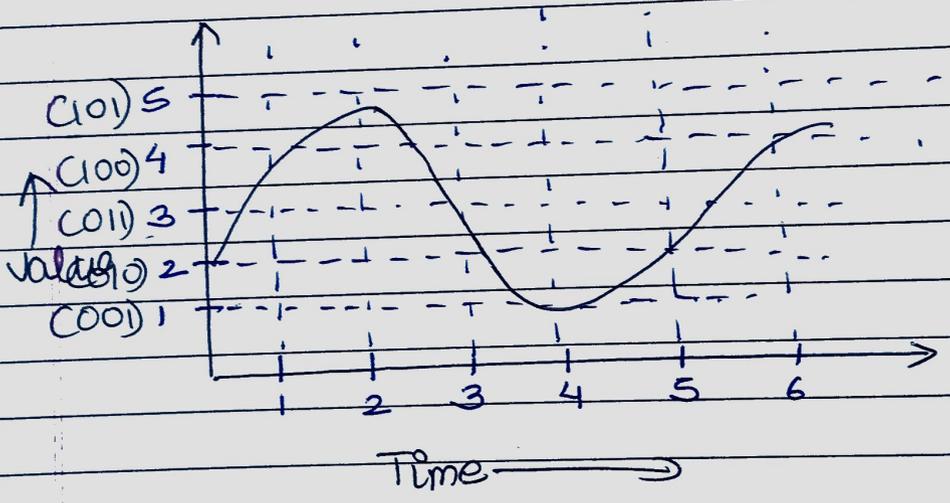


Basic Concepts of Computer

It is an electronic device, it takes input data and processes on this data and produces the output.

- ① Analog Computer ← Works on analog signals
- ② Digital Computer

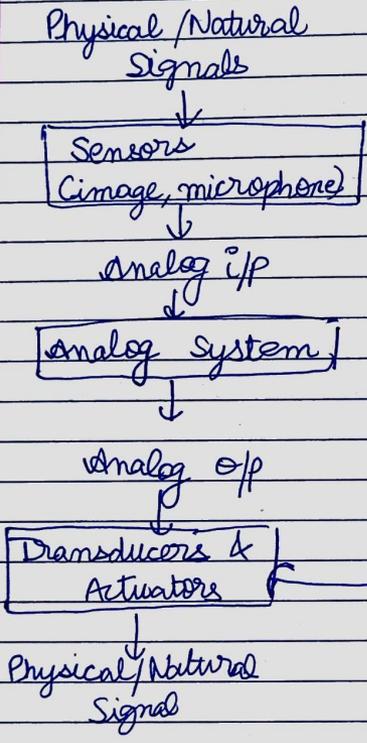
Analog Signals - Analog signals are continuous in nature, both in time and value.



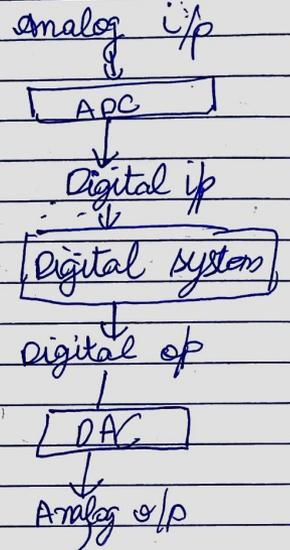
If we make this signal discrete or we can say quantize it, that discrete signal will become analog signal.

If you take sample of this analog signal at enough frequency rate.

Analog System



Digital System



Digital systems are essentially electronic systems. So, they work in terms of voltage. Because of technology we can classify them into voltage signals. i.e. we can say high voltage means it is 1 and low voltage means it is 0.

5V	3.5V	3.6V	3.6 → 1
0V	Analog Signal	3.4V	3.4 → 0

* digital systems are programmable.

* We can use logic gates

- AND
- OR
- NOT
- NAND
- NOR

30/07/24

Hybrid Computer A hybrid computer is a computing system which combines the features of analog and digital computers. It can process both analog (continuous) data and discrete (digital) data.

Ex- Medical equipments like ECG, MRI and CT. (Electrocardiogram)

MRI Scanner :- electrical signals

↓
analog system

- ① Analog Signal Processing
- ② Digital Signal Processing

The analog signals collected by the sensors are converted into digital signals using ADC (analog to digital converter).

- ③ Digital processing - The digital data is then

processed by the computer's digital section. Some algorithms and mathematical models are used to reconstruct the digital data into detailed images of body's internal structure.

Characteristics:

- Even smaller
- More efficient
- Increased Processing Power
- Allowed the development of more sophisticated softwares

Evolution of Computers:

1) First Generation (1940-1956)
It used the Vacuum Tubes Technology.

