BIM

Semester: I

Foundation of Information technology

Computer Software

Reference Note

Unit-4: Computer Software

Introduction

Computer program is a group of instructions given to the computer to perform a certain task. A program is used to solve a problem in computers. The program is written using a series of instruction that consists of all symbols, characters and certain rules.

- Any **set of instructions** that guides the hardware and tells it how to accomplish each task.

Computer software, or just **software**, is a collection of computer programs and related data that provides the instructions for telling a computer what to do and how to do it.

Software consist series of instruction and decision rules that instruct the computer in executing a given task. Software is also called a collection of computer programs. It is a written by a using a programming language. *It refers to a program or a set of instructions and applications used to manage and control various functions of a device such as a computer.*

Firmware: Firmware are also software (program or data) that has been permanently written onto ROM.

Software may enter the computer through one of following three ways.

> ➢ It may be built into the computer circuit in the form of firmware.
> ➢ It may be loaded into the computer from a secondary storage device such as CD-ROM or hard disk drives.
> ➢ It is also be typed into the computer with the aid of the keyboard and programming tools.
> ➢ It is the interface between the computer and the user. Without software a computer cannot do anything like a dead machine.
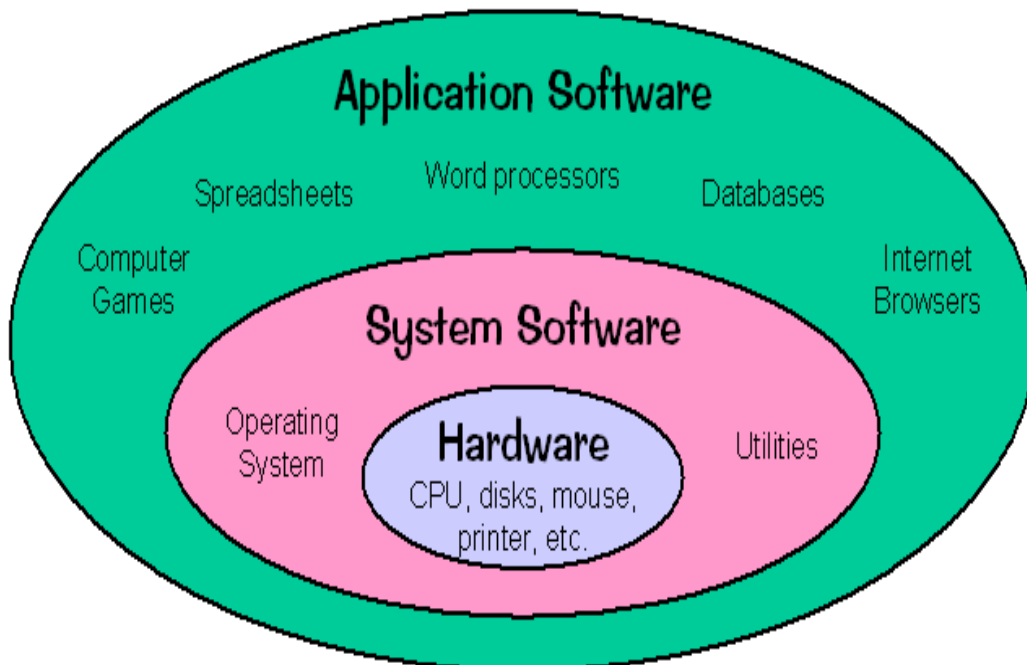
Types of Software

      1. System Software

          i. Operating System

          ii. Translating Program

          iii. Utility software or system support program

          iv. Device Driver Software

      2. Application Software

          i. Customized or Tailored Software

          ii. Packaged Software or General Software

System Software

System software is computer software designed to operate the computer hardware to provide basic functionality and to provide a platform for running application software. It also provides the interface between the user and component of the computer.

The software which is designed operate, control and manage the actual operation of computer hardware is called system software.

- It is designed to provide a platform to run application software and operate the computer hardware.
- It is a collection of operating system, servers, device drivers, utilities and windows systems which helps in running the computer hardware and the computer system.
- The system software controls internal computer operation like reading data from input devices, sending, processed information to the device, checking system component, converting data and instruction to computer understandable (binary) form etc.

1. **Operating System**

It consists of programs, which controls, coordinates and supervises the activities of the various components of a computer system. Its function is to provide link between the computer hardware and the user.

It performs all internal management functions (disk access, memory management, task scheduling and user interfacing) and ensures systematic functioning of a computer system. It provides an environment to run the programs. e.g., MS-DOS, windows XP/2000/98, Unix Linux, etc.

- Below are some of its functions.

    - Provide security and backup.
    - Booting computers.
    - Controlling peripheral devices such as a keyboard, disk drives, printers, etc.
    - Provide interface between software and hardware.
    - Scheduling processes.
    - Memory management.
    - Keeping track of files and directories on the disk.
    - Recognize input from the keyboard.
    - Send output to the display screen.

2. Translating Program or Language Processor

It is a special kind of computer software which translates the programs written in one language into another language. It is compulsory for both low and high-level language. The types of language translators are:

- *Assembler:* It is a software that converts a program written in assembly languages into machine code.
- *Compiler:* It is a software that translates the program written in high-level languages to machine languages.
- *Interpreter:* It is a software that converts the high-level language program into computer understandable form.

Translating program is used transfer instruction written in human understandable or readable language like VB, C, ASP.net, Java etc. to machine language which the computer understand.

3. Utility Software

Utility software (also known as service program, service routine, tool or utility routine) is computer software designed to help manage and tune the computer hardware, operating system or applications software by performing a single task or a small range of tasks.

Examples are Disk fragmentation, Disk Cleanup, Backup & Recovery, Antivirus, File managers, Data compression etc.

- **Disk defragmenters** rearranges the fragmented files back together to improve file retrieval speed and efficiency.
- **Disk check or scandisk** is a free utility that can help you scan your disk drives for errors and fix them. It can also scan entire disk for bad sectors and try to recover them.
- **Backup utility** is a program that allows you to back up selected files or an entire disk to a removable storage medium.
- **Antivirus** software is a program or set of programs that are designed to prevent, search for, detect, and remove software viruses, and other malicious software like worms, Trojans, adware, and more.
- **Disk cleanup** (cleanmgr.exe) is a computer maintenance utility included in Microsoft Windows designed to free up disk space on a computer's hard drive.
- **Disk partitioning** is the creation of one or more regions on a hard disk or other secondary storage, so that an operating system can manage information in each region separately.
- **Disk compression** is software designed to organize or compress data to maximize free disk space.
- **File manager** File manager or file browser is a computer program that provides a user interface to manage files and folders.
- **Debuggers**: These are used mainly to solve programming errors.

