

Unit 2:

ntroduction to Operating System: Definition of Operating System, Types and Functions of Operating Systems, Free and Open-Source Software. Introduction to Database Management System: Introduction, File Oriented Approach and Database, importance and applications of DBMS..

GUI Operating System

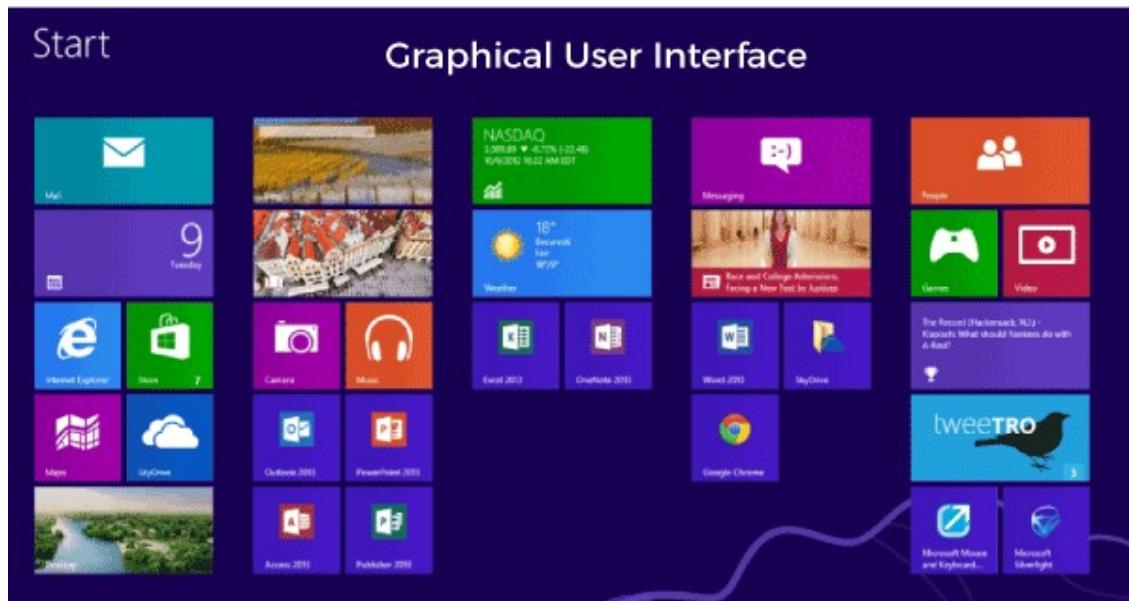
An operating system is software that provides an interface between the user and the hardware. The computer cannot perform any task without an operating system. The operating system controls and manages the operation of computer hardware.

Some popular, modern graphical user interfaces include Microsoft Windows, macOS, Ubuntu, Android, Apple's iOS, BlackBerry OS, Windows 10 Mobile,

Some operating systems are graphical user interfaces (GUI), and some are command-line interfaces (CLI)

What is GUI OS?

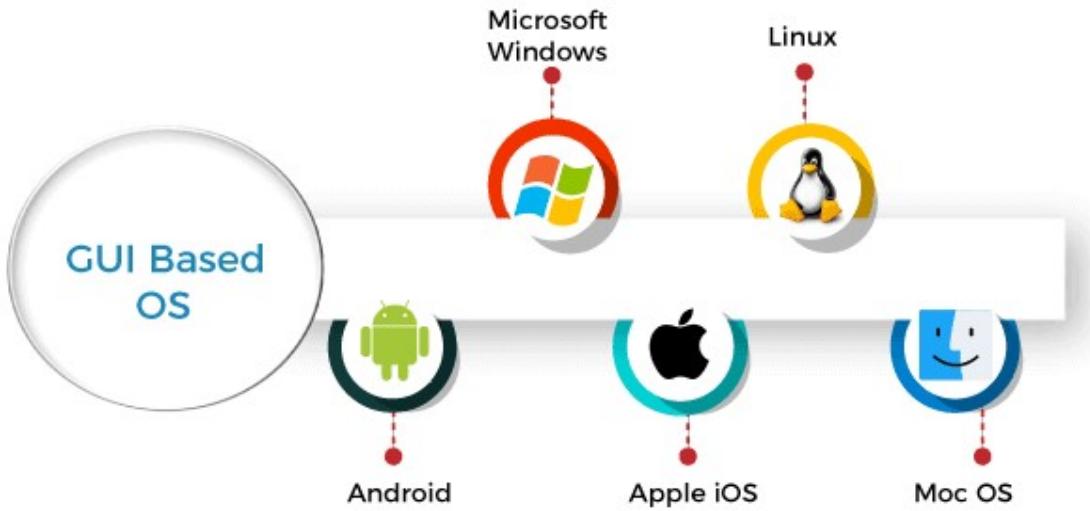
GUI stands for Graphical User Interface. It is a visual representation of communication presented to the user for easy interaction with the machine. The actions in a GUI are usually performed through direct manipulation of graphical elements like buttons and icons. Communication can be performed by interacting with these icons rather than the usual text-based or command-based communication.



There are different elements and objects that the user use to interact with the software to make a user friendly GUI.

- **Button:** A graphical representation of a button that acts as a program when pressed.
- **Dialogue box:** A type of window that displays additional information and asks a user for input.
- **Icon:** Small graphical representation of a program, features, or file.
- **Menu:** List of commands or choices offered to the user through the menu bar.
- **Ribbon:** Replacement for the file menu and toolbar that groups programs activities together.
- **Tab:** Clickable area at the top of a window that shows another page or area.
- **Toolbar:** Row of buttons, often near the top of an application window, that controls software functions.
- **Window:** Rectangular section of the computer's display that shows the program currently being used.

Types of GUI based Operating System



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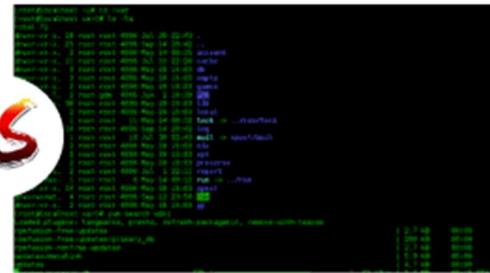
Difference between GUI and CUI Operating System

The interface can be understood as the medium we communicate with each other. In the same way, to communicate with the computer, we have interfaces. There are two types of interface one is the graphical user interface, and the other one is the command-line interface.

GUI



CUI



A command user interface (CUI) processes commands to a computer program in the form of lines of text. The program which handles the interface is called a command-line interpreter or command-line processor. Operating systems implement a command-line interface in a shell for interactive access to operating system functions or services.

The graphical user interface (GUI) allows users to interact with electronic devices through graphical icons and audio indicators such as primary notation instead of text-based user interfaces, typed command labels, or text navigation. Below are some more differences between GUI and CUI Operating System, such as:

Terms	GUI	CUI
Interaction	A user interacts with the computer using Graphics like images, icons.	A user interacts with a computer using commands like text.
Navigation	Navigation is easy.	Navigation is difficult.
Usage	GUI is easy to use.	CUI is difficult to use and requires expertise.
Peripherals used	GUI operating system requires a keyboard, mouse or any other pointing device.	CUI operating system requires the only keyboard.
Memory requirement	It required high memory.	It required low memory.

Flexibility	Highly flexible user interface.	Less flexible user interface.
Customize	GUI is highly customizable.	CUI appearance is not easily changeable.

What are the benefits of GUI?

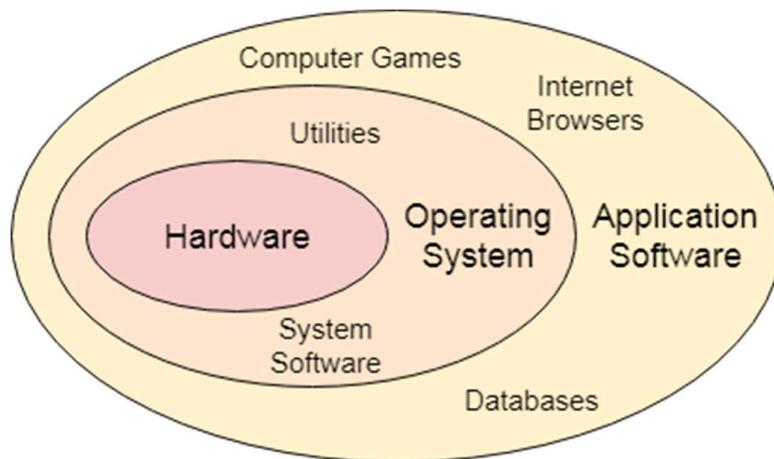
A GUI is considered to be more user-friendly than a text-based command-line interface, such as MS-DOS or the shell of Unix-like operating systems.