Characteristics: Bulky computers
○ Consumed a lot of power
○ Produced a lot of heat

Ex- ENIAC, UNIVAC I

2) Second Generation (1956-1963)
It used the Transistor Technology.

Characteristics:
○ Smaller than first generation computer
○ More reliable and more energy efficient
○ Faster than first generation computer

Ex- IBM 7094, CDC 1604

3) Third Generation (1963-1971)
It used the ICs (Integrated circuits) as a Technology

Ex- IBM 360, PDP-8

4) Fourth Generation (1971-1985)
Used microprocessor with thousands of ICs on a single silicon chip.

Characteristics:

- Smaller than III generation computers
- Increased Power
- Affordable

Ex- Intel 4004, Apple Macintosh, IBM PC

5) Fifth Generation (1985-onwards)
Based on AI, parallel processing & quantum computation

Characteristics:

- Ability to perform complex tasks.
- Learn and make decisions includes technologies like Networks, Machine Learning

Ex-

02/08/24

Quantum Computers - works on qubits

Qubits can be 0 and 1 both at the same time, a property called superposition.

Entanglement:

When qubits become entangled, the state of one qubit is directly related to the state of another, no matter how far apart they are.

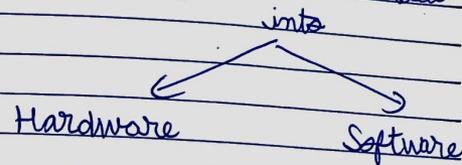
Let say we have 2 magic die.
If you roll one and it comes up 5, the other one will automatically show 5 as well.

Let say you have 2 die. These dices are linked in a mysterious way. If you roll one of and get a number, the other die shows the same number instantly.

For instance, if you roll one die in India and it shows a 5, the other die even if it's in USA, will also show a 5 at the exact same moment.

In quantum world, we have electrons and photons

Components of a computer - can be divided into



H/W Components:

a) Central Processing Unit (CPU)
* referred as brain of computer
* executes instructions from software by performing basic arithmetic, logical, control and I/O operations.

b) Memory (RAM and ROM)

RAM (Random Access Memory)
* volatile memory
→ because loses its data when power gets off
* Used for temporary storage of data.

ROM (Read Only Memory)
* non-volatile memory
→ data don't get lost even if the power is turned off
* Used for permanent storage of data.

PROM (Programmable ROM)
* can be programmed once after manufacturing.

EPROM (Erasable Programmable ROM)

EEPROM (Electrically Erasable Programmable ROM)

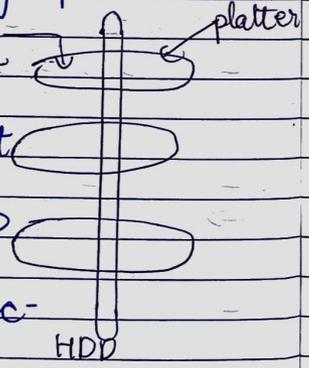
EPROM - EPROM chip data can be erased by exposing it to ultraviolet light and then reprogramming it.

EEPROM - EEPROM can be erased and reprogrammed using electrical signals.

c. Storage Devices

HDDs (Hard Disk Drives) - HDDs use spinning disks, motors and read/write heads to store data on a rotating platter.

SSDs (Solid State Drive) store data permanently inside an integrated circuit using flash memory. The flash memory inside an SSD means data is written, transferred and erased electronically and silently.



SSD's don't have moving parts

- * HDDs are more affordable than SSDs
- * It is easier to recover data if damaged.

Optical Drives - like CD, DVDs, Blu-ray discs.

Input Devices - used to input data into the computer

- Ex- keyboard, mouse, scanner, microphone, stylus, webcam, etc.

Output Devices - Devices that output data from the computer to the user.

- Ex- monitor, printers, speakers,

GPU (Graphics Processing Unit) - a specialised processor designed to accelerate graphics rendering.

Cooling System: Includes fans, heat sinks and sometimes liquid cooling system to dissipate heat generated by CPU, GPU and other components

Motherboard - The main circuit board that connects all the components of a computer including CPU, memory & peripheral devices. (External devices like projector)

Modem (Short for Modulator-Demodulator) is a hardware device that enables a computer to connect to internet.

Modulation - When a computer sends data to modem, it converts this ~~sig~~ signal into an analog digital signal.

Demodulation - When a modem receives analog signal from communication lines, it converts the signal back into digital data.

2) Software components - Program design to perform specific tasks.

System Software Application Software

Operating system Browser MS Office
Editors

3) Fundamental Software that manages computer hardware, software resources

NIC (Network Interface Card) - A hardware component that allows a computer to connect to a network either wired (Ethernet) or wireless (WiFi).

History of Linux
1964 → at Bell Laboratory, New Jersey

↓
attempt to make a multiuser, multitask operating system.

