SERVER OPERATING SYSTEM & DESKTOP OPERATING SYSTEM

What is Server Operating System?

It is an operating system designed for usage on servers. It is utilized to give services to a large number of clients. It is a very advanced operating system that can serve several clients simultaneously. It is a more advanced operating system with features and capabilities needed in a client-server architecture or comparable enterprise computing environment.

A server is a computer that makes data available to other computers. It can serve data across the Internet to systems on a **LAN** or a **WAN**

Server operating systems support and enable common server tasks like Windows, file, and database server, Web server, mail server, application server, and print server. It is an advanced version of the basic operating system, and it serves server-client computers request on the network. It has all the functionality needed to work in a client-server computing environment.

Features of Server Operating System.

There are various features of the server operating system. Some of the features are as follows:

1. It executes all or most processes from the operating system command.
2. A server operating system is designed to run large programs and perform activities like heavy data transfers with simplicity.
3. It can access the server both **GUI (Graphical User Interface)** and command-level interface.
4. The server operating system includes all the administrative tools necessary to execute a wide range of applications and tasks.
5. It offers the central interface to manage the users, implement the security and other administration processes.
6. The operating system helps in the creation of a stable environment in which all apps and processes may run smoothly. An operating system that is still in development or contains bugs and glitches might slow down procedures and have an impact on data.
7. It provides advanced-level hardware, software, and network configuration processes.
8. It manages and monitors the client's computers and operating systems.
9. A server operating system with a built-in firewall and security capabilities is essential because servers are prone to infiltration and infection. Hackers and malicious apps cannot easily penetrate the client's operating system when a proper security system exists.
10. It installs and deploys business applications and web applications.

Main Function of Server Operating System

The interaction between a Web server and browser is a good example of how a server's most crucial duty is to listen in on a port for incoming network requests.

Types of Server Operating System

There are various types of server operating systems. Some of them are as follows:

1. Windows Operating System

The Windows Operating System is a family of the operating system that is developed by the **Microsoft Corporation**. It allows the users to play games, videos, music, store the files, run the software. It was developed for both personal and professional works. The Windows OS series contain other series, including **Windows 2000, Windows 2003**, and others.

It offers virtual memory management, a graphical user interface, multitasking, and support for various peripheral devices. Microsoft offers Windows operating systems for desktop computers, servers, and mobile devices.

2. Linux Operating System

Linux is a type of free software that performs all the features of **UNIX**. Linux is a fantastic operating system. It is open, allows multi-user, multi-process, multi-thread, has good real-time performance, is powerful and robust, and is available for free through the CNU Free Software Foundation under the GPL.

The OS software package also contains application software like a text editor and a high-level language compiler, which allows the system to be controlled via windows, icons, and menus.

3. UNIX Operating System

UNIX began as a time-sharing OS for small computers, but it has now developed into one of the most popular operating systems in a client-server environment. It is written in the C language, and the C language abbreviator supports several platforms. UNIX has been ported to a larger number of machines than other operating systems.

UNIX OS is a multi-user operating system that offers built-in TCP/IP functionality and great stability and security. At the moment, the UNIX operating system is used by more than 90% of the numerous sites that provide services on the Internet. Unlike other operating systems, UNIX is sold by different vendors, and there is no true UNIX. On the other side, despite efforts to create a standard UNIX version, there are various identical and incompatible versions.

4. Netware Operating System

It is a server-based network operating system that needs the use of a dedicated server in the network. In early computer networks, the NetWare operating system was widely used in the local area network (LAN). **Novell** developed it in the early **1980s**. NetWare series operating systems may support multiprocessor and large-capacity physical memory management. It may offer shared file access and printing services and support for the high scalability of corporate networks via open standards and file protocols. NetWare versions 2 and 3 were primarily used for LAN-based file and print servers that used the **Internetwork Packet Exchange (IPX)** protocol and managed via menu-driven MS-DOS programs like fconsole, pconsole, etc., syscon, filer, and monitor. NetWare 4 provides a more scalable solution through **Novell**

Directory Services (NDS). The hierarchical NDS enables users to discover and utilize shared resources regardless of their actual location on the network.

NetWare 5 is the latest version of the NetWare operating system. It contains native Internet Protocol (IP), Dynamic Host Configuration Protocol (DHCP), Domain Name System (DNS), and a new multiprocessing kernel with virtual memory support.

5. Red Hat Enterprise Linux (RHEL)

It is a commercial Linux distribution created by Red Hat. Red Hat Enterprise Linux is available in the server, and desktop editions for **x86-64, Power ISA, ARM64**, and **IBM Z**. The Red Hat Enterprise Linux platform is the center of all official support and training from Red Hat and the Red Hat Certification Program.

The initial Red Hat Enterprise Linux version was released under **"Red Hat Linux Advanced Server".** Red Hat renamed Red Hat Linux Advanced Server **"Red Hat Enterprise Linux AS"** in **2003** and included two new variations, **Red Hat Enterprise Linux ES** and **Red Hat Enterprise Linux WS**.

Red Hat uses strict trademark regulations to limit the free re-distribution of its officially supported Red Hat Enterprise Linux versions, while the source code is freely available. Third-party derivatives can be created and distributed by removing non-free components such as Red Hat's trademarks. For example, Scientific Linux is a community-supported distribution, while Oracle Linux is a commercial derivative.

Benefits of Server Operating System

There are various benefits of a server operating system. Some of the benefits are as follows:

Higher Efficiency: It helps in reducing dependence on physical servers, resulting in greater savings.

Future-Proofing: It ensures long-term sustainability by calculating the expected growth of the corporate network.

Higher savings with reduced downtime: Reduced downtime leads to increased savings for any organization.

Increased Performance: A network-supporting system with higher performance can support more users and storage options than another.

What is 32-Bit Operating System?

It is a CPU architecture type that holds the capacity to transfer 32 bits of data. It refers to the amount of data and information that your CPU can easily process when operating. A majority of the computers produced in the early 2000s and 1990s were 32-bit machines.

One bit in the register can typically reference an individual byte. Thus, the 32-bit system is capable of addressing about 4,294,967,296 bytes (4 GB) of RAM. Its actual limit is less than

3.5 GB (usually) because a portion of the register stores various other temporary values apart from the memory addresses.

What is 64-Bit Operating System?

