

Ministry of Higher Education



زانکۆی پۆلیتەکنیکی هه‌ولێر
ERBIL POLYTECHNIC UNIVERSITY

Koya Technical institute

Information Technology for Department

Operating System



Second Stage

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Introduction:

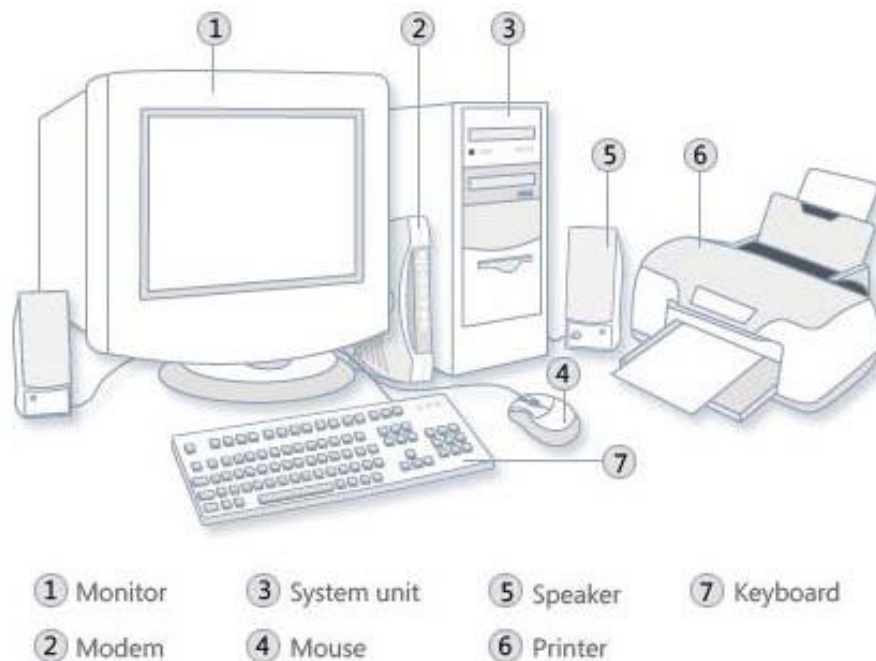
A Computer is an electronic device that can perform activities that involve Mathematical, Logical and graphical manipulations. Generally, the term is used to describe a collection of devices that function together as a system.

➤ **It performs the following three operations in sequence.**

1. It receives data & instructions from the **(input)** device.
2. **(Processes)** the data as per instructions.
3. Provides the result **(output)** in a desired form.

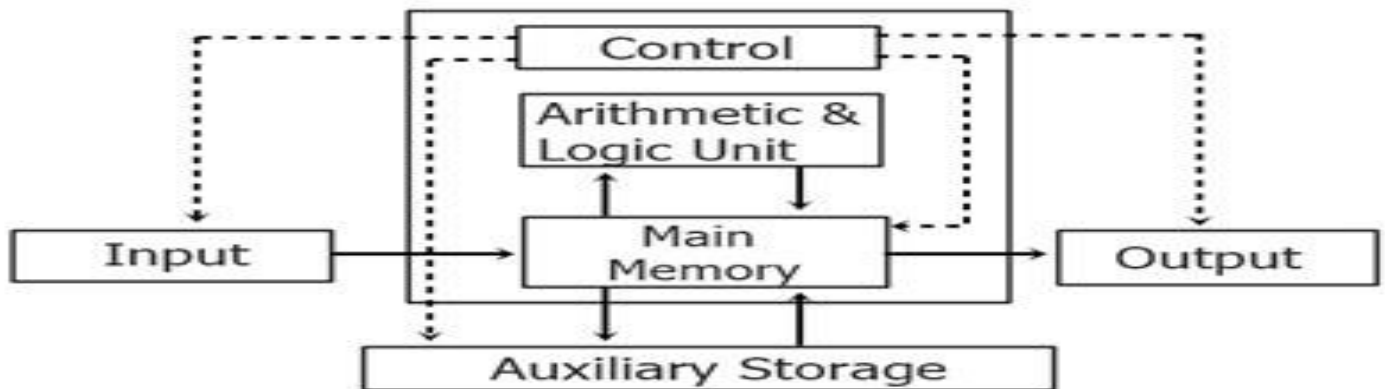
What can do with computers?

In the workplace, many people use computers to keep records, analyze data, do research, and manage projects. At home, you can use computers to find information, store pictures and music, track finances, play games, and communicate with others—and those are just a few of the possibilities. You can also use your computer to connect to the Internet, a network that links computers around the world. Internet access is available for a monthly fee in most urban areas, and increasingly, in less populated areas. With Internet access, you can communicate with people all over the world and find a vast amount of information. Here are some of the most popular things to do with computers: **the web, E-mail, Instant messaging, Pictures, music, movies, and gaming.**



The computer system consists of three units:

1. **Input device**: Reads information from input media and enters to the computer in a coded form.
2. **Central Processing Unit (CPU)**: This box is the brain of a computer system. It processes, stores, and communicates information. The main circuit chip in computer, it performs most of the calculations necessary to run computer. CPU speed measured by account of instructions that can execute in one secant, usually measured in (MHz). CPU content three units:
 - A- **Memory Unit**: Stores program and data.
 - B- **Arithmetic Logic Unit**: Performs arithmetic and logical functions.
 - C- **Control Unit**: Interprets program instructions and controls the input and output devices.
3. **Output device**: decodes information and presents it to the user.



Block Diagram of Computer

1. Control Unit (CU): This unit control or supervised to all parts of computers such as:

- Control operation of transfers data and instruction from input unit to memory and from memory to output unit.
- Control operation of account executable instructions on ALU.
- Basic work of CU is interpreter the instructions that is mean data oriented to specific location on ALU. for example: if the instruction is (B+C) the B,C values transfers to (Adder) part, if the instruction is (BxC) the B,C values transfers to (Multiplier) part.

2. Arithmetic and Logic Unit (ALU): This unit execute the following operations:

- Mathematical operations such as: add (+), abstract (-), multiplier (×), divide (÷).
- Logical operations: this is basic to account comparisons to choose true or false specific case, such as >, <, >=, <=, <>, = as a result of these comparisons specific instructions may be executable.
- Merge number of simple comparisons by specific tools such as: AND, OR, NOT.

What are Buses?

The command received on CPU through buses, where the buses use to transfer electric impulse between different computer parts, as **code signals** therefore the buses are data path between the CPU and other computer parts such as input, output, and storage units. The one bus made of set of metal wires that sprawled over mother board. The types of buses are:

1. **Data Bus:** use to transfer data.
2. **Address Bus:** use to transfer storage location addresses.
3. **Control Bus:** use to transfer control signal and operation timer between computer parts.

System Board or (Mother Board): the important part on computer loading the CPU, memories, and control circuit. it is allows to computer parts to exchange data to perform the required work, and coordinate computer parts, and memory organization.

- **Main memory:** refers usually to Random Access Memory (RAM) the temporary storage area the computer uses to run programs and store data. information store in RAM is temporary and is designed to be erased when computer turn off.

RAM is a general indication of performance that is measured either in **megabytes** (MB) or **gigabytes** (GB).

Memory is set of electronic circuit named (Cells), each cell store 0 or 1, like (on or off), the single cell content named (Bit) which represent basic unit in process data, because all data transfer to set of bits in digital computers.

(BYTE) term for eight Bit i.e: **1 Byte = 8 Bit**

- **Memory Capacity:** Memory capacity units measured in **kilo Byte** which abstract by (KB) where:

<u>Kilobytes (KB)</u>	<u>Bytes (B) binary</u>
1 KB =	1024 Bytes

→ In memories has large capacity measured in **Megabyte** which abstract by (MB) where:

<u>Megabytes (MB)</u>	<u>Kilo Bytes (KB) binary</u>	<u>Bytes (B) binary</u>
1 MB =	1024 KB	1,048,576 Bytes

→ In larger memories capacity measured in **Gigabyte** which abstract by (GB) where:

<u>Gigabytes (GB)</u>	<u>Mega Bytes (MB) binary</u>	<u>Kilo Bytes (KB) binary</u>	<u>Bytes (KB) binary</u>
1 GB =	1024 MB	1,048,576 KB	1,073,741,824 Bytes

→ In largest memories capacity measured in **Terabyte** which abstract by (TB) where:

<u>Terabytes (GB)</u>	<u>Gega Bytes (MB) binary</u>	<u>Mega Bytes (KB) binary</u>	<u>Kilo Bytes (KB) binary</u>
1 TB =	1,048,576 GB	1,073,741,824 MB	1,099,511,627,776 KB

1-bit(1,0)	Nibble = 4-bit	Byte = 2Nibble	K.B	M.B	G.B	T.B	P.B	E.B
Z.B	Y.B							

Memory Speed:

Memory speed measured in **WRITE** speed where write mean translate data operations from CPU to main memory also measured in **READ** speed where read mean translate data operations from main memory to CPU. read and write operations in memory named by **Access**. Because read and write operations generated by CPU therefore memory speed equal almost CPU speed.

• Types of Memory:

Random Access Memory (RAM): in this kind of memory can read and write on it generated by CPU. This kind of memory used by user to store his programs on it. this memory is temporary storage ends when the process is end or when split electric power.

Read Only Memory (ROM): in this kind of memory can read only from it generated by CPU, but cannot write on it from this unit because store specific computer system software on these kinds of memories, such as: BIOS, Startup Routine, Input/ output routine, Interpreter. This memory does not miss it is contents where split electric power.

What is BIOS?

BIOS (Basic Input Output System): is a software that is built into computers and that is run when the computer first turn on. among other things this software starts the operating system and support transfer information between hardware devices. BIOS is part of your computer's hardware and is separate from Windows.

What are the 2 types of BIOS?

There are two main types of BIOS:

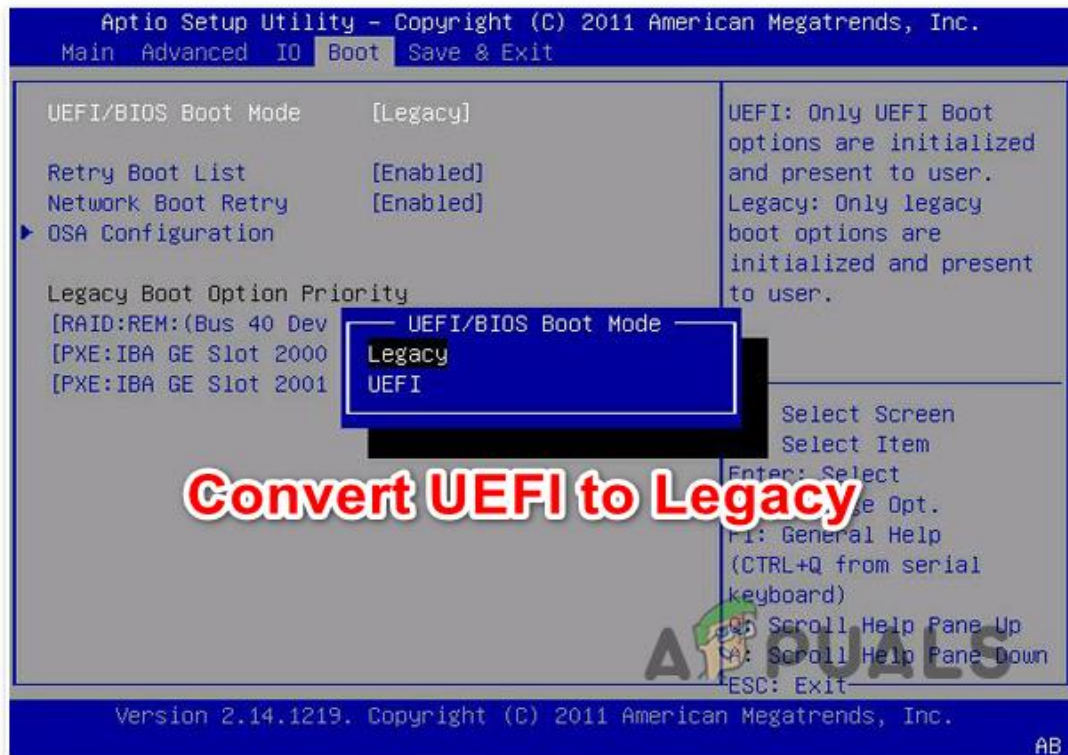
- **Legacy BIOS:** Legacy BIOS is used in older motherboards to turn on the computer, and it controls how the CPU and different computer components talk to each other. Unfortunately, the Legacy BIOS has limitations. For example, it can't handle or recognize data drives larger than 2.1 TB.
- **UEFI:** The acronym stands for **Unified Extensible Firmware Interface**. Unlike the Legacy BIOS, the UEFI can accommodate 2.2 TB or larger drives. In addition, UEFI handles drives with the aid of the Master Boot Record rather than GPT technology, the latter being a more modern GUID Partition Table.

