COURSE NAME: OPERATING SYSTEMS

(COURSE CODE: 22516)

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UNIT NO 1(08Marks)

OVERVIEW OF OPERATING SYSTEM

Course Outcome : Install Operating System And Configure It.

- UNIT OUTCOME

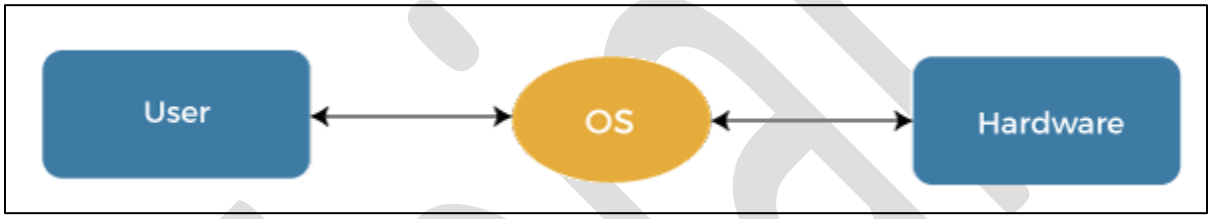
1a	Explain the functioning of given component of OS.
1b	Explain characteristics of the given type of operating system
1c	Identify type of operating system suitable for the given type of application
1d	Execute command on command line for the given task

1.1 Concept of Operating System :

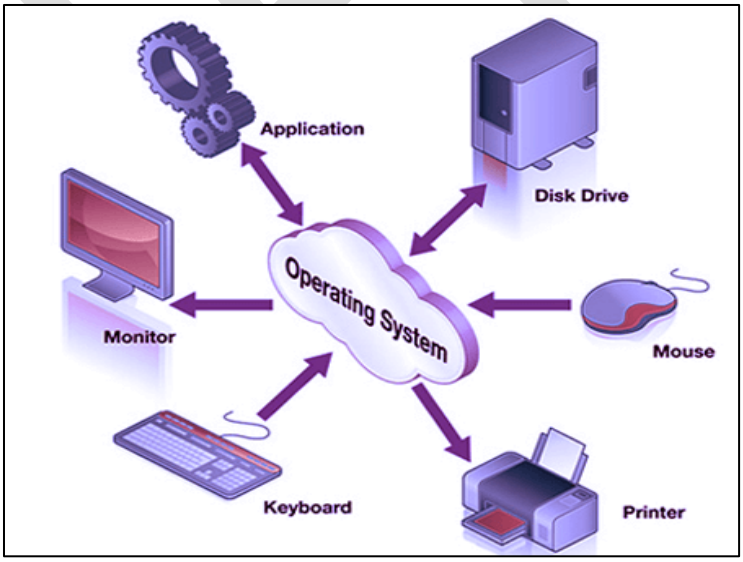
What do you mean by Operating system?

No matter its size and application, every computer needs an operating system to make it functional and useful. The operating system is an integral part of modern computer systems. It is a well-organized collection of programs that manages the hardware.

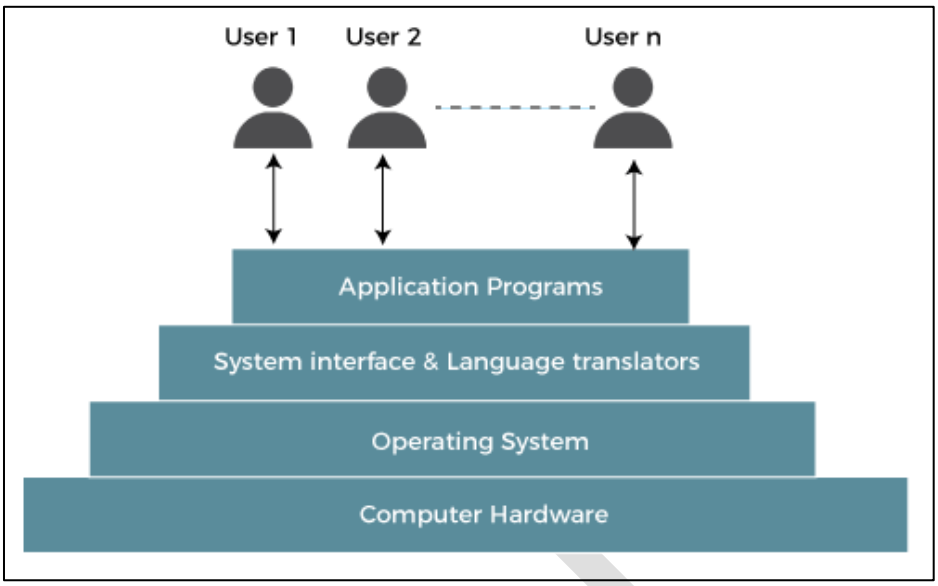
An Operating System provides an interaction between the users and computer hardware. A user is a person sitting at the computer terminal concerned about the application rather than the architecture of the computer. The user never interacts with the hardware directly. To get the services of the hardware, he has to request through the operating system.