4. Device Driver Software

It is a system software that controls a particular type of device attached to a computer. It enables the operation of numerous devices, including mouse, keyboard printer, video card and CD-ROM drive by translating commands from the operating system or the user into commands understood by the associated component.

It also translates responses from the component back to the operating system, software application or user.

Application Software

The software that a user uses for accomplishing a specific task is the *application software*. Application software may be a single program or a set of programs. A set of programs that are written for a specific purpose and provide the required functionality is called software package.

- It is designed to do only specific task is called application software.
- The application software made for one purpose cannot do other task.
- Examples, Word processing, Inventory control, financial accounting, Result preparation, Reservation etc.

There are two types of application software:

1. **Package or General Purpose Software:**

   General purpose software's are designed to perform general tasks. The software which is design to meet the common requirement of different people & organization. It is not possible to design software to fulfill the requirement of each of them.

   ➢ It is also called universal software.
   ➢ It should be user friendly.
   ➢ It should have menu driven facility.
   ➢ It should be designed for general purpose.
   ➢ Examples, Word processing Software, Database Software, Spreadsheet Software, Multimedia Software, Presentation Software, MS-office (word, excel, PowerPoint etc.), Adobe Photoshop etc.

   Some of the general purpose application software are:

   ➢ *Word processing software:* For writing letters, reports, documents etc. E.g. MS-Word
   ➢ *Spreadsheet software:* Used for creating budgets, tables etc. E.g. MS-Excel
   ➢ *Presentation software:* To make presentations, slides shows etc. E.g. MS-PowerPoint.
   ➢ *Image processing software:* For drawing, editing photos or images, manipulating graphics etc. E.g. Adobe Photoshop *etc.*

2. **Tailored or Customized / *Specific purpose software:***

   Specific purpose software are designed to perform specific tasks. This type of application software generally has one purpose to execute.

   a. The software which is designed to meet the specific requirement of a particular person or an organization is called Tailored Software.

    b. It is written according to the demand of person or and organization.

    c. The tailored made for one organization cannot be used in another organization.

    d. Examples, Payroll system, sales ledger, Salary sheet, School Management System, Library System, banking software, hotel reservation software, hospital software, billing software, etc.

Some of the specific purpose application software's are:

i) **Reservation system:** It is used to store and retrieve information and conduct transaction related to air travel, hotels, car rental or other activities.

ii) **Attendance system:** It is used to track and optimize the presence of a person/ student in an organization or school.

iii) **Billing system:** It is used to perform the billing process. It handles the tracking of ladled products and services delivered to a customer or set of customers. *etc.*

Different between Application and Software.

S.N.	Application Software	S.N.	System Software
1	It is developed to solve the particular problem of the user or to make the user's task easier.	1	It is developed to operate or manage the hardware components like I/O management, process management, Memory management, Security
2	It is user oriented software.	2	It is hardware oriented software.
3	It is not capable of running independent	3	It is capable of running independently.
4	It is a specific purpose software.	4	It is a general purpose software.
5	It is usually expensive.	5	It is either cheaper or provided of free of cost.
6	A computer runs without application software.	6	A computer cannot be operated without system software.
7	It is comparatively easier to develop.	7	It is difficult to develop and require high level of intelligence.
8	Examples: Banking Software, Mozilla Firefox, Word, Excel etc.	8	Examples: Android, LINUX, UNIX, Windows OS etc.

Software Acquisition

The act or process of acquiring software in different ways like purchase, download free from internet or get it bundled along with hardware is called software acquisition. It is the way in which the software are made available to users.

Some of the ways in which the software are made available to users are as follows:

1. ***Retail software:***

   It is the software sold in retail stores. It comes with printed manuals and installation instructions. For E.g. MS windows OS

2. ***Original Equipment Manufacturer (OEM) software:***

   It refers to software which is sold, and bundled with hardware. Microsoft sells its operating system as OEM software to hardware dealers. OEM software is sold at reduced price, without the manuals, packaging and installation instructions.

3. ***Shareware:***

   It is a program that the user is allowed to try for free, for a specified period of time, as defined in the license. It is downloadable from the Internet. When the trial period ends, the software must be purchased or uninstalled.

4. ***Freeware:***

   It is software that is free for personal use. It is downloadable from the Internet. The commercial use of this software may require a paid license. The author of the freeware software is the owner of the software, though others may use it for free. The users abide by the license terms, where the user cannot make changes to it, or sell it to someone else.

5. ***Open source software:***

   It is software whose source code is available and can be customized and altered within the specified guidelines laid down by the creator. Unlike public domain software, open-source software has restrictions on their use and modification, redistribution limitations, and copyrights. Linux, Apache, Firefox, OpenOffice are some examples of open-source software.

6. ***Public Domain Software***:

   It is free software. Unlike freeware, public domain software does not have a copyright owner or license restrictions. The source code is publicly available for anyone to use. Public domain software can be modified by the user.

7. ***Demo Software:***

   It is designed to demonstrate what a purchased version of the software is capable of doing and provides a restricted set of features. To use the software, the user must buy a fully- functional version.

8. ***Cloud computing:***

   In this concept, software is obtained from third- party providers who run the applications at remote sites. Users have access to the applications through the Internet or through virtual private networks (VPNs). The application provider buys, installs, maintains and upgrades the applications. Users pay on a per-use basis or they license the software, typically month to month.

Programming Language:

The process of writing computer using such rules and symbols is called computer programming or coding. Computer programming is used to prepare computer programs and software.

The language which is used to develop program in computer is called programming language. Being an electronic machine, computer can understand only binary code i.e. 0 and 1 represented by the flow of electricity in the form of 'ON' and 'OFF' in voltage.

Every programming language consists of a set of codes that a computer programmer uses to give instruction to computer to perform some specific task. The set of rules to write the code is called syntax. The computer understand the code after it is complied.

Nowadays there are many programming language for making program in computer. For example: C, C++, VB, .NET, Java etc.

| S.N.	Program	S.N.	Software
1	It is a set of instructions which instructs computer to perform a specific job.	1	It is a collection of instructions, programs, and data which instruct the computer on how to solve computer problems.
2	It is independent.	2	To develop software, collections of programs are needed.
3	It is a component of software	3	It is a logical unit driving the computer system.
4	It defines the computer process.	4	It defines both data and process.
5	A programmer creates programs.	5	Software is created by groups of programmers as a team.
6	It is not generally licensed for sale.	6	It is generally licensed under a company.
7	It cannot be divided in accordance to needs and uses.	7	It can be divided under various needs and uses like application software, utility software, system software, etc.
8	Example: SYS, FoRMAT.SYS, interest calculations, etc.	8	Example: MS Word, Adobe Photoshop, Internet Explorer, etc.

