Chapter 2 Operating System

Operating System:-

An Operating system (OS) is a software program that controls the internal activities of the computer hardware and provides user interface. Application programs need to interact with the operating system for using hardware resources.

OS is the first program loaded in to the computer's main memory after the computer is switched on.

Operating system acts as an interface between computer hardware and user. It manages and controls all the hardware and flow of data, instructions and information to and within the system.

The operating system takes instruction from the user and directs it to CPU which further passes the instructions to the hardware.

Eg. **MS DOS, Linux, Unix, Windows XP, Windows Vista, Windows 7, Windows 8, Windows 8.1, Windows 10, Solaris, OS/2, etc.**

Basics of Operating System:-

Operating System is one of the core software programs that run on hardware and makes it unusable. The user can interact with the hardware so that they can send commands and receive output. An operating system provides and interfaces between user and machine. This interface can be a Graphic User Interface (GUI) in which users click on screen elements to interact with the OS or a Command Line Interface (CLI) to tell the OS to do things. It also manages the computer's resources such as CPU, memory, disk drives and printers. It provides services for application software.

Important Terminology:-

Booting

Boot means start or make the computer system ready so that it can take instructions. The word "BOOT" comes from "BOOTSTRAP", since bootstraps helps you to get your boots ON. Likewise booting the computer helps it to get its read only memory(ROM) instructions loaded in its main memory. When the computer is first switched on, it is called cold booting. When the computer is already on and being restart/reset because it is struck up due to some reason then it is called warm booting.

Kernel:-

The kernel is a program that manages the computer's resources and allows other programs to run and use of these resources. It is the first part of operating system to load into memory during booting and it remains its continuous services requirement.

File System:-

A file is a collection of related information defined by its creator. A file system is a method of organizing and retrieving files from a storage medium like hard drive. It consists of files separated into groups called directories.

Example- NTFS with windows, FAT etc.

Functions of Operating system:-

An OS performs the following function-

i. Processor Management

ii. Memory Management

iii. Input/Output Management

iv. File Management

v. Security Management

vi. Time Sharing/Sheduling

i. 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 –

a. Keeps tracks of processor and status of process. The program responsible for this task is known as **traffic controller**.

b. Allocates the processor (CPU) to a process.

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

ii. 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 –

a. Keeps tracks of primary memory, i.e., what part of it are in use by whom, what part are not in use.

b. In multiprogramming, the OS decides which process will get memory when and how much.

c. Allocates the memory when a process requests it to do so.

d. De-allocates the memory when a process no longer needs it or has been terminated.

iii. Input/Output Management-

An Operating System manages device communication via their respective drivers. It does the following activities for device management –

a. Keeps tracks of all devices. Program responsible for this task is known as the **I/O controller**.

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

c. Allocates the device in the efficient way.

d. De-allocates devices.

iv. 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 –

a. Keeps track of information, location, uses, status etc. The collective facilities are often known as **file system**.

b. Decides who gets the resources.

c. Allocates the resources.

d. De-allocates the resources.

Types of Operating System:-

All operating system can be classified into many categories.

i. single user OS

ii. Multi User OS

iii. Single Tasking OS

iv. Multi Tasking OS

v. Batch OS

vi. Time Sharing OS

vii. Distributed OS

viii. Network OS

ix. Real time OS

a. Single User Operating System:-

An Operating system which allows only one user to work on computer at a time is known as single user operating system.

Example:- MS DOS

b. Multi User Operating system:-

A multi user operating system allows a number of users to work together on a single computer. Each user will be provided a terminal connected to a computer.

Example:- Linux, Unix, window 7 etc.

c. Single Tasking Operating system:-

An operating system which can execute only a single task at a time is known as single tasking operating system.

Example:- MS DOS

d. Multi tasking operating system:-

Multi tasking operating system supports execution of more than one job at a time.

Example:- UNIX, Linux, etc.

e. 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.

f. 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.

g. 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.

h. 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.

i. 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.

Operating System for Desktop and Laptop

Let us discuss some most commonly used operating systems.

1. MS-DOS (Microsoft Disk Operating System):-

MS-DOS is one of the oldest and widely used operating system. DOS is a set of computer programs, the major functions of which are file management, allocation of system resources, providing essential features to control hardware devices.

DOS commands can be typed in either upper case or lower case. It has three essential files and many command files. These essential files are IO.SYS (Input Output system), MSDOS.SYS (Microsoft Disk Operating System) and COMMAND.COM. these files are called system files of MS-DOS

DOS Commands-

Instructions given to the computer to work are called commands. These are the common words between the computer and the user. It gives orders to the computer system to work.