The operating system is a primary resource manager. It manages the hardware, including processors, memory, Input-Output devices, and communication devices.



The operating system operates either in kernel mode or user mode. Compilers and editors run in user mode, whereas operating system code runs in kernel mode.



Operating system is software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers.

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

Following are some of important functions of an operating System.

• Memory Management

• Processor Management

• Device Management

• File Management

• Security

• Control over system performance

• Job accounting

• Error detecting aids

• Coordination between other software and users

- **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 in the main memory.

An Operating System does the following activities for memory management:

• Keeps tracks of primary memory, i.e., what parts of it are in use by whom, what parts are not in use?

• 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.

- **Processor 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 traffic controller.

• Allocates the processor (CPU) to a process.

• De-allocates processor when a process is no longer required.

- **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 program responsible for this task is known as the

• I/O controller.

• Decides which process gets the device when and for how much time.

• Allocates the device in the most efficient way.

• De-allocates devices.

- **File Management**

A file system is normally organized into directories for easy navigation and usage. These directories may contain files and other directions.

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.

❖ **Other Important Activities**

Following are some of the important activities that an Operating System performs:

• **Security** -- By means of password and similar other techniques, it prevents

unauthorized access to programs and data.

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

• **Job accounting** -- Keeping track of time and resources used by various jobs and users.

• **Error detecting aids** -- Production of dumps, traces, error messages, and other

debugging and error detecting aids.

• **Coordination between other software and users** -- Coordination and assignment of compilers, interpreters, assemblers and other software to the various users of the computer systems.

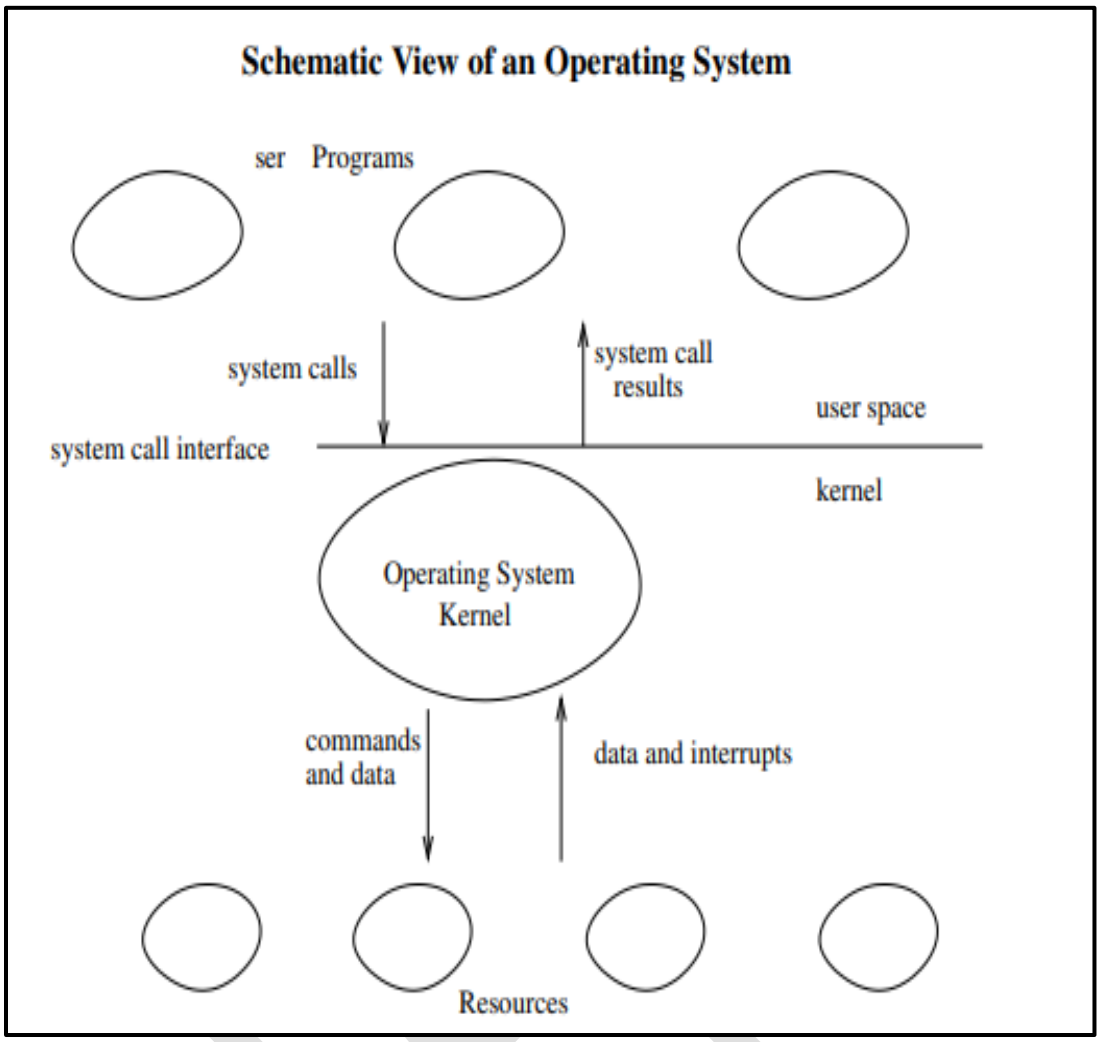
✓ Views of Operating System :

