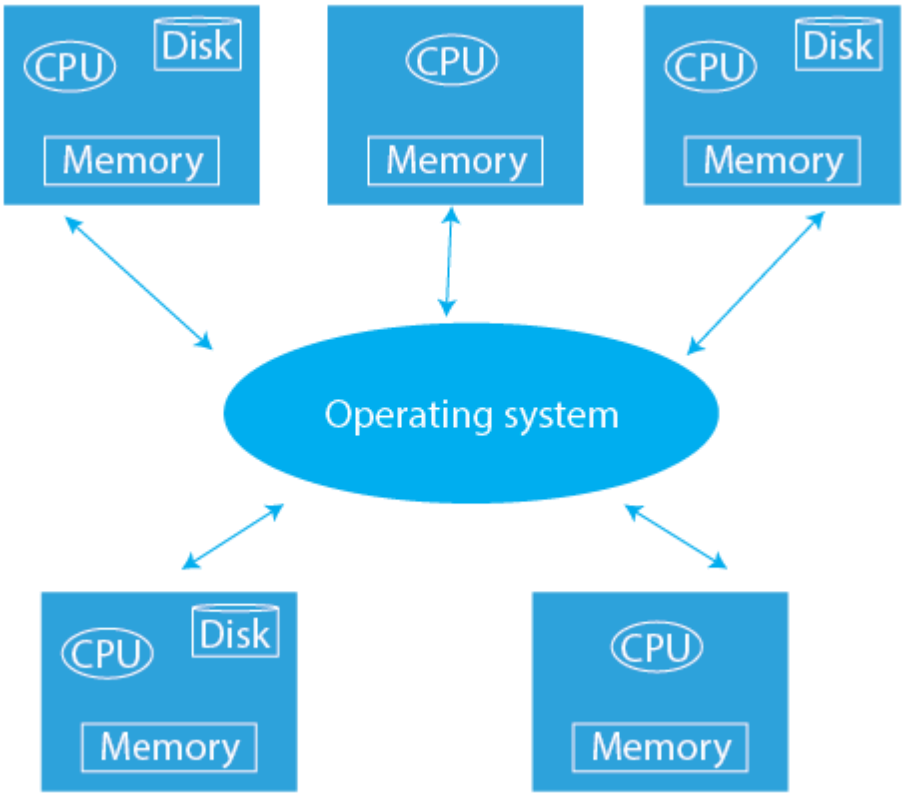
Advantages:

a. Increase Throughput.
(**Throughput:** is the number of jobs completed in unit of time.)
b. Increase reliability.
c. save money.





5- Distributed Systems:



It is **multi processor** system, the processors do not share memory and clock, each processor has its own local memory, the processors communicate with one another through communication lines, such as high speed buses, LAN, WAN.

Advantages:

a. Resource Sharing.
b. Computation speeds up.
c. Communications.
d. Reliability.

6- Desktop systems:

Computer system dedicated to a single user.

7- Handheld systems:

a. Personal Digital Assistants.

b. Cellular telephones.

Issues:

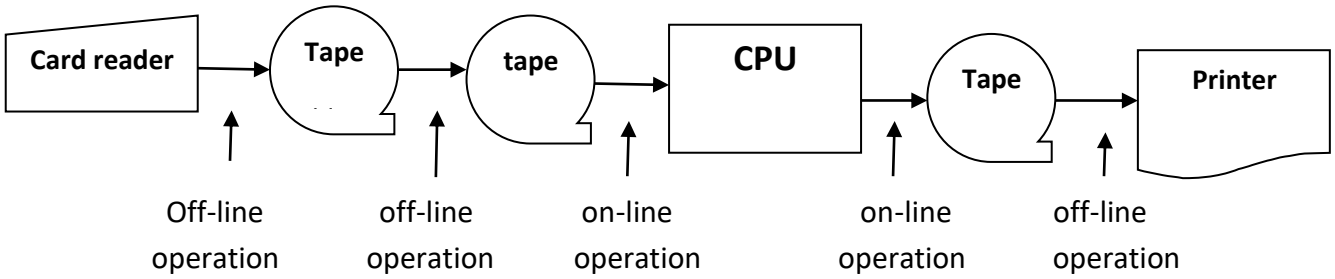
1. Limited memory.
2. Slow processors.
3. Small display screens.