What is UEFI? (Unified Extensible Firmware Interface)

It defines a new method by which Oses and platform firmware communicate, providing a lightweight BIOS alternative that uses only the information needed to launch the OS boot process. In addition, UEFI provides enhanced computer security features and supports most existing BIOS systems with backward compatibility.

What is difference between BIOS and UEFI?

UEFI supports drive sizes up to 9 zettabytes, whereas BIOS only supports 2.2 terabytes. UEFI provides faster boot time. UEFI has discrete driver support, while BIOS has drive support stored in its ROM, so updating BIOS firmware is a bit difficult.



<https://www.simplilearn.com/what-is-bios-article#what is a bios and whats included>

What is CMOS?

Complementary metal-oxide semiconductor: typically refers to a battery-powered memory chip in your computer that stores startup information. Your computer's basic input/output system (BIOS) uses this information when starting your computer.

Data: It is the collection of raw facts, figures & symbols.

Ex: Names of students and their marks in different subjects listed in random order.

Information: It is the data that is processed & presented in an organized manner.

Ex: When the names of students are arranged in alphabetical order, total and average marks are calculated & presented in a tabular form, it is information.

Program: Set of instructions that enables a computer to perform a given task.

Advantages of computers:

1. **High speed:** Computers have the ability to perform routine tasks at a greater speed than human beings. They can perform millions of calculations in seconds.
2. **Accuracy:** Computers are used to perform tasks in a way that ensures accuracy.
3. **Storage:** Computers can store large amount of information. Any item of data or any instruction stored in the memory can be retrieved by the computer at lightning speeds.
4. **Automation:** Computers can be instructed to perform complex tasks automatically (which increases the productivity).
5. **Cost effectiveness:** Computers reduce the amount of paper work and human effort, thereby reducing costs.

Limitations of computers

1. Computers need clear & complete instructions to perform a task accurately.
2. Computers cannot think.
3. Computers cannot learn by experience.

The computer performs basically five major operations

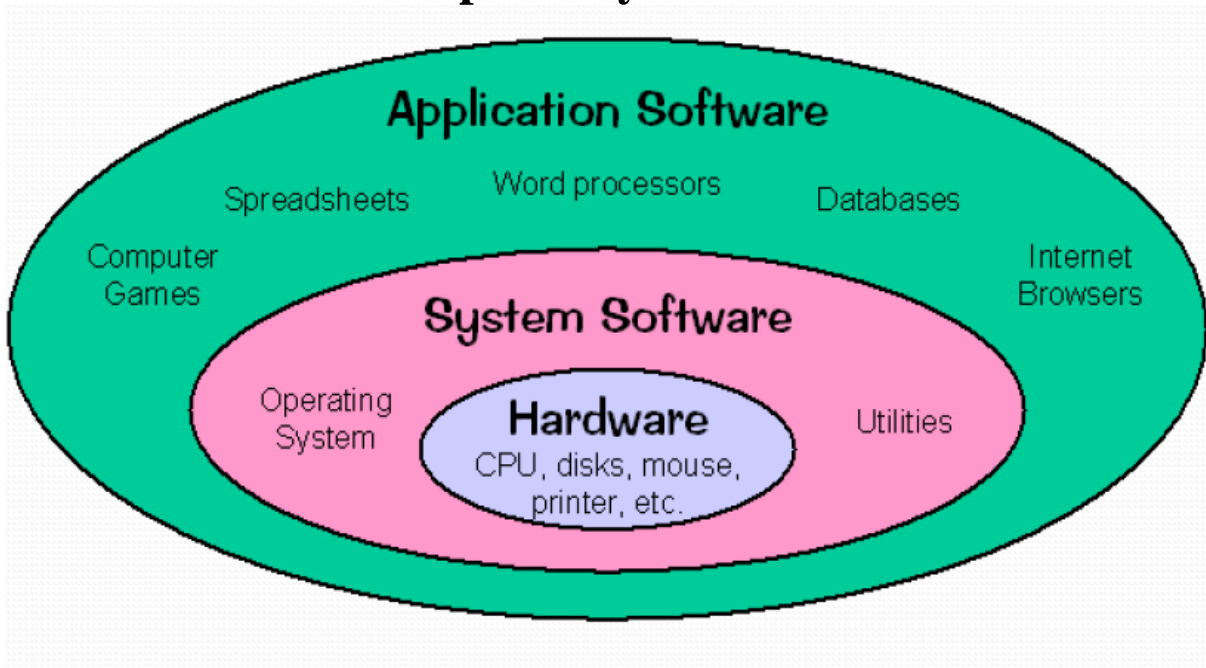
- 1) it accepts data or instruction form input device/instructions.
- 2) it stores data.
- 3) it can process data as required by the user.
- 4) it gives results in the form of output.
- 5) And repeat again from first step

Secondary storage devices: To keep software, programs data permanently, you have to save your work on the storage devises before shutting down your computer.

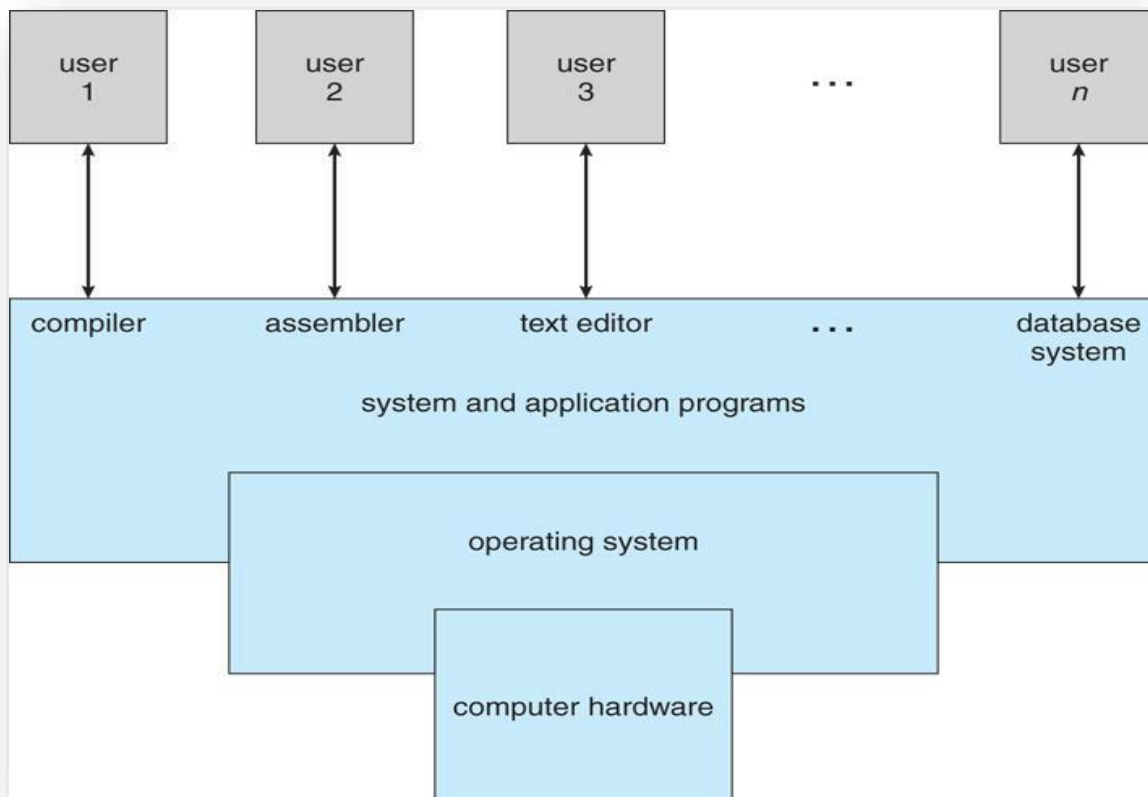
Typical secondary storage devices include:

1. Hard Disk
2. Floppy Disk
3. CD-ROM (Compact Disk Read Only Memory)
 - A) CD-R Recordable
 - B) CD-RW Rewritable
4. DVD (Digital Versatile Disk)
5. Magnetic Tape
6. Smart cards
7. USB Flash Drives

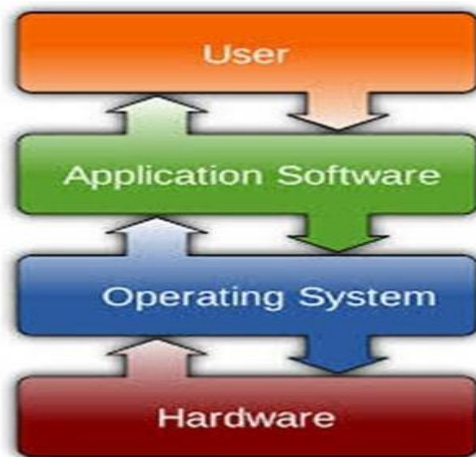
Computer System Structure



Component of a Computer System



Computer system can be divided into four components:



Computer System Structure:

- 1) **Hardware:** provides basic computing resources (CPU, memory, I/O devices).
- 2) **Operating system:** Controls and manages use of hardware among various applications and users.
- 3) **Application programs:** define the ways in which the system resources are used to solve the computing problems of the users (Word processors, compilers, web browsers, database systems).
- 4) **Users People:** machines, other computers.

Hardware vs. Software

- **Hardware** includes the parts of the computer system that you actually *can touch* (like the keyboard, mouse, monitor, or CPU).
- **Software** refers to the programs that you use on your computer (like a word-processing program) or the programs that make your computer work (you physically *cannot touch* these). Programs are also called applications.

Computer Software refers to the instructions or programs, that tell the hardware what to do.

Programs set of instructions that a computer uses to perform specific task such as word processing accounting or data management also called an application.

→ Software includes:

1. **Low Level Language:** this language include:

- **Machine Language** the instructions input to computer must be written in binary system i.e.by [0,1] the unique language that computer understand .it is very complex.
- **Assembly Language** this language used simple words such as [**Jump, Add, Move, Sub**] this lead to simplify computer using.

2. **High Level Language:** the data and instruction using symbols and numbers and words written in language similar to human language. Each language has it is specific grammar and rules.