Following are the major types of DOS Command –

Internal DOS Command:-

An internal command is an MS-DOS command that is stored in the system memory and loaded from the command.com or cmd.exe. The illustration shows how commands contained within command.com are part of the command.com file. However, with the external commands, each of the commands is their own separate file.

External DOS Command:-

An external command is an MS-DOS command that is not included in command.com. External commands are commonly external either because they require large requirements or are not commonly used commands. The illustration shows each of the external commands are separate files. However, the internal commands are all included in the command.com file.

List of Internal & External DOS Command:-

Sr. No.	Internal DOS	External DOS
1	date	edit
2	time	move
3	md	format
4	mkdir	mem
5	cd	xcopy
6	rd	ping
7	copy con	tree
8	type	tracert
9	copy	route
10	ren	label
11	del	attrib
12	title	chkdsk
13	ver	sort
14	vol	find
15	dir	more
16	cls	telnet
17	color	mode
18	path	sys
19	chdir	diskcopy
20	echo	doskey
21	erase	backup
22	prompt	power
23	pause	print
24	lock	scandisk
25	goto	help
26	rename	
27	start	
28	unlock	
29	rmdir	

2. Windows:-

Microsoft Windows (also referred to as **Windows** or **Win**) is a graphical operating system developed and published by Microsoft. It provides a way to store files, run software, play games, watch videos, and connect to the Internet.

Microsoft Windows was first introduced with version 1.0 on November 10, 1983. Over a dozen versions of Windows were released after that, including the current version, Windows 10.

3. Linux:-

Linux is a multi user, multi tasking, open source operating system first developed by Linux Benedict Torvalds in the year 1991. Linux is a 32 bit operating system. It runs on a wide variety of platforms, such Intel, Sparc, Alpha, etc.

LINUX is an operating system or a kernel distributed under an open-source license. Its functionality list is quite like UNIX. The kernel is a program at the heart of the Linux operating system that takes care of fundamental stuff, like letting hardware communicate with software.

Linux Elements:-

Kernel –

Kernel is the core part of Linux. It is responsible for all major activities of this operating system. It consists of various modules and it interacts directly with the underlying hardware. Kernel provides the required abstraction to hide low level hardware details to system or application programs.

Shell –

Linux provides a special interpreter program which can be used to execute commands of the operating system. It can be used to do various types of operations, call application programs. etc. The shell takes commands from the user and executes kernel's functions.

File System-

Each file in the Linux is stored according to a particular sequence of directories. It uses forward slash(/) as a separator. All files and directories are connected to a root directory.

4. Mac Operating System:-

macOS is a proprietary graphical operating system developed and marketed by Apple Inc. since 2001. It is the primary operating system for Apple's Mac computers. Within the market of desktop, laptop and home computers, and by web usage, it is the second most widely used desktop OS, after Microsoft's Windows NT.

Operating system for Mobile Phone and Tablets

A mobile operating system (OS) is software that allows smartphones, tablet PCs (personal computers) and other devices to run applications and programs. A mobile OS typically starts up when a device powers on, presenting a screen with icons or tiles that present information and provide application access. Mobile operating systems also manage cellular and wireless network connectivity, as well as phone access.

A mobile operating system (OS) is the software that allows mobile devices like phones, tablets and other smart devices like wearable technology to run applications and other programs. Most mobile operating systems only work on specific hardware. For example, an iPhone runs on iOS and a Google Pixel runs on Android.

i. Android (Google)

ii. iPhone OS / iOS (Apple)

iii. Bada (Samsung)

iv. Blackberry OS (Research in Motion)

v. Windows Mobile OS (Windows Phone)

vi. Symbian OS (Nokia)

vii. Tizen (Samsung)

viii. MeeGO OS (Nokia and Intel)

User Interface for Desktop and laptop:-

The user interface (UI) is the point of human-computer interaction and communication in a device. This can include display screens, keyboards, a mouse and the appearance of a desktop. It is also the way through which a user interacts with an application or a website. The growing dependence of many businesses on web applications and mobile applications has led many companies to place increased priority on UI in an effort to improve the user's overall experience.

