* CPU never deals with secondary memory

