

Subject: Basics of Operating System
[433703]

Unit 1 : Introduction Of Operating System

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Course Outcome (CO)..

After completion of Unit-1 Students
will be able to..

*Differentiate Operating Systems
based on their features.*

What is Program and software?

- Program

- Is a set of instructions that can be executed to perform a specific task.

- Software

- Is a collection of programs and related data that will instruct the computer what to do? and how to do?

Types of software

- **Application software**
 - Is a software or group of programs, designed for End users.
 - For Ex. Word processor, spreadsheet, accounting applications, web browser etc.
- **System software**
 - Is a software designed to provide the platform for other software like application software, utility software etc.
 - For Ex. Operating system like Linux, windows, Mac OS etc.

Definition

Definition: OS is a program (type of system software) that controls the execution of application program and acts as an interface between the **user** and **H/W**

-An OS is an intermediary between the user of the computer & the computer hardware

-OS is an important part of almost every computer systems

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Goals of OS

- OS doing mainly two tasks:
 - Manage comp H/W
 - provide user a simpler interface

Goal:

- Provide convenience to users
- Efficient operations of the comp sys

Objectives of the OS

- Hide details of computer HW from User
- Effective management and allocation of resources to processes.
- Acts as an interface between user and HW
- Makes computer system easier to use in efficient manner.
- Provide effective and efficient environment for user to execute programs.

Functions of OS

Process Management

- Takes care of creating and deleting processes, scheduling of resources, process synchronisation.

Memory Management

- Allocates and reallocates memory for various processes according to their needs.

File Management

- Keeping track of all files and maintaining the integrity of data within them, including their directory structure.

Functions of OS

Security

- Protects resources and information of a computer system against destruction and unauthorized access.

Device management/ IO Management

- Co ordinating and controlling various input and output devices.

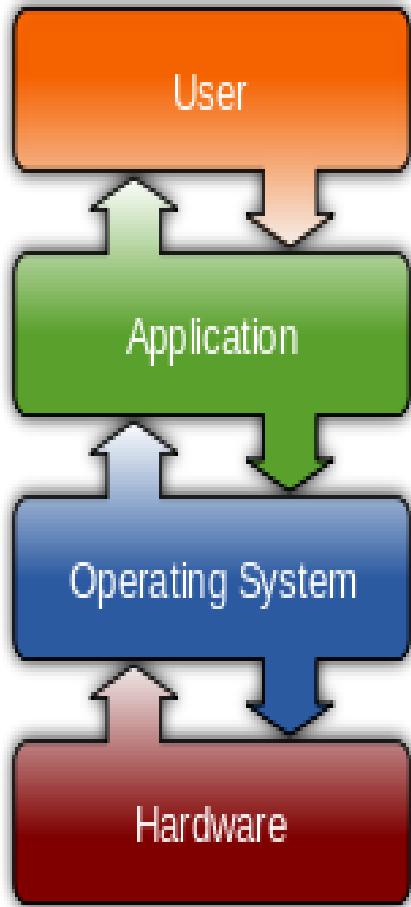
Job control

- System commands which controls the operation of OS

Why there is a Need of OS ?

- OS as resource allocator
- Easy interaction between human (user) and HW
- When power is ON, OS starts itself.
- Controlling of IO and program execution
- Providing security
- Loading and scheduling user programs
- Efficient use of memory in computer

Components of the Computer System



- H/W
 - H/W is at lowest level, contain physical devices like processor, memory, KB etc.
- OS
 - OS manages all the H/W, also hide the complex details of the H/W from users.
 - provide simpler i/f
- Application program
 - Appl program are for particular tasks
 - Ex->railway reservation sys, banking sys etc
- User
 - at the top
 - Interact with the system using appl program

Views of Operating system

(1) User View (user point of view)

- This is a top down view
- OS can be considered as an **extended machine**
- OS hides all the details of the H/W from user, provide simple i/f
- User doesn't know the complexities of the H/W
- Primary goal is → **user convenience**

(2) System View (system point of view)

- This is a bottom up view
- OS can be considered as a **resource manager**
- OS manager all the resources as CPU, memory, I/O devices
- Resources can be shared in two ways:
 1. By multiplexing in Time
 - and
 2. By multiplexing in Space

