

Assignment 1: 19 October

1. Booting Process - 6 stages.

Power up / Reset

System Startup

stage 1 bootloader

stage 2 bootloader

kernel

Init

Operation

BIOS / Boot Monitor

Master Boot Record (MBR)

GRUB, LILO, UEFI

OS

user space.

1. BIOS: stands for Basic Input / Output system

- Performs some system integrity checks
- searches, loads & executes boot loader program
- It looks for boot loader in floppy, cd-rom or harddrive
- BIOS loads & executes MBR boot loader

2. MBR

- Master Boot Record: loads & executes GRUB boot loader
- It is located in 1st sector of bootable disk.
- MBR is less than 512 bytes in size and has 3 comp
 - Primary boot loader info in 1st 446 bytes
 - Partition table info in next 64 bytes

error detection: mbr validation check in last 2 bytes Magic No

3. GRUB:

- GRUB stands for Grand Unified Bootloader
- GRUB displays a splash screen, waits for few seconds, if we don't enter anything it loads the default kernel image as specified in the grub configuration file.

loads kernel into memory

4. Kernel:

- Mount the root file system as specified in the 'root =' in grub.conf.
- Kernel executes the /sbin/init program
- Initrd stands for initial RAM Disk.
- Since init was the 1st program to be executed by Linux Kernel, it has the process id (PID) of 1. Do a 'ps -ef | grep init' & check the pid.

5. Init:

- Looks at /etc/inittab file to decide the Linux run level

→ Following are the available run levels.

- 0 - halt
- 1 - Single user Mode
- 2 - Multuser, without NFS
- 3 - Full Multuser mode
- 4 - Unused
- 5 - X11
- 6 - Reboot.

→ Init identifies the default initlevel from /etc/inittab and uses that to load all appropriate program

6. Runlevel Programs:

→ When Linux system is booting up, "starting sendmail... ok." Those are runlevel programs, executed from run level directory as defined by your run level.

→ Programs starts with s → startup. and k → shutdown/kill

→ under /etc/rc.d/rc*.d / directories, programs start with s & k.

2. Functions of Operating System

- Security:
 - The OS uses password protection to protect user data & similar other techniques.
 - It also prevents unauthorized access to programs and user data.
- Control over System performance:
 - Monitors overall system health to help improve performance
 - Records the response b/w service requests and system response to have a complete view of system health.
- Job accounting:
 - OS keeps track of time and resources used by various tasks and users, this information can be used to track resources usage for a particular user or group of users.
- Error detecting aids:
 - The OS constantly monitors the system to detect errors & avoid the malfunctioning of computer system.
- Coordination between other s/w and users
 - OS also coordinate and assign interpreters, compilers, assembler and other software to the various users of the computer system.
- Memory Management:
 - The OS manages the Primary Memory or Main Memory. Main Memory is made up of a large array of bytes or words where each byte or word is assigned a certain address.

→ It keeps track of primary memory. i.e., which bytes of memory are used by which user program.

• Processor Management:

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

• 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

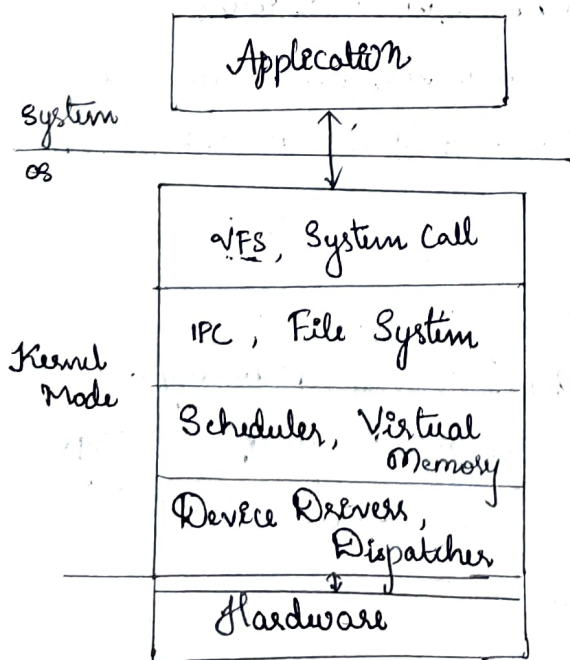
→ Allocate & deallocate devices as required.