Types of computer programming Language

1) Low Level Language
   i)   Machine Level Language (First Generation Language)
   ii) Assembly Level Language (Second Generation Language)
2) High Level Language
   i.   Procedural language (Third Generation Language)
   ii. Problem oriented language (4GL)
   iii. Natural Language (5GL)

Low Level Language:

Low level language is a machine oriented or depended language in which detail knowledge of hardware specification is required to run the program. Statements in Low Level language are written based on the hardware structure of the computer. The low level language is divided into two types:

Machine Level Language:

The machine language which is written in the form of binary 0's and 1's. The machine level language is directly understand by computer because it is written in the form of 0's and 1's. Each instruction of the machine level language tells computer what to perform. The programs written in machine level language are executed very fast than the program written in any other language.

| Object Program | ⟶ | Processor |
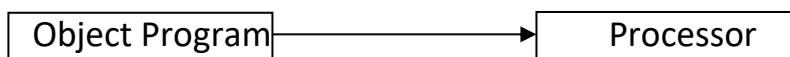
Program in machine Level Language

Advantage

- Program execution is faster than other language.
- It does not require any translating program.

Disadvantages

- Machine Level Language are machine dependent
- It is difficult to perform the machine level language.
- Program development is time consuming.
- There is a greater chance of error in the programming.
- Need to higher level of skill programmer.

Assembly Level Language:

Assembly Level Language is a low level machine dependent language in which the symbolic codes (Mnemonic codes) are used to write assembly programs. With the use of symbolic codes in assembly language, it is easy to write the program for the programmer. For example ADD for addition, SUB for Subtraction, CMP for Comparison. It is easier to understand, find error and correct error. The program written in assembly language needs to be translated into the machine level language. This is done by an assembler an assembler translates the assembly level language into the machine language.

| Source program | ⟶ | Assembler | ⟶ | Object Program | ⟶ | Processor |

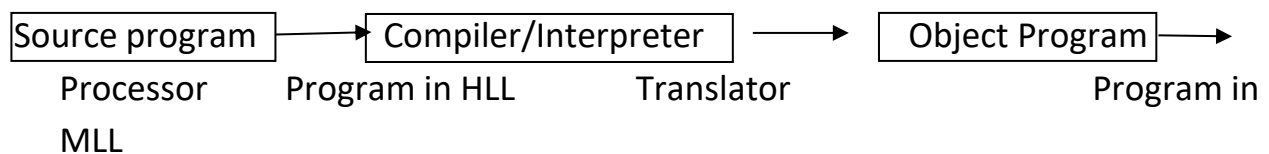Program in ALL   Translator   Program in MLL

Advantage

- It is easy to understand
- It is easy to find and correct error.
- It is easier to modify.
- Program Execution is faster than High level language

Disadvantage

- It is machine dependent language.
- Program development and debugging is more difficult and time consuming than HLL.
- It is very hard to remember the mnemonics
- It required translating program.

High Level Language:

High Level languages are the language which uses human language and mathematical notations. High level language uses the English keywords and mathematical symbols to write the program rather than mnemonics codes used in assembly language. High level languages are machine independent. While using high level language the program is not concerned about the machine structure of the computer. The high level language is to be translated into machine level language. This task is done by using the compilers and interpreters. These are also called translating program. The program written using high level language is easier to maintain than low level language. Advanced program can be developed using high level programming language. Some of the common high level language is: BASIC, PASCAL, FORTRAN, C, C++, Java etc.

Source program	→	Compiler/Interpreter	→	Object Program	→
Processor MLL		Program in HLL Translator			Program in

Advantage

- It is machine independent
- It is easier to learn and develop
- Easily detect and remove errors.
- It is easier to maintain.
- Lower programming cost.
- Better documentation.
- Programmer does not need to remember large no. of mnemonics.
- No need to knowledge of internal structure Tef computer architecture for writing source program in HLL.

Disadvantage

- Computer does not understand directly
- More time to require for execution of the program.

- Require more memory space
- Less flexibility
- It needs to be translating program.
- Operating speed is slow.

Differentiate between Assembly level language and Machine level language.

S.N.	Assembly Level Language	S.N.	Machine Level Language
1	It can't directly understand by computer.	1	It can directly understand by computer.
2	It need to translator program: Assembler	2	It is not required translator program.
3	It is used to symbolic instructions code.	3	It is used to 0 and 1 code in program.
4	It is also called symbolic/2nd generation language	4	It is also called binary/1st generation language.
5	It takes more time to execution.	5	It takes less time to execution.
6	It is easy to understand & write program.	6	It is difficult to understand & write program.
7	It is easy to debug errors.	7	It is hard to debug errors.

High Level Language can be further categories as:

i)   Procedural oriented language (3GL)

ii) Problem oriented language (4GL)

iii) Natural Language (5GL)

Procedural oriented language (3GL)

This language uses simple English and mathematical statements to solve various problems. It includes the languages like BASIC, C, C++, etc.

Advantages:

- It is easier to develop and debug program.
- More advanced and user-friendly.
- It is machine independent language.

Disadvantages:

- It needs to be translated into a machine language code.
- Program execution will be slower than 1GL AND 2GL.
- It is difficult to develop hardware oriented software.

Fourth Generation Language:

It is also known as domain specific language due to accessibility of appropriate domain such as database queries, report generators, data manipulation, analysis and reporting, screen painters and generators, GUI creators, mathematical optimization, web development and general purpose languages. Dbase, MS Access, Sybase, MySQL, MS SQL

Server, Oracle are the some database and query processing language to maintain database. Visual C++, Java, C#, Visual.net are some example of application based programming language whereas HTML, XML, Java script, PHP, JSP, VBScript are some web based scripting languages.

Advantage:

» It is a programmer friendly language to develop a program in easily and efficiently,

» Program can be created and designed in short period of time. So it is a high productivity language,

» It requires less time, cost and effort to develop program than 4 GL comparatively,

» It requires less numbers of codes for performing a any specific task,

» It is a highly portable language,

» It is very easy to debug any application written in this language.

Disadvantage:

» It requires more memory and storage than other language,

» It takes more execution time,

» It is cannot communicate directly with the hardware.

Fifth Generation Language:

The fifth generation language is also known as natural language. This language is still in development stage. The computer becomes a smarter, intelligence and user friendly and able to understand and procedure human being language such as English, Nepali, Chinese and many more because of this language.

Fifth generation language allows people to interact with computers without needing any specialized knowledge. People can talk to computers and the voice recognition systems can convert spoken sounds into written words. The major fields in which the fifth generation programming language are employed are Artificial Intelligence, research, robotics, defense system, expert system and Artificial Neural Networks. Mercury, PROLOG, OPS5 and LISP are the languages used for developing its application.