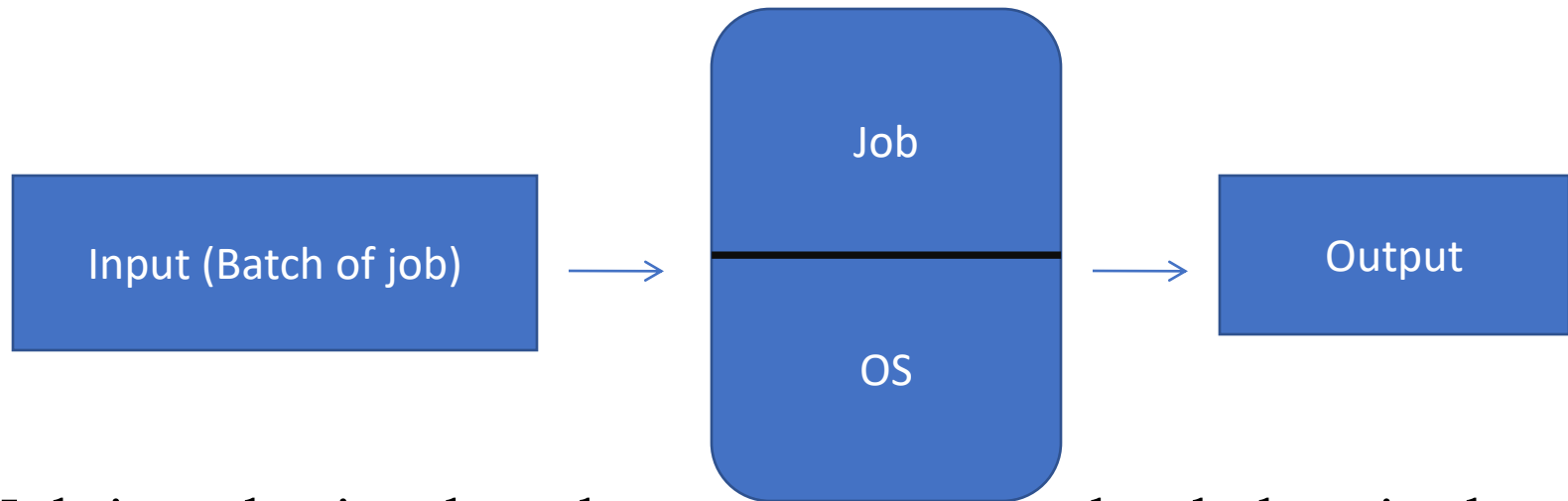
Types of Operating systems

- Batch operating system
- Multiprogramming operating system
- Multiuser operating system
- Time sharing operating system
- Multitasking operating system
- Real time operating system
- Network operating system
- Distributed operating system

Types of OS

1. Batch Operating System

- In earlier systems → input were card readers, tape drives and outputs were line printers, punch cards, tape drives



- Job is submitted to the operator, then loaded a single program into main memory
- Operator sort them in batches with similar char.
- After some time (days) comp generated out put and errors.
- Memory is divided in to two parts → Job and OS