Example of these language: **BASIC, FORTRAN, COBOL, PASCAL, PL/1, ADA, RPG, LISP, FORTH, SNOBOL, APL, ALGOL, LOGO.**

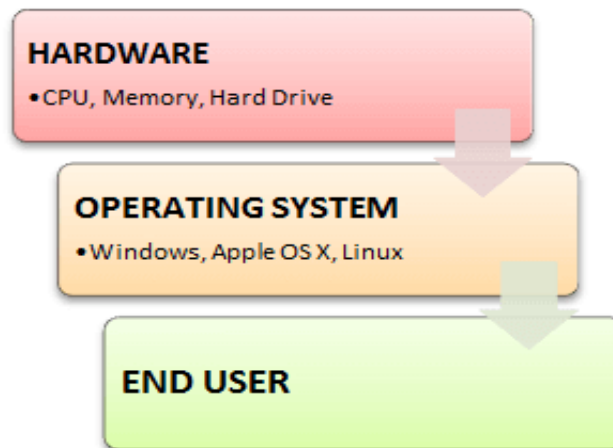
3. **Translation Programs:** these programs transfer high level language to low level language or assembly language to machine language, these programs include:

- **Assembler:** program transfer the program written in assembly language to machine language.
- **Compiler:** program transfer high level language programs to machine language program, the program written in high level language named **Source Program**, after transfer it to machine language by compiler is named **Object Program**. when using compiler in transfer operation, cannot execute the program unless complier all program sentences end.
- **Interpreter:** program written in machine language and store in ROM memory, it is work similar to compiler but differ from it where is compiler program sentences immediately.

4. Operating System (OS): is a software that acts as an interface between computer hardware components and the user. Every computer system must have at least one operating system to run other programs. Applications like Browsers, MS Office, Notepad Games, etc., need some environment to run and perform its tasks.

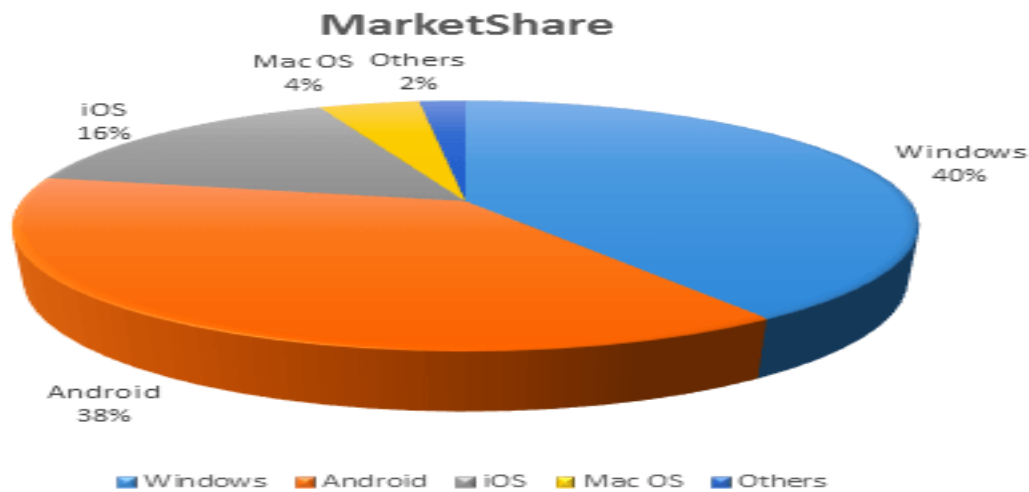
The OS helps you to communicate with the computer without knowing how to speak the computer's language. It is not possible for the user to use any computer or mobile device without having an operating system.

Operating System program that manages all computer parts. The operating system allows you to use software programs, and coordinate the use of computer hardware (such as the keyboard and mouse).



History Of OS:

- Operating systems were first developed in the late 1950s to manage tape storage
- The General Motors Research Lab implemented the first OS in the early 1950s for their IBM 701
- In the mid-1960s, operating systems started to use disks
- In the late 1960s, the first version of the Unix OS was developed
- The first OS built by Microsoft was DOS. It was built in 1981 by purchasing the 86-DOS software from a Seattle company
- The present-day popular OS Windows first came to existence in 1985 when a GUI was created and paired with MS-DOS.



Operating Systems Services: Following are the five services provided by operating systems to the accessibility of the users

- Program creation
- Program Execution
- I/O Operations
- Controlled access to resources, e.g. files (File System Operation)
- Error Detection

Aims of Operating system:

- ➔ To make a computer system suitable to use in an effective way
- ➔ To hide the details of the hardware resources from the users
- ➔ To provide users a suitable interface to use the computer system
- ➔ To manage the resources of a computer system
- ➔ To keep track of who is using which resource, allowing resource requests, according for resource using from different programs and users

Operating System Types:

1. **Single-Tasking Operating System:** A single-tasking system can only run one program at a time, single user operating system by these systems can execute on program in one using (one personal) computer, MS.DOS example of this kind of operating system.
2. **Multi-Tasking Operating Systems for Single User:** a multi-tasking operating system allows more than one program to be running in concurrency/happening. by these systems the user can use the personal computer to execute different types of programs in the same time, WINDOWS example of this kind of operating system.

3. Multi user Operating Systems: these operating system apply on many types of computers linked together, by these systems different users can use many computers in the same time, such as UNIX operating system.

Following are the popular types of OS (Operating System):

- Batch Operating System
- Multitasking/Time Sharing OS
- Multiprocessing OS
- Real Time OS
- Distributed OS
- Network OS
- Mobile OS

Batch Operating System

Some computer processes are very lengthy and time-consuming. To speed the same process, a job with a similar type of needs are batched together and run as a group.

The user of a batch operating system never directly interacts with the computer. In this type of OS, every user prepares his or her job on an offline device like a punch card and submit it to the computer operator.

Multi-Tasking/Time-sharing Operating systems

Time-sharing operating system enables people located at a different terminal(shell) to use a single computer system at the same time. The processor time (CPU) which is shared among multiple users is termed as time sharing.

Real time OS

A real time operating system time interval to process and respond to inputs is very small. Examples: Military Software Systems, Space Software Systems are the Real time OS example.

Distributed Operating System

Distributed systems use many processors located in different machines to provide very fast computation to its users.

Network Operating System

Network Operating System runs on a server. It provides the capability to serve to manage data, user, groups, security, application, and other networking functions.



Mobile OS

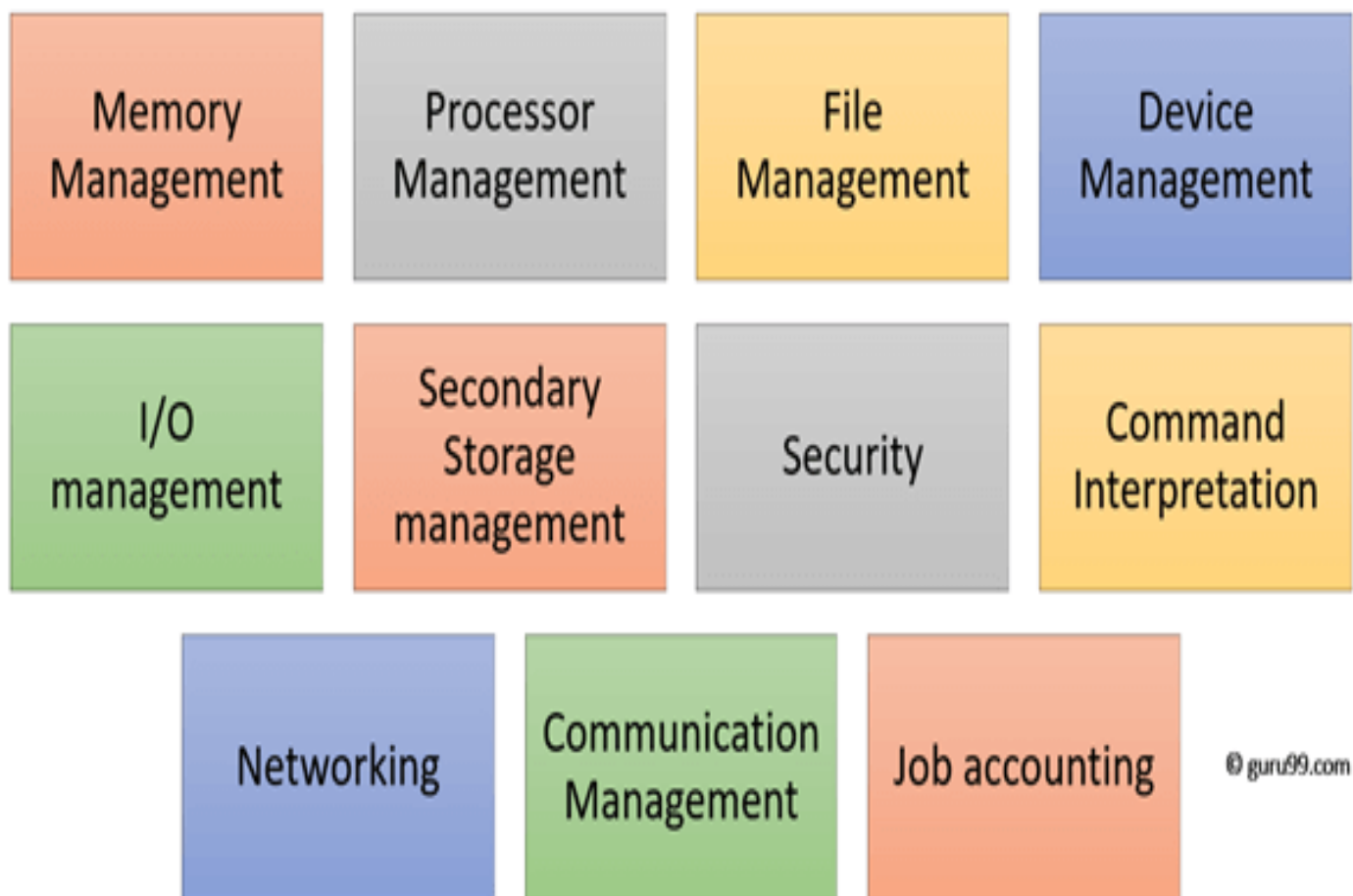
Mobile operating systems are those OS which is especially that are designed to power smartphones, tablets, and wearables devices.

Some most famous mobile operating systems are Android and iOS, but others include BlackBerry, Web, and watchOS.

Functions of Operating System

Some typical operating system functions may include managing memory, files, processes, I/O system & devices, security, etc.

Below are the main functions of Operating System:



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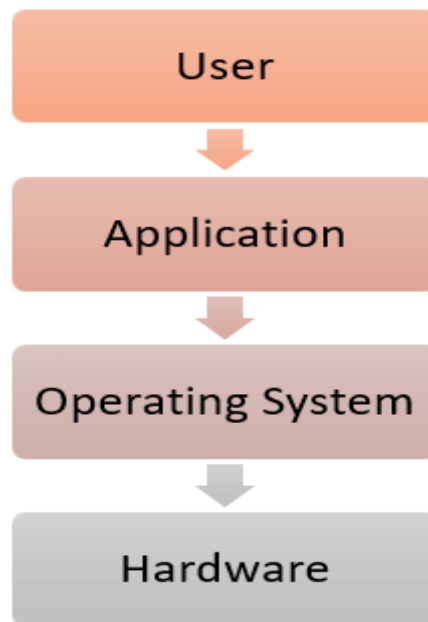
In an operating system software performs each of the function:

1. **Process management:** Process management helps OS to create and delete processes. It also provides mechanisms for synchronization and communication among processes.
2. **Memory management:** Memory management module performs the task of allocation and de-allocation of memory space to programs in need of this resources.
3. **File management:** It manages all the file-related activities such as organization storage, retrieval, naming, sharing, and protection of files.
4. **Device Management:** Device management keeps tracks of all devices. This module also responsible for this task is known as the I/O controller. It also performs the task of allocation and de-allocation of the devices.
5. **I/O System Management:** One of the main objects of any OS is to hide the peculiarities of that hardware devices from the user.
6. **Secondary-Storage Management:** Systems have several levels of storage which includes primary storage, secondary storage, and cache storage. Instructions and data must be stored in primary storage or cache so that a running program can reference it.
7. **Security:** Security module protects the [data and information](#) of a computer system against malware threat and authorized access.
8. **Command interpretation:** This module is interpreting commands given by the and acting system resources to process that commands.
9. **Networking:** A distributed system is a group of processors which do not share memory, hardware devices, or a clock. The processors communicate with one another through the network.
10. **Job accounting:** Keeping track of time & resource used by various job and users.
11. **Communication management:** Coordination and assignment of compilers, interpreters, and another software resource of the various users of the computer systems.