Some features of fifth generation are as given below:

» The user can communicate with the computer system in a simple and an easy manner,

» They are designed to allow the computer to become smarter, intelligence and natural,

» These languages can be used to query the database in a fast and efficient manner.

Advantages:

- It will be even easier to develop and debug the program.
- The programs designed using 5GL will have artificial intelligence (AI).

Disadvantages:

- It is slower than previous generation languages.
- Highly advanced and expensive electronic devices are required to run programs developed in 5GL. Therefore, it is an expensive approach.

Language Processor (Translator)

Language Processor is the programs that translate the program written in other language (source program) to the machine level language program (object program). They are three types.

1. Assembler:

An assembler is a translator or translating program which translates codes of assembly language into equivalent machine level code. The program which is to be translated by assembler is called source program and the translated program by assembler is object program.

```
Source program  ───►  Assembler  ───►  Object Program  ───►  Processor
Program in ALL         Translator       Program in MLL
```
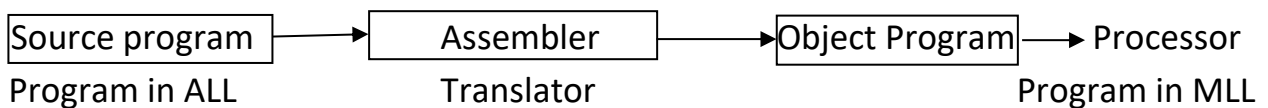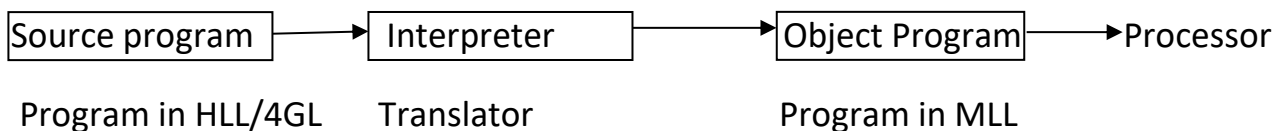
2. Compiler:

A compiler is a translating program that translates the program written in high level language into equivalent machine level language at once. The program written in high level language is called source program and the program translated into machine language is called object program.

```
Source program  ───►  Compiler  ───►  Object Program  ───►  Processor
Program in HLL/4GL     Translator      Program in MLL
```
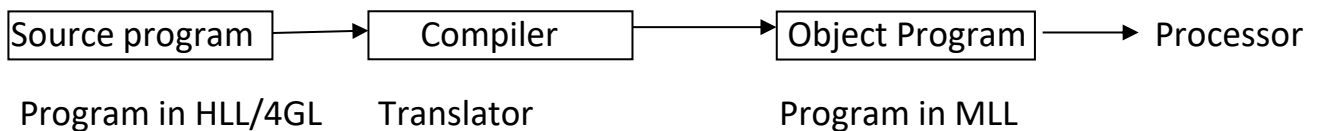
3. Interpreter:

An interpreter is a translating program which translates the program written using high level language into equivalent machine level language one line at a time. It is similar to compiler but it converts the program's one line at a time into machine level language.

```
Source program  ───►  Interpreter  ───►  Object Program  ───►  Processor
Program in HLL/4GL     Translator         Program in MLL
```

Differentiate between Compiler and Interpreter.

S.N.	Compiler	S.N.	Interpreter
1	It translates a complete high-level language program into machine language at once.	1	It translates high-level language program into machine language line by line.
2	It finds the syntax errors after compiling the whole program.	2	It finds the syntax errors after translating each line of the program.

3	The compiling process is faster than the interpreter.	3	The interpreting process is slower than a compiler.
4	It creates the object code after compiling the whole program.	4	It creates the object code after translating each line of the program.
5	The debugging process is complicated in a compiler.	5	Debugging process is easy in the interpreter.
6	Compiler demands more resources (memory, CPU time etc.) than interpreter.	6	Interpreter requires low resources.
7	Example: C, C++, Visual Basic, java, etc.	7	Example: BASIC, QBASIC, GWBASIC, etc.

Operating System

Operating system is a computer program (a system software) that acts as intermediate between the user and computer hardware. On other word operating system is an organized set or collection of software program that control the overall operation of the computer system.

• An ***operating system*** is a program that acts as an intermediary between a user of a computer and the computer hardware.

• The purpose of an operating system is to provide an environment in which a user can execute programs. The primary goal of an operating system is thus to make the computer system *convenient* to use.
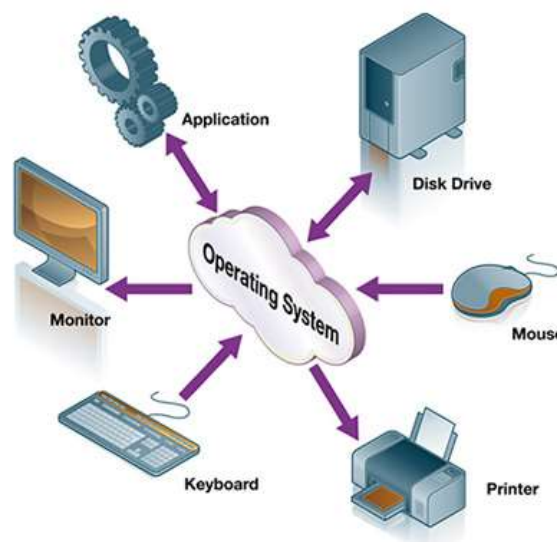

Fig. Interface between the user & computer hardware

As computer consist of various resources (parts) like memory, CPU, disk etc. it's very difficult for the user computer to understand how to operate them directly. So operating system became interprets between the computer hardware and user. OS is a resources manager which is used to operate the computer properly by managing following.

- Memory Management   - I/O Mgmt.
- Process Management   - Error prompt Mgmt.
- File Management   - Data & programs Mgmt.

Operating system is the master software to the computer. Without operating system computer is a like death machine (Ideal) so that it controls the overall parts of computer and force. It's to function like a working computer. During starting to the computer operating system can control and handed overall function like memory management, CPU management. Input output device management etc. Therefore operating system like a soul of human being.

Objectives of Operating System

An operating system is the master controller and sets the standard for all application software that a computer runs. It works like an air traffic controller to coordinate the activities within the computer. It performs a variety of important functions. Some of the important objectives of operating system are listed below:

➢ To make the computer system convenient to use in an efficient manner.

➢ To hide the details of the hardware resources from the users.

➢ To provide users a convenient interface to use the computer system.

➢ To act as an intermediary between the hardware and its users, making it easier for the users to access and use other resources.

➢ To manage the resources of a computer system.

➢ To keep track of who is using which resource, granting resource requests, and mediating conflicting requests from different programs and users.

➢ To provide efficient and fair sharing of resources among users and programs.

