

Assignment : 19-October-2021.

1. Booting process.

Stages involved in booting are as shown

Power-up / Reset

System start up

BIOS / Boot monitor

Stage 1 boot loader

Master Boot Record (MBR)

Stage 2 boot loader

GRUB, LILO, UEFI etc.

Kernel

OS { Linux, (Windows) }

Init

User space

Operation.

BIOS → Basic Input / Output System

It is stored in flash memory on the motherboard. It is the first code executed by processor.

BIOS must determine which devices are candidate for boot.

When the boot device is found, the first stage boot loader is loaded into RAM and executed. MBR is less than 512 bytes in length and its job is to load Stage 2 boot loader.

The 512 bytes of MBR are used as follows

446 bytes for boot loader

64 bytes for partition table

2 bytes for magic number.

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In this case only 4 partitions on the disk can be used with the 64 byte memory.

The magic number allocation must contain the hex value AASS which officially classifies this as a valid MBR. An invalid magic number indicates a corrupt or missing MBR.

Once the second stage bootloader is in RAM and executing, Linux (OS) and an optional RAM disk (temporary root file system) are loaded into memory.

When the images are loaded, Stage-2 bootloader passes control to the kernel image and kernel is decompressed and initialized.

Stage 2 bootloader at this stage checks the system hardware, enumerates the attached hardware devices, mounts the root device and loads the necessary kernel modules.

Once the above step is completed first user space program (init) starts and high level system initialization is performed.

2. Functions of Operating Systems (OS)

- a. security
- b. control over system performance
- c. job accounting
- d. error detecting aids
- e. co-ordination between other software and users
- f. memory management
- g. processor management
- h. device management
- i. file management

a → security: Prevents unauthorised access to programs and user data.

b → control over system performance:

Monitors all (overall) system health to improve performance. Records response time between service request and system response having complete view of system health to provide important information to troubleshooting problems.

c → job accounting: Keeps track of time & resources used by various tasks and users that can be used to track resource usage for user(s).

d → error detecting aids →: Constantly monitors the system to detect errors and avoid malfunctioning.

e → Co-ordination between other software and users
OS also coordinate and assign interpreters, compilers, assemblers and other software to the various users of the computer.

f → memory management:

OS manages the primary memory or the main memory (RAM) by keeping track of primary memory { which memory addresses are used and which are not }, and in multi programming it controls the order of processors access to memory and duration of the same. Also it handles allocation & deallocation of memory during I/O operations.

g → Processor Management:

OS uses process scheduling which involves deciding the order in which processes have access to the processor and its duration.

h → Device Management:

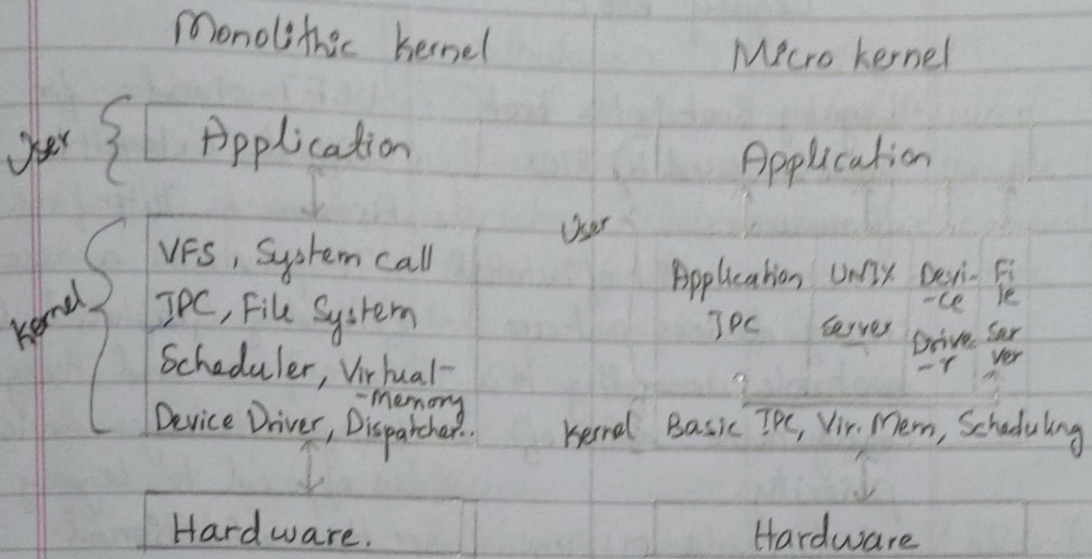
OS manages device communication via their respective drivers