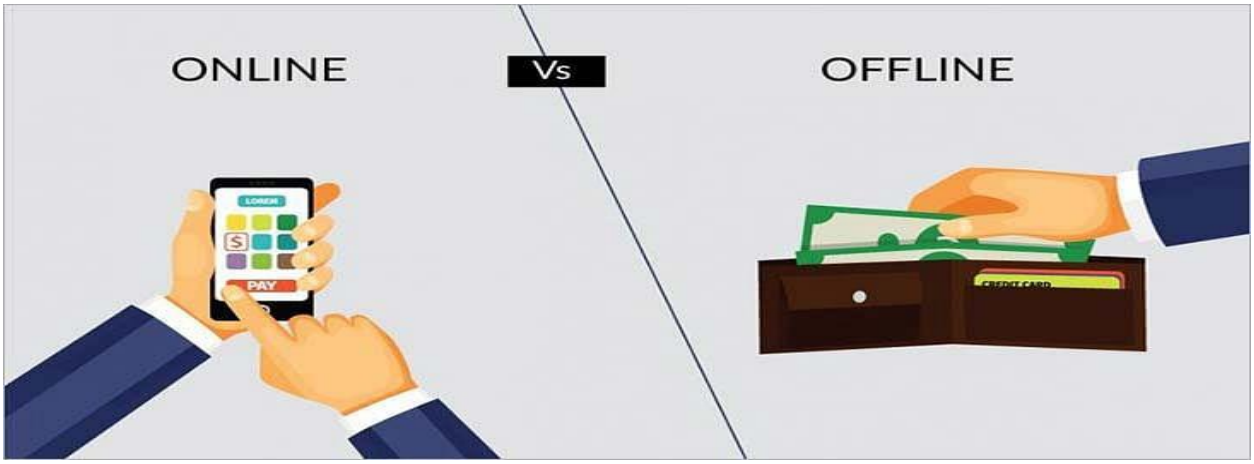
1.7 Performance Development

1.7.1 On-Line and Off-Line operations

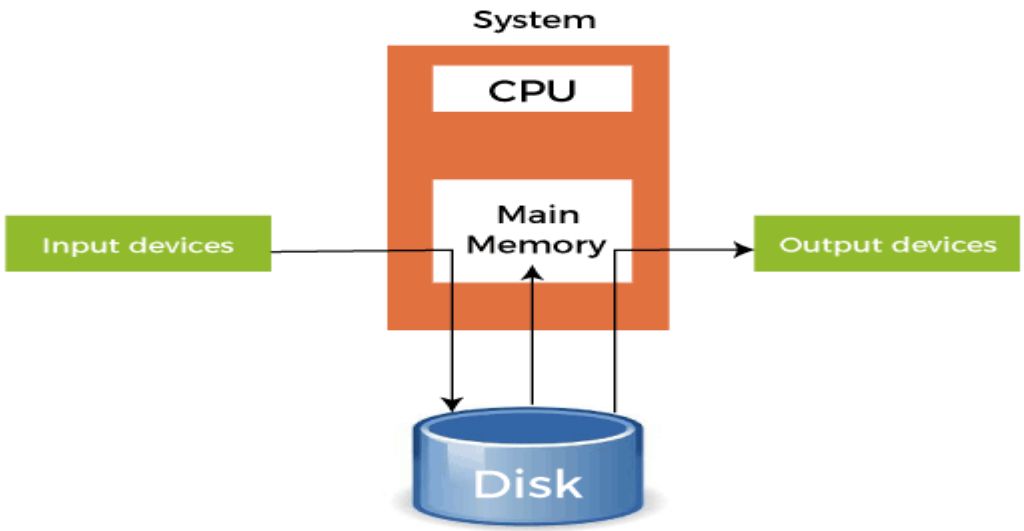
1. **On-Line Operation:** in which they are connected to the processor.

2. **Off-Line Operation:** in which they are **not** connected to the central C/S.