Unlike a command-line operating system or CUI (command-line user interface), like Unix or MS-DOS, GUI operating systems are easier to learn and use because commands do not need to be memorized. Additionally, users do not need to know any programming languages. Because of their ease of use and more modern appearance, GUI operating systems are the primary type of operating systems used today.

Operating System Definition and Function

In the Computer System (comprises of Hardware and software), Hardware can only understand machine code (in the form of 0 and 1) which doesn't make any sense to a naive user.

We need a system which can act as an intermediary and manage all the processes and resources present in the system.



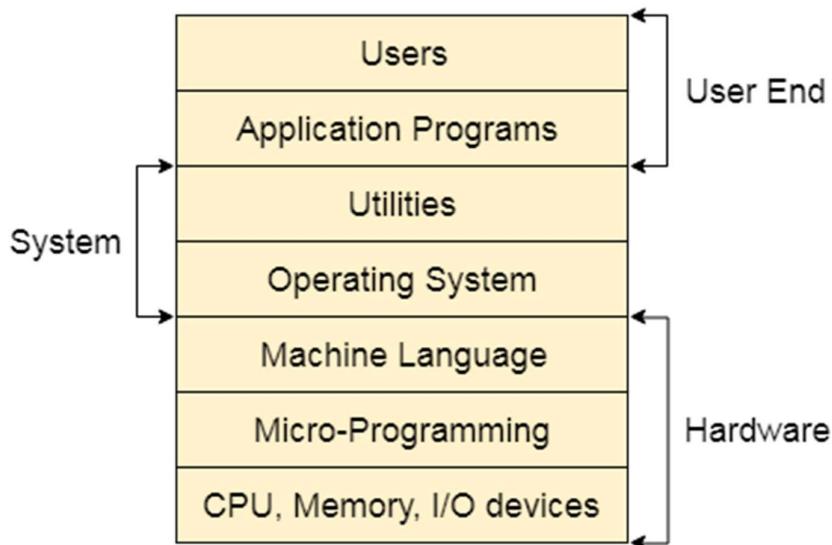
An **Operating System** can be defined as an **interface between user and hardware**. It is responsible for the execution of all the processes, Resource Allocation, **CPU** management, File Management and many other tasks.

The purpose of an operating system is to provide an environment in which a user can execute programs in convenient and efficient manner.

Structure of a Computer System

A Computer System consists of:

- Users (people who are using the computer)
- Application Programs (Games, Video player, Browsers, etc.)
- System Programs (Shells, Editors, Compilers, etc.)
- Operating System (A special program which acts as an interface between user and hardware)
- Hardware (CPU, Disks, Memory, etc)



What does an Operating system do?

Functions/services of Operating System

1. Process Management
2. Storage management
3. Memory Management
4. Device management
5. CPU Scheduling
6. File Management
7. Security

Functions of Operating System

1. Memory Management

It is the management of the main or primary memory. Whatever program is executed, it has to be present in the main memory. Main memory is a quick storage area that may be accessed directly by the CPU. When the program is completed, the memory region is released and can be used by other programs. Therefore, there can be more than one program present at a time. Hence, it is required to manage the memory.

The operating system:

- Allocates and deallocates the memory.
- Keeps a record of which part of primary memory is used by whom and how much.
- Distributes the memory while multiprocessing.
- In multiprogramming, the operating system selects which processes acquire memory when and how much memory they get.

2. Processor Management/Scheduling

Every software that runs on a computer, whether in the background or in the frontend, is a process. Processor management is an execution unit in which a program operates. The operating system determines the status of the processor and processes, selects a job and its processor, allocates the processor to the process, and de-allocates the processor after the process is completed.

When more than one process runs on the system the OS decides how and when a process will use the CPU. Hence, the name is also **CPU Scheduling**. The OS:

- Allocates and deallocates processor to the processes.
- Keeps record of CPU status.

Certain algorithms used for CPU scheduling are as follows:

- First Come First Serve (FCFS)
- Shortest Job First (SJF)
- Round-Robin Scheduling
- Priority-based scheduling etc.

Purpose of CPU scheduling

The purpose of CPU scheduling is as follows:

- Proper utilization of CPU. Since the proper utilization of the CPU is necessary. Therefore, the OS makes sure that the CPU should be as busy as possible.
- Since every device should get a chance to use the processor. Hence, the OS makes sure that the devices get fair processor time.
- Increasing the efficiency of the system.

3. Device Management

An operating system regulates device connection using drivers. The processes may require devices for their use. This management is done by the OS. The OS:

- Allocates and deallocates devices to different processes.
- Keeps records of the devices.
- Decides which process can use which device for how much time.

4. File Management

The operating system manages resource allocation and de-allocation. It specifies which process receives the file and for how long. It also keeps track of information, location, uses, status, and so on. These groupings of resources are referred to as file systems. The files on a system are stored in different directories. The OS:

- Keeps records of the status and locations of files.
- Allocates and deallocates resources.
- Decides who gets the resources.

5. Storage Management

Storage management is a procedure that allows users to maximize the utilization of storage devices while also protecting data integrity on whatever media on which it lives. Network virtualization, replication, mirroring, security, compression, deduplication, traffic analysis, process automation, storage provisioning, and memory management are some of the features that may be included. The operating system is in charge of storing and accessing files. The creation of files, the creation of directories, the reading and writing of data from files and directories, as well as the copying of the contents of files and directories from one location to another are all included in storage management.

The OS uses storage management for:

- Improving the performance of the data storage resources.
- It optimizes the use of various storage devices.
- Assists businesses in storing more data on existing hardware, speeding up the data retrieval process, preventing data loss, meeting data retention regulations, and lowering IT costs

Another functions of Operating System

- **Security** – For security, modern operating systems employ a firewall. A firewall is a type of security system that monitors all computer activity and blocks it if it detects a threat.
- **Job Accounting** – As the operating system keeps track of all the functions of a computer system. Hence, it makes a record of all the activities taking place on the system. It has an account of all the information about the memory, resources, errors, etc. Therefore, this information can be used as and when required.
- **Control over system performance** – The operating system will collect consumption statistics for various resources and monitor performance indicators such as reaction time, which is the time between requesting a service and receiving a response from the system.
- **Error detecting aids** – While a computer system is running, a variety of errors might occur. Error detection guarantees that data is delivered reliably across susceptible networks. The operating system continuously monitors the system to locate or recognize problems and protects the system from them.
- **Coordination between other software and users** – The operating system (OS) allows hardware components to be coordinated and directs and allocates assemblers, interpreters, compilers, and other software to different users of the computer system.
- **Booting process** – The process of starting or restarting a computer is referred to as Booting. Cold booting occurs when a computer is totally turned off and then turned back on. Warm booting occurs when the computer is restarted. The operating system (OS) is in charge of booting the computer.