➢ Production of dumps, traces, error message and other debugging, detection aids.

➢ Accounting, maintenance of internal time clock and log of system and computer operators.

The function of Operating System
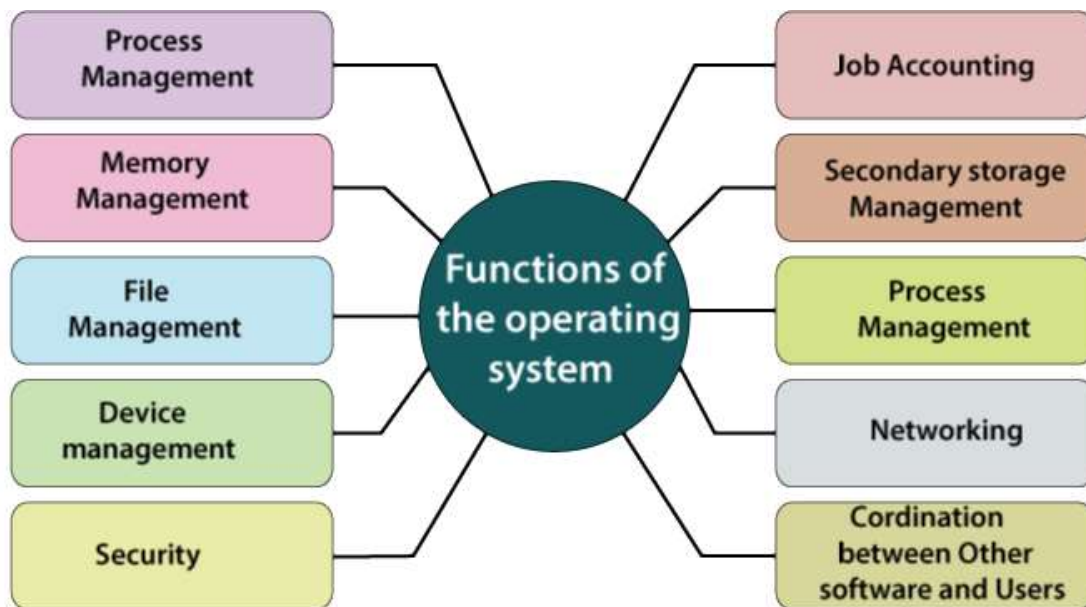
1. Memory Management functions

➢ Keeps track of memory by recording which is in use by which program and which is free.

➢ Decides which jobs should get memory and for how much time in case of multiprogramming.

➢ Allocates the memory space to a job.

➢ After the use of memory, makes it available for use by others.

2. Processor Management Functions

➢ Keep track of the processor by recording whether it is busy and if so who is using it.

➢ Decides which job should the processor use and for how long.

➢ Allocates the processor to the job decided.

➢ De-allocates the processor after use for an allotted time.

3. Device Management Functions

➢ Keeps track of I/O device and channels. i.e., which devices is in use and by which job.

➢ Decides which job should use the device and for how long.

➢ Allocate the device to the job.

➢ De-allocates the device after use.

4. Program and Data Management

➢ Keeps track of files, i.e., which files are in use and by which jobs and also maintain a directory of files.

➢ Decides which job should use the files and for what purpose, i.e., read/write/execute.

➢ Allocates the file for use.

➢ De-allocates the file, i.e., close the file.

5. File or Storage Management

Disk storage is only one of the memory types that must be managed by the operating system, and is the slowest. The different types of memory to be managed in a computer system are given here in the order of their speed, the fastest memory first.

6. I/O Management

Input/output (IO) is an essential element for the operation of any computer. It allows the computer to interact with peripheral devices such as a keyboard, mouse, terminals (like modem, TV card, and NIC card), disks or tapes (CD, DVD, and Floppy disk), printer etc.

Types of operating System

1. Classification of OS based on the Processing Method:

1. *Batch Processing OS*
2. *Real time system*
3. *Multiprogramming*
4. *Multiprocessing*
5. *Multitasking*
6. *Online Processing*
7. *Time Sharing*
8. *Network and distributed*

2. Classification of OS based on the User Interface:

1. *GUI*
2. *CUI*

**3. Classification of OS based on the Mode of user:**

1. *Single User*
2. *Multi User*

1. Batch Processing Operating System

In the 1970s, Batch processing was very popular. In this technique, similar types of jobs were batched together and executed in time. People were used to having a single computer which was called a mainframe.

In Batch operating system, access is given to more than one person; they submit their respective jobs to the system for the execution.

The system put all of the jobs in a queue on the basis of first come first serve and then executes the jobs one by one. The users collect their respective output when all the jobs get executed.
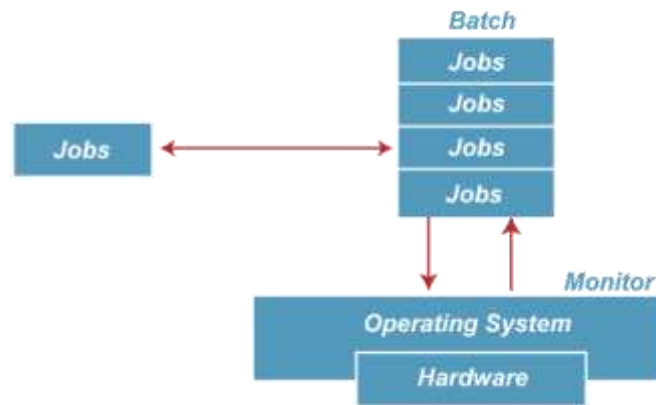
The purpose of this operating system was mainly to transfer control from one job to another as soon as the job was completed. It contained a small set of programs called the resident monitor that always resided in one part of the main memory. The remaining part is used for servicing jobs.

2. Multiprogramming Operating System

Multiprogramming is an extension to batch processing where the CPU is always kept busy. Each process needs two types of system time: CPU time and IO time.

In a multiprogramming environment, when a process does its I/O, The CPU can start the execution of other processes. Therefore, multiprogramming improves the efficiency of the system.
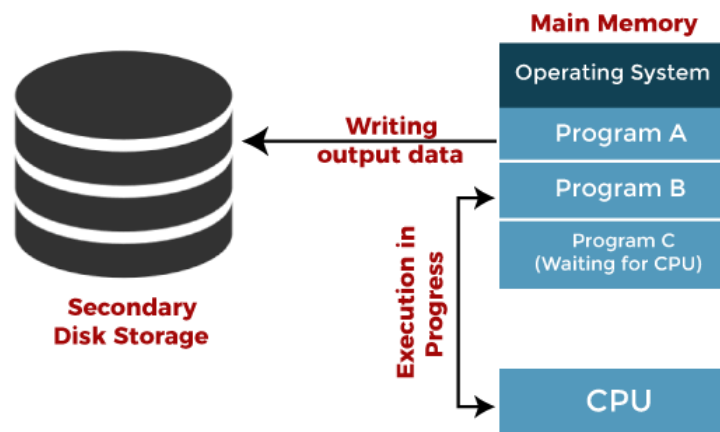
Jobs in multiprogramming system

**Advantages of Multiprogramming OS**
 ➢ Throughout the system, it increased as the CPU always had one program to execute.
 ➢ Response time can also be reduced.