Types of OS

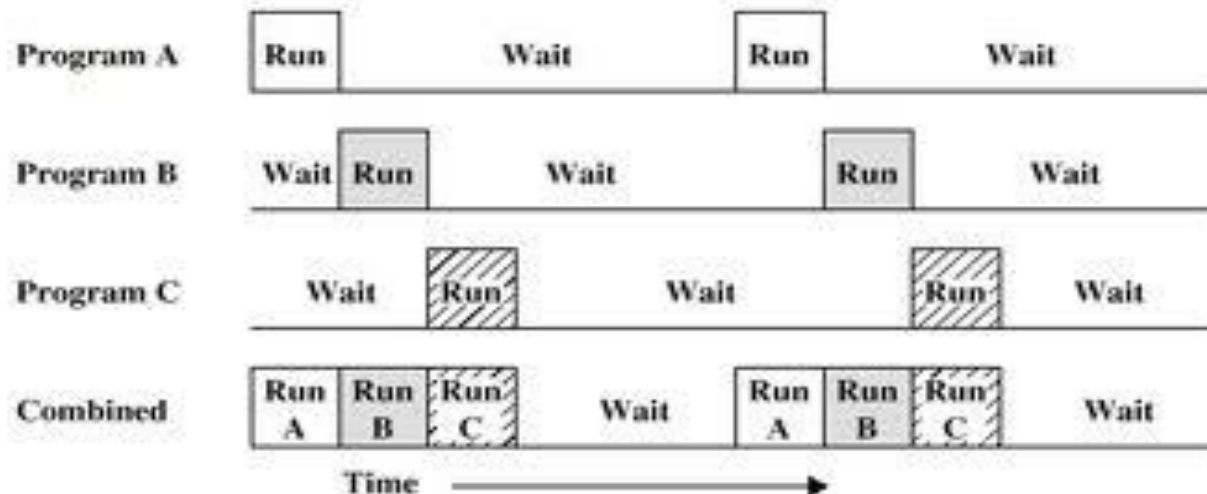
- Disadvantages of Batch OS

- Low throughput → as CPU remains idle when I/O going on
- Programmers do not have direct interaction with the job
- Debugging is only offline
- Operations were too much time consuming

Types of OS

2. Multi programming Operating System

- In which ability to run more than one program concurrently
- More than one program loaded into main memory (RAM) simultaneously and executed simultaneously
- Also referred as Multi tasking
- It improves system throughput and resource utilization



Types of OS

Multiprogramming can be implemented in two ways

1. Non preemptive

- Program is allowed to execute until it voluntarily gives up the CPU
- Program gives up when it wait for some event like I/O operation or when it terminates.
- When CPU becomes free, it is allocated to some other program

2. Preemptive

- Program is allowed to run for some maximum amount of time
- After then, CPU is forcibly taken away from the program
- It is also called 'Time sharing operating system'
- Suitable for interactive programs.
- Most of modern operating systems use this category

Types of OS

OS required following features for multi programming

- Memory management and protection
- OS should have virtual memory and swapping
- CPU scheduling should be sophisticated
- Disk management and file system should not be complex
- Synchronization and communication should be there to avoid deadlock

Types of OS

3. Time sharing operating system

- Time sharing is a logical extension of multiprogramming.
- Provide simultaneous user interaction
- Time-sharing systems were developed to provide interactive use of a computer system at a reasonable cost.
- Multiple jobs are executed by switching the CPU between them.
- In this, the CPU time is shared by different processes, so it is called as “Time sharing Systems”.
- Time slice is defined by the OS, for sharing CPU time between processes.
- Examples: Multics, Unix, etc.,