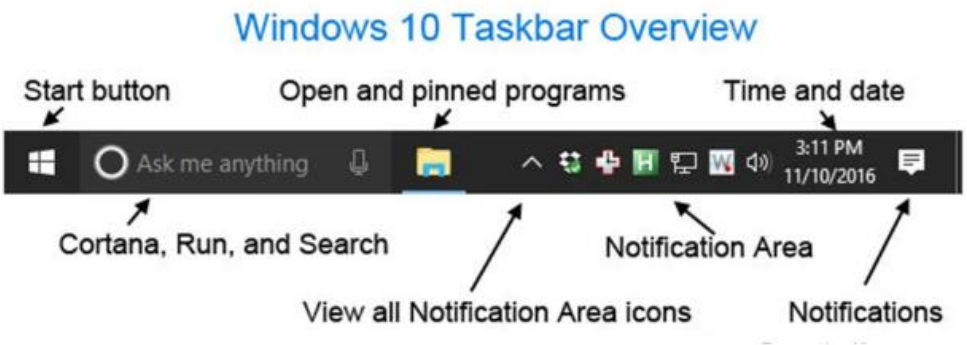
Desktop:

The desktop is the primary user interface of a computer. When we boot up our computer, the desktop is displayed once the startup process is complete. It includes the desktop background (or wallpaper) and icons of files and folders Windows, the desktop includes a bottom of the screen by default.

Windows 10 also introduces search box in the Taskbar, which facilitates browsing both your computer and the web.

Taskbar:-

The **taskbar** is an element of an operating system located at the bottom of the screen. It allows you to locate and launch programs through Start and the Start menu, or view any program that's currently open. On the right side of the taskbar is the Notification Area that allows you to check the date and time, items running in the background. The taskbar first introduced with Microsoft Windows 95 and is found in all subsequent versions of Windows.



Icons & shortcuts:-

Icons:-

Icons are special types of buttons which include image and label given to that button are known to be object Icons. There are basically three types of Icon like **System Icons, User Defined Icons and Shortcuts**

My Computer, Recycle Bin, My Documents, Network is the system Icons.

Shortcuts:-

Shortcut icons have a northeast-pointing arrow at their button left side. Difference between the icons on the actual items on the left and the shortcuts that point to them deleting the shortcut does not delete the original item.

Running and Application:-

You will see various applications are available in the windows in the Accessories like Notepad issued to create and edit simple text documents. Paint is used to create and edit drawing and images. Calculator is used to perform simple and scientific calculations. Windows media player for playing music, windows movie maker for making movies from photos, games etc.

System Tools:-

System tools are very important tools of computer system and are used to enhance the performance of the computer. Backup is used to take backup of files present in hard disk. There are many types of system tools

Disk Cleanup:-

You can use disk cleanup to free up space on your hard disk by removing temporary Internet file, removing installed components and programs that you no longer use, and emptying the Recycle Bin.

Disk Defragmenter:-

Disk Defragmenter consolidates fragmented files and folders on your computer's hard disk, so that each file occupies a single, contiguous space on the volume. As a result, your system can efficiently. By consolidating your files and folders, Disk Defragmenter also consolidates the volume's free space, making it less likely for new files to be fragmented.

Character Map:-

You can use character Map to insert special characters into a document. To run character map, click on start and point to Programs, take mouse point Accessories and click on Character Map.

File and Folder Management:-

File:-

A file is any collection of related information that is given a name and stored on a disk so that is can be read and manipulated whenever required.

Folder:-

A folder is a special kind of file that contains a list of other files or subfolders. The files on the list are said to be in the folder.

Folder is also known as directory.

Types of File Extensions

A file has two parts : the first is name of file and the second is extension of file.

Extension Name:-

Sr. NO	File Name/Software	Extension Name
1	MS Paint	.bmp, .png
2	Notepad	.txt
3	Wordpad	.rtf
4	MS Word 2003	.doc
5	MS Word 2007	.docx
6	MS Excel 2003	.xls

7	MS Excel 2007	.xlsx
8	MS Power Point 2003	.ppt
9	MS Power Point 2007	.pptx
10	MS Access	.mdb, .accdb
11	Internet/HTML	.html, .htm
12	Image	.jpg, .jpeg, .png, .tiff, .gif
13	Audio	.mp3, .ra, .wav,
14	Video	.mp4, .3gp, .dat, .avi, .flv, .mpeg
15	Setup/Software	.exe

16	Winrar	.rar
17	Corel Draw	.cdr
18	Photoshop	.psd
19	Adobe reader	.pdf
20	Writer Document	.odt
21	Writer Template	.ott
22	Cal Spreadsheet	.ods
23	Cal Template	.ots
24	Impress Presentation	.odp
25	Impress Template	.otp

Motherboard

All the electronic components in a system are mounted on a piece of fiberglass called the motherboard. Fiberglass is used because it is a non- conductor of electricity and hence various components remain insulated from one other.