Features of Operating System (OS)

Here is a list important features of OS:

- Protected and supervisor mode
- Allows disk access and file systems Device drivers Networking Security
- Program Execution
- Memory management Virtual Memory Multitasking
- Handling I/O operations
- Manipulation of the file system
- Error Detection and handling
- Resource allocation
- Information and Resource Protection



Advantage of Operating System

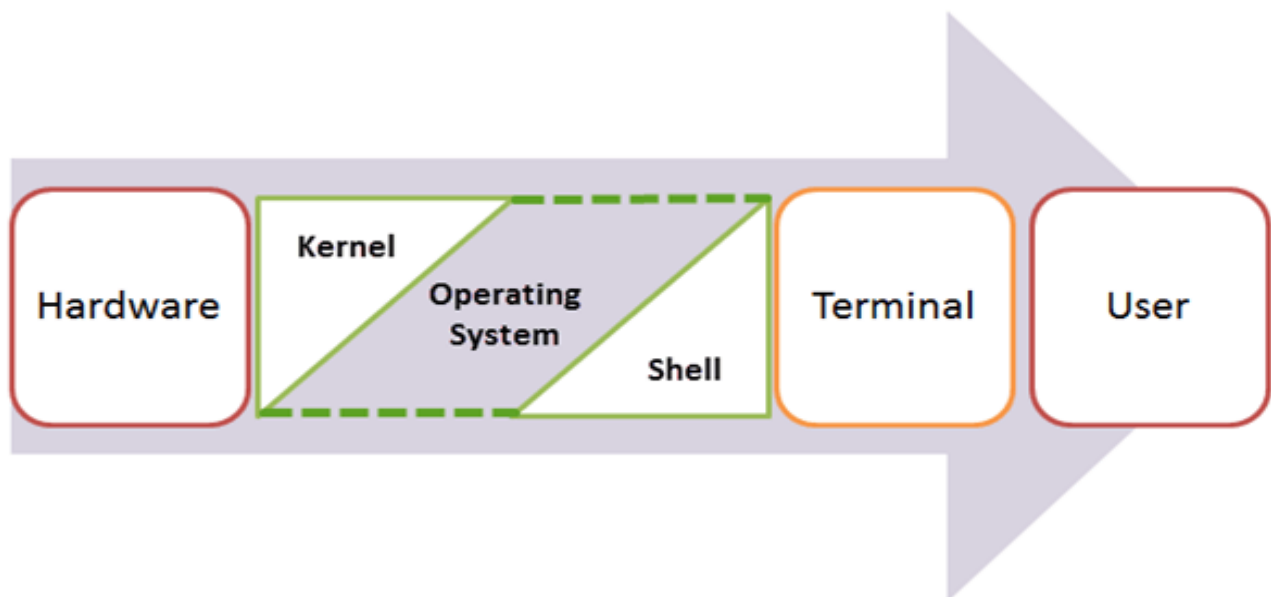
- Allows you to hide details of hardware by creating an abstraction
- Easy to use with a GUI
- Offers an environment in which a user may execute programs/applications
- The operating system must make sure that the computer system convenient(suitable) to use
- Operating System acts as an intermediary(middle) among applications and the hardware components
- It provides the computer system resources with easy to use format
- Acts as an intermediary between all hardware's and software's of the system

Disadvantages of Operating System

- If any issue occurs in OS, you may lose all the contents which have been stored in your system
- Operating system's software is quite expensive for small size organization which adds burden(effect) on them. Example Windows
- It is never entirely secure as a threat can occur at any time

What is Kernel in Operating System?

The kernel is the central component of a computer operating systems. The only job performed by the kernel is to manage the communication between the software and the hardware. A Kernel is at the nucleus of a computer. It makes the communication between the hardware and software possible. While the Kernel is the innermost(deepest) part of an operating system, a shell is the outermost(external) one.



Introduction to Kernel

Features of Kernel

- Low-level scheduling of processes
- Inter-process communication
- Process synchronization
- Context switching

Types of Kernel:

There are many types of kernels that exists, but among them, the two most popular kernels are:

1. Monolithic

A monolithic kernel is a single code or block of the program. It provides all the required services offered by the operating system. It is a simplistic design which creates a distinct communication layer between the hardware and software.

2. Microkernels

Microkernel manages all system resources. In this type of kernel, services are implemented in different address space. The user services are stored in user address space, and kernel services are stored under kernel address space. So, it helps to reduce the size of both the kernel and operating system.

Difference between Firmware and Operating System

Firmware	Operating System
Firmware is one kind of programming that is embedded on a chip in the device which controls that specific device.	OS provides functionality over and above that which is provided by the firmware.
Firmware is programs that been encoded by the manufacture of the IC or something and cannot be changed.	OS is a program that can be installed by the user and can be changed.
It is stored on non-volatile memory.	OS is stored on the hard drive.

Difference between 32-Bit and 64-Bit Operating System

Parameters	32. Bit	64. Bit
Architecture and Software	Allow 32 bit of data processing simultaneously(together)	Allow 64 bit of data processing simultaneously
Compatibility	32-bit applications require 32-bit OS and CPUs.	64-bit applications require a 64-bit OS and CPU.
Systems Available	All versions of Windows 8, Windows 7, Windows Vista, and Windows XP, Linux, etc.	Windows XP Professional, Vista, 7, Mac OS X and Linux.
Memory Limits	32-bit systems are limited to 3.2 GB of RAM.	64-bit systems allow a maximum 17 Billion GB of RAM.

Files Organization

While you're working with a file in a program, you should save it frequently to avoid losing data unexpectedly due to a power failure or other problems.

What is File System?

A file is a collection of correlated/match information which is recorded on secondary or non-volatile storage like magnetic disks (HD), optical disks (CD), and tapes. It is a method of data collection that is used as a medium for giving input and receiving output from that program.

Without using the file system, information placed in a storage medium would be one large body of data with no way to know where one piece of information stops and the next one begins.

There are three main types of secondary storage in a computer system:

- **Solid** state storage devices, such as USB memory sticks
- **Optical** storage devices, such as CD, DVD and Blu-ray discs
- **Magnetic** storage devices, such as hard disk drives



File: a collection of information that is stored on a computer under a single name. a file can be a text document, a picture, a program and so on. The file name extensions typically consist of three letters that helps to indicate of file formats. The following file types and their extensions.

File type	Extension
Executable file	exe
Operating system file	sys
Text file	Doc / txt / Rtf
Picture file	Bmp/ jpg
Commands file	com
Program file	Prg
Backgate file	Bat
Drawing file	Dwg/Gif
Help file	Hlp
Voice file	Mp3/wav

Location: any disk drive, folder, or other place in which you can store files or folders. Programs will commonly ask you to choose a location to save files.

Path: a sequence of folders(directories) that leads to a specific file or folder. a backslash is used to separate each folder in the path. for Example: to access the file **prog3.Docx** the path as following link:

C:\applicate\basic\prog1\prog2\prog3.docx

What is a file system?

A **file system** defines how files are **named**, stored, and **retrieved** from a storage device.

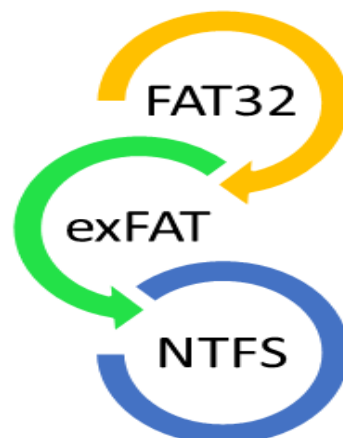
Every time you open a file on your computer or smart device, your operating system uses its file system internally to load it from the storage device.

Or when you copy, edit, or delete a file, the file system handles it under the hood.

Whenever you download a file or access a web page over the Internet, a file system is involved too.

The Type of File System:

- 1- **FAT32: File Allocated Technology:** a system used to store files on computer drive. FAT32 is based on file allocate table (FAT)file system, but it uses 32-bit values for storing files instead of 16 –bit values used by original FAT file system. A FAT32 partition should be less than 8 TeraByte (TB). The FAT32 contains four bytes per cluster inside the file allocation table.
- 2- **exFAT: File Allocated Technology:** The exFAT file system was introduced in 2006 and was added to older versions of Windows with updates to Windows XP and Windows Vista operating systems.
- 3- **NTFS: New Technology File System:** NTFS is a modern-day file system that is used by default used by Windows. When you install Windows 10 into your PC or laptop, it formats your system drive with the NTFS file system. This file system has the file size and partition size limits, which are so huge that you are not likely to run up with disk space.

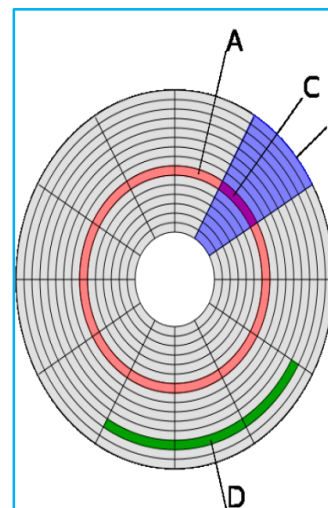
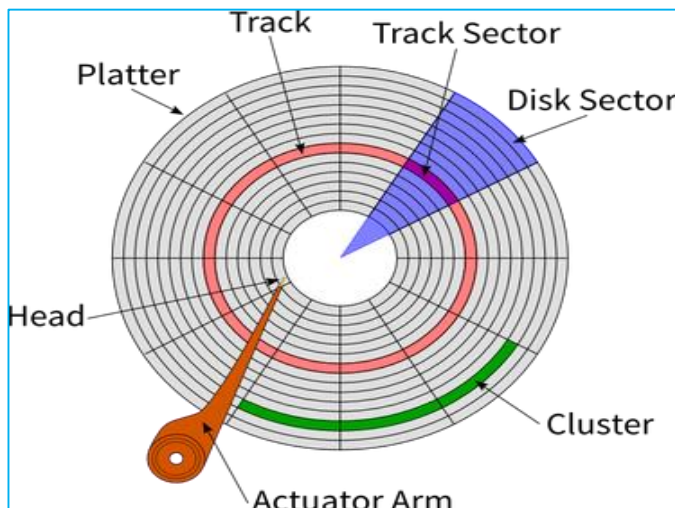


What is a Hard Disk Drive?