Disadvantages of Multiprogramming OS
 ➢ Multiprogramming systems provide an environment in which various systems resources are used efficiently, but they do not provide any user interaction with the computer system.

3. Multiprocessing Operating System

In Multiprocessing, Parallel computing is achieved. There are more than one processors present in the system which can execute more than one process at the same time. This will increase the throughput of the system.
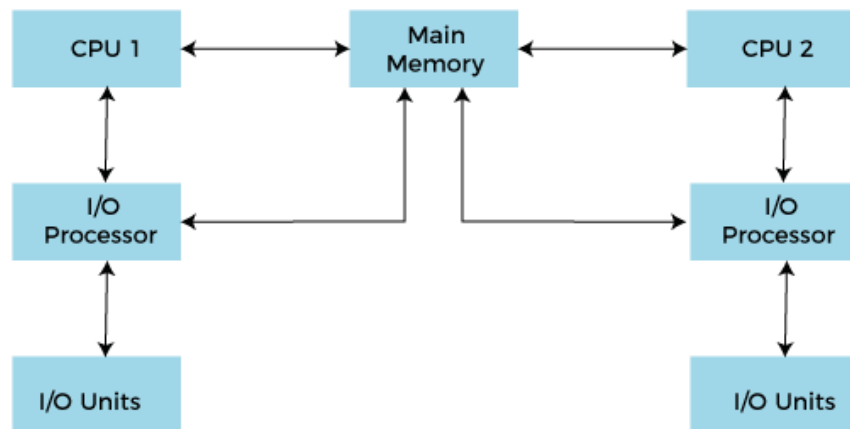
Working of Multiprocessor System

In Multiprocessing, Parallel computing is achieved. More than one processor present in the system can execute more than one process simultaneously, which will increase the throughput of the system.
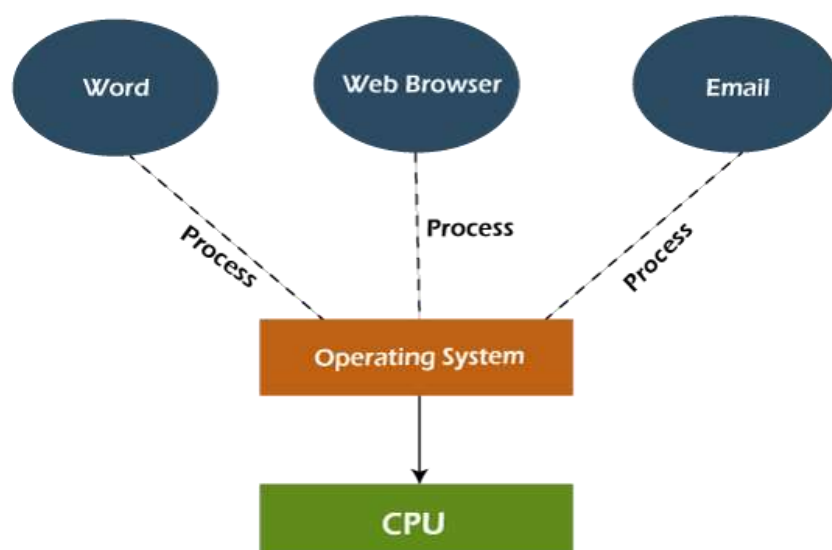
Advantages of Multiprocessing operating system:
- **Increased reliability:** Due to the multiprocessing system, processing tasks can be distributed among several processors. This increases reliability as if one processor fails, the task can be given to another processor for completion.
- **Increased throughout:** As several processors increase, more work can be done in less.

Disadvantages of Multiprocessing operating System
- Multiprocessing operating system is more complex and sophisticated as it takes care of multiple CPUs simultaneously.

4. Multitasking Operating System

The multitasking operating system is a logical extension of a multiprogramming system that enables **multiple** programs simultaneously. It allows a user to perform more than one computer task at the same time.

Advantages of Multitasking operating system

➢ This operating system is more suited to supporting multiple users simultaneously.

➢ The multitasking operating systems have well-defined memory management.

Disadvantages of Multitasking operating system

➢ The multiple processors are busier at the same time to complete any task in a multitasking environment, so the CPU generates more heat.

5. Time sharing management:

It is a kind of multiprogramming OS which operates in an interactive mode with quick response time. The user request to the computer and get response on the user terminal. Hence this operating system is also called Online Operating System. A time sharing system allows the many users to simultaneously share the computer resources. Example CP/CMS.

In this system, the CPU executes multiple jobs by switching among them, but the witches occur so frequently that the users can interact with each program while it is running.
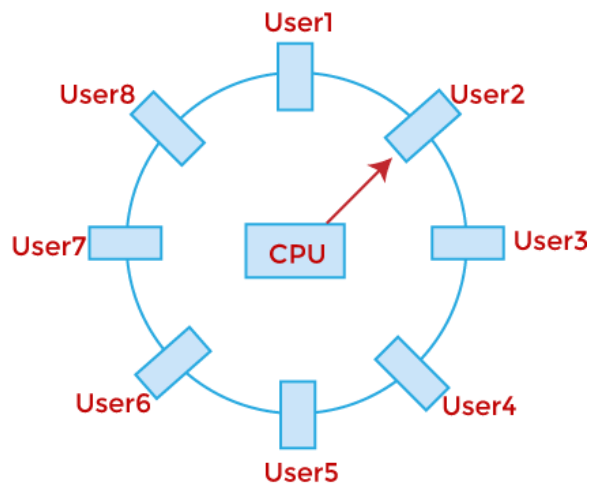
Timesharing in case of 8 users

Advantages of Time Sharing Operating System

➢ The time-sharing operating system provides effective utilization and sharing of resources.

➢ This system reduces CPU idle and response time.

Disadvantages of Time Sharing Operating System

➢ Data transmission rates are very high in comparison to other methods.

➢ Security and integrity of user programs loaded in memory and data need to be maintained as many users access the system at the same time.

6. Real time system:

Real time operating system is method which controls environment by receiving data, processing them and taking action quickly at that time. Application of Real time system Operating system.