Types of OS

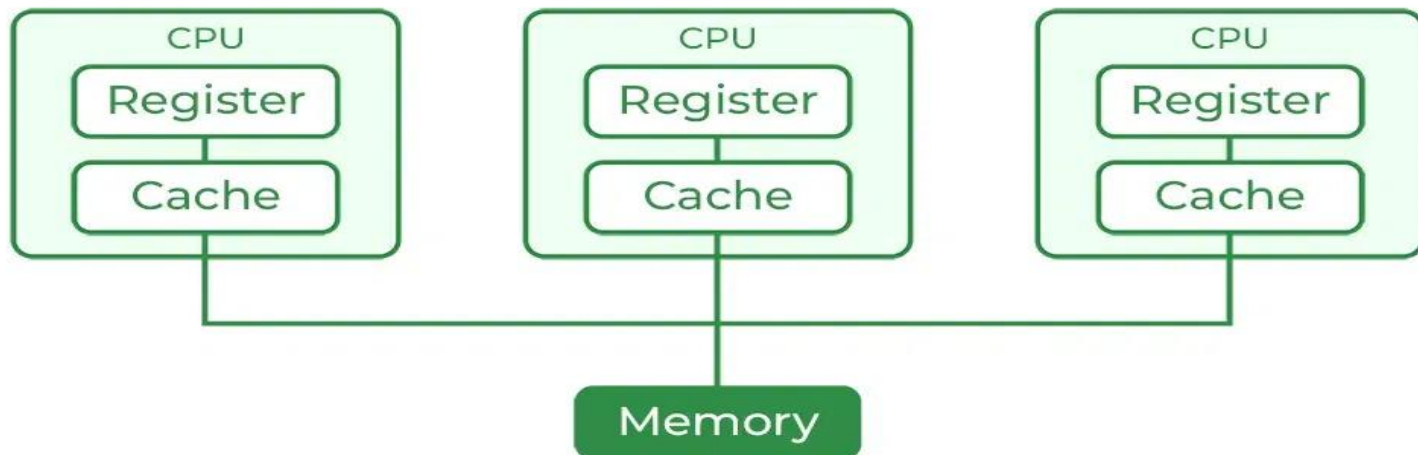
4. Real time operating system

- In which time is a key parameter
- Input immediately affects output and time is very critical
- Generally used in nuclear power plants, oil refining, chemical processing and air traffic control
- Input coming from some sensors are processed immediately and then results are generated which controls some devices
- All operations occurs in some time limits
- There are two types of RTOS
 1. Hard real time system → all critical tasks must be completed within specified time limit, tasks are guaranteed to occur in time.
 - Ex → oil refining
 2. Soft real time system → less strict
 - Missing deadline some time
 - Ex → digital audio and multimedia system

Multi processing OS

- Multi-Processing Operating System is a type of Operating System in which more than one CPU is used for the execution of resources. It better the throughput of the System

Multiprocessing



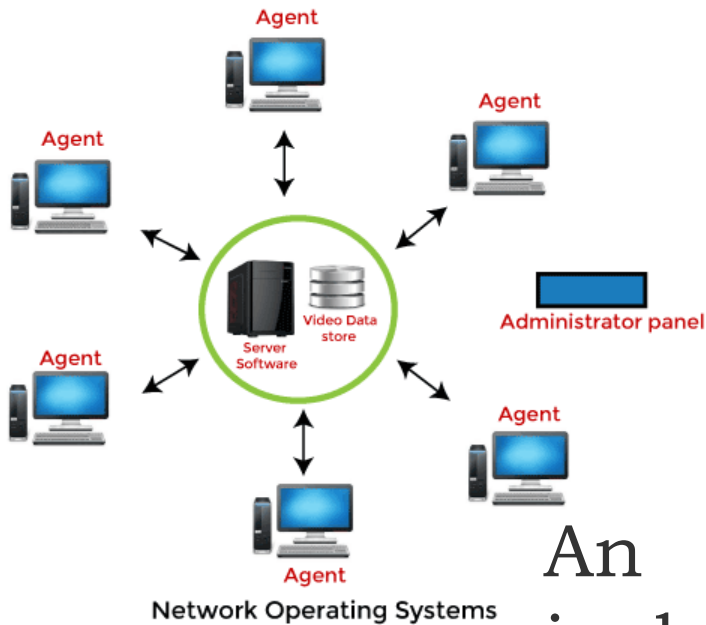
- **Advantages**

- It increases the throughput of the system.
- As it has several processors, so, if one processor fails, we can proceed with another processor.

- **Disadvantages**

- Due to the multiple CPU, it can be more complex and somehow difficult to understand.

Network operating system



An Operating system, which includes software and associated protocols to communicate with other computers via a network conveniently and cost-effectively, is called Network Operating System.