An HDD uses magnetism, which allows you to store data on a rotating platter. It has a read/write head that floats above the spinning platter for Reading and Writing of the data. The faster the platter spins, the quicker an HDD can perform. HDD also consists of an I/O controller and firmware, which tells the hardware what to do and communicates with the remaining system. The full form of HDD is Hard Disk Drive

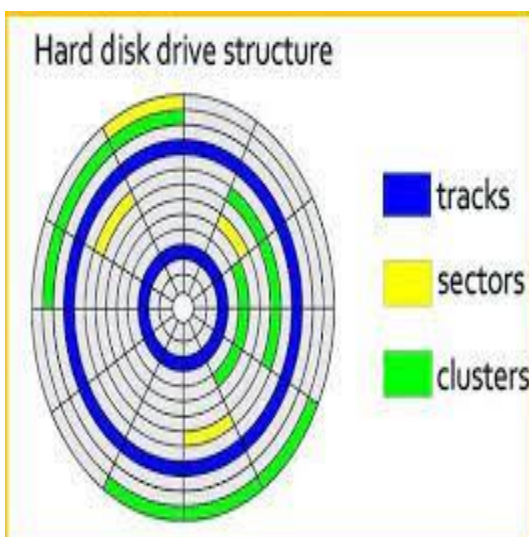
What is a Solid-State Drive?

Solid State Drive (SSD) is a non-volatile storage device that stores and retrieves data constantly on solid-state flash memory. However, this data is stored on interconnected flash memory chips instead of platters, which makes them faster than HDDs. It provides better performance compared to HDD.



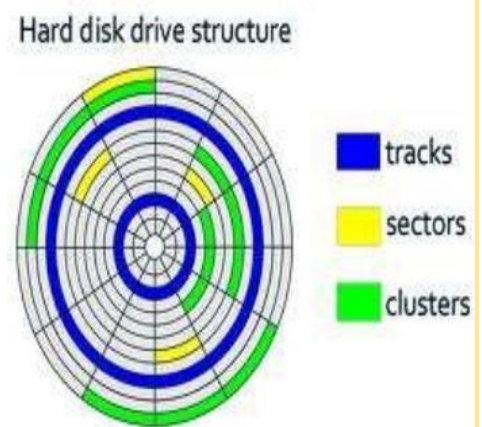
Hard Drive Structure:

A = track
B = sector
C = sector of a track
D = cluster



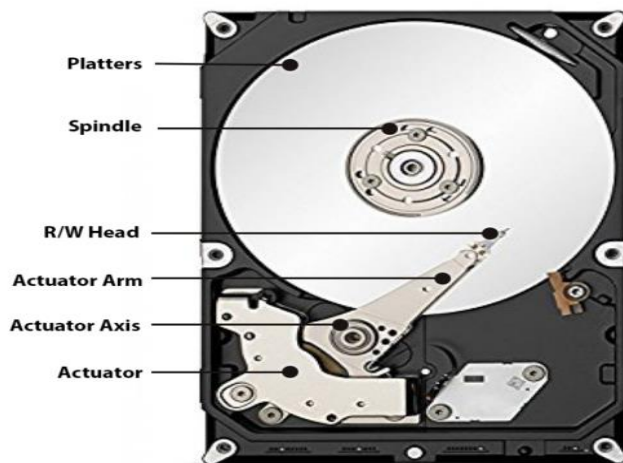
Sectors, Clusters and Volume.

- Sector:** The smallest physical storage unit on the disk.
 - In windows, size of each sector is 512(bytes).
- Cluster:** Group of one or more contiguous sectors is called a cluster.
- Volume:** logical partitioning of a disk, consisting of one or more clusters.
 - Volume consist of files, system information and unallocated space, that can be allocated to files

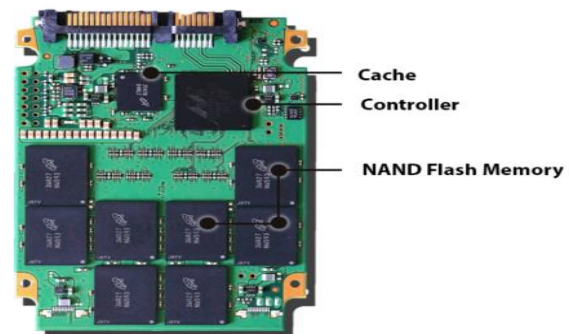


Hard Disk Drive	Solid State Drive
HDD has longer Read and Write time.	SSD has a shorter Read and Write time.
HDD supports fewer I/O operations per second (IOPS).	SSD supports more I/O operations per second (IOPS).
Over a longer time, and with larger files stored on an HDD, there is a high chance of fragmentation (<i>Division into segments or Partitioning</i>).	Fragmentation doesn't occur(<i>happen</i>) on an SSD drive.
HDD is available in various different capacities.	An SSD drive offers limited storage capacities.
HDD stands for Hard Disk Drive.	SSD stands for Solid State Drive.
HDD offers a slower speed for reading and writing data.	SSD is faster at reading and writing data.
An HDD weighs more.	SDD drives are lighter than HDD drives.
The performance of HDD drives worsens because of the fragmentation.	SSD drive performance is never impacted by fragmentation.
The moving parts of HDDs make them vulnerable to crashes and damage because of vibration.	SSD drives can tolerate vibration up to 2000Hz, that is more than HDD.
HDD contains moving mechanical parts, like the arm.	SSD does not contain mechanical parts, only electronic parts like ICs.
HDD can produce noise due to mechanical movements.	SSD does not produce noise.
HDD are usually 3.5" and 2.5" size for desktop and laptops.	SDD is available in 2.5 inch, 1.8" and 1.0", increasing the available space in a computer, especially desktop or server.

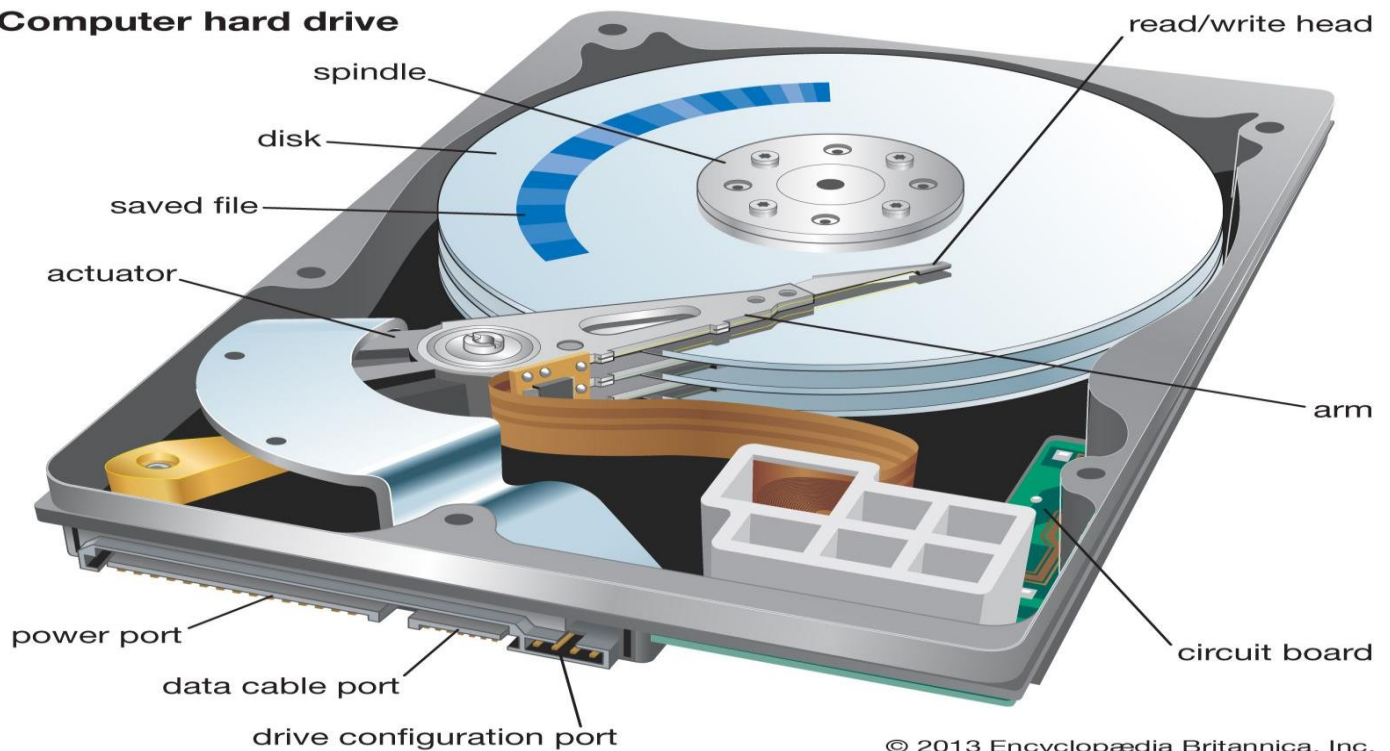
HDD
3.5"



SSD
2.5"



Computer hard drive



Boot Sector:

The first sector of a hard drive is called the boot sector and contains the **Master Boot Record (MBR)**. The MBR contains the information concerning (*relate to*) the location of partitions on the drive and reading of the bootable operating system partition and is responsible for loading the remainder of the **operating system**. It tells the computer how the **hard drive** is **partitioned**, and how to load the **operating system**.

BIOS looks for a target device to boot from that contains a **master boot record**.

A **Master Boot Record** consists of three major pieces:

- The **master partition table**.
- The **disk signature**.
- The **master boot code**.

MBR and GPT: What's the Difference?

When we talk about MBR and GPT (GUID Partition Table), we're talking about two different methods of storing partition information.

GPT is replacing MBR simply because it has fewer limitations. For example, the maximum partition size of an MBR disk that's formatted with a 512-byte unit allocation size is a **2 TB** compared to the **9.3 ZB** (over 9 *billion* TB) that GPT disks allow.

Also, MBR only allows four primary partitions and requires an *extended* partition be built to hold other partitions called *logical* partitions. Windows operating systems can have up to 128 partitions on a GPT drive *without* the need to build an extended partition.

Another way GPT outperforms MBR is how easy it is to recover from corruption. MBR disks store the boot information in one place, which can easily be corrupted. GPT disks store this same data in multiple copies across the hard drive to make it much easier to repair. A GPT partitioned disk can even identify issues automatically because it periodically checks for errors.

GPT is supported through **UEFI**, which is intended/planned to be a replacement to BIOS.

Numbering Systems

The computer working with numbers, letters and symbols. When input the number to computer that number transfer to specific numbers to understand it, then processing and outcome of the results. It is means transfer from machine language (Binary system) to another language which is understandable by humans.

Computer architecture supports following number systems.

- 1- **Binary number system**
- 2- **Octal number system**
- 3- **Decimal number system**
- 4- **Hexadecimal (hex) number system**

1) Binary Number System

A Binary number system has only two digits that are **0 and 1**. Every number (value) represents with 0 and 1 in this number system. The base of binary number system is 2, because it has only two digits.

❖ **Example (10101.01):** Convert from binary to decimal system:

$$(1 * 2^4) + (0 * 2^3) + (1 * 2^2) + (0 * 2^1) + (1 * 2^0) + (0 * 2^{-1}) + (1 * 2^{-2}) = (21.25)_{10}$$

❖ **Example:** convert the number **(25)₁₀** from decimal system to binary system

Number	Number/2	Submit
25	12	1
12	6	0
6	3	0
3	1	1
1	0	1

The number in decimal system **(25)₁₀** = **(11001)₂** in binary system.

2) Octal number system

Octal number system has only eight (8) digits from **0 to 7**. Every number (value) represents with 0,1,2,3,4,5,6 and 7 in this number system. The base of octal number system is 8, because it has only 8 digits.

