

Q. What is an OS?

- An OS is a "system software" (i.e. a collection/set of system programs) which acts as an interface between user and hardware.
- An OS also acts as an interface between programs and hardware.
- As an OS allocates all required resources like main memory, CPU time, io devices access etc... to running programs, it is also called as a "resource allocator".
- As an OS not only starts an execution of any program it provides environment for running program, as well an OS is responsible for termination of a program i.e. an OS controls an execution of all types of programs, and an OS also controls h/w devices connected to the system, and hence an OS is also called as a "control program".
- An OS is a software which comes either on CD/DVD/PD, which has mainly three components:
[OS = Kernel + Utility softwares].

1. "Kernel": Kernel is a core part/program of an OS which runs continuously into the main memory and does basic minimal functionalities of it.

Kernel = OS OR OS = Kernel

e.g. Linux: "vmlinuz"

Windows: "win32krnl.exe"

2. Utility Programs/Extra Utilities: e.g. firewire, disk manager, task manager etc...

3. Application Programs: e.g. google chrome, calculator, game apps etc...

+ Functions of an OS:

Basic minimal functionalities/compulsory functionalities:

Kernel functionalities

1. Process Management
2. Memory Management
3. CPU Scheduling
4. Hardware Abstraction
5. File & IO Management

extra utility functionalities/optional functionalities

6. Networking
7. User Interfacing
8. Protection & Security

- Program is a set of instructions given to the machine to do specific task.
- Process is a program in execution/running program is called as a process.
"Program in main memory is also called as Process"
- "Program" is a passive entity, whereas "Process" is an active entity
- "Installation of an OS: a process to store OS s/w i.e. programs onto the machine i.e. onto the hard disk drive.
- Components which are onto the motherboard referred as "core computer system"
e.g. CPU/Processor, RAM, cache memory etc...
- Devices which are connected to motherboard externally through ports are referred as "peripheral devices"/"peripherals".
e.g. i/o devices like kbd, monitor, mouse etc...

- **"Micro-Program"**: is a program which is very small in size stored into the memory with all its possible set of input values.
e.g. BIOS.

- **"Bootable Device"/"Bootable Partition"**: if any storage device/partition contains a special program called as "boot strap program" in its first sector i.e. in a "boot sector" then it is referred as a bootable device/bootable partition.

+ **"Booting"**: it is a process in which "bootstrap program" locates the kernel and load it into the main memory.

- There are two steps of Booting:

1. Machine boot:

- when we switch on the power supply, first current gets passed to the motherboard where there is a "ROM" memory which contains one micro-program gets executed, named as "BIOS": Basic Input Output System.

- First step of BIOS is "POST": Power On Self Test: under POST, BIOS checks whether all peripherals are connected properly or not and their working status.

- After POST is finished, BIOS invokes "bootstrap loader" program

- Bootstrap loader program detects for available "bootable devices" in a system, and it selects any one out of them as per decided priority.

2. System boot

- Upon selection of bootable device (in case of HDD), "Bootloader" program gets executed/invoked, which displays name of an OS's which have installed onto the disk, so that user can select any one OS out of them at a time.

- After selection of a specific OS, bootstrap program of that OS gets invoked, which locates the kernel and load it into the main memory.

+ **Computer Organization/Fundamentals:**

Main Components of Computer Hardware:

1. Processor:

- It is also called as CPU(Central Processing Unit).

- CPU contains CPU Registers, ALU, CU etc...

- CPU Registers: to store currently executing instructions and data temporarily

- ALU: Arithmetic & Logical operations

- CU: Control Unit: to control all operations in a system

+ "Bus":

- components of the computer can communicate with each other through conducting wires referred as "bus", through the bus address, data & control signal can be transferred to each other.

- there are three types of buses:

1. data bus/data lines: data gets transferred

2. address bus/address lines: addresses get transferred

3. control lines: control signals get transferred

- bus is a "shared communication pathway": i.e. data which is sent by one device can be received by any other device which is connected to the bus.

- bus which connects core components of a computer system is referred as a "system bus".

- each device has got its own dedicated processor which controls all its operations referred as "controller".
e.g. hdd has got its own processor referred as "disk controller", which controls all disk operations.
- As the Processor, controls all the operations in a computer system by means of communicating with controller's of devices centrally, and hence processor is also called as CPU.

2. Memory Devices:

- Computer memory follows a memory hierarchy:

Q. What is Primary Memory & Secondary Memory

Q. What is an Internal & External Memory?

Q. Why RAM is also called as Main Memory?

- Memory which is directly accessible by the CPU is referred as a primary memory
e.g. CPU registers, L1 & L2 cache, Cache Memory & RAM
- Memory which is not directly accessible by the CPU is referred as a secondary memory, if the CPU want to access data from secondary memory, then first those contents gets loaded into the main memory.
e.g. HDD, CD, DVD etc...
- Memory which is internal to the motherboard is referred as an "internal memory", whereas memory which is connected to the motherboard externally through ports is referred as an "external memory".
- For an execution of any program RAM Memory is must, i.e. without RAM memory execution of any program cannot be started, and hence RAM is also called as "Main Memory".
- RAM: Random Access Memory
as data can be accessed from this memory by using "random access" method.
- there are four access methods by which data can be accessed from computer memory:
 1. linear/sequential access: e.g. magnetic tape
 2. direct access: e.g. hard disk drive
 3. random access: e.g. main memory
 4. associative access: e.g. cache memory

3. I/O Devices