Operating System can be viewed from two viewpoints– User views & System views

1. User Views:- The user's view of the operating system depends on the type of user.
i. If the user is using standalone system, then OS is designed for ease of use and high performances. Here resource utilization is not given importance.
ii. If the users are at different terminals connected to a mainframe or minicomputers, by sharing information and resources, then the OS is designed to maximize resource utilization. OS is designed such that the CPU time, memory and i/o are used efficiently and no single user takes more than the resource allotted to them.
iii. If the users are in workstations, connected to networks and servers, then the user have a system unit of their own and shares resources and files with other systems. Here the OS is

designed for both ease of use and resource availability (files).
iv. Users of hand held systems, expects the OS to be designed for ease of use and performance per amount of battery life.
v. Other systems like embedded systems used in home device (like washing m/c) & automobiles do not have any user interaction.
There are some LEDs to show the status of its work.

2. System Views:- Operating system can be viewed as a resource allocator and control program.
i. Resource allocator – The OS acts as a manager of hardware and software resources. CPU time, memory space, file-storage space, I/O devices, shared files etc. are the different resources required during execution of a program. There can be conflicting request for these resources by different programs running in same system. The OS assigns the resources to the requesting program depending on the priority.
ii. Control Program – The OS is a control program and manage the execution of user program to prevent errors and improper use of the computer



1.2 Operating System – Types :

Operating systems are there from the very first computer generation and they keep evolving with time. In this chapter, we will discuss some of the important types of operating systems which are most commonly used.

Batch Operating System

The users of a batch operating system do not interact with the computer directly. Each user prepares his job on an off-line 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.

The problems with Batch Systems are as follows:

• 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.

Time-sharing Operating Systems

Time-sharing is a technique which enables many people, located at various terminals, to use a particular computer system at the same time. Time-sharing or multitasking is a logical extension of multiprogramming. Processor's time which is shared among multiple users simultaneously is termed as time-sharing.

The main difference between Multiprogrammed Batch Systems and Time-Sharing Systems is that in case of Multiprogrammed batch systems, the objective is to maximize processor use, whereas in Time-Sharing Systems, the objective is to minimize response time.

Multiple jobs are executed by the CPU by switching between them, but the switches occur so frequently. Thus, the user can receive an immediate response. For example, in a transaction processing, the processor executes each user program in a short burst or quantum of computation. That is, if n users are present, then each user can get a time quantum. When the user submits the command, the response time is in few seconds at most.

The operating system uses CPU scheduling and multiprogramming to provide each user with a small portion of a time. Computer systems that were designed primarily as batch systems have been modified to time-sharing systems.