Types of Operating Systems (OS)

- [Batch Operating System](#)
- [Multi-Programming System](#)
- Multi-Processing System
- Multi-Tasking Operating System
- [Time-Sharing Operating System](#)

- Distributed Operating System
- Network Operating System
- Real-Time Operating System

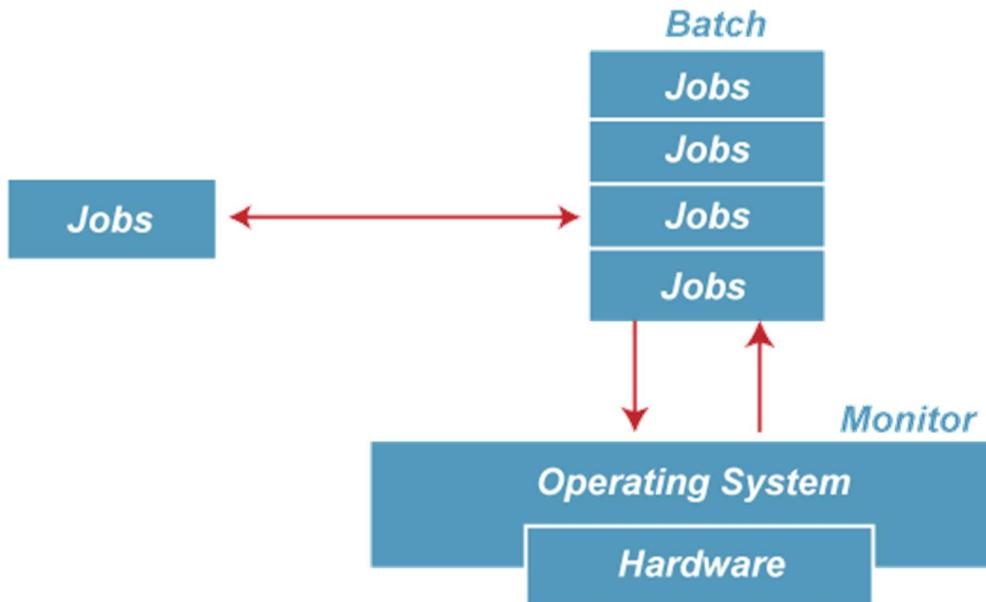
An operating system is a well-organized collection of programs that manages the computer hardware. It is a type of system software that is responsible for the smooth functioning of the computer system.

Batch 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 this os user can not directly interact with computer system.

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.

In this os user prepare similar types of jobs and submit to the operator and wait for output.



Advantage:

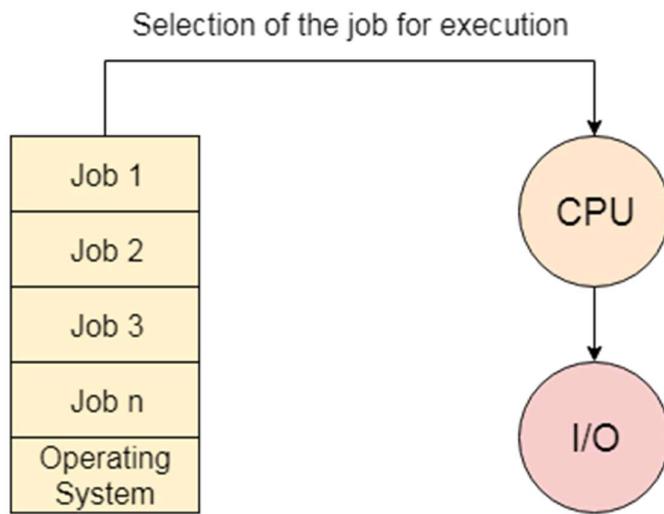
It is suitable for execute similar types of job.

Disadvantages of Batch OS

1. Starvation

Batch processing suffers from starvation.

For Example:



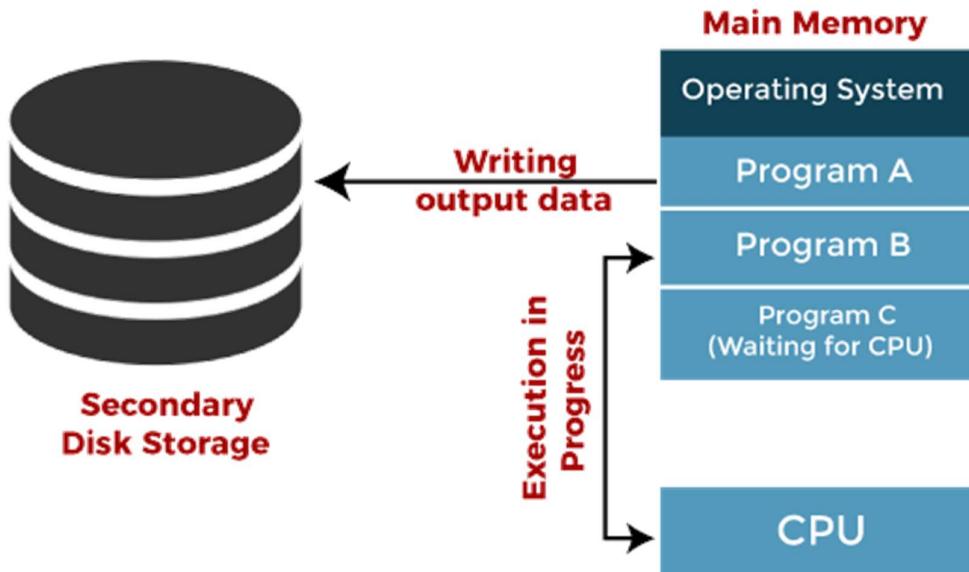
Job Queue

There are five jobs J1, J2, J3, J4, and J5, present in the batch. If the execution time of J1 is very high, then the other four jobs will never be executed, or they will have to wait for a very long time. Hence the other processes get starved.

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

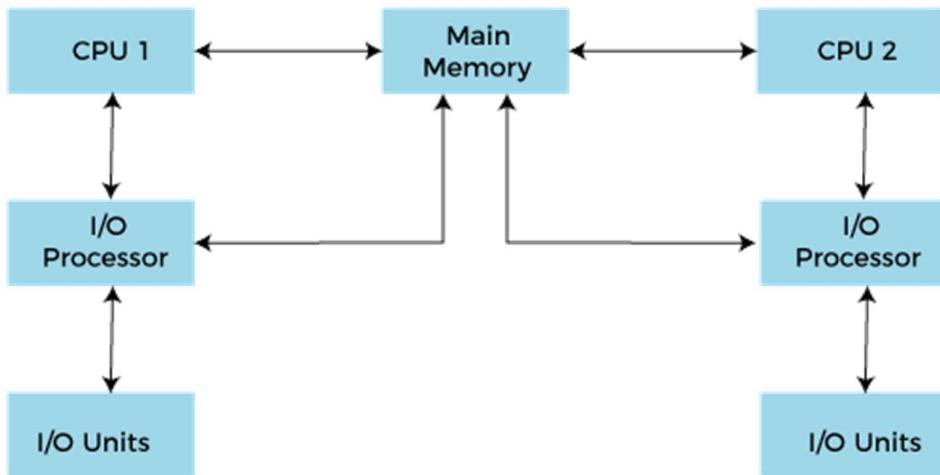
- Throughout the system, it increased as the CPU always had one program to execute.
- Response time can also be reduced.

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.

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.

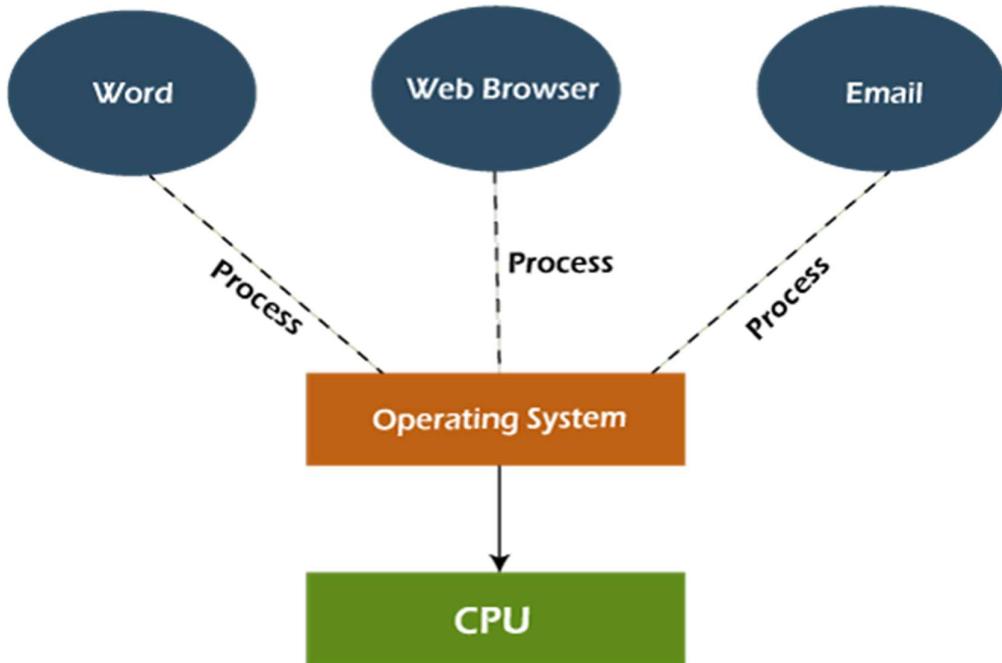
Advantages of Multiprocessing operating system:

- **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.