• File Management

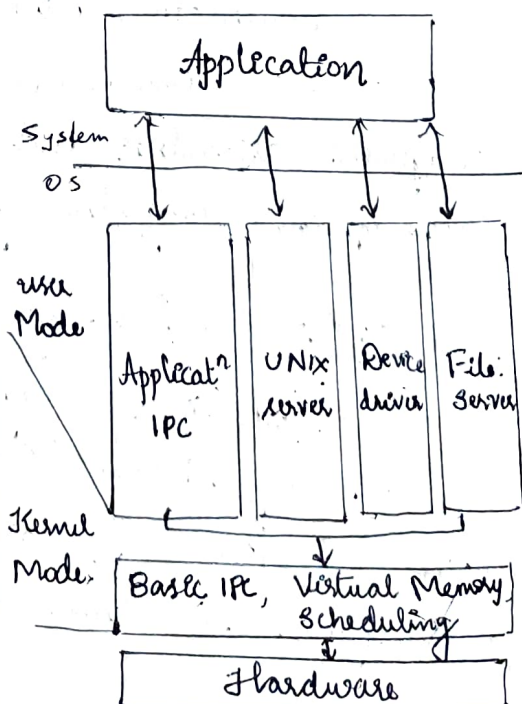
→ Keeps track of where information is stored, user access settings and status of every file etc.

3. With a neat diagram, explain the difference between Monolithic & Microkernel.

→ Monolithic Kernel



Micro Kernel



→ In Monolithic kernel, both user services and kernel services are kept in the same address space

→ Monolithic kernel is larger than microkernel

→ Fast execution

→ The monolithic kernel is hard to extend

→ If a service crashes, the whole system crashes in monolithic kernel.

→ To write a monolithic kernel, less code is required

→ Ex: Linux

→ In microkernel user services and kernel services are kept in separate address space.

→ Microkernel are smaller in size.

→ slow execution

→ The microkernel is easily extendible

→ If a service crashes, it does not affect on working of microkernel

→ To write a microkernel, more code is required

→ Ex: QNX, Mac OS X.

4. Difference between UEFI and Legacy

UEFI Boot

Unified Extensible

→ UEFI provides better user interface

→ provides faster boot time

→ security additional and is more efficient

→ UEFI stands for Unified Extensible Firmware Interface

→ More user friendly

→ It stores a list of installed storage devices that are bootable according to a configurable order of priority

Legacy Boot

→ Legacy Boot mode is traditional and very basic

→ It's slower compared to UEFI

→ Security and efficiency is lower compared to UEFI

→ Legacy Boot is the boot process used by BIOS firmware

→ Less user friendly.

→ Provides a user friendly GUI and recognize large storage devices as opposed to legacy boot.

5. Discuss on OS, Linux, Windows & Mac OS.

Linux

- Open Source.
- Stores data in the form of tree
- Does not have a specific registry of its own
- Provides terminal
- Easy to switch interfaces

Windows

- Closed Source
- Uses directory structure
- Registry is a master database which stores all the settings
- Terminal is Command Prompt
- Not interchangeable interfaces till Windows 8

Mac OS

- 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 n/w interfaces.

6. Commands on windows os to check disk partitions.

→ Step 1: Open Command prompt.
Step 2: Use diskpart command

Active: Mark the selected partition as Active.

Add: Add a mirror to a simple volume

Break: Break a mirror set

Clean: Clear information off the disk

compact: Attempt to reduce physical size of disk file.

Delete: Delete an object

Detail: Details of an Object

Exit: Exit diskpart

List: Display list of objects

Select: Shift the focus on object

Import: Import disk group

7. List the commands to check services in Windows.

→ Open Command prompt

↳ Type the command : services.msc

↳ Press enter

8. List the steps to check disk partitions in Windows

→ 1. Open file Explorer

2. Right click on 'This PC'

3. Choose 'Manage' from pop up menu

4. Navigate to storage → Disk Management in navigation panel.

9. List the steps to start or stop services in Windows.

→ Step 1: Press Windows key + R to open the run windows

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.

find - search for files in a directory hierarchy. find -#
cut - Remove sections from each line of files cut -d " " -f 1
l1.txt
grep - print lines matching a pattern
sed - stream editor for filtering and transforming text
sed 's/A/Z/' l1.txt
sort - sort lines of text files.

sort -r l2.txt

↳ Sorting in Reverse Order

sort l2.txt

↳ Sorting in alphabetical order

head - outputs the first part of files.

↳ head l1.txt { sort 10 lines }

↳ head -n 20 l1.txt.

tail - outputs the last part of files.

↳ tail l1.txt

tail -n 20 l1.txt.

fdisk - manipulate disk partition table.

↳ sudo fdisk -l

journalctl - Query the systemd journal.

↳ journalctl.

Crontab → Maintains crontab files for individual users

↳ crontab is program used to install, deinstall or list the tables used to drive the cron(s) daemon in a user's crontab.

→ dmesg - Print / Control the kernel ring buffer.
driver messages

↳ dmesg.

↳ dmesg | less.

↳ dmesg | grep "text" to search

→ dd : convert & copy a file.

→ date : print or set system date & time

↳ date

↳ date -u

To set date

↳ date --set = "Tue Oct 25 16:05:31 IST 2021"

→ file - determines file type

file -b ls.txt

= UTF-8 Unicode text.

file --v

→ parted - parted is a program to manipulate disk partitions.
You are not superuser.

→ Mawk - pattern scanning & text processing language.