Real - Time Operating System (RTOS)
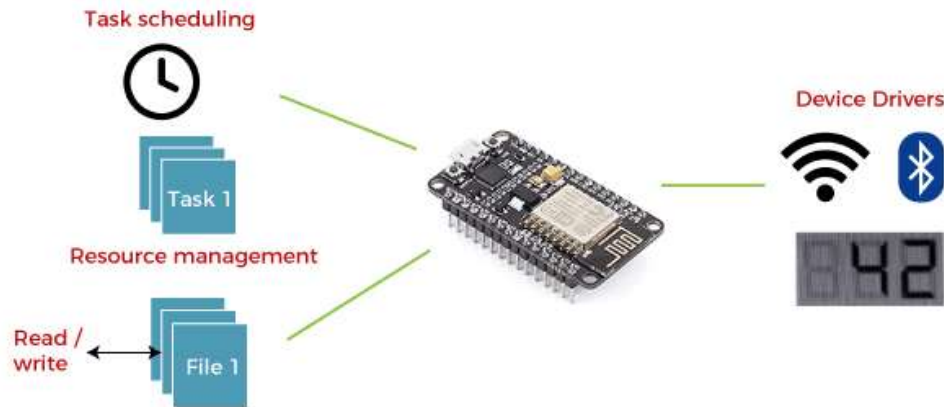
- ➢ Rocket launching
- ➢ Monitoring and controlling nuclear power station
- ➢ Robotics
- ➢ Traffic light control
- ➢ Airlines reservation

It is an OS where there are a number of possibly unrelated external activities needed to be controlled by a single processor system. In such systems a hierarchical interrupt system was coupled with process prioritization to ensure that key activities were given a greater share of available process time. Examples: Basic real time monitor, BSO/RTOS, RT Linux, etc.

Advantages of Real-time operating system:
- ➢ Easy to layout, develop and execute real-time applications under the real-time operating system.
- ➢ In a Real-time operating system, the maximum utilization of devices and systems.

Disadvantages of Real-time operating system:
- ➢ Real-time operating systems are very costly to develop.
- ➢ Real-time operating systems are very complex and can consume critical CPU cycles.

7. Network System

➢ Network operating system works under client/ server principle. The server provides services such as mail, database, printing etc. client computer take service provided by the server.

➢ When computers in a group work in cooperation, they make a distributed system. Distributed systems use multiple central processors to serve multiple real time application and multiple users. Data processing jobs are distributed among the processors accordingly to which one can perform each job most efficiently.

➢ Examples of network operating systems are Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD.
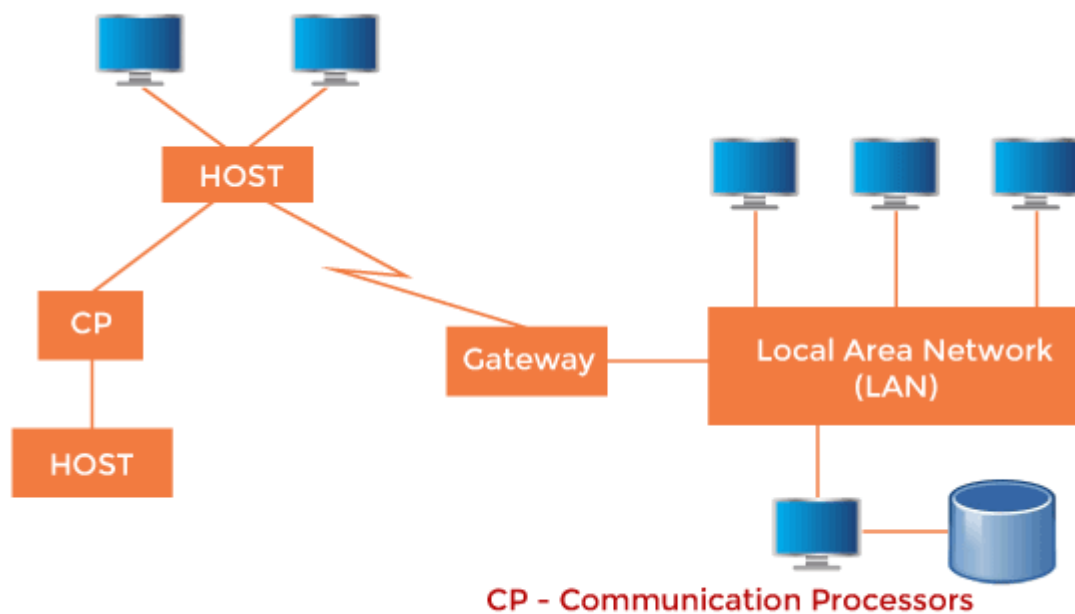
Advantages of Network Operating System

➢ 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.

8. 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.

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.

Classification of OS based on the User Interface

CUI (Character User Interface) / CLI (Command Line Interface) / TBI (Text Base Interface)

In CUI, where the user provides the input by typing a commands string with the computer keyboard and the system provide output by printing text on the computer monitor. So, the commands are accepted and executed by a part of the OS called CUI.

Features of CUI

- ➢ CUI is more textual and less user friendly.
- ➢ User have to remember syntax and commands.
- ➢ It needs less amount of memory space.
- ➢ It does not contain different components such as text box, icon, desktop, pointing devices etc.
- ➢ CUI is faster than GUI.
- ➢ Other peripherals like mouse, light pen and joystick are not recognized.
- ➢ It cannot display graphics, pictures or icon.
- ➢ It does not support multimedia environment.
- ➢ It does not support multitasking, multiprogramming, multiprogramming etc.

GUI (Graphical User Interface)

A graphical user interface allows a user to enter commands by pointing and clicking at objects that appear on the screen. It takes advantage of the computer`s graphical capabilities to make the program easier to use for the users.

Features of GUI

- ➢ GUI is graphical and user friendly.
- ➢ Users don't have to remember syntax and commands
- ➢ It needs large amount of memory space.
- ➢ It runs other windows based programs like Ms-word etc.
- ➢ It provide utility software to improve the functionality of the computer.
- ➢ It consists of different components such as text box, icon, desktop, pointing devices etc.
- ➢ It needs faster processor to operate.
- ➢ In GUI, other peripherals like mouse, light pen, joystick can be used.
- ➢ It supports multimedia environment.
- ➢ It supports multitasking, multiprogramming, multithreading etc

Classification of OS based on Mode of user

Single User

It allows one user at a time. Normally, only allows one user program to be run and processed at a time. It based on small microcomputer which allows a single user to operate the machine. Example are MS-DOS, PC-DOS etc.

Multiuser

It allows two or more users to run program at the same time. Some OS permit hundreds or even thousands of concurrent users. The OS systems of mainframe and minicomputers are multiuser systems. Examples are UNIX, LINUX etc.