Example: convert the number $(74211.03)_8$ from octal system to decimal system:

$$7 * 8^4 + 4 * 8^3 + 2 * 8^2 + 1 * 8^1 + 1 * 8^0 + 0 * 8^{-1} + 3 * 8^{-2} = (30857.05)_{10}$$

Example: convert the number $(30)_{10}$ from decimal system to octal system

Number	Number/8	Submit
30	3	6
3	0	3

The number in decimal system $(30)_{10} = (36)_8$ in octal system.

3) Decimal number system

Decimal number system has only ten (10) digits from **0 to 9**. Every number (value) represents with 0,1,2,3,4,5,6, 7,8 and 9 in this number system. The base of decimal number system is 10, because it has only 10 digits.

Example: The number in decimal system (29029.98)₁₀ is compute as the followings:

$$\{ 2 * 10^4 + 9 * 10^3 + 0 * 10^2 + 2 * 10^1 + 9 * 10^0 + 9 * 10^{-1} + 8 * 10^{-2} = 29029.98 \}$$

4) Hexadecimal number system

A Hexadecimal number system has sixteen (16) alphanumeric values from **0 to 9 and A to F**. Every number (value) represents with 0,1,2,3,4,5,6, 7,8,9,A,B,C,D,E and F in this number system. The base of hexadecimal number system is 16, because it has 16 alphanumeric values. Here A is 10, B is 11, C is 12, D is 13, E is 14 and F is 15.

Number	Number/16	Submit
50	3	2
3	0	3

The number in decimal system $(50)_{10} = (32)_{16}$ in hexadecimal system.

Disk Cleanup and Disk Defragmenting

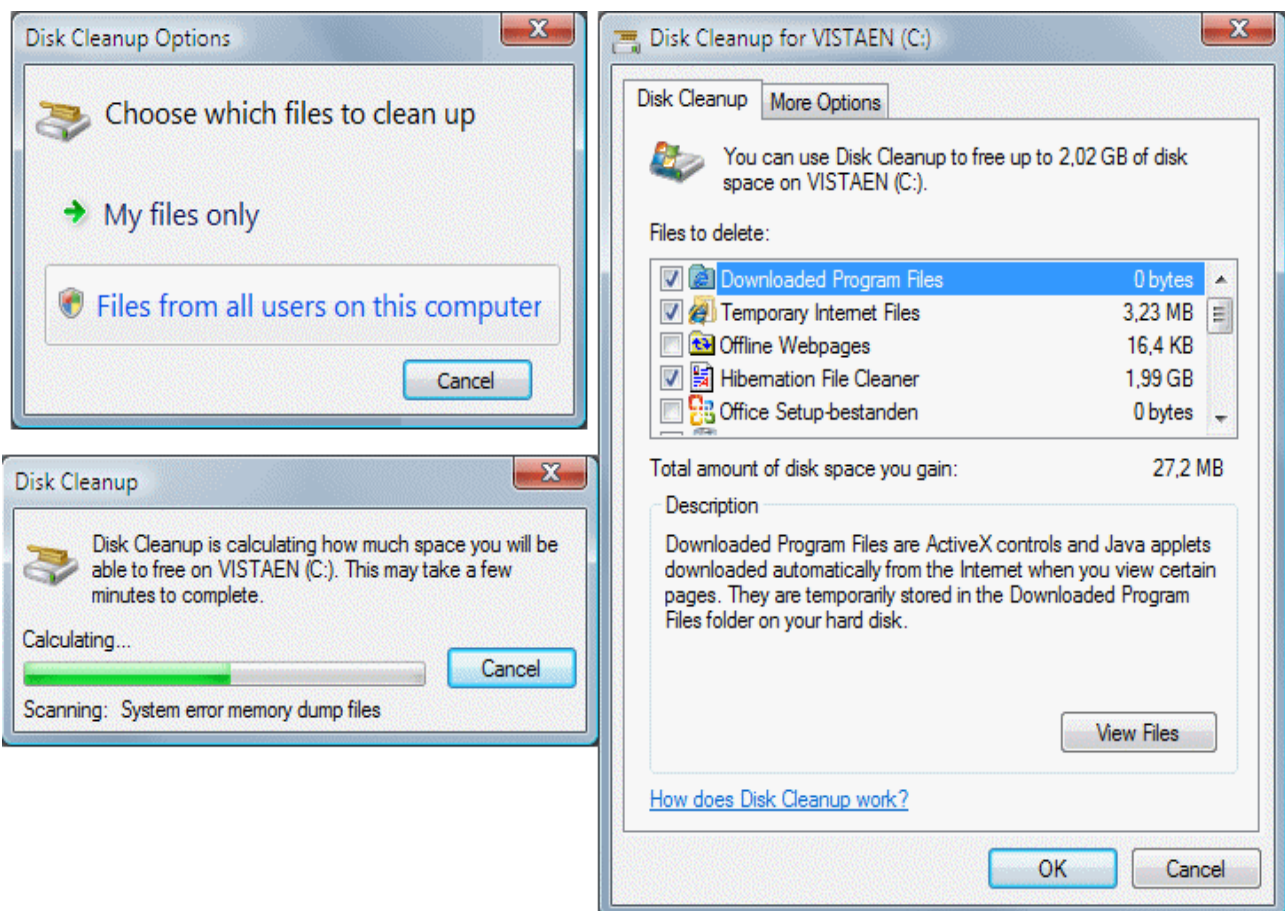
After the installation and optimization of Windows, it is time to clean up the unnecessary files of the hard disk. Deleting the unnecessary files, followed by a defragmentation of the hard disk improves system performances significantly. Do not expect miracles, but every small improvement is important. Because some files are secured, it is not always easy to delete files. But there are still a lot of files which can be deleted safely to create additional free space.

Disk Cleanup:

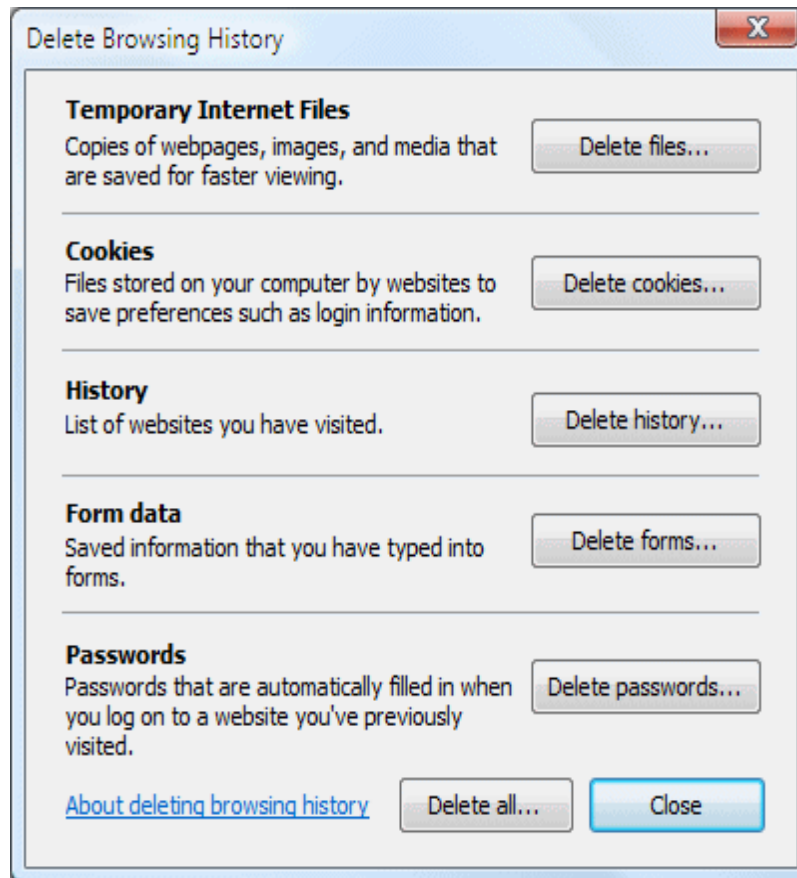
The Disk Cleanup utility frees up space on your hard disk by finding files you can safely delete. You can decide which files you want to delete.

The method for using the Disk Cleanup utility depends on your version of Windows:

- **Windows 8**
- **Windows 10**



Disk Cleanup does not delete all files, afterwards there are still many hidden files which are not deleted (for example check the properties of the folder for temporary internet files). Deleting the browsing history (the temporary internet files and cookies included) is done more effectively using the **Internet Options** in the Control Panel, button **Delete**, button **Delete files** and button **Delete cookies**. Unfortunately, this procedure has to be done for each user account separately.



The most important folders

The most important folders with (possibly hidden) files to delete are on the following locations:

C:\Users\loginname\AppData\Local\Microsoft\Windows**Temporary Internet Files**

C:\Users\loginname\AppData\Local\Microsoft\Windows**History**

C:\Users\loginname\AppData\Local**Temp**

C:\Users\loginname\AppData\Roaming\Microsoft\Internet Explorer\UserData**Low**

C:\Users\loginname\AppData\Roaming\Microsoft\Office**Recent**

C:\Users\loginname\AppData\Roaming\Microsoft\Windows**Cookies**

C:\Users\loginname\AppData\Roaming\Microsoft\Windows**Recent**

C:\Windows**Temp**

Disk Defragmenter

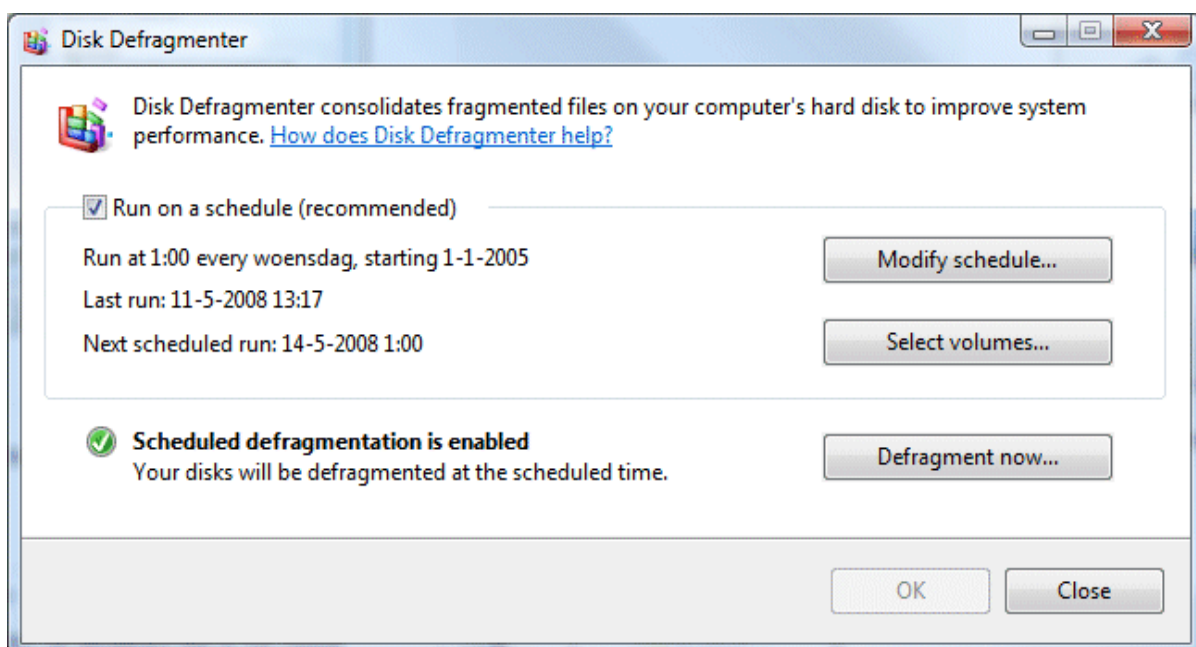
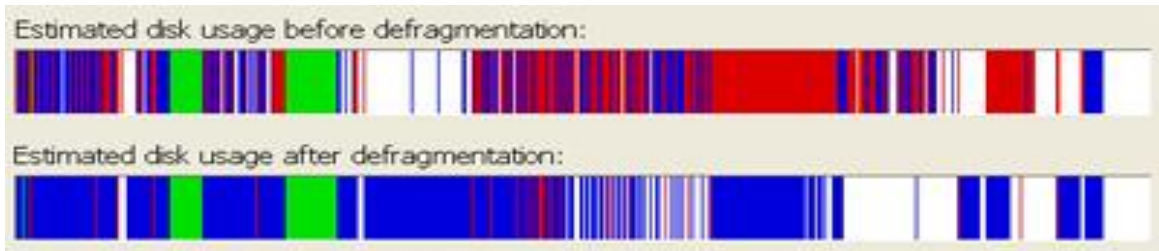
The Disk Defragmenter utility consolidates files so they occupy space more efficiently. The end result is that files are accessed faster, improving your computer's overall performance.