Advantages of Network Operating System

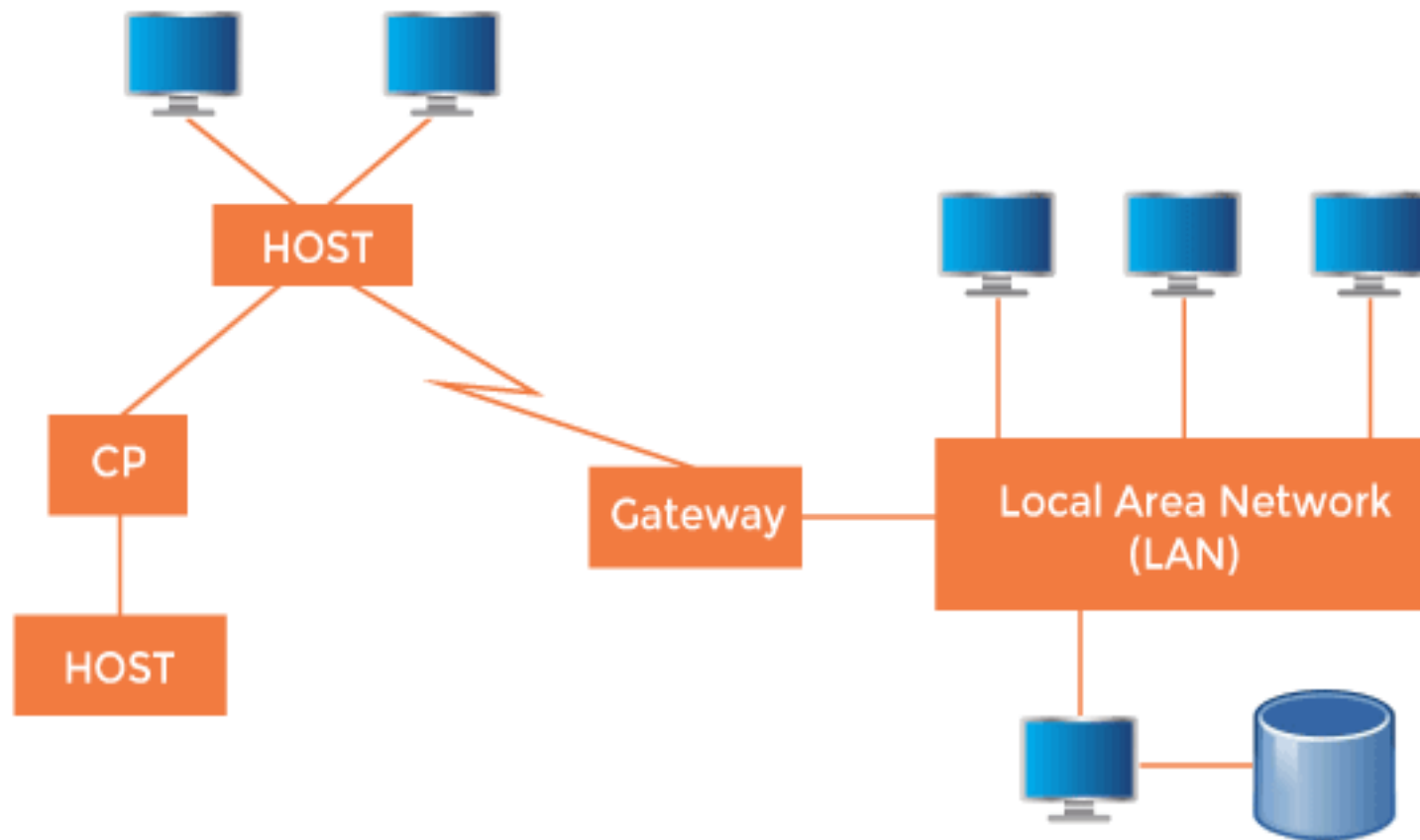
- In this type of operating system, network traffic reduces due to the division between clients and the server.
- This type of system is less expensive to set up and maintain.

Disadvantages of Network Operating System

- In this type of operating system, the failure of any node in a system affects the whole system.
- Security and performance are important issues. So trained network administrators are required for network administration.

Distributed Operating System

- The Distributed Operating system is not installed on a single machine, it is divided into parts, and these parts are loaded on different machines.
- A part of the distributed Operating system is installed on each machine to make their communication possible.
- Distributed Operating systems are much more complex, large, and sophisticated than Network operating systems because they also have to take care of varying networking protocols.



CP - Communication Processors

A Typical View of a Distributed System

Advantages of Distributed Operating System

- The distributed operating system provides sharing of resources.
- This type of system is fault-tolerant.

Disadvantages of Distributed Operating System

- Protocol overhead can dominate computation cost.