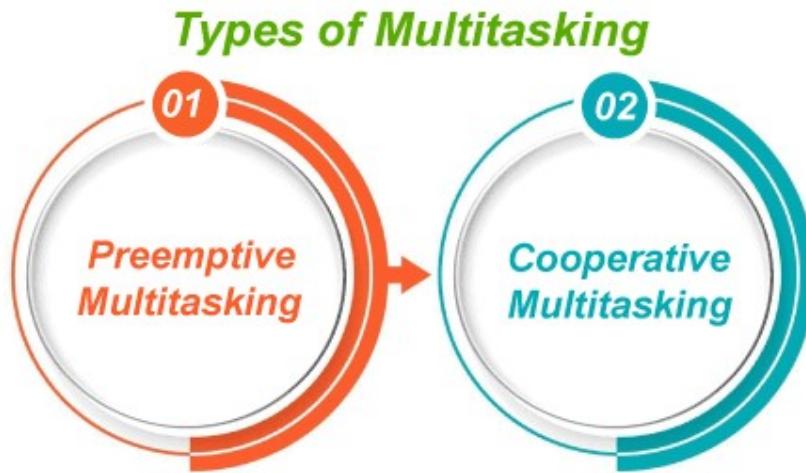
Disadvantages of Multiprocessing operating System

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

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.



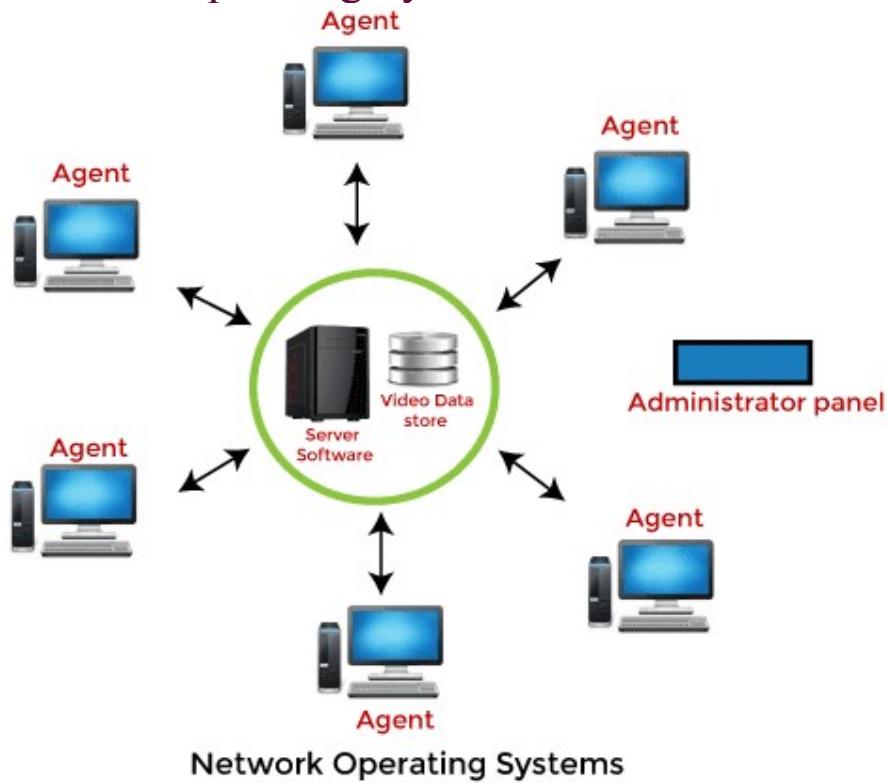
Advantages of Multitasking operating system

- This operating system is more suited to supporting multiple users simultaneously.
- The multitasking operating systems have well-defined memory management.

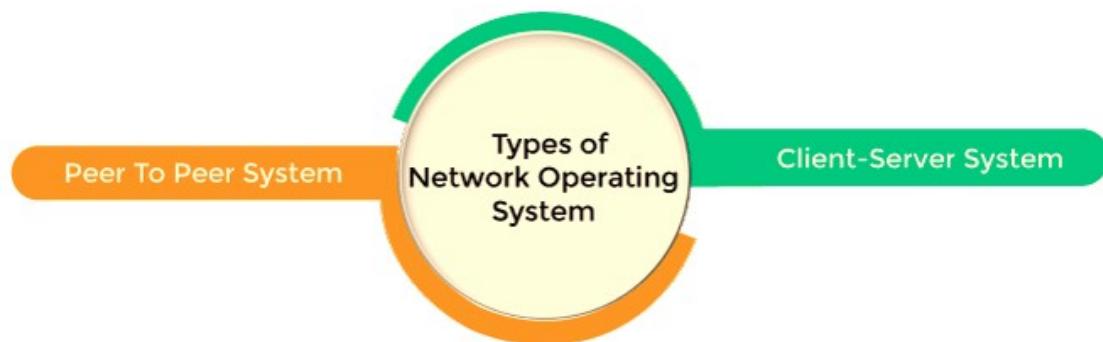
Disadvantages of Multitasking operating system

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

Network Operating System



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



Advantages of Network Operating System

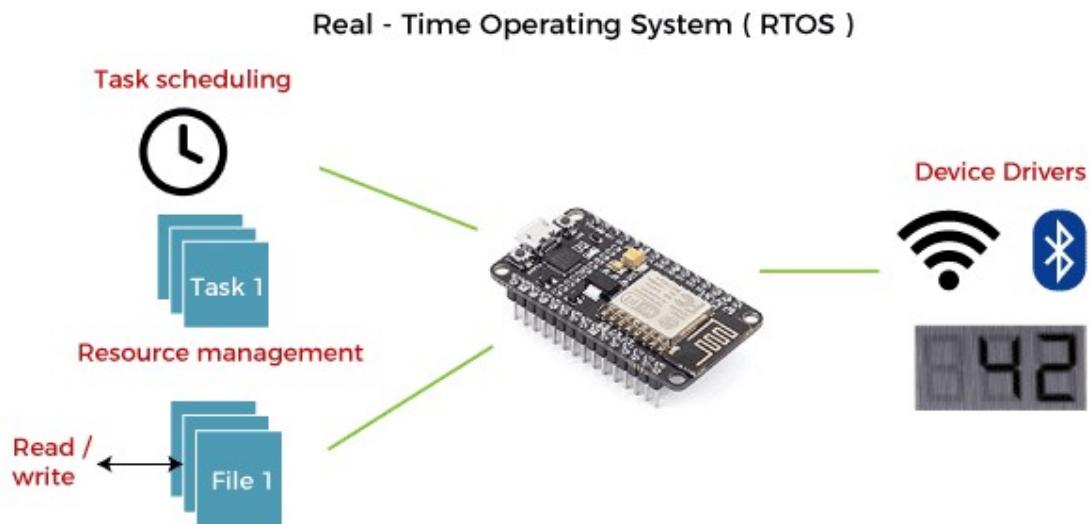
- In this type of operating system, network traffic reduces due to the division between clients and the server.
- This type of system is less expensive to set up and maintain.