Defragmenting can take an hour or more, so it's best to do this when you don't need to use your computer.

1. Select **Start, All Programs, Accessories, System Tools, and Disk Defragmenter**.
2. Select the hard drive to be defragmented (usually the C drive).
3. Select the **Defragment** or **Defragment disk** button. If a **User Account Control** message appears, select **Yes**.

If you have multiple hard drives, repeat these steps for each drive.

By default, defragmenting takes place daily as a background task. Because defragmenting has a low priority, it is normally not noticed by the user. When the automatic defragmentation is disabled (or the computer is switched off at the moments defragmenting is planned), it is also possible to start the defragmenting manually by the start menu, **All Programs, Accessories, System Tools**, sub **Disk Defragmenter**.



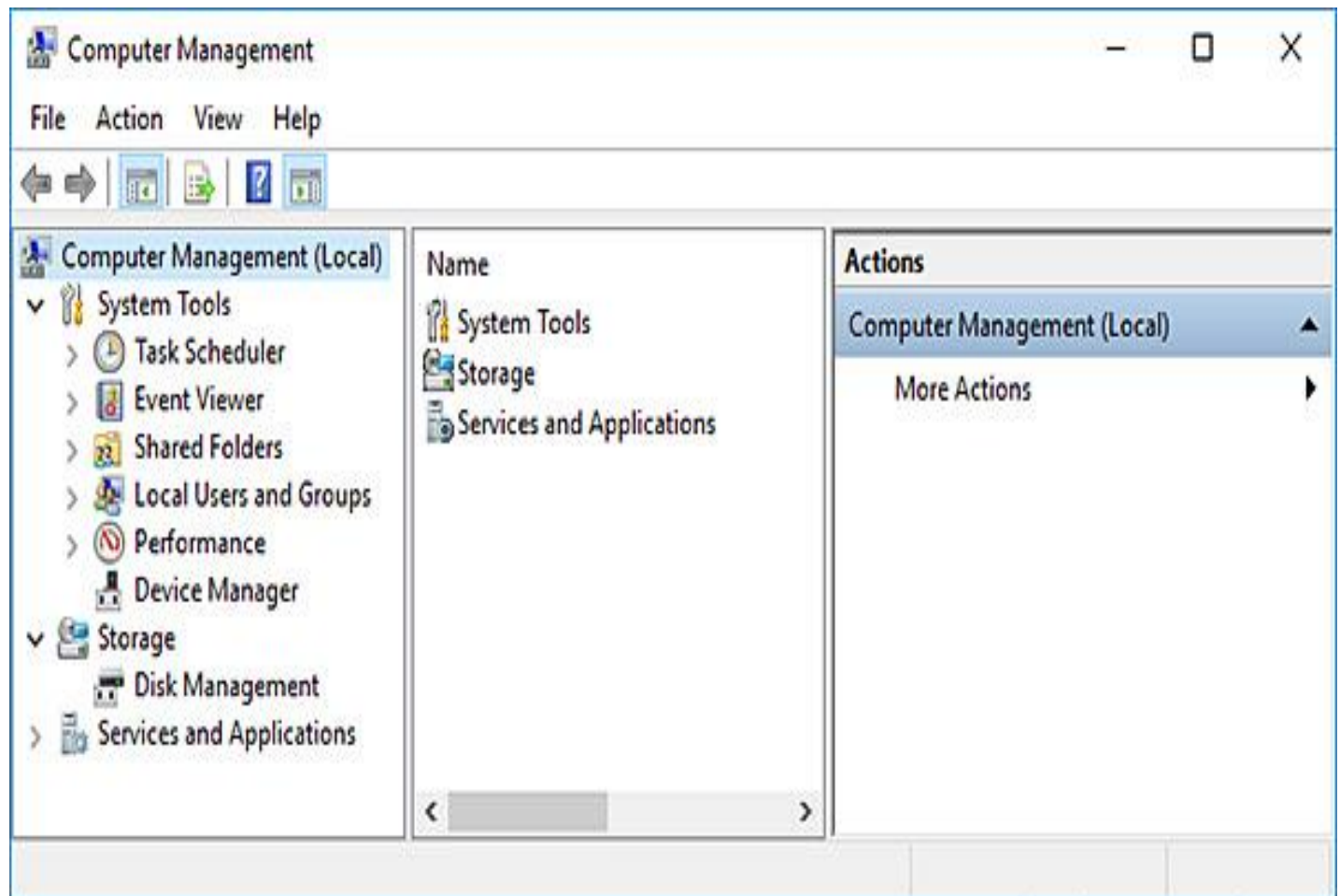
Click the button **Defragment now** in the **Disk defragmenter** window to start the defrag of all partitions manually. The button **Select volumes** is used for selecting/deselecting partitions to defrag.

~~~~~

## Computer Management:

The first method is to navigate the **Control Panel** and choose the **Administrative Tools** icon.

Computer Management has three sections to work with. They are **System Tools**, **Storage and Services**, and **Applications**.



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## A- System Tools:

Now the first section that we will deal with is the System Tools. This section has a lot of items to manage things.

### 1- Task Scheduler

The advanced characteristics of **Task Scheduler** include the creation of advanced tasks, security options and also setting up the triggers and things like that. You can even run any task at your will, disable or delete any existing task in **Task Scheduler**.

### 2- Event Viewer

The event logs of Windows are stored and viewed in the **Event Viewer** along with the installed applications. You can save logs in Event Viewer, create your own custom view, attach tasks to a log and a lot more such related things can be carried out in **Event Viewer**.

### 3- Shared Folders

The third spot is occupied by the **Shared Folders**. The folders that you share on your network are all viewed in the **Shared Folders**. Apart from this, you can also see the running sessions and the active files operating by others on the network.

### 4- Local Users and Groups

The next tool is of **Local Users and Groups**. Here you can work on the user groups that you see on your computer. You can also view the details of the user accounts and their integration to other groups.

### 5- Performance Monitor

This tool is very useful when it comes understand the performance of your system. You can even trace out the problem and also the reasons behind them. You can also see which programs work best for your computer.

### 6- Device Manager

The **Device Manager** tool lets you display all the installed components of your computer which helps you in scanning the drivers and see if there are any problems related to the installed drivers.

The second section of our today's discussion is **Storage**. This **Storage** section of **Computer Management** holds only one tool with it:

## 1- Disk Management.

When you wish to manage all your disks, this tool is the best to carry out your task. Using this tool, you can manage your disks; hide a partition in Windows and many such related things.

## C- Services and Applications:

We have reached the last section of the **Computer Management, Services and Applications**. Here, you can control all the services of your Windows computer. With this tool, you can control your network connections, the sound of your speaker, display of colors on your screen, and many more.



**Microsoft Disk Operating System, MS-DOS** is a non-graphical command line operating system derived from 86-DOS that was created for IBM compatible computers. MS-DOS originally written by [Tim Paterson](#) and introduced by [Microsoft](#) in August [1981](#) and was last updated in 1994 when MS-DOS 6.22 was released. MS-DOS allows the user to navigate, open, and otherwise manipulate files on their computer from a command line instead of a [GUI](#) like [Windows](#).

## Four parts of the DOS Structure

The structure of DOS (Disk Operating System) breaks down to four major components:

1. BIOS Module
2. Kernel
3. Command Processor
4. External Commands

## 1- The BIOS Module

The BIOS module includes the default resident drivers for:

- Console display and keyboard (CON)
- Line printer (PRN)
- Auxiliary device (AUX)
- Date and time (CLOCK)
- Boot disk device (block device)

Installable drivers are accommodated by DEVICE=**driver** entries in the CONFIG.SYS file. Driver examples are:

- MOUSE.SYS (mouse driver)
- ANSI.SYS (auxiliary console functions)
- 386EMM.SYS (memory management)
- CLOCK.SYS (software clock)

The primitive parts of the resident drivers are in the ROM BIOS while the rest are in the IO.SYS (or IBMBIO.COM) system file.

## 2- The DOS Kernel

The DOS Kernel performs the following functions:

- File and record management
- Memory management
- Character device input/output
- Spawning other programs
- Access to real-time clock

The DOS kernel components are contained in the MSDOS.SYS (or IBMDOS.COM) system file. Programs communicate with the kernel via software interrupts.

## 3- The Command Processor

The DOS **command processor** is COMMAND.COM. A command processor is also known as a **shell** and a **command interpreter**. The DOS command processor is not the operating system, but rather a special class of program running under control of the MS-DOS kernel. Its major function is to provide the DOS **user interface** (UI).

The command processor, COMMAND.COM, is responsible for parsing and carrying out user commands, including both internal and external commands.

Programming code for internal commands is contained within COMMAND.COM itself (see [DOS Internal Commands](#)), while code for external commands resides in disk files and must be loaded into primary memory (RAM) before being executed. (See [DOS External Commands](#)).

## ***DOS Internal Commands***

These DOS commands are called ***internal commands*** because their code is included in COMMAND.COM, the DOS and Windows 9x command processor. Since COMMAND.COM is loaded into primary memory when DOS or Windows 9x is booted, the internal commands are always in memory and can be executed at any time without first being fetched from disk (secondary memory).

\*The syntax for some frequently used internal commands follows.

### **TIME**

Displays current time and allows it to be changed.

Syntax:

TIME

### **DATE**

Displays current date and allows it to be changed.

Syntax:

DATE

### **CLS**

Clears the screen.

Syntax:

CLS

## DIR

Shows directory information of a diskette: name, size, and the date and time stamp of files.

Syntax:

```
DIR [d:][path]
```

Optional switches:

```
/p Display dir info and pauses display when the screen is full
```

```
/w Display names and extensions only in five columns
```

To display a file directory listing for D:\DATA\LETTER\ANNUAL from different current directories:

```
D:\DATA\LETTER\ANNUAL> DIR
```

```
D:\DATA> DIR LETTER\ANNUAL
```

```
C:\WINDOWS> DIR D:\DATA\LETTER\ANNUAL
```

## COPY

Copies a file. Name of copy may be the same as original, or different. Syntax:

```
COPY [d:][path][name.ext] [d:][path][name.ext]
```

Optional switches:

```
/v Verify, copies the file and compares it with the original
```

```
/b Binary file
```

To copy a file from D:\BATCH to the root of A: drive

```
A:\> COPY D:\BATCH\CL.BAT (from A: drive)
```

```
D:\BATCH> COPY CL.BAT A:\ (from D:\BATCH)
```

To copy a file from the root of C: to A: drive and change its name