↓
1969 → withdraw from this project and closed it.

Dennis Ritchie & Ken Thompson

↓
They started working and made an O.S. named UNICS.

UNICS - was free for all

↓
1975 - UNICS V6

Many companies and made their version of this O.S. → IBM - AIX

→ Sun Solaris

→ Mac OS

→ HP UX

→ Linux

In 1991 - Linus Torvalds, a 21-year-old student began working on a new O.S.

1980's → Andrew S. Tanenbaum - MINIX (source code was made available) (to students)

Linus studies about ~~Linux~~ ^{Minix} and made an O.S. named Linux

↓
Kernel

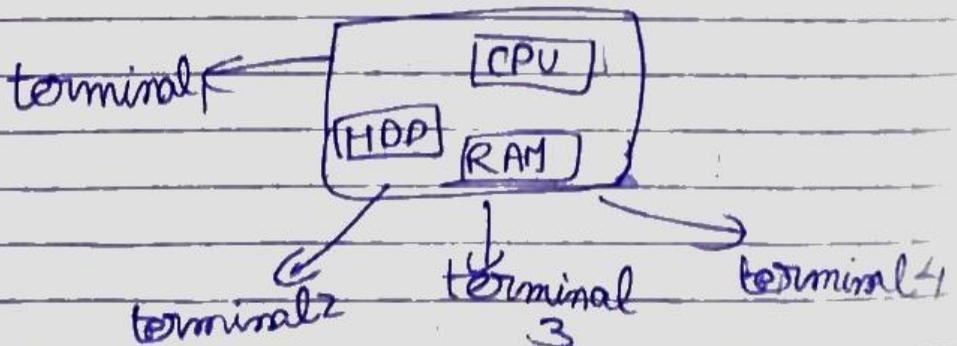
1991-95 - Free Software Movement

↓
GNU was one movement which made many software free.
Linux + Softwares provided by GNU → O.S

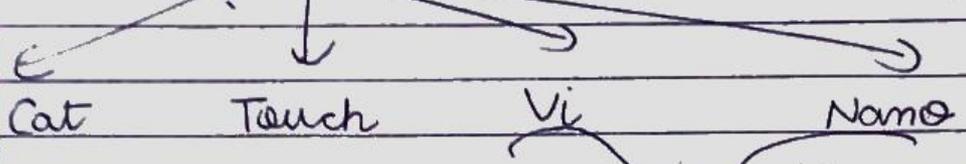
Linux — RHEL (Red Hat Enterprise Linux)
— Fedora
— Debian
— Others
(Ubuntu, CentOS, Amazon Linux, Kali Linux etc)

Linux Features / Advantages:

- 1) Open Source
- 2) Secure
- 3) Simplified updates for all installed softwares.
- 4) Light weight.
- 5) Multi-user - Multitasking
- 6) Multiple Distribution



How to create a file



- concatenate files
- create, copy files
- ⇒ tac → From bottom to top prints the contents of file

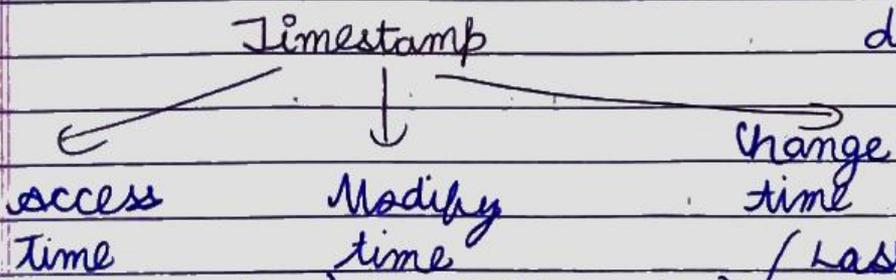
- create files → creates a single file
- concatenate files → to add more than one files into single file
- copy files → to copy the content of x into y

24/08/24

Touch

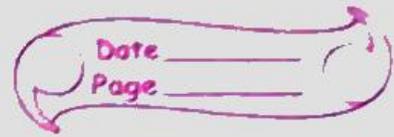
- create empty file
- create multiple files
- Change time stamp of a file
- Update only access time of file, modify time of a file

metadata → data about data



(Last time when a file was accessed) (Last time when a file was modified) (Last time when file meta data was changed)

/ → forward
 \ → backward



⑥ Make the script executable so for that you need to give it executable permission.

```
chmod +x myscript.sh
```

⑦ Run the script

```
./myscript.sh
```

Input output Redirection - i/p & o/p

Redirection in Linux allows you to control where the i/p of a command comes from & where the o/p goes.