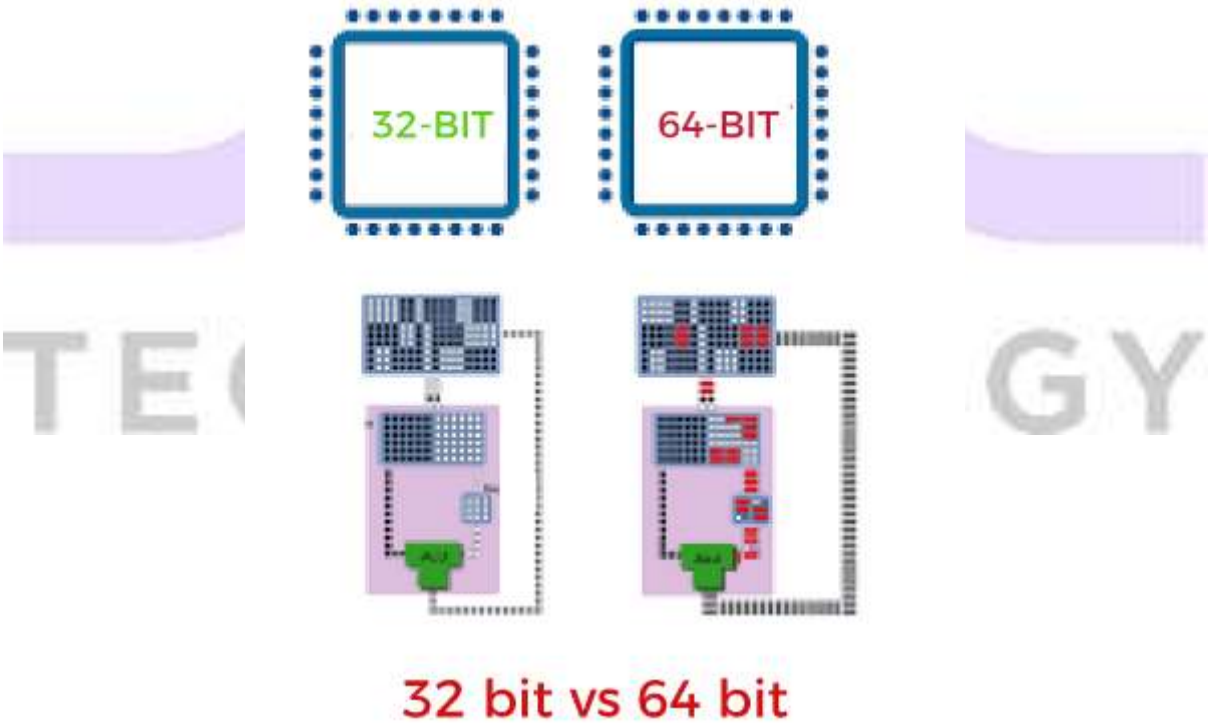
The 64-bit microprocessor allows computer systems to process information, data, and memory addresses represented by 64 bits. Such a system can typically reference 16 exabytes (17,179,869,184 GB), or 18,446,744,073,709,551,616 bytes of memory.

A 64-bit system (a computer with a 64-bit processor) can access more than 4 GB of RAM. It is numerous million times more than what an average workstation would require to access. It means that if a computer has 8 GB of RAM, it requires a 64-bit processor. Or else, the CPU will be inaccessible to at least 4 GB of the memory.

Difference between 32 bit and 64 bit Operating System

In computing, a byte is the unit of data, and processing is generally denoted as bit processing. In general, there exist two types of processors, namely a 32-bit processor and a 64-bit processor

. This type of processor tells us how much memory a processor can have access from a CPU register.



- A 32-bit system can access 2^{32} memory addresses, i.e., 4 GB of RAM or physical memory; ideally, it can also access more than 4 GB of RAM.
- A 64-bit system can access 2^{64} memory addresses, i.e., actually 18-Quintillion bytes of RAM. In short, any amount of memory greater than 4 GB can be easily handled by it.

With an increase in the availability of 64-bit processors and larger RAM capacities, Microsoft and Apple both have upgraded versions of their operating systems designed to take full

advantage of the new technology. The first fully 64-bit operating system was Mac OS X Snow Leopard in 2009. Meanwhile, the first Smartphone with a 64-bit chip (Apple A7) was the iPhone 5s.

A 64-bit processor is more capable than a 32-bit processor because it can handle more data at once. A 64-bit processor can store more computational values, including memory addresses, which means it can access over 4 billion times the physical memory of a 32-bit processor.

Here is the key difference, 32-bit processors are perfectly capable of handling a limited amount of RAM (in Windows, 4GB or less), and 64-bit processors can utilize much more. A major difference between **32-bit processors and 64-bit processors** is the number of ***calculations per second*** they can perform, which affects the speed at which they can complete tasks. Below are some more differences between 32-bit and 64-bit operating systems, such as:

Parameters	**32-bit Processors**	**64-bit Processors**
Handling of Data and Storage	As its name suggests, the 32 bit OS can store and handle lesser data than the 64 bit OS. More specifically, it addresses a maximum of 4,294,967,296 bytes (4 GB) of RAM.	The 64 bit OS, on the other hand, can handle more data than the 32 bit OS. It means that it can address a total of 264 memory addresses, which is 18-Quintillion GB of RAM.
Architecture	The 32-bit system has general computing, including IBM System/360 and IBM System/370, the DEC VAX, the Motorola 68000 Family, the Intel IA-32, and the 32-bit version of x86 architecture different versions. These are architectures that are used for embedded computing and include 68000 families.	The registers are divided into different groups like integer, floating, control and often for addresses of various uses and names like address, index or base registers. The size of these registers is dependent on the amount of addressable memory.
Compatibility of System	A 32-bit processor system could properly run a 32-bit OS, but it cannot run the 64-bit OS at its full capability.	A 64-bit processor system can run either a 32-bit or 64-bit version of an installed operating system (OS).
Performance	The factor of performance in a 32-bit processor is less efficient than the 64-bit processor.	It exhibits a higher performance than the 32-bit processor.
Application Support	The 64-bit programs and applications won't work.	The 32-bit programs and applications will work with no hassle.
Addressable Space	It has an addressable space of 4 GB.	These have an addressable space of 16 GB.
Calculation per second	32-bit systems have dual-core and quad-core versions available.	64bit systems can come with dual-core, quad-core, six-core, and eight-core versions. Having these multiple

		cores available has increased its speed of calculations per second.
Multitasking Support	The 32-bit system is not an ideal option for multitasking and stress-testing.	For multitasking and stress testing, the 64-bit processor is better. It also works well for the execution of other heavy applications.
OS Support	It needs a 32-bit operating system.	This one can run on both 32-bit and the 64-bit operating system.
OS and CPU Requirements	The 32-bit applications and operating systems require 32-bit CPUs.	The 64-bit operating system needs a 64-bit CPU, and the 64-bit applications require a 64-bit CPU and OS.
Systems Available	These support Windows 7, Windows XP, Windows Vista, Windows 8, and Linux.	These support Windows XP Professional, Windows 7, Windows 8, Windows 10, Windows Vista, Linux, and Mac OS X.
Limits in Memory	A 32-bit system has a limit of 32 bit Windows 3.2 GB of RAM. The limit in its addressable space doesn't allow you to use the entire physical memory space of 4GB.	A 64-bit system enables its users to store up to 17 Billion GB of RAM.