```
A:\> COPY C:\MSDOS.SYS MSDOSSYS.BAK (from A:)
```

```
C:\> COPY MSDOS.SYS A:\MSDOSSYS.BAK (from the root of C:)
```

To copy all of the files from the root of A: to D:\CCV\ENGCOMP

```
A:\> COPY *.* D:\CCV\ENGCOMP (from A:)
```

```
D:\CCV\ENGCOMP> COPY *.* A:\ (from D:\CCV\ENGCOMP)
```

## TYPE

Displays the contents of a file.

Syntax:

```
TYPE [d:][path][name.ext]
```

To display the contents of the file MY.LET to the screen

```
A:\> TYPE MY.LET
```



## DEL

Deletes a file from disk.

Syntax:

```
DEL [d:][path][name.ext]
```

To delete one file:

```
A:\> DEL A:\MY.LET
```

To del all files in current directory

```
A:\> DEL *.*
```

## REN

Renames a file.

Syntax:

```
REN [d:][path][name.ext] [d:][path][newname.ext]
```

To change the name of the file D:\LET\ANNUAL\99.DOC to 1999.DOC

```
D:\LET> REN ANNUAL\99.DOC 1999.DOC (from D:\LET)
```

```
D:\DATA> REN \LET\ANNUAL\99.DOC 1999.DOC (from D:\DATA)
```

```
C:\WINDOWS> REN D:\LET\ANNUAL\99.DOC 1999.DOC (from C:\WINDOWS)
```

## MD

Makes (creates) a new directory.

Syntax:

```
MD [d:][path][dirname]
```

To create a directory named HERMIT in the root of D: drive

```
D:\> MD HERMIT (from D:\)
```

```
C:\> MD D:\HERMIT (from C:\)
```

## RD

Removes an existing directory (directory must be empty).

Syntax:

```
RD [d:][path][dirname]
```

To remove the HERMIT sub-directory:

```
D:\> RD HERMIT (from D:\)
```

```
C:\> RD D:\HERMIT (from C:\)
```

## CD

Changes the current directory.

Syntax:

```
CD [path][dirname]
```

To make D:\HERMIT the current directory

```
D:\> CD HERMIT (from D:\)
```

```
D:\DATA> CD \HERMIT (from D:\DATA)
```

```
D:\DATA\SOURCE> CD \HERMIT (from D:\DATA\SOURCE)
```

```
D:\DATA\SOURCE> CD .. (from D:\DATA\SOURCE)
```

## PATH

The PATH command is used to help the command interpreter find external commands which are not in the current directory. The command interpreter looks into the [DOS environment](#) for "PATH=" and then searches the paths (each separated from the next by a semicolon) that follow.

To set the DOS PATH:

```
PATH=C:\DOS;C:\PCW;\C:\BIN
```

## SET PROMPT

Used to specify the appearance of the DOS prompt.



## ***DOS External Commands***

Unlike the DOS [internal commands](#), which are loaded into primary memory (ram) along with COMMAND.COM at boot time, the DOS external commands are disk-bound. This means they must be fetched from secondary memory (disk) and loaded into primary memory (ram) each time they are used.

FORMAT.EXE, CHKDSK.COM, and DISKCOPY.EXE are three examples of external commands. Their syntax follows.

### **1- FORMAT**

Prepares a diskette for use by DOS.

Syntax: FORMAT [d:]

Parameters: [d:] = Drive which is to receive the format.

Optional switches:

- /s Include all system files necessary to make disk "bootable"
- /b Reserve space for system files on diskette. (Formats 320k instead of 360k).
- /v Volume label of 11 characters

#### **Some examples:**

- To format a diskette in drive B: without system files:  
FORMAT B:
- To format a diskette in drive A: with system files:  
FORMAT A: /s
- To give the formatted diskette a volume name, include the /v switch:  
FORMAT A: /V
- Combine switches to format a boot diskette with a volume label:  
FORMAT A: /S /V



## 2- CHKDSK

Analyzes disk or diskette (first and only parameter) and displays disk and memory status report.

Syntax: CHKDSK [d:] [/f] [/v]

Parameters: [d:] = Drive upon which to perform CHKDSK.

Optional switches:

- /f Fix. Writes lost clusters to a disk file and corrects file allocation table.
- /v Verbose. Lists all files on a disk.

### Example:

- To display statistics about the diskette in drive A:  
CHKDSK A:
- To display statistics about the first hard disk and fix any lost clusters:  
CHKDSK A: /f

## 3- DISKCOPY

Makes an exact copy of a diskette, including hidden system files if they are present.

Syntax: DISKCOPY [d1:] [d2:]

Parameters:[d1:] = Drive for source diskette, [d2:] = Drive for target diskette.

### Example:

- To make an exact copy of a diskette in drive A: to a diskette in B:  
DISKCOPY A: B:
- To make an exact copy of a diskette using only drive A:  
DISKCOPY A: A:

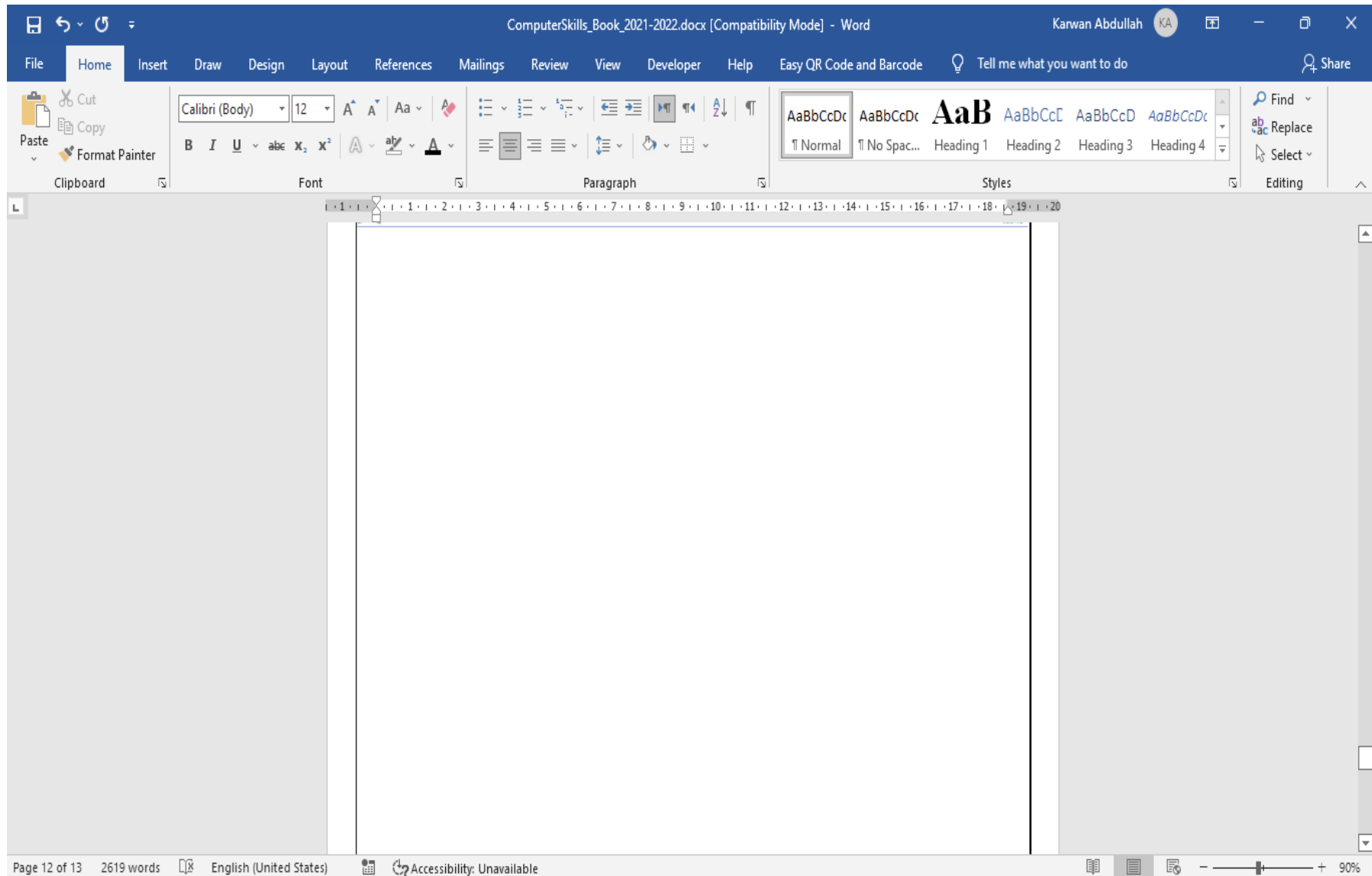
(Change source and target diskettes as requested).

DISKCOPY asks for a SOURCE diskette (the diskette being copied) and a TARGET diskette (the diskette being copied to). The TARGET diskette need not be formatted, DOS will format it while doing the DISKCOPY. If the SOURCE diskette is bootable, the system will be transferred to the TARGET as well. The two disk drives must always use the same media.











Presentation1 - PowerPoint

Karwan Abdullah KA

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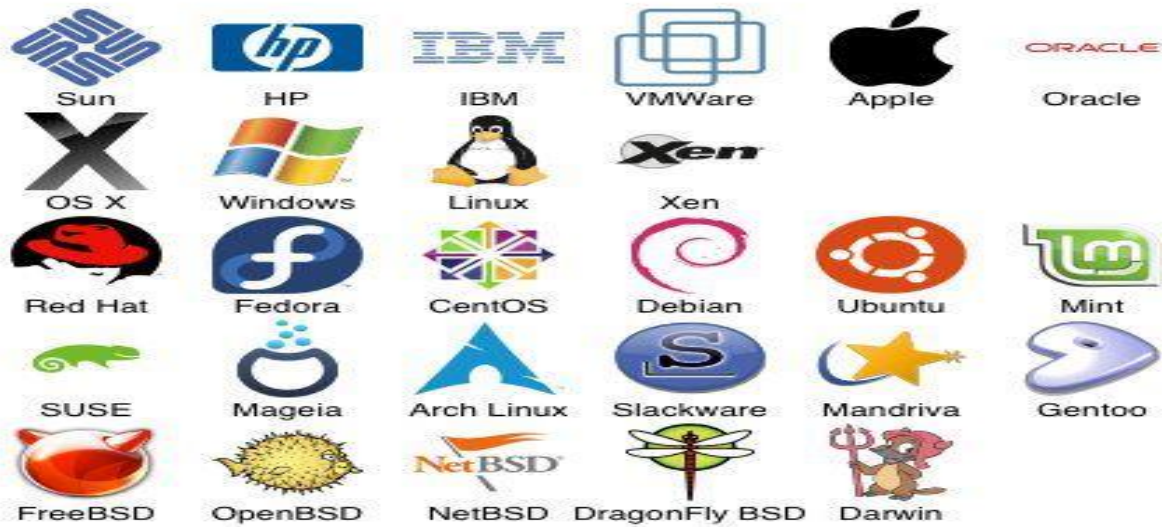
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# Good Luck

**Mac OS** is a series of graphical user interface-based operating systems developed by Apple Inc. for their Macintosh



**Linux** is a Unix-like computer operating system assembled under the model of free and open source software development and distribution.



**Microsoft Windows** is a series of graphical interface operating systems developed, marketed, and sold by Microsoft.



**iOS** (previously **iPhone OS**) is a mobile operating system developed and distributed by Apple Inc. Originally unveiled in 2007 for the iPhone, it has been extended to



**Android** is a Linux-based operating



**BSD/OS** had a reputation for reliability in server roles; the