Card reader
Tape
tape
CPU
Tape
Printer
Off-line operation
off-line operation
on-line operation
on-line operation
off-line operation


ONLINE
Vs
OFFLINE
PAY

1.7.3 Spooling (Simultaneous Peripheral Operation on- Line)

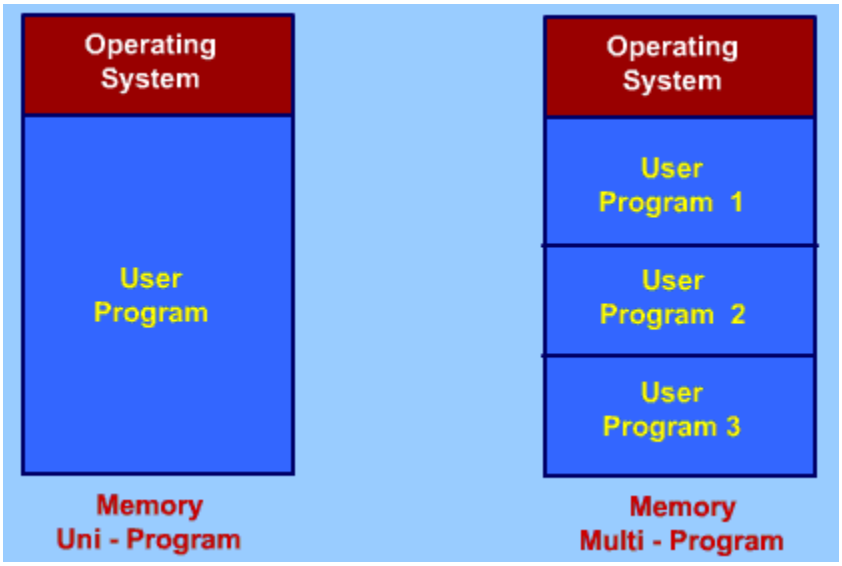


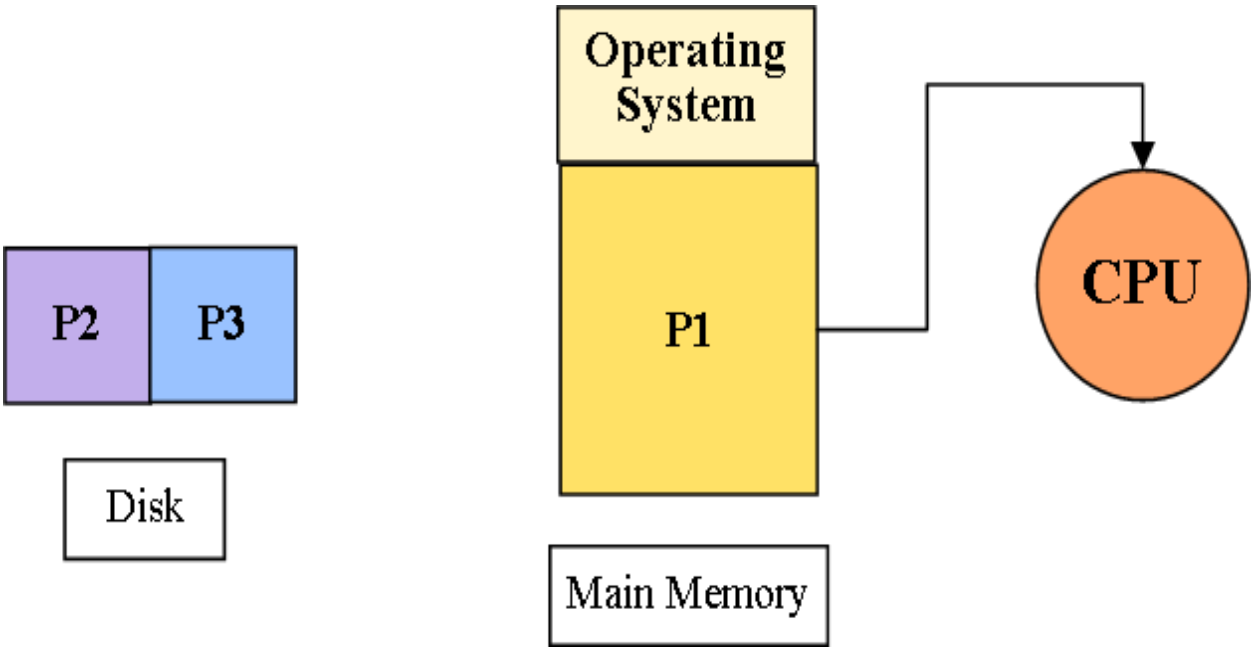
1. The Spooling Operation uses a disk as a very large buffer for reading and for storing output files.
2. Rather than the cards being read from the card reader directly into memory, the cards are read directly from the card reader onto the disk, the operating system satisfies its requests by reading from the disk, similarly when the job requests the printer to output a line.