Advantages of 64-bit over the 32-bit operating system

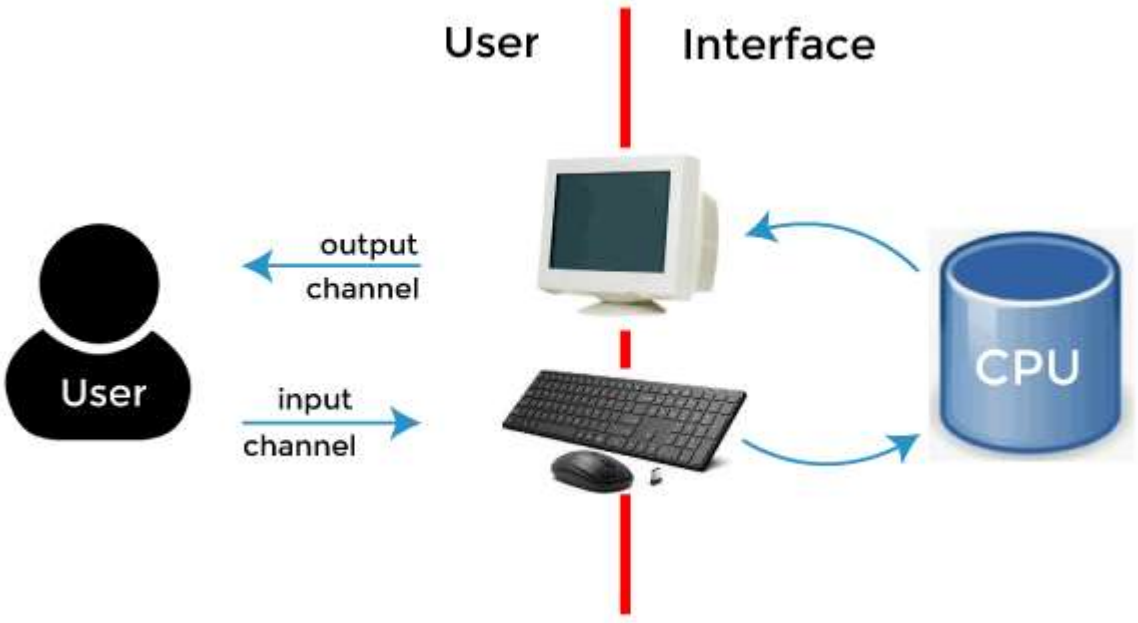
Below are the following advantages of a 64-bit operating system over the 32-bit

1. **Addressable memory:** 32-bit operating systems can address a maximum of 4 GB of RAM. But 64-bit operating system can address up to 17,179,869,184 GB (16 exabytes). That's a lot more than 4GB of memory that a 32-bit operating system can handle.
2. **Available Resources:** The 64-bit operating system can make full use of available system resources compared to a 32-bit system. To simplify, installing more RAM on a system with a 32-bit OS doesn't impact performance. However, upgrade that system with excess RAM to the 64-bit version of Windows, and you'll notice a difference.
3. **Computer Performance:** The system can perform more calculations per second using a 64-bit system with a 64-bit processer. As a result, it increases the processing power and makes a computer run faster. This is limited in the case of 32-bit operating systems.
4. **Software performance:** More software's are written to leverage the benefit of a 64-bit operating system fully. If you are using a 64-bit operating system and install software of 64 bit, you can up-front notice the increase in performance. It becomes even more critical when performing a huge operation that requires the system to access more memory. An increase in software performance leads results in an increase in overall efficiency.
5. **Multitasking:** Using 64-bit, users can do various things in multitasking at the same time. Users can easily switch between various applications without any windows hanging problems.

Single User Operating System

A single-user operating system is a type of operating system developed and intended for use on a computer or similar machine that will only have a single user at any given time. This type of OS is typically used on devices like wireless phones and two-way messaging devices.

The operating system is responsible for handling many different tasks and is typically one of the most important programs used on a computer. It manages memory usage and other resources, hardware connectivity and the proper execution of other applications. A single task operating system can only run one program or application at a time. So it is not as useful for a computer or other device intended to run multiple programs at once.

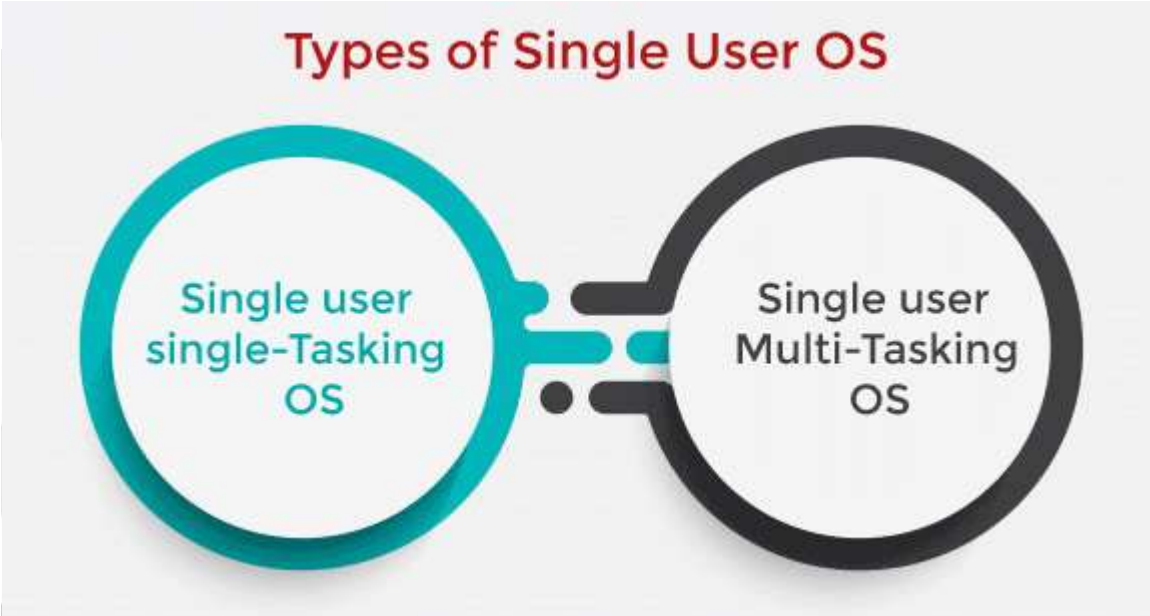


This is where a multitasking single-user operating system is used instead. A multitasking OS can run multiple applications and programs at once. This is often used on computers where someone may want to navigate the internet, run a graphics editing program, play music through a media playing program, and type in notes in a simple word processing program all at the same time. A single task OS could not do this, but the multitasking systems can handle all these processes.