- keeps track of connected devices.
- Designates a program responsible for every device known as I/O controller
- Decides which process gets access to a certain device and how long.
- Allocate & de allocate devices as required

i → File Management:

- keeps track of where information is stored, user access settings and status of every file etc.,

3. With a neat diagram explain the difference between monolithic vs micro kernel.



- Provides mechanisms such as low-level address space management, thread management & interprocess communication to implement an operating system.

↓ (Microkernel) ↓ ↘ ↓ (Monolithic) ↓

- OS services and kernel are separated
 - Slow
 - Failure in one component won't affect the other
 - Easier to add new functionalities
 - Smaller in size
- ↔ Kernel contains the OS services
- Fast
 - Failure in one component will affect the entire system.
 - Difficult to add new functionalities
 - Larger in size

4. Difference between UEFI & Legacy boot

Legacy Boot

- Legacy Boot is the boot process used by BIOS firmware.
- It stores a list of installed storage devices that are bootable according to a configurable order of priority.
- Security & Efficiency is lower compared to UEFI
- Less user friendly
- Uses the ~~MBR~~ ~~partition~~ ~~table~~ ~~(GPT)~~ MBR partition.
- Uses BIOS firmware for boot process.

UEFI

- UEFI stands for Unified Extensible Firmware Interface.
- It provides a user-friendly Graphical User Interface and recognises large storage devices as opposed to legacy boot.
- Has additional security features and is more efficient.
- More user friendly
- Uses the ~~MBR~~ GTP partitioning scheme.
- Uses UEFI firmware for boot process.

5. Discuss on the Operating Systems Linux, Windows & Mac OS.

Linux	Windows	Mac OS
<ul style="list-style-type: none"> • Open source • Stores data in the form of tree. There is a single file tree and all the drives are mounted on this tree. • Does not have a specific registry of its own. • Provides terminal • Easy to switch interfaces 	<ul style="list-style-type: none"> • Closed source • Uses more xx xx directory structure to store different kinds of files of the user. It has logical drives & cabinet drawers. • Registry is a master database which stores all the settings. • Terminal is command prompt • Not interchangeable interfaces till Windows 8 	<ul style="list-style-type: none"> • Closed source • Uses the file structure commonly known as mac OS X. • Stores all application settings in a series of .plist files. • Provides console as terminal. • has a facility to bridge virtual network interfaces.

6. Commands on windows OS to check disk partitions

Step 1: Open Command prompt

Step 2: Use diskpart command.

the following commands can be used to operate on disk / disk volumes after 'diskpart' command.

Active : Mark the selected partition as active

Add : Add a mirror to a simple volume

Assign : Assign a drive letter or mount point to the selected

Attributes : Manipulates disk / volume attributes

Break : Break a mirror set

Clean : Clear information off the disk

Compact : Attempt to reduce physical size of disk / file

Create : Create a volume, partition or virtual disk

Delete : Delete an object

Detail : Details of an object

Detach : Detaches a virtual disk file

Exit : Exit diskpart

Extend : Extend a volume

Expand : Expands the max size of virtual disk.

Filesystems : Display of current & supported file systems.

Format : Format volume / partition.

Help : Display a list of commands

Import : Import disk group

Inactive : Mark selected as inactive

List : Display list of objects

Merge : Merges child disks with parent disk

Remove : Remove a drive letter / mount point assignment

Select : Shift the focus on an object

7. List the commands to check services in windows.

One can open services from command prompt by the command `services.msc` and pressing Enter in keyboard.

8. List the steps to check disk partitions in windows.

Step 1: Open File Explorer.

Step 2: Right click on 'This Pc'.

Step 3: Choose 'Manage' from the pop-up menu.

Step 4: Navigate to Storage → Disk management in navigation panel.

9. List the steps to start ^{or stop} services in windows.

Step 1: Hit Windows key + R to open the run window.

Step 2: Type in `services.msc` in the Open: box.

Step 3: Services dialog box/window will open.

Step 4: Select the service to start / stop.

Step 5: Choose the relevant option to operate.