Output Redirection (> and >>):

>: Redirects o/p to a file

>>: Redirects o/p to a file appending to the file if it exists

Ex-1) `echo "Hello world" > output.txt`

This command writes Hello World to a file named output.txt

Ex-2) `echo "Text I want to append" >> output.txt`

Output.txt → Hello World

Input Redirection (<):

<: Redirects i/p from a file.

Ex: `cat <input.txt`

This command reads the content of input.txt and displays them on the terminal

Redirecting stderr (> and >>):

>: Redirects error o/p to a file.

>>: Redirects error o/p to a file, appending the file if it exists.

* (&>) ^{appends} Redirects both error and output to a file.

Ex- `ls nonexistingfile >>error.txt`

This command attempts to list a non existing file. The error message is redirected to error.txt.

Filters

i) Sort the file RED & display on the screen.

ii) Sort the file RED and store it in another file

iii) Sort the file in reverse order and store it in REVERSE file

iv) Remove duplicates using uniq command

v) Display the first two lines from file RED.

vi) Display last 3 lines from file RED

vii) Create a text file student.txt with 3 fields: Roll No, name & class and another file studentmarks.txt with 3 fields rollno, marks1 & marks2

a) Display only Roll No. and marks1.

b) Combines these two files student.txt and studentmarks.txt

viii) Using grep command

a) Search a word APPLE exists in a file named FRUITFILE.

b) Count the number of matches.

c) Display the lines that do not match the word apple "APPLE".

\$ `sort RED`

\$ `sort RED >NEWRED`

\$ `sort RED ->>REVERSEFILE`

\$ `uniq RED`

\$ `head -2 RED`

\$ `tail -3 RED`

\$ `cat >studentmarks.txt`

Roll no	marks1	marks2
==	==	==
==	==	==
==	==	==

awk '{ print \$1, \$2 }'
studentmarks.txt

\$ cat > student.txt

Roll No.	Name	Class
—	—	—
—	—	—

\$ paste student.txt studentmarks.txt

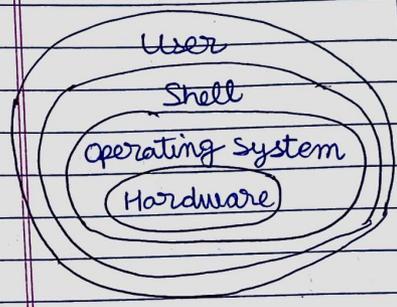
FRUITFILE

Apple color is RED.
Mango is YELLOW.
Apple is nutritious to our body.
An apple a day keeps the doctor away.

\$ grep "apple" FRUITFILE
\$ grep -c "apple" FRUITFILE
\$ grep -v "apple" FRUITFILE

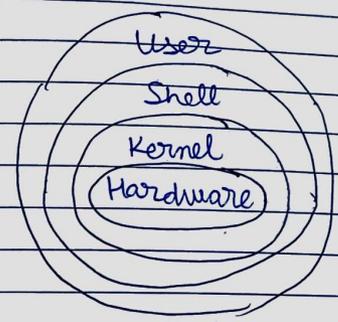
Kernel - This is actually a component of the "Linux" System as a whole. The kernel, which controls the CPU, memory and peripherals, serves as the brain of the system. The operating system's kernel is at the most fundamental level.

Windows



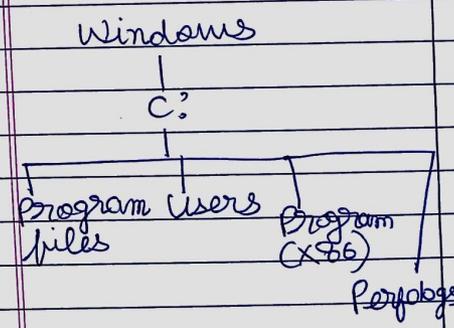
Folder →
Administrator →
File →
Software →

Linux



Directory
Root
File
Package

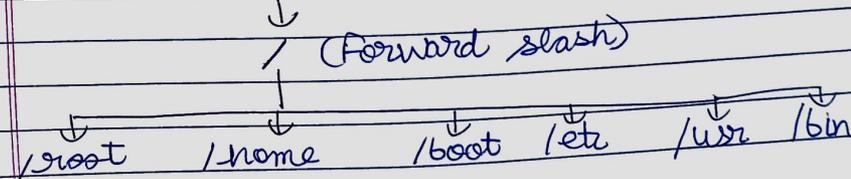
File System Hierarchy:



/ - It represents the top level

POST → Power on Self Test

Linux



/home - home directory for other users

/root - it is home directory for root users

/boot - it contains bootable files in Linux

/etc - it contains all configuration files

/usr - By default softwares are installed in this directory

/bin - It contains commands used by all users including root user.

/sbin - It contains commands used by only root user.

/dev - Essential device files. This include terminal device - USB or any other device attached to system.

/opt - optional application packages