Advantages of Timesharing operating systems are as follows:

• Provides the advantage of quick response

• Avoids duplication of software

• Reduces CPU idle time

Disadvantages of Time-sharing operating systems are as follows:

• Problem of reliability

• Question of security and integrity of user programs and data

• Problem of data communication

Distributed Operating System

Distributed systems use multiple central processors to serve multiple real-time applications and multiple users. Data processing jobs are distributed among the processors accordingly.

The processors communicate with one another through various communication lines (such as high-speed buses or telephone lines). 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.

The advantages of distributed systems are as follows:

• 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.

Network Operating System

A Network Operating System runs on a server and provides the server the capability to manage data, users, groups, security, applications, and other networking functions. The primary purpose of the network operating system is to allow shared file and printer access among multiple computers in a network, typically a local area network (LAN), a private network or to other networks.

Examples of network operating systems include Microsoft Windows Server 2003, Microsoft

Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD.

The advantages of network operating systems are as follows:

• Centralized servers are highly stable.

• Security is server managed.

• Upgrades to new technologies and hardware can be easily integrated into the system.

• Remote access to servers is possible from different locations and types of systems.

The disadvantages of network operating systems are as follows:

• High cost of buying and running a server.

• Dependency on a central location for most operations.

• Regular maintenance and updates are required.

Real-Time Operating System

A real-time system is defined as a data processing system in which the time interval required to process and respond to inputs is so small that it controls the environment. The time taken by the system to respond to an input and display of required updated information is termed as the response time. So in this method, the response time is very less as compared to online processing.

Real-time systems are used when there are rigid time requirements on the operation of a processor or the flow of data and real-time systems can be used as a control device in a dedicated application. A real-time operating system must have well-defined, fixed time constraints, otherwise the system will fail. For example, Scientific experiments, medical imaging systems, industrial control systems, weapon systems, robots, air traffic control systems, etc.

There are two types of real-time operating systems.

Hard real-time systems

Hard real-time systems guarantee that critical tasks complete on time. In hard real-time systems, secondary storage is limited or missing and the data is stored in ROM. In these systems, virtual memory is almost never found.

Soft real-time systems

Soft real-time systems are less restrictive. A critical real-time task gets priority over other tasks and retains the priority until it completes. Soft real-time systems have limited utility than hard real-time systems. For example, multimedia, virtual reality, Advanced Scientific Projects like undersea exploration and planetary rovers, etc.

Operating System – Service

An Operating System provides services to both the users and to the programs.

- It provides programs an environment to execute.
- It provides users the services to execute the programs in a convenient manner.

Following are a few common services provided by an operating system:

- Program execution
- I/O operations
- File System manipulation
- Communication
- Error Detection

• Resource Allocation

• Protection

Program Execution

Operating systems handle many kinds of activities from user programs to system programs like printer spooler, name servers, file server, etc. Each of these activities is encapsulated as a process.

A process includes the complete execution context (code to execute, data to manipulate, registers, OS resources in use).

Following are the major activities of an operating system with respect to program management:

Loads a program into memory

Executes the program

Handles program's execution

Provides a mechanism for process synchronization

Provides a mechanism for process communication

Provides a mechanism for deadlock handling

I/O Operation

An I/O subsystem comprises of I/O devices and their corresponding driver software. Drivers hide the peculiarities of specific hardware devices from the users.

An Operating System manages the communication between user and device drivers.

I/O operation means read or write operation with any file or any specific I/O device.

Operating system provides the access to the required I/O device when required.

File System Manipulation

A file represents a collection of related information. Computers can store files on the disk (secondary storage), for long-term storage purpose. Examples of storage media include magnetic tape, magnetic disk and optical disk drives like CD, DVD. Each of these media has its own properties like speed, capacity, data transfer rate and data access methods.

A file system is normally organized into directories for easy navigation and usage. These directories may contain files and other directions. Following are the major activities of an operating system with respect to file management:

• Program needs to read a file or write a file.

• The operating system gives the permission to the program for operation on file.

• Permission varies from read-only, read-write, denied, and so on.

• Operating System provides an interface to the user to create/delete files.