Even though this type of operating system can connect to other computers through a network, it is still only being used by a single user. As long as the computer only has one monitor, keyboard and other input devices, then it is a single-user system.

Types of Single-User Operating System

Single user operating system can be classified into two parts, such as:



1. Single-User Single-Tasking operating system

In the Single-User Single-Tasking operating system, only one user is permitted for performing a single task at a time. Some functions such as printing a document and downloading images and videos are performed in one given frame. This operating system is designed especially for wireless phones as well as two-way messaging devices. For example, MS-DOS, Palm OS, etc. It has the following advantages:

- This operating system occupies less space in memory.
- It is cost-effective.

2. Single-User Multi-Tasking operating system

Single-User Multi-Tasking operating system is developed especially for one user, but this single user can perform multiple tasks simultaneously. For example, you can write any text while surfing the internet, downloading images, watching movies, etc., on Windows, Linux, Mac O/S. It has the following advantages:

- Time-saving.
- High productivity in less time frame.
- Less memory is used for performing multiple tasks.

Features of Single User Operating System

Single user operating system provides the following features to the user, such as:

- It does not use the scheduling process for I/O.
- It uses less scheduling for the users.
- It is only dedicated to single-use.
- It is not intended for several tasks at the same given time.
- It does not use MMU.

Functions of a Single User Operating System

Description and exemplification are the main functions of a single user operating system. Below are some more functions of single-user OS, such as:

1. **Interpreting users commands:** It takes the instructions from the user and passes them on to the rest of the operating system. This is the part of the OS that the user interacts with to give instructions to the computer. It can be command-driven, menu-driven or a GUI, which may use a WIMP system.
2. **File management:** It controls the organization of backing storage. It uses part of the disc as a file catalogue, which holds details of where data is stored on the disc. Files are organized into a hierarchical filing system storing files in separate directories and subdirectories.
3. **Memory management:** It controls where programs and data are placed in the main memory. Many OS's allow more than one program to be in memory at the same time. Memory management ensures that any program does not overwrite any other program (including the OS itself).
4. **Input/output management:** It communicates between the computer system and the input and output devices. It handles the transfer of data between peripherals and the CPU.
5. **Resource Allocation:** The OS allocates resources to other programs such as applications. For example:
    - Scheduler to share processor, e.g. batch, foreground or background, timesharing.
    - Memory management - e.g. Virtual memory paging, swapping memory contents to hard disc.
    - Ensures drivers are given access to hardware devices.
    - Mechanisms for accounting; limit enforcement - e.g. no. of pages printed, file space per user etc.
6. Managing Processes: It controls processes and handles interrupt**ions. The kernel** manages processes (when a program runs, it starts a process, which may start further processes) and handles interrupts.

Examples of Single User Operating System

There are some operating system examples like DOS, Windows 3x, Windows 95, 97, 98. Also, in mobile phones, Symbian OS is single-user OS.

These systems are also known are single application OS as one application is concentrated at a time. These systems require fewer resources and can do processing in a queue. The recurring tasks are performed well in these systems, such as making payroll or employees' salaries.

Advantages of Single User Operating System

Single-user operating is that in which one user works on one interface. In these systems, no other operating system is interrupting the processing. Single-user operating systems work on processing that requires fewer resources. Below are some more important advantages of single-user OS, Such as:

- **Supports one user at a time:** In these systems, one user is only active at a time. So there will be no other user interfering with the applications. And in these systems, all computer resources are used by user requests.

- **Easy to maintain:** These systems use fewer resources, and their complexity is less, making them easy to maintain and debug. Higher resources are needed in a multi-user operating system, and resources are used most of the time.
- **Less chance to damage:** These systems include fewer requests to hardware and software at a time, so they have less chance to damage. These systems do not make higher load time also.
- **Concentrate on one task:** In a modern operating system, there are running multiple tasks at a time. Like many applications and tasks are running simultaneously, but in single-user OS, only one task runs at a time. So these systems sometimes give less output result at a time.

Disadvantages of Single User Operating System

Single user operating system also has some disadvantages, such as:

- **Tasks take longer to complete:** As you know, many tasks are waiting for the CPU if no multiple tasks run at a time. So these systems respond to processes at a higher time. This will make the system slow, and response time is higher.
- **Idle time is higher:** If only one task is running and this task doesn't require memory or I/O use, these devices remain idle. But other tasks need those devices. So only one task is run at a time, then other tasks have to wait till the first task is finished. So CPU, memory and disk I/O are not used properly.

Difference between Single User and Multi-User OS

The difference between single-user operating systems and multi-user operating systems are given below:

Terms	Single User Operating System	Multi-User Operating System
Definition	A Single-User Operating System is a system in which only one user can access the computer system at a time.	A Multi-User Operating System is a system that allows more than one user to access a computer system at one time.
Bootloader	The bootloader loads all the resources of the CPU in the profile of a single superuser.	The bootloader distributes the resources of the CPU based on the priority of the users.
Super User	A superuser gets all the powers of maintaining the system and making changes to ensure the system runs smoothly.	Superuser does not exist for a multi-user operating system as each entity has control over their working.
Complexity	Single-User Operating System is simple and easy to design.	The Multi-User Operating systems are complicated as they have to apply complex techniques to share the resources among various users.

Performance	Only one task at one time gets performed.	Schedules different tasks for performance at any rate.
Example	MS-DOS, Windows 95, Windows NT, Windows 2000, Personal Computers, etc.	Mainframes, IBM AS400, Linux & Unix Distributed OS, etc.

Desktop OS

Overview

The control program that operates in a **user's machine** is termed as the **desktop system**. Such a system is also referred as a **client operating system**. The client can be said as a computer in a network where the user performs some task or activity over the network.

Such computer operating systems do not have complete control over the resources but use the network to access them. Also, these operating system only use the network to carry out tasks such as downloading a file from the network or browsing the internet.