Disadvantages of Network Operating System

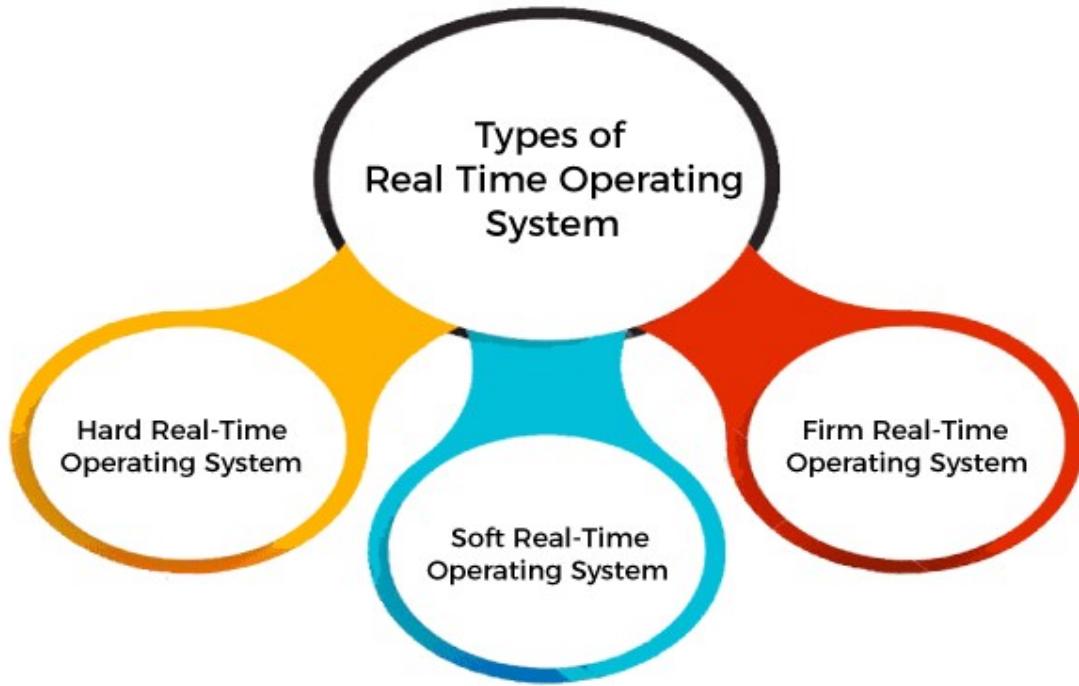
- In this type of operating system, the failure of any node in a system affects the whole system.
- Security and performance are important issues. So trained network administrators are required for network administration.

Real Time Operating System

In Real-Time Systems, each job carries a certain deadline within which the job is supposed to be completed, otherwise, the huge loss will be there, or even if the result is produced, it will be completely useless.



The Application of a Real-Time system exists in the case of military applications, if you want to drop a missile, then the missile is supposed to be dropped with a certain precision.



Advantages of Real-time operating system:

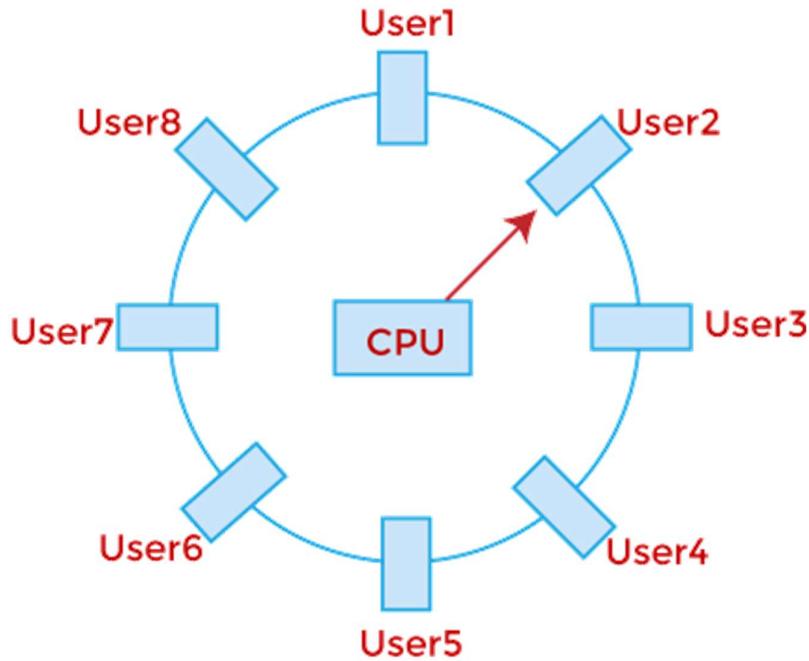
- Easy to layout, develop and execute real-time applications under the real-time operating system.
- In a Real-time operating system, the maximum utilization of devices and systems.

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.

Time-Sharing Operating System

In the Time Sharing operating system, computer resources are allocated in a time-dependent fashion to several programs simultaneously. Thus it helps to provide a large number of user's direct access to the main computer. It is a logical extension of multiprogramming. In time-sharing, the CPU is switched among multiple programs given by different users on a scheduled basis.



Timesharing in case of 8 users

A time-sharing operating system allows many users to be served simultaneously, so sophisticated CPU scheduling schemes and Input/output management are required.

Time-sharing operating systems are very difficult and expensive to build.

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

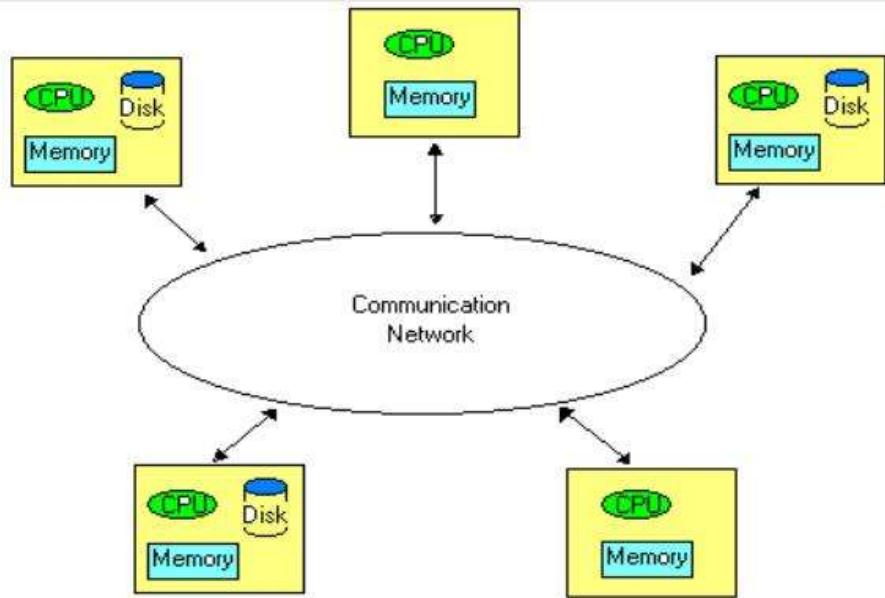
- Data transmission rates are very high in comparison to other methods.
- Security and integrity of user programs loaded in memory and data need to be maintained as many users access the system at the same time.

Distributed Operating System

Distributed System is used to describe a system with the following characteristics:

- Consists of several computers that do not share a memory or a clock;
- The computers communicate with each other by exchanging messages over a communication network.
- Each computer has its own memory and runs its own operating system.

Architecture of Distributed OS



Definition of Distributed OS

It extends the concepts of resource management and user friendly interface for shared memory computers a step further, encompassing a distributed computing system consisting of several autonomous computers connected by a communicating network.

Advantages of Distributed Operating System

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

Disadvantages of Distributed Operating System

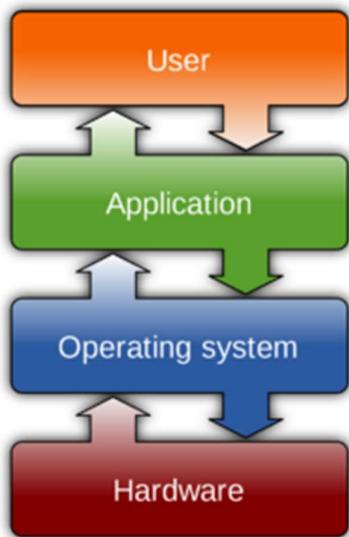
- Protocol overhead can dominate computation cost.