ASCII code:-

ASCII(pronounced "askee") is the most common alphanumeric code used to represent character like A,B,C numbers and other symbols. Now industry has settled on **ASCII(American standard code for information interchange)** code, this code allows manufacturers to standardize computer hardware such as keyboard , printer and video display.

ASCII code used either 7 or 8 bit data representation.

EBCDIC:-

EBCDIC stands for Extended Binary Coded Decimal Interchange Code. It uses 9 bits for each character-eight bits for the character and an extra bit for the parity. It was originally developed by IBM (International Business Machines) and is now used to represent characters in many modern computers.

BUG:-

A software bug is the common term used to describe an error, flaw, mistake, failure, or fault in a computer program or system that produces an incorrect or unexpected result

Linux Command

1. **pwd Command:-** The pwd command is used to display the location of the current working directory.
2. **mkdir Command:-** The mkdir command is used to create a new directory under any directory.
3. **rmdir Command:-** The rmdir command is used to delete a directory.
4. **ls Command:-** The ls command is used to display a list of content of a directory.
5. **cd Command:-** The cd command is used to change the current directory.
6. **touch Command:-** The touch command is used to create empty files. We can create multiple empty files by executing it once.
7. **cat Command:-** The cat command is used to create a file, display content of the file, copy the content of one file to another file, and more.
8. **rm Command:-** The rm command is used to remove a file.
9. **cp Command:-** The cp command is used to copy a file or directory.
10. **mv Command:-** The primary use of the **mv** command is to move files, although it can also be used to rename files.
11. **rename Command:-** The rename command is used to rename files. It is useful for renaming a large group of files.
12. **less Command:-** The less command is includes some extra features such as 'adjustment in width and height of the terminal.' Comparatively, the more command cuts the output in the width of the terminal.
13. **grep Command:-** The grep is the most powerful and used filter in a Linux system. The 'grep' stands for "**global regular expression print**." It is useful for searching the content from a file. Generally, it is used with the pipe.
14. **sed command:-** The sed command is also known as **stream editor**. It is used to edit files using a regular expression. It does not permanently edit files; instead, the edited content remains only on display. It does not affect the actual file.
15. **wc Command:-** The wc command is used to count the lines, words, and characters in a file.

16. **find Command:-** The find command is used to find a particular file within a directory. It also supports various options to find a file such as byname, by type, by date, and more.
17. **date Command:-** The date command is used to display date, time, time zone, and more.
18. **mount Command:-** The mount command is used to connect an external device file system to the system's file system.
19. **clear Command:-** Linux **clear** command is used to clear the terminal screen.
20. **touch command:-** The **touch** command allows you to create a blank new file through the Linux command line
21. **df command:-** Use **df** command to get a report on the system's disk space usage
22. **du command:-** If you want to check how much space a file or a directory takes.
23. **chmod command:- chmod** is another Linux command, used to change the read, write, and execute permissions of files and directories
24. **chown command:-** In Linux, all files are owned by a specific user.
25. **uname command:-** The **uname** command will print detailed information about your Linux system like the machine name, operating system, kernel, and so on.
26. **Who:-** who command gives the information about the users logged on to the system.

Unix Command

1. man – view manual pages for Unix commands
2. clear – clear screen
3. date – show current date and time
4. who – find out who is logged into the system
5. ls – list files and directories
6. cp – copy files (work in progress)
7. rm – remove files and directories (work in progress)
8. mv – rename or move files and directories to another location
9. chmod – change file/directory access permissions
10. chown – change file/directory ownership
11. ps – list processes
12. kill – kill a process (stop application running)
13. lpr- printing
14. cpio- Backup files

Ubuntu Command

1. pwd:- This command refers to the present working directory
2. dir:- the dir command is used to print (on the terminal) all the available directories in the present working directory;
3. ls:- This command is used to list down all the directories and files inside the present working directory
4. cd:- you can change the directories in the terminal using the "cd" command.
5. cp:- The cp command will help you to copy any file or folder to any directory
6. mv :- You can use this command to move files around the computer, and you can also rename files or directories inside a specific directory
7. man:- The man command will help you to get the complete user manual of any specific command.