S.N.	Multiprogramming	S.N.	Multiprocessing
1	It is more than one program can be used at the same time.	1	It is more than one program can be processed/ executed at the same time.
2	It can have either single or multiple processors.	2	It contains multiple processors.
3	This systems may or may not be multiprocessing.	3	This system will be multiprogramming.
4	It will be comparatively slower as the CPU time is divided among multiple programs.	4	It will be comparatively faster due to multiple processors.
5	The hardware requirement of multiprogramming OS is cheaper.	5	The hardware requirement multiprocessing is expensive.
6	It is older processing concept.	6	It is newer processing concept.
7	examples MS windows, Linux, Mac OS	7	Examples UNIX, MS windows Sever.

S.N.	Online Processing	S.N.	Real time processing
1	The transaction is processed as soon as it happened and at the place of origin.	1	It is an online processing in which the processing time is critical or important.
2	It is not as complex as real time processing.	2	It is more complex than the online system.
3	The response time of online system is lower than the real time systems.	3	It has better response time.
4	It takes fewer resources and cost to develop an online system.	4	It takes more resources and cost to develop.
5	It is a transaction processing system.	5	It is an event processing system.
6	It is mainly used in the general purpose system.	6	It is mainly used in a Special purpose system.

Example of Operating System

Microsoft Windows

Microsoft Windows, or simply Windows, is a Meta family of graphical operating systems Developed, marketed, and sold by Microsoft. It is the most flexible and powerful operating

System that makes computing on personal computers simpler than before. It includes support for networking, Plug and Play technology, longer filenames and Internet access.

Windows is a graphical operating system developed by Microsoft. It allows users to view and store files, run the software, play games, watch videos, and provides a way to connect to the internet. It was released for both home computing and professional works.

Microsoft introduced the first version as 1.0

It was released for both home computing and professional functions of Windows on **10 November 1983**. Later, it was released on many versions of Windows as well as the current version, Windows 11.

In 1993, the first business-oriented version of Windows was released, which is known as **Windows NT 3.1**. Then it introduced the next versions, **Windows 3.5**, **4/0**, Windows 95, windows 98, **Windows 2000, and Windows Me**. When the XP Windows was released by Microsoft in 2001, the company designed its various versions for a personal and business environment. Examples windows Server 2003, Windows Vista, Windows Server 2008, Windows 7, Windows 8, Windows 10.

Microsoft Disk Operating System

Microsoft Disk Operating System (MS-DOS) was developed by Microsoft. It is a single-tasking, single-user operating system with a command-line interface. It provides many capabilities that include efficient use of disk space, easy recovery facilities, high speed input/output operations and user-friendly command language.

Microsoft Disk Operating System (MS-DOS) is a popular, single-user Operating System. It was developed for the IBM range of computers at Microsoft Inc, USA, in 1981. It was developed for 16-bit microcomputers.

UNIX:

UNIX is a powerful flexible and manageable operating system with good utilities and communication abilities. It is multi-user, multi-tasking and multi-processing operating system. It is used in bigger size machine like mainframe and Min Computer. It was develop by AT&T Bell lab around 1970 AD. UNIX is developed in C and Assembly language. The development of the UNIX has given birth too many operating system such as Linux, Solaris etc. These operating system inherits its main feature from UNIX.

Linux:

It is open source powerful UNIX based operating system, that can run on variety of platform including Intel, Power PC, DEC Alpha processor as well as multiprocessing system. It was developed by Linux Torvalds at the University of Helsinki as a college project. He release the version of Linux including all the source code. It is user develop product, meaning that user around the world who ran this OS for their own use have develop many of its components and drivers. It is multi-user, multi-tasking and multi-programming OS

mainly popular for server system. It is distributed through different distributor such as Red Hat, Open USE, Ubuntu, Fedora, Debian, Granular Linux, Mandriva etc

MAC OS:

MAC OS is a popular GUI based OS for Apple Inc. It is used in Apple Macintosh computer. It has very high quality graphical user interface. Earlier version of this OS were only compatible with Motorola 68000 series of processors but now they are compatible with Intel processors also.

Popular Operating Systems for Mobile Devices

A mobile operating system, also called a mobile OS, is an operating system that is specifically designed to run on mobile devices such as mobile phones, smartphones, PDAs, tablet computers and other handheld devices. The mobile operating system is the software platform on top of which other programs, called application programs, can run on mobile devices.

Examples of mobile device operating systems include Apple iOS, Google Android, BlackBerry OS and Windows Phone.

Android

Android is the name of the mobile operating system owned by American company, Google. The OS is based on Linux, making it an open source. It most commonly comes installed on a variety of smartphones and tablets from a host of manufacturers offering users access to Google's own services like Search, YouTube, Maps, Gmail and more.

Apple iOS

iOS (formerly iPhone OS) is a mobile operating system created and developed by Apple Inc. exclusively for its hardware. It is the operating system that powers mobile devices, including the iPhone, iPad, and iPod Touch. Users can only download apps for their Apple devices from the App store in iTunes. The Apple website indicates that more than 500,000 apps and games are available in iTunes for Apple devices.

BlackBerry OS

BlackBerry OS is a proprietary mobile operating system designed specifically for Research In Motion's (RIM) BlackBerry devices. The BlackBerry OS is designed for smartphone environments and is best known for its robust support for push Internet email. The operating system provides multitasking. The BlackBerry OS runs on Blackberry variant phones like the BlackBerry Bold, Curve, Pearl and Storm series.

Windows Phone

Windows Phone is a family of mobile operating systems developed by Microsoft for smart phones. Windows Phone features a new user interface derived from Metro design language. It was first launched in October 2010 with Windows Phone 7. Windows Phone 8.1 is the latest public release of the operating system, released to manufacturing on April 14, 2014.

Cloud Operating System

A cloud operating system is a type of operating system designed to operate within cloud computing and virtualized environments. A cloud operating system manages the operation, execution and processes of virtual machines, virtual servers and virtual infrastructure, as well as the back-end hardware and software resources. It is designed for Netbooks, Mobile Internet Devices, and PCs that are mainly used to browse the Internet. A cloud operating system may also be called a virtual operating system.

New Trends in Software

The current trend in software development is a mix of technologies such as cloud computing, micro services architecture, and DevOps practices. These recent trends in software development have changed a lot of things in the IT sector and also it has transformed how software is developed, deployed, and maintained. Agile methodologies have gained worldwide acceptance, which also allows for faster development cycles and increased collaboration among teams from different departments in this new software trend.

TOP 10 **SOFTWARE DEVELOPMENT TRENDS** IN 2024

- Artificial Intelligence
- Cybersecurity
- Blockchain Adoption
- ISO/IEC 9126 Software Quality Standard
- Low-code Development
- Progressive Web Applications
- Software Outsourcing
- Distributed Cloud Services
- The Internet of Things (IoT)
- Mixed Reality