Multiprogramming System	Time-Sharing System
Multiprogramming operating system allows executing multiple processes by monitoring their process states and switching between processes.	Time-Sharing is the logical extension of multiprogramming. In this time-sharing Operating system, many users/processes are allocated with computer resources in respective time slots.
The processor and memory underutilization problem is resolved, and multiple programs run on the CPU. That's why it is called multiprogramming.	The processor's time is shared with multiple users. That's why it is called a time-sharing operating system.
In multiprogramming, the process can be executed by a single processor.	In this process, two or more users can use a processor in their terminal.
Multiprogramming OS has no fixed time slice.	Time-sharing OS has a fixed time slice.
In a multiprogramming OS system, before finishing a task, the executive power is not taken off.	In a time-sharing OS system, executive power is taken off before finishing execution.
Here the system does not take some time to work on different processes.	Here the system works for the same or less time on each process.
In Multiprogramming OS, the system depends on devices to switch between tasks such as I/O interrupts.	In time-sharing, the OS system depends on time to switch between different processes.
The system model of a multiprogramming system is multiple programs.	A system model of the time-sharing system is multiple programs and multiple users.

Multiprogramming system maximizes response time.	The Time-sharing system maximizes response time.
Example: Mac OS, Window OS, microcomputers such as MP/M, XENIX, and ESQview	Example: Windows NT server, Unix, Linux, Multics, TOPS-10, TOPS-20

Operating System

An operating system (OS) is a program that acts as an interface between the system hardware and the user. Moreover, it handles all the interactions between the software and the hardware. All the working of a computer system depends on the OS at the base level. Further, it performs all the functions like handling memory, processes, the interaction between hardware and software, etc. Now, let us look at the functions of operating system.



Operating System

Objectives of OS

The primary goals of an operating system are as follows:

- **Convenience** – An operating system improves the use of a machine. Operating systems enable users to get started on the things they wish to complete quickly without having to cope with the stress of first configuring the system.
- **Efficiency** – An operating system enables the efficient use of resources. This is due to less time spent configuring the system.
- **Ability to evolve** – An operating system should be designed in such a way that it allows for the effective development, testing, and introduction of new features without interfering with service.
- **Management of system resources** – It guarantees that resources are shared fairly among various processes and users.

What is Database

The database is a collection of inter-related data which is used to retrieve, insert and delete the data efficiently. It is also used to organize the data in the form of a table, schema, views, and reports, etc.

For example: The college Database organizes the data about the admin, staff, students and faculty etc.

Using the database, you can easily retrieve, insert, and delete the information.

Database Management System

- Database management system is a software which is used to manage the database. For example: [MySQL](#), [Oracle](#), etc are a very popular commercial database which is used in different applications.
- DBMS provides an interface to perform various operations like database creation, storing data in it, updating data, creating a table in the database and a lot more.
- It provides protection and security to the database. In the case of multiple users, it also maintains data consistency.

DBMS allows users the following tasks:

- **Data Definition:** It is used for creation, modification, and removal of definition that defines the organization of data in the database.
- **Data Updation:** It is used for the insertion, modification, and deletion of the actual data in the database.
- **Data Retrieval:** It is used to retrieve the data from the database which can be used by applications for various purposes.
- **User Administration:** It is used for registering and monitoring users, maintain data integrity, enforcing data security, dealing with concurrency control, monitoring performance and recovering information corrupted by unexpected failure.

Characteristics of DBMS

- It uses a digital repository established on a server to store and manage the information.
- It can provide a clear and logical view of the process that manipulates data.
- DBMS contains automatic backup and recovery procedures.
- It contains ACID properties which maintain data in a healthy state in case of failure.
- It can reduce the complex relationship between data.
- It is used to support manipulation and processing of data.
- It is used to provide security of data.
- It can view the database from different viewpoints according to the requirements of the user.

Advantages of DBMS

- **Controls database redundancy:** It can control data redundancy because it stores all the data in one single database file and that recorded data is placed in the database.
- **Data sharing:** In DBMS, the authorized users of an organization can share the data among multiple users.
- **Easily Maintenance:** It can be easily maintainable due to the centralized nature of the database system.
- **Reduce time:** It reduces development time and maintenance need.
- **Backup:** It provides backup and recovery subsystems which create automatic backup of data from hardware and software failures and restores the data if required.
- **multiple user interface:** It provides different types of user interfaces like graphical user interfaces, application program interfaces

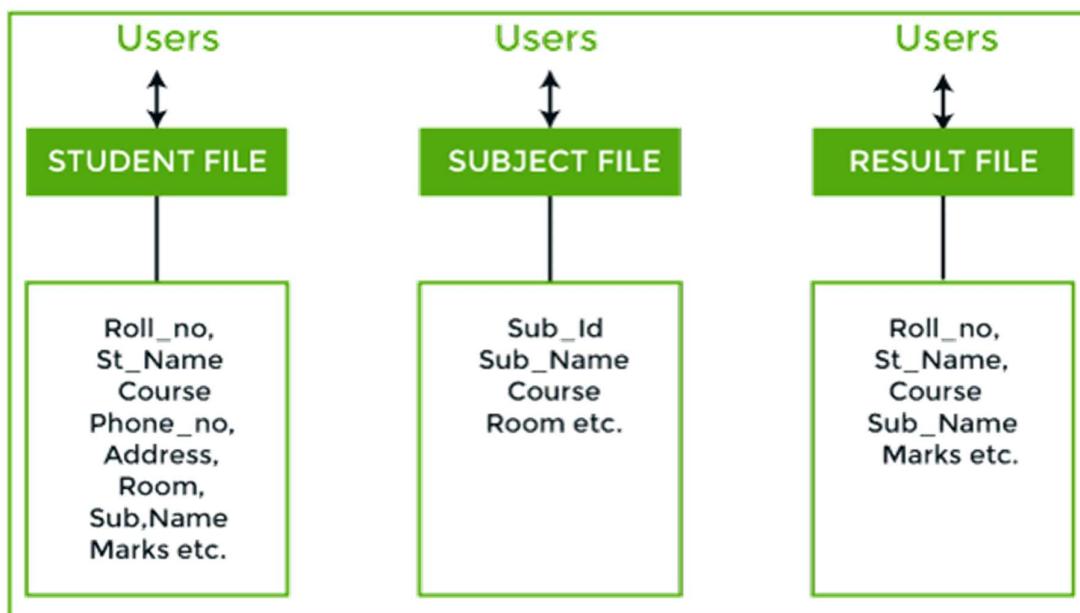
Disadvantages of DBMS

- **Cost of Hardware and Software:** It requires a high speed of data processor and large memory size to run DBMS software.
- **Size:** It occupies a large space of disks and large memory to run them efficiently.
- **Complexity:** Database system creates additional complexity and requirements.
- **Higher impact of failure:** Failure is highly impacted the database because in most of the organization, all the data stored in a single database and if the database is damaged due to electric failure or database corruption then the data may be lost forever.

Difference between File System and DBMS

File System Approach

File based systems were an early attempt to computerize the manual system. It is also called a traditional based approach in which a decentralized approach was taken where each department stored and controlled its own data with the help of a data processing specialist. The main role of a data processing specialist was to create the necessary computer file structures, and also manage the data within structures and design some application programs that create reports based on file data.

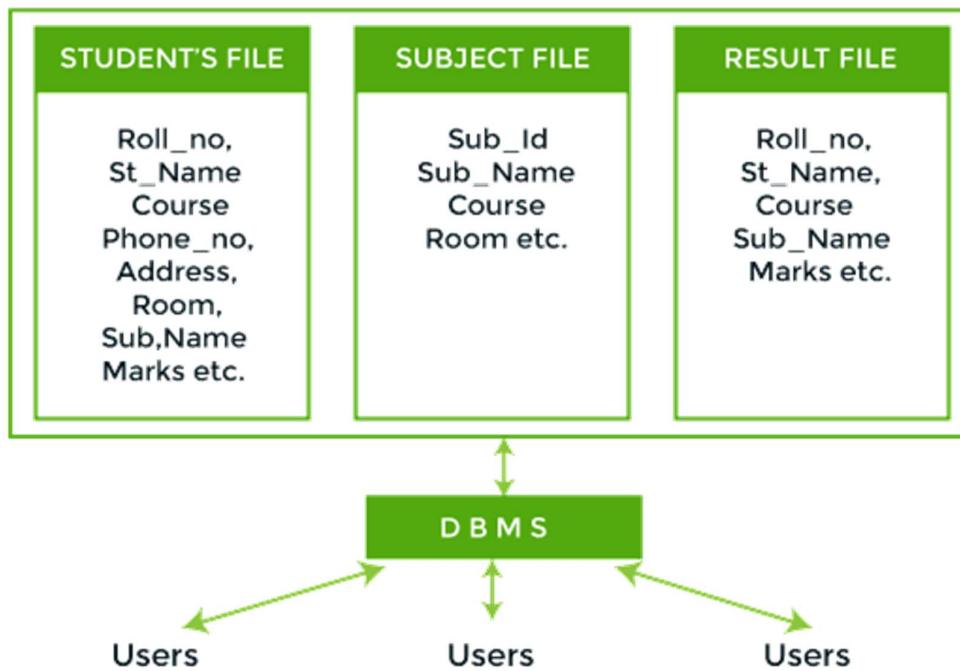


In the above figure:

Consider an example of a student's file system. The student file will contain information regarding the student (i.e. roll no, student name, course etc.). Similarly, we have a subject file that contains information about the subject and the result file which contains the information regarding the result.