• Operating System provides an interface to the user to create/delete directories

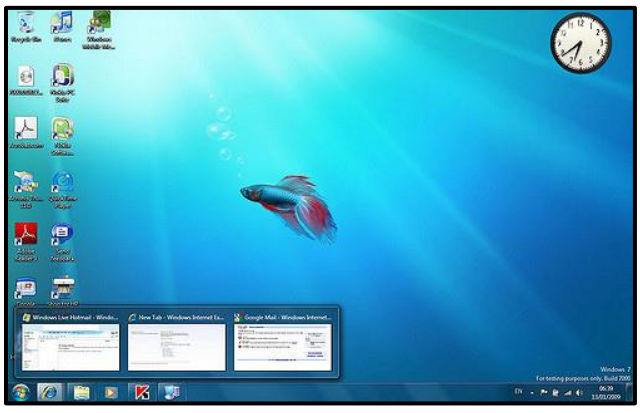
• Operating System provides an interface to create the backup of file system.

1.3 Command Line Based OS and GUI Based OS :

The main difference between **GUI and CLI** is that the Graphical User Interface (GUI) allows the user to interact with the system using graphical elements such as windows, icons, menus while the Command Line Interface (CLI) allows the user to interact with the system using commands.

What is GUI

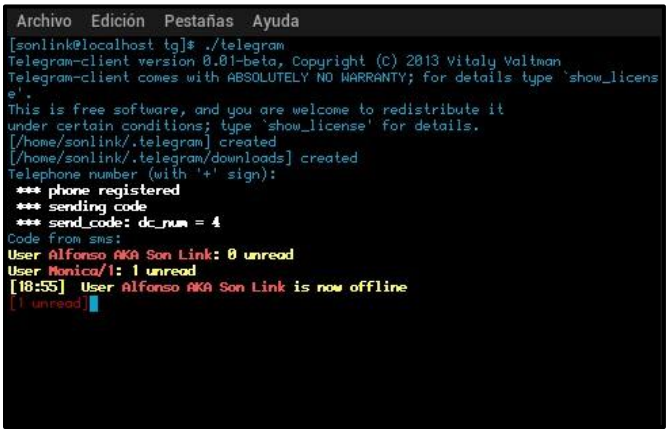
GUI stands for **Graphical User Interface**. It takes the advantage of computer graphics. It allows the user to interact with the computer using components such as windows, icons, labels, text boxes, and radio buttons. It is easy for the user to perform tasks using GUI as it does not require remembering commands. He can easily click on icons, drag and drop objects using the mouse.



Operating Systems such as Windows and Linux provide GUI. They contain windows, icons, search boxes, menus, drop down lists and many graphical elements. There is also application software designed for specific business requirements such as Human Resource Management systems, Library Management Systems, etc. They consist of GUIs to accomplish necessary tasks. Overall, a GUI is a user-friendly mechanism to interact with the system.

What is CLI

CLI stands for **Command Line Interface**. CLI is also called **Command Language Interpreter, Console User Interface** or **Character User Interface**. It allows the users to enter commands to the terminal to perform the task. When the user enters a command and presses "enter" key, the terminal or the shell will interpret that command and will display the response back to the terminal. Likewise, the user can communicate with the operating system.



The user should have a good understanding to use the CLI. He should thoroughly know the correct syntax to issue effective commands. Operating systems such as UNIX contains a CLI while OS such as Windows and Linux contains both CLI and GUI. Overall, CLI is memory efficient and faster in execution than the GUI.

S.NO	CLI	GUI
1.	CLI is difficult to use.	Whereas it is easy to use.
2.	It consumes low memory.	While consumes more memory.
3.	In CLI we can obtain high precision.	While in it, low precision is obtained.
4.	CLI is faster than GUI.	The speed of GUI is slower than CLI.
5.	CLI operating system needs only keyboard.	While GUI operating system need both mouse and keyboard.
6.	CLI's appearance cannot be modified or	While it's appearance can be modified or

S.NO	CLI	GUI
	changed.	changed.
7.	In CLI, input is entered only at command prompt.	While in GUI, input can be entered anywhere on the screen.
8.	In CLI, the information is shown or presented to the user in plain text and files.	While in GUI, the information is shown or presented to the user in any form such as: plain text, videos, images, etc.
9.	In CLI, there are no menus provided.	While in GUI, menus are provided.
10.	There are no graphics in CLI.	While in GUI, graphics are used.
11.	CLI do not use any pointing devices.	While it uses pointing devices for selecting and choosing items.
12.	In CLI, spelling mistakes and typing errors are not avoided.	Whereas in GUI, spelling mistakes and typing errors are avoided.