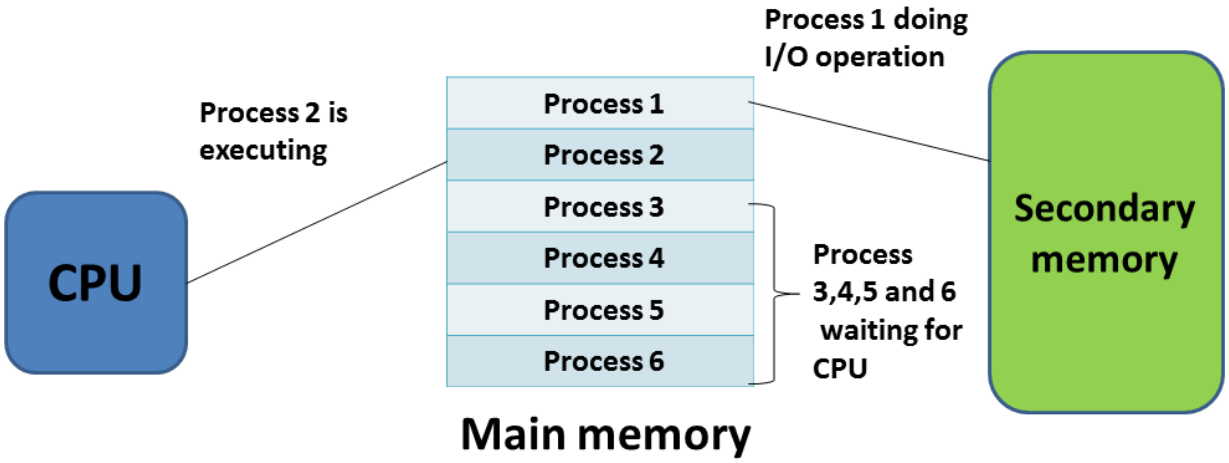
Advantages:

Spooling can keep both CPU and the I/O devices working as much higher rates.

1.7.4 Multiprogramming







In multiprogramming system, when a job may have to wait for any reason such as an I/O, the o/s simply switches to and executes another job.

In a non-multiprogramming system (uni-programming), the CPU would sit idle. (Inefficient)

Advantages:

1. Maximize CPU utilization. (The CPU will never be idle)

2. High and efficient CPU utilization.

CHAPTER 1 review QUESTIONS

1. What is an Operating System?

2. What are the **purposes** (goals) of an operating system?

3. In what system the CPU is often **idle**? Explain the reason.

4. In what kind of processing we can keep both the CPU and the I/O devices working at higher rates? Explain.

5. In what kind of system the **CPU will never be idle**? Explain how this system works, with drawing.

6. In what kind of system the **CPU** and **I/O** are both busy.

   (e.g. what is the system that allows overlap operation with processing.)

7. Give three another names for Time-Sharing system.

8. What are the differences between **Batch-System** and **Time-Sharing System**?

9. What are the differences between **Parallel Systems** and **Distributed System**?

10. What is **Real- Time System**? What are its applications?

11. What are the differences between **On-Line** and **Off-Line** operation? Give examples.

12. What is **Throughput**?

13. What is the difference between each two of the following?

1. Parallel system and Distributed system.

2. Time-sharing system (Multi-tasking) and Multi-programming.

14. What is the reason for building parallel system?

15. <u>Circle</u> the correct answer to the following questions:

1. distributed system is a collection of processers that:

A. Share memory & clock **B**. Do not share memory & clock

C. Share memory nor clock **D**. Share clock nor memory

2. Programs that do not require interaction or programs with long execution time may served well by:

A. Batch System **B**. Real time System

C. Time-Sharing System **D**. Parallel System