DBMS:

A database approach is a well-organized collection of data that are related in a meaningful way which can be accessed by different users but stored only once in a system. The various operations performed by the DBMS system are: Insertion, deletion, selection, sorting etc.



In the above figure,

In the above figure, duplication of data is reduced due to centralization of data.

Some fields are duplicated in more than one file, which leads to data redundancy. So to overcome this problem, we need to create a centralized system, i.e. DBMS approach.

Basis	DBMS Approach	File System Approach
Meaning	DBMS is a collection of data. In DBMS, the user is not required to write the procedures.	The file system is a collection of data. In this system, the user has to write the procedures for managing the database.
Sharing of data	Due to the centralized approach, data sharing is easy.	Data is distributed in many files, and it may be of different formats, so it isn't easy to share data.
Data Abstraction	DBMS gives an abstract view of data that hides the details.	The file system provides the detail of the data representation and storage of data.
Security and Protection	DBMS provides a good protection mechanism.	It isn't easy to protect a file under the file system.
Recovery Mechanism	DBMS provides a crash recovery mechanism, i.e., DBMS protects the user from system failure.	The file system doesn't have a crash mechanism, i.e., if the system crashes while entering some data, then the content of the file will be lost.
Manipulation Techniques	DBMS contains a wide variety of sophisticated techniques to store and retrieve the data.	The file system can't efficiently store and retrieve the data.
Concurrency Problems	DBMS takes care of Concurrent access of data using some form of locking.	In the File system, concurrent access has many problems like redirecting the file while deleting some information or updating some information.
Where to use	Database approach used in large systems which interrelate many files.	File system approach used in large systems which interrelate many files.
Cost	The database system is expensive to design.	The file system approach is cheaper to design.
Data Redundancy and Inconsistency	Due to the centralization of the database, the problems of data redundancy and inconsistency are controlled.	In this, the files and application programs are created by different programmers so that there exists a lot of duplication of data which may lead to inconsistency.

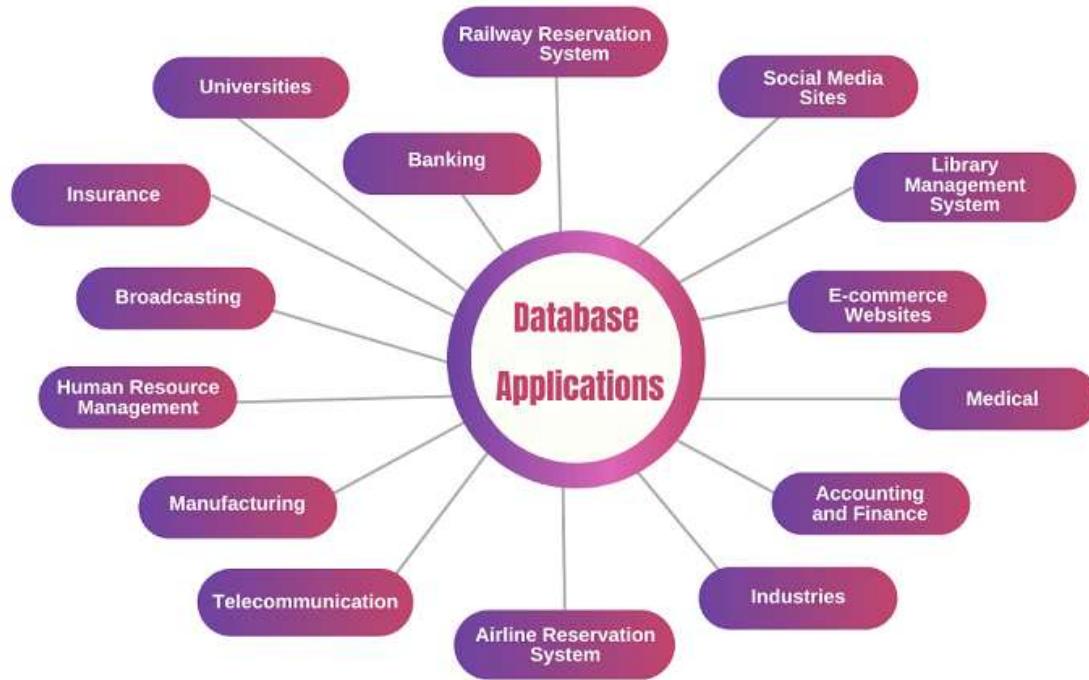
Structure	The database structure is complex to design.	The file system approach has a simple structure.
Data Independence	In this system, Data Independence exists, and it can be of two types. <ul style="list-style-type: none"> o Logical Data Independence o Physical Data Independence 	In the File system approach, there exists no Data Independence.
Integrity Constraints	Integrity Constraints are easy to apply.	Integrity Constraints are difficult to implement in file system.
Data Models	In the database approach, 3 types of data models exist: <ul style="list-style-type: none"> o Hierachal data models o Network data models o Relational data models 	In the file system approach, there is no concept of data models exists.
Flexibility	Changes are often a necessity to the content of the data stored in any system, and these changes are more easily with a database approach.	The flexibility of the system is less as compared to the DBMS approach.
Examples	Oracle, SQL Server, Sybase etc.	Cobol, C++ etc.

There are the following differences between DBMS and File systems:

Database Applications

Nowadays, any business that has small or large amounts of data needs a database to store and manage the information. The database is an easy, reliable, secure, and efficient way to maintain business information. There are many applications where databases are used.

In this article, we will discuss some of the applications of databases, which are mentioned below:



1. Universities:

It is an undeniable application of the database. Universities have so much data which can be stored in the database, such as student information, teacher information, non-teaching staff information, course information, section information, grade report information, and many more. University information is kept safe and secure in the database.

Anyone who needs information about the student, teacher, or course can easily retrieve it from the database. Everything needs to be maintained because even after ten years, information may be required, and the information may be useful, so maintaining complete information is the primary responsibility of any university or educational institution.

2. Banking:

It is one of the major applications of databases. Banks have a huge amount of data as millions of people have accounts that need to be maintained properly. The database keeps the record of each user in a systematic manner. Banking databases store a lot of information about account holders. It stores customer details, asset

details, banking transactions, balance sheets, credit card and debit card details, loans, fixed deposits, and much more. Everything is maintained with the help of a database.

3. Railway Reservation System:

It is an inevitable area of application of databases. They store information such as passenger name, mobile number, booking status, reservation details, train schedule, employee information, account details, seating arrangement, route & alternate route details, etc. All the information needs to be maintained, so railways use a database management system for their efficient storage and retrieval purpose.

4. Social Media Sites:

Nowadays, everyone has a smartphone and accounts on various social media sites like Facebook, LinkedIn, Pinterest, Twitter, Instagram, etc. People can chat with their friends and family and make new friends from all over the world. Social media has millions of accounts, which means they have a huge amount of data that needs to be stored and maintained. Social media sites use databases to store information about users, images, videos, chats, etc.

5. Library Management System:

There are hundreds and thousands of books in the library, so it is not easy to maintain the records of the books in a register or diary, so a database management system is used which maintains the information of the library efficiently. The library database stores information like book name, issue date, author name, book availability, book issuer name, book return details, etc.