OS Services

- OS services can be describes in two diff ways
 1. user point of view → convenience
 2. system point of view → efficiency

Services from user point of view	Services from system point of view
• Program execution	• Resource allocation
• I/O operations	• Accounting
• File system manipulation	• Protection
• Communication	
• Error detection	

Services from user point of view

❑ **Program Execution:**

The main Goal of OS is to provide an efficient and convenient environment for the execution of program. So an OS must provide various functions for **loading a program into main memory, execute it and after execute terminate it.**

❑ **I/O Operations:**

A running program needs I/O operations for reading input data, and for outputting the result. This I/O may be with a file or with a device. As User cant control I/O device directly for security reasons, OS provides service for I/O operations

❑ **File System Manipulations**

OS provides file system manipulations functionalities like create, read, write, and delete a file.

❑ **Communications:**

In multitasking environment more than one process is running simultaneously. Sometimes there is a need of exchanging information among processes. Such processes may be on the same machine, or on different machines. OS provides mechanism for such inter process communication

❑ **Error Detection**

Errors may be in user program, CPU and Memory Hardware, or in I/O devices. OS detects such errors and makes User aware from them. It also provides some error recovery mechanism.

Services from system point of view

❑ **Resource Allocation:**

When multiple users are sharing the same machine, or when multiple jobs are running simultaneously, there is a need of fair allocation of resources among them, OS does this.

❑ **Accounting:**

Accounting is the process of keeping information about *which user uses which resource and for what duration of time*. Such information can be used to bill the users in multi-user environment, or to get usage statistics to make future planning.

❑ **Protection:**

OS ensures that all access to system resource is controlled. Also security from outsides is important.

Generations of Operating Systems

- First generation (1945-1955)
 - Vacuum Tubes
- Second Generation (1955- 1965)
 - Era of Transistors
- Third Generation (1965-1980)
 - Era of Integrated Circuits (ICs)
- Fourth Generation (1980 onwards)
 - Era of Large Scale Integration (LSI)

History of OS Evaluation of OS

Generation	Year	Electronic devices used	Types of OS and devices
First	1945 – 55	Vacuum tubes	Plug boards
Second	1955 – 1965	Transistors	Batch system
Third	1965 – 1980	Integrated Circuit (IC)	Multiprogramming
Fourth	Since 1980	Large scale integration	PC

GENERATION OF COMPUTER

First
Generation



Vacuum Tubes

Second
Generation



Transistors

Third
Generation



Integrated Circuit

Fourth
Generation



Very large scale
integration

Fifth
Generation



Ultra large scale
integration

Evolution of Operating System

1.The First Generation(1945-1955)

- Hardware : Vacuum tube and plug boards
- No Operating System, No programming languages.

2. The Second Generation(1955-1965)

- Hardware : Transistors
- Machines were called Mainframes
- Batch Operating System took birth (described in next section).

3. The Third Generation(1965-1980)

- Hardware : Integrated Circuits (ICs)
- Multiprogramming OS and Variations of it such as Time-Sharing, Multitasking OS came in picture.
- UNIX became popular Operating System.

4. Forth Generation(1980- Present)

- Hardware: LSI (Large scale integration)
- Personal Computers evolved
- OS with GUI as Windows 95, 98, NT, XP, Windows 7, 8 etc and LINUX.

Case Study: Windows Vs Linux

Windows

1. Closed Source
2. Less secure
3. High Hardware cost
4. Customizable features
5. Uses different data drives like C: D: to store files and folders
6. Hard drives, printers are considered as devices.
7. Four types of user account types 1) administrator 2) Standard 3) Child 4) Guest

Linux

1. Open source
2. Secure
3. High Hardware cost
4. Non customizable
5. There are no drives, tree like hierarchical file system is used.
6. Peripherals are considered as files
7. Three types of user accounts 1) Regular 2) Root 3) Service account

Case Study: Windows Vs Linux

Windows

- 8. Administrator user has all admin privileges of computer
- 9. Two files with same name in same folder are not possible
- 10. My Documents is default Home directory
- 11. Backward slash (\) is used as path separator between directories.

Linux

- 8. Root user is super user having all administrative privileges
- 9. Linux is case sensitive, so “sample” and “SAMPLE” are two different files in LINUX/Unix
- 10. For every user /home/username directory is created which is called his home directory
- 11. Forward slash (/) is used as path separator between directories.

THANK YOU..