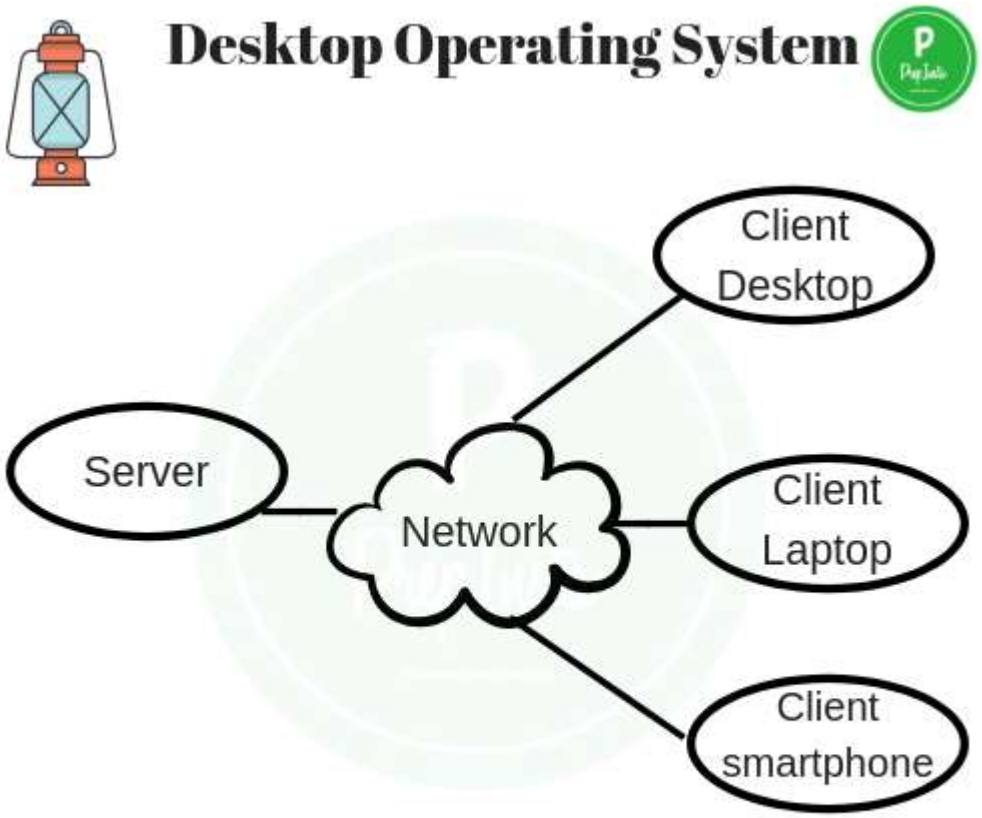
Desktop operating systems usually operate with a server computer which has the complete control over the resources. Also, the processing power remains completely in the hand of the server operating system. The **server operating system** is developed in such a way that it can fulfill all the requirements and requests of the client or the desktop operating system.

Desktop or the client operating system is completely dependent on the server operating systems and are ineffective in the absence of a server.

Basic Features

Some of the features of a client operating system are:

- Basic operating features such as data sharing, internet browsing, and detecting hardware.
- Needs minimal memory requirements
- Highly budget friendly
- Better utilization of resources
- Less operational complexity



Advantages

Some of the advantages of a client operating system are:

- Centralization of resources as all the resources are present at a common location.
- Better management of resources as the files are stored at a single place. This also avoids redundancy of resources such as printers and scanners.
- Remote access to the server gives processing power to every user.
- High security as only the server needs to be secured from threats and attacks.
- The server can play different roles for the different

Disadvantages

Some of the disadvantages of a client operating system are:

- Network congestion as multiple requests from the clients can block the network traffic.
- The architecture of request and response is not robust enough for heavy processing.
- If the server fails, all the desktop systems connected over the network fails.
- If the service interrupts, the task has to be started from scratch. For instance, if a desktop system requests a file download which gets interrupted, the file becomes corrupt, and the entire process needs to be carried out from the start.

- The operating system architecture is highly costly.
- A professional IT personnel is needed to manage and maintain such an operating environment.

Examples

- Windows 95
- Windows NT

What is a physical server?

The physical server vs virtual server comparison should start with the definition. A physical server, also known as a 'bare-metal server,' is a single-tenant computer server, meaning that a specific physical server is designated to a single user. The resources and components of a physical server are not shared between multiple users. Each physical server includes memory, processor, network connection, hard drive, and an operating system (OS) for running programs and applications. A bare-metal server is large in size due to the powerful processing components that it contains.

What is a virtual machine?

A virtual machine (VM) is a software computer used as emulation of an actual physical computer. A virtual server operates in a "multi-tenant" environment, meaning that multiple VMs run on the same physical hardware. In this case, the computing resources of a physical server are virtualized and shared among all VMs running on it. The architecture of a virtual server is a little more complex than that of a physical server. Thus, a hypervisor, such as VMware vSphere or Microsoft Hyper-V, is installed on top of physical hardware. A hypervisor is then used to create and manage VMs, which have their own virtual computing resources. After that, you can load multiple guest OSes and server applications on top of the virtual hardware. Thus, virtual servers allow you to run several OSes and applications on the basis of the shared physical hardware, which makes it a more cost-effective option than a physical server.

Comparing physical servers and virtual machines

To see the physical server vs virtual server differences, a closer look at all of their components is required.

Performance

This factor should be considered if your organization works with a large amount of data which needs to be constantly processed. Physical servers are far more powerful and efficient than VMs, due to the fact that VMs are prone to performance issues as a result of an overflow of virtual servers in a physical machine. Thus, a physical machine and a virtual machine, both having the same hardware and software resources and capabilities, cannot perform on the same level. If your organization runs operations which require the use of computing resources to the fullest extent, a physical server is the optimal choice.

Management

As for the management factor, VMs are much easier to maintain than physical servers. In case of server failure, it could take several days to restore a physical server to its original

state. For VMs, the recovery process can be initiated in just a few clicks with the help of a previously-created VM backup. Moreover, a physical server must be closely inspected for any deficiencies and, if required, additional drivers should be installed and set up before it can be used. This is not the case with VMs as they are built upon physical hardware which is ready for use. Thus, VMs can be created and powered on in a few minutes' time.
However, managing a virtual server environment requires a high level of expertise and specific skills. Thus, make sure that the members of your IT team are competent enough to control your virtual infrastructure.

Portability
One of the major physical server vs virtual server differences lies in portability. You can easily move VMs across the virtual environment and even from one physical server to another, with minimal input on your part. This is due to the fact that VMs are isolated from one another and have their own virtual hardware, which makes a VM hardware-independent. Moving your physical server environment to another location is a more resource-intensive task. In this case, you will need to copy all data stored on the server to a removable media, transport the media as well as all hardware resources that you have to a new location, and then re-install all of the system components on a new server. Essentially, you will have to re-build a server from scratch.

Scalability
To expand a physical server environment, you need to buy additional hardware components, which can be very expensive, and go through a long process of installation and configuration. At the same time, a virtual server environment provides the option of on-demand scalability. A single virtual server can host multiple VMs at the same time, which can be added or removed with the click of a mouse. Your virtual environment can be scaled up or down depending on the growth of your business needs. In this case, you don't need to buy additional hardware to ensure VM deployment. This is due to the fact that VMs running on the host share the same computing resources, which can be evenly distributed among all VMs. Thus, you can design an easily configurable environment which can carry out operations of any complexity levels.

Capacity management
Physical servers do not use their hardware and software capabilities to maximum levels, with their average production capacity being at 25%. Thus, a lot of computing resources are left unused, which isn't cost-effective. On the other hand, a server hosting multiple VMs takes care of underutilized resources by distributing them among other VMs which need it most. This way, optimum capacity management is achieved.

System recovery
If the production site was hit by disaster, it is essential to quickly restore mission-critical data and operations so as to reduce system downtime and minimize its negative impact on business. It can take several hours or days to restore business operations running on a physical server. In this case, the disaster recovery (DR) process entails setting up a new physical server, installing an OS, setting up applications, and restoring critical data from backups.

Currently, businesses are expected to operate on an always-on basis, meaning that even a minor interruption in business operations can lead to major repercussions. Therefore, ensuring business continuity, especially in case of disaster, should be one of the main priorities of any organization.

When comparing physical servers and VMs, it becomes evident that VMs are more fault-tolerant. In case of disaster, the workload of your virtual environment can be transferred in a few clicks to another site, so as to ensure the minimum downtime. After the effects of the disaster have been mitigated and the production center has been restored, you can move the workload from the DR site back to the primary site.

If a disaster has affected or destroyed your physical server infrastructure, the damage, in most cases, is irreversible.

Security
Security management is more easily configurable in a virtual server environment than in a physical one. With physical servers, you have to build a system of protection for each individual server, depending on its computing capabilities and resources and the sensitivity of data that it stores. This can be a resource-intensive task if your IT infrastructure is built upon 10 or more physical servers.

On the other hand, a virtual server environment can be protected on the basis of a universal security model. Thus, security policies and procedures can be developed, documented, and implemented from a single pane of glass - that is, through the hypervisor dashboard.

Costs
Building and maintaining a physical server environment can be quite expensive. This is due to constant hardware and software upgrades, frequent system failures, and breakdown of computer components and equipment, which are difficult or even impossible to repair.

At the same time, virtualization is considered a perfect option for enterprises which contain a large number of servers. A virtual server environment allows you to evenly distribute computing resources among all running VMs, thus ensuring capacity optimization for a minimal price. However, you should note that VM software licenses can be quite expensive as well. Depending on the size of the virtual environment, the price can be up to a few thousand dollars.

Difference between Server OS and Client OS

1. Client OS :
It is an operating system that operates within desktop. It is used to obtain services from a server. It run on the client devices like laptop, computer and is very simple operating system.
2. Server OS :
It is an operating system that is designed to be used on server. It is used to provide services to multiple client. It can serve multiple client at a time and is very advanced operating system.

Server Operating System	Client Operating System
It can be used to provide services to multiple client.	It can obtain services from a server.
It can serve multiple client at a time.	It serves a single user at a time.

Server Operating System	Client Operating System
It is complex operating system.	It is simple operating system.
It runs on the server.	It runs on the client devices like laptop, computer etc.
It is an operating system that is designed to be used on server.	It is an operating system that operates within desktop.
It provides more security.	It provides less security.
It has greater processing power.	It has less processing power.
It is more stable.	It is less stable.
It is highly efficient.	It is less efficient.
Examples: Red Hat, Linux.	Examples: Windows, Android.

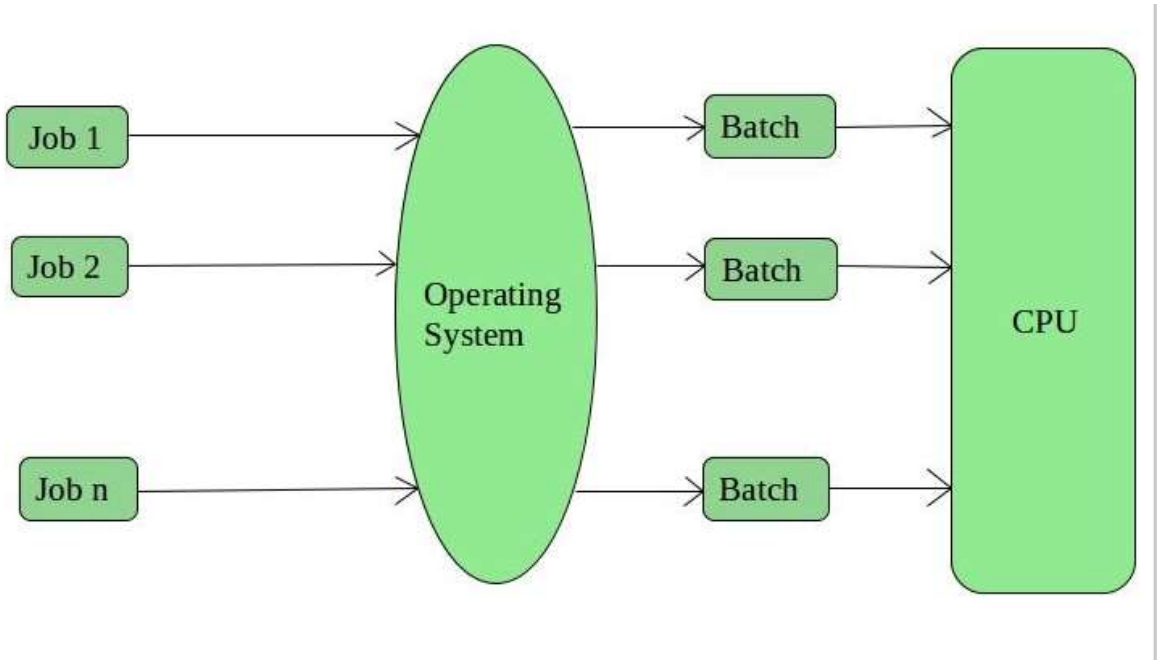
Types of Operating Systems

An Operating System performs all the basic tasks like managing files, processes, and memory. Thus operating system acts as the manager of all the resources, i.e. **resource manager**. Thus, the operating system becomes an interface between user and machine.

Types of Operating Systems:

Some widely used operating systems are as follows-

1. Batch Operating System –
This type of operating system does not interact with the computer directly. There is an operator which takes similar jobs having the same requirement and group them into batches. It is the responsibility of the operator to sort jobs with similar needs.



Advantages of Batch Operating System:

- It is very difficult to guess or know the time required for any job to complete. Processors of the batch systems know how long the job would be when it is in queue
- Multiple users can share the batch systems
- The idle time for the batch system is very less
- It is easy to manage large work repeatedly in batch systems

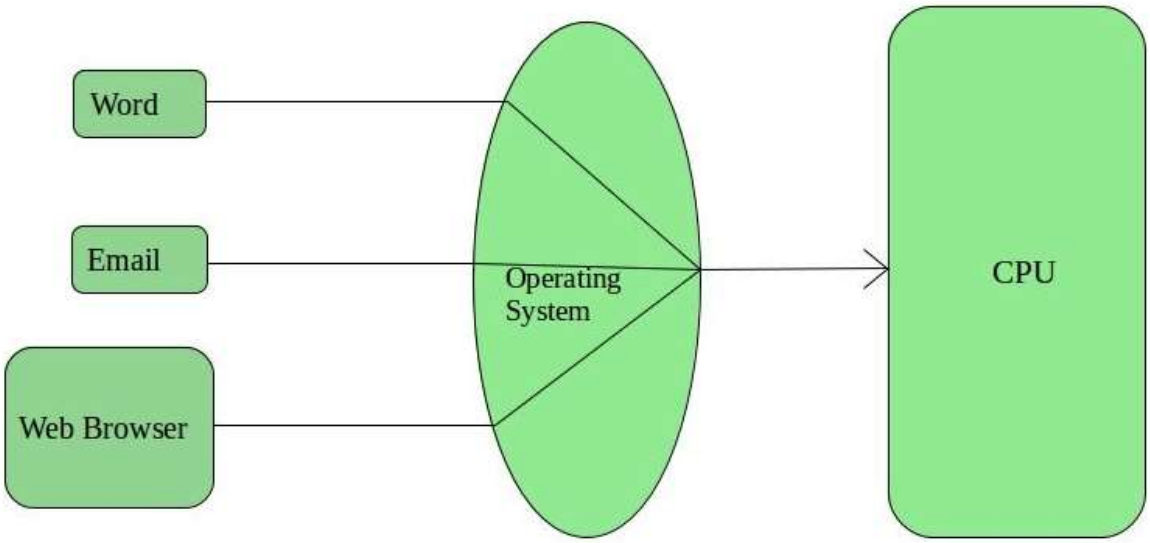
Disadvantages of Batch Operating System:

- The computer operators should be well known with batch systems
- Batch systems are hard to debug
- It is sometimes costly
- The other jobs will have to wait for an unknown time if any job fails

Examples of Batch based Operating System: Payroll System, Bank Statements, etc.

2. Time-Sharing Operating Systems –

Each task is given some time to execute so that all the tasks work smoothly. Each user gets the time of CPU as they use a single system. These systems are also known as Multitasking Systems. The task can be from a single user or different users also. The time that each task gets to execute is called quantum. After this time interval is over OS switches over to the next task.



Advantages of Time-Sharing OS:

- Each task gets an equal opportunity
- Fewer chances of duplication of software
- CPU idle time can be reduced

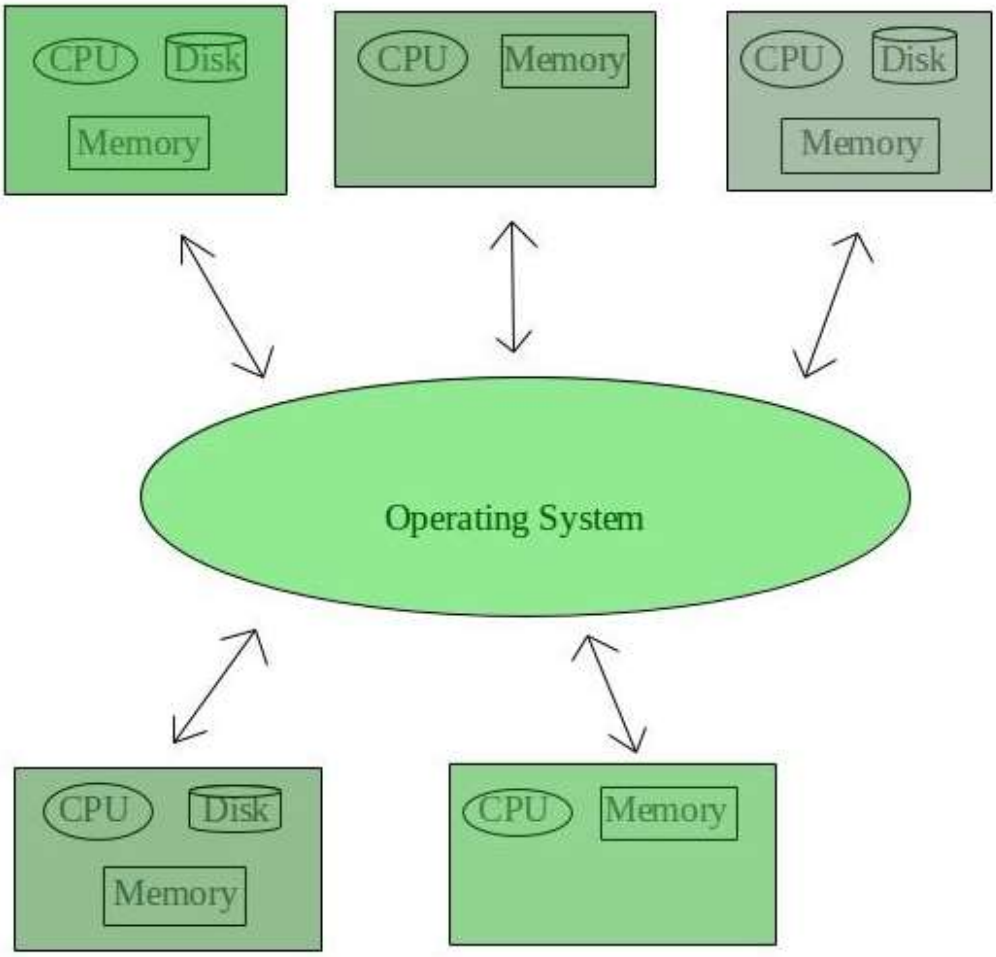
Disadvantages of Time-Sharing OS:

- Reliability problem
- One must have to take care of the security and integrity of user programs and data.
- Data communication problem

Examples of Time-Sharing OSs are: Multics, Unix, etc.

3. Distributed Operating System –

These types of the operating system is a recent advancement in the world of computer technology and are being widely accepted all over the world and, that too, with a great pace. Various autonomous interconnected computers communicate with each other using a shared communication network. Independent systems possess their own memory unit and CPU. These are referred to as **loosely coupled systems** or distributed systems. These system's processors differ in size and function. The major benefit of working with these types of the operating system is that it is always possible that one user can access the files or software which are not actually present on his system but some other system connected within this network i.e., remote access is enabled within the devices connected in that network.



Advantages of Distributed Operating System:

- Failure of one will not affect the other network communication, as all systems are independent from each other
- Electronic mail increases the data exchange speed
- Since resources are being shared, computation is highly fast and durable
- Load on host computer reduces
- These systems are easily scalable as many systems can be easily added to the network
- Delay in data processing reduces

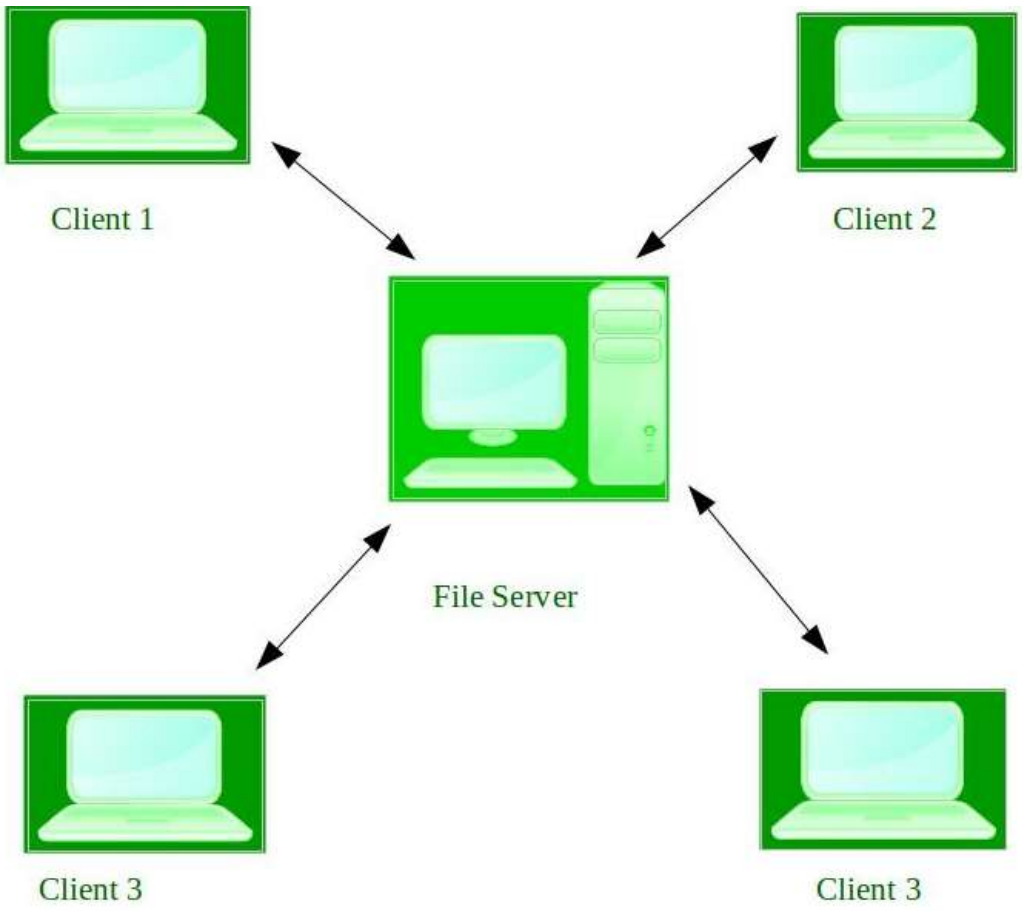
Disadvantages of Distributed Operating System:

- Failure of the main network will stop the entire communication
- To establish distributed systems the language which is used are not well defined yet
- These types of systems are not readily available as they are very expensive. Not only that the underlying software is highly complex and not understood well yet.

Examples of Distributed Operating System are- LOCUS, etc.

4. Network Operating System –

These systems run on a server and provide the capability to manage data, users, groups, security, applications, and other networking functions. These types of operating systems allow shared access of files, printers, security, applications, and other networking functions over a small private network. One more important aspect of Network Operating Systems is that all the users are well aware of the underlying configuration, of all other users within the network, their individual connections, etc. and that's why these computers are popularly known as **tightly coupled systems**.



Advantages of Network Operating System:

- Highly stable centralized servers
- Security concerns are handled through servers
- New technologies and hardware up-gradation are easily integrated into the system
- Server access is possible remotely from different locations and types of systems

Disadvantages of Network Operating System:

- Servers are costly
- User has to depend on a central location for most operations
- Maintenance and updates are required regularly

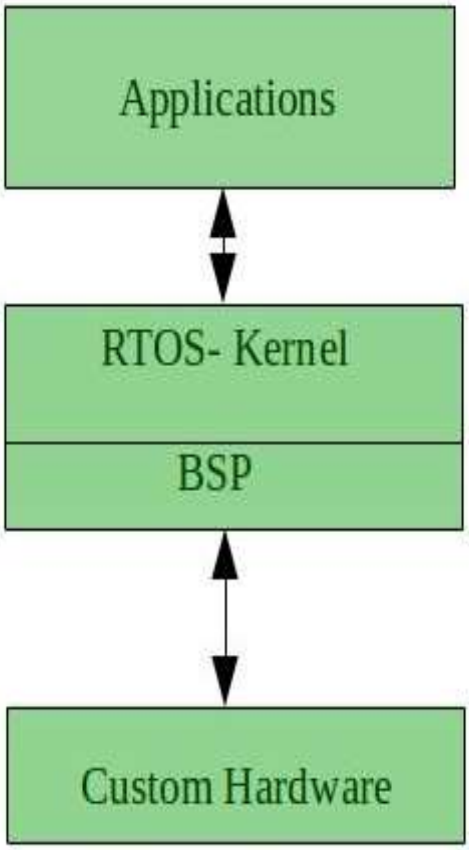
Examples of Network Operating System are: Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD, etc.

5. Real-Time Operating System –

These types of OSs serve real-time systems. The time interval required to process and respond to inputs is very small. This time interval is called **response time**.
Real-time systems are used when there are time requirements that are very strict like missile systems, air traffic control systems, robots, etc.

Two types of Real-Time Operating System which are as follows:

- **Hard Real-Time Systems:**
  These OSs are meant for applications where time constraints are very strict and even the shortest possible delay is not acceptable. These systems are built for saving life like automatic parachutes or airbags which are required to be readily available in case of any accident. Virtual memory is rarely found in these systems.
- **Soft Real-Time Systems:**
  These OSs are for applications where for time-constraint is less strict.



Advantages of RTOS:

- **Maximum Consumption:** Maximum utilization of devices and system, thus more output from all the resources
- **Task Shifting:** The time assigned for shifting tasks in these systems are very less. For example, in older systems, it takes about 10 microseconds in shifting one task to another, and in the latest systems, it takes 3 microseconds.
- **Focus on Application:** Focus on running applications and less importance to applications which are in the queue.
- Real-time **operating system in** the **embedded system:** Since the size of programs are small, RTOS can also be used in embedded systems like in transport and others.
- **Error Free:** These types of systems are error-free.
- **Memory Allocation:** Memory allocation is best managed in these types of systems.

Disadvantages of RTOS:

- **Limited Tasks:** Very few tasks run at the same time and their concentration is very less on few applications to avoid errors.
- **Use heavy system resources:** Sometimes the system resources are not so good and they are expensive as well.
- **Complex Algorithms:** The algorithms are very complex and difficult for the designer to write on.
- **Device driver and interrupt signals:** It needs specific device drivers and interrupts signals to respond earliest to interrupts.
- **Thread Priority:** It is not good to set thread priority as these systems are very less prone to switching tasks.

Examples of Real-Time Operating Systems are: Scientific experiments, medical imaging systems, industrial control systems, weapon systems, robots, air traffic control systems, etc.