6. E-commerce Websites:

E-commerce websites are one of the prominent applications of the database. Websites such as Flipkart, Myntra, Amazon, Nykaa, Snapdeal, Shopify, and many more, are online shopping websites where people buy items online. These websites have so much data. These websites use databases to securely store and maintain customer details, product details, dealer details, purchase details, bank & card details, transactions details, invoice details, etc. You can analyze the sales and maintain the inventory with the help of a database.

7. Medical:

There is a lot of important data collection in the medical field, so it is necessary to use the database to store data related to the medical field, such as patient details, medicine details, practitioner details, surgeon details, appointment details, doctor schedule, patient discharge details, payment detail, invoices, and other medical

records. The database management system is a boon for the medical field because it helps doctors to monitor their patients and provide better care.

8. Accounting and Finance:

When there is big data regarding accounting and finance, there is a need to maintain a large amount of data, which is done with the help of a database. The database stores data such as accounting details, bank details, purchases of stocks, invoice details, sales records, asset details, etc. Accounting and finance database helps in maintaining and analyzing historical data.

9. Industries:

The database management system is the main priority of industries because they need to store huge amounts of data. The industry database stores customer details, sales records, product lists, transactions, etc. All the information is kept secure and maintained by the database.

10. Airline Reservation System:

It is one of the applications of database management systems that contain data such as passenger name, passenger check-in, passenger departure, flight schedule, number of flights, distance from source to destination, reservation information, pilot details, accounting detail, route detail, etc. The database provides maintenance and security to airline data.

11. Telecommunication:

We cannot deny that telecommunication has brought a remarkable revolution worldwide. The Telecom field has huge data, and it is very difficult to manage big data without a database; that is why a telecom database is required, which stores data such as customer names, phone numbers, calling details, prepaid & post-paid connection records, network usage, bill details, balance details, etc.

12. Manufacturing:

In the manufacturing field, a lot of data needs to be maintained regarding supply chain management, so the database maintains the data such as product details, customer information, order details, purchase details, payment info, worker's details, invoice, etc. Manufacturing companies produce and supply products every day, so it is important to use a database.

13. Human Resource Management:

Any organization will definitely have employees, and if there are a large number of employees, then it becomes essential to store data in a database as it maintains and securely saves the data, which can be retrieved and accessed when required. The human resource database stores data such as employee name, joining details, designation, salary details, tax information, benefits & goodies details, etc.

14. Broadcasting:

Broadcasting is distributing video and audio content to a dispersed audience by television, radio, or other means. Broadcasting database stores data such as subscriber information, event recordings, event schedules, etc., so it becomes important to store broadcasting data in the database.

15. Insurance:

An insurance company needs a database to store large amounts of data. Insurance database stores data such as policy details, user details, buyer details, payment details, nominee details, address details, etc.

Why is DBMS important?

The DBMS was introduced to take advantage of disk drive technology (vs. tape drives) to speed up reading and writing data and provide random access to specific records in the database. Remember, prior to this data was read sequentially off of tapes.

Once the mechanics of data access was mastered the focus since then has been on enhancing the DBMS to be more flexible for meeting business needs: reduce impact of changes to application code, improve productivity by abstracting data to a more “logical” view of the data (e.g., relational, objects), and improving the programming interface to data.

For several decades the database has become recognized as the foundation and framework for complex software systems and applications. Software architects have learned that the overall system is most impacted by changes to this data

foundation (vs. discrete programs and algorithms). This is what has made the DMBS so important to information technology solutions.

DBMS is most important thing in Software Development. A database management system is important because it manages data efficiently and allows users to perform multiple tasks with ease. A database management system stores, organizes and manages a large amount of information within a single software application.

DBMS is important to store the data and retrieve it. This system reduces the redundancy, which removes inconsistency and increases this concurrency.

Without hanging the server. And a good data base help people to do their work easily and in efficient way.

Free and Open-Source Software

What does Open-source mean?

The term **Open-source** is closely related to [Open-source software \(OSS\)](#). Open-source software is a type of computer software that is released under a license, but the source code is made available to all the users. The copyright holders of such software allow the users to use it and do some valuable modifications in its source code to add some new features, to improve the existing features, and to fix bugs if there are any. Because of this reason only Open-source software is mostly developed collaboratively.

Some famous examples of Open-source products are :

- **Operating systems –**
Android, Ubuntu, Linux
- **Internet browsers –**
Mozilla Firefox, Chromium
- **Integrated Development Environment (IDEs) –**
Vs code (Visual Studio Code), Android Studio, PyCharm, Xcode

Open-source community and Contributions :

The **open-source community** is a worldwide community of programmers and software developers who are continuously working on various open-source projects to

make our lives better. This community is self-governing and self-organizing, there are no executives to take the decisions solely. This community plays a very crucial role in the sustainability of various open-source organizations.

The contributions made in any open-source project which improves its usability are called **open-source contributions**. These contributions can be of any form not only some software codes like we can work on improving its **documentation**, improving its **UI/UX (user interface and design)**, organize meetups, or find new collaborators.

Benefits of Open-source contributions :

- We code for real-world open-source projects.
- It refines our existing knowledge of programming and also helps us to learn new skills.
- Many open-source projects offer mentorship programs to guide and help us through our first few contributions.
- We need not develop the whole thing from scratch, we just have to fork our favorite projects and start experimenting with them.
- After making any open-source contribution, we get immediate feedback regarding our developmental work.
- While doing open-source contributions, we interact with like-minded developers from all over the world and build connections along the way.
- As we get more closer to the open-source community, we get to know much more about our field of interest and other related fields.
- The most important aspect of open-source contributions is It may fetch us a job in our field of interest.

Free Software:

“Free software” means software that respects users’ freedom and community. Roughly, it means that the users have the freedom to run, copy, distribute, study, change and improve the software. The term “free software” is sometimes misunderstood—it has nothing to do with price. It is about freedom.

Advantages:

- Cost: Free software is typically free to use, modify and distribute.
- Freedom: Free software is often accompanied by a set of ethical principles that promote users’ freedom to use, study, modify, and share the software.
- Collaboration: Free software often encourages collaboration among developers and users, leading to faster development and better quality software.
- Transparency: Free software is often developed in a transparent way, with the source code and development process available for public scrutiny.
- Flexibility: Free software can be used on a wide range of platforms and devices.

Disadvantages:

- Support: While free software does have a community of developers and users, it may not always have the same level of professional support as commercial software.

- Compatibility: Free software may not always be compatible with other software applications and hardware devices.
- Security: Because free software is available for everyone to use and modify, it may be easier for malicious actors to identify and exploit vulnerabilities.
- Complexity: Free software can be more complex and difficult to use than commercial software, especially for non-technical users.
- Documentation: Free software may not always have the same level of documentation and user guides as commercial software.

Open Source Software:

Open Source Software is something that you can modify as per your needs, and share with others without any licensing violation burden. When we say Open Source, the source code of the software is available publicly with Open Source licenses like GNU (GPL) which allows you to edit the source code and distribute it. Read these licenses and you will realize that these licenses are created to help us.

1. Coined by the development environments around software produced by open collaboration of software developers on the internet.
2. Later specified by the Open Source Initiative (OSI).
3. It does not explicitly state ethical values, besides those directly associated with software development.

Advantages:

- Cost: Open source software is typically free to use, modify and distribute.
- Customization: The source code of open source software is available to everyone, allowing users to modify and customize it to suit their needs.
- Community support: Open source software often has a large community of developers and users who contribute to its development and provide support.
- Transparency: The source code of open source software is open for everyone to see, making it easier to identify and fix bugs and vulnerabilities.
- Flexibility: Open source software can be used on a wide range of platforms and devices.

Disadvantages:

- Support: While open source software does have a large community of developers and users, it may not always have the same level of professional support as commercial software.
- Compatibility: Open source software may not always be compatible with other software applications and hardware devices.
- Security: Because the source code of open source software is available to everyone, it may be easier for malicious actors to identify and exploit vulnerabilities.
- Complexity: Open source software can be more complex and difficult to use than commercial software, especially for non-technical users.
- Documentation: Open source software may not always have the same level of documentation and user guides as commercial software.

Similarities:

- Both free software and open source software have access to the source code, allowing users to modify and improve the software.
- Both types of software often rely on a community of users and developers to provide support and contribute to the development of the software.
- Both free software and open source software are often distributed under open licenses, allowing users to use, modify, and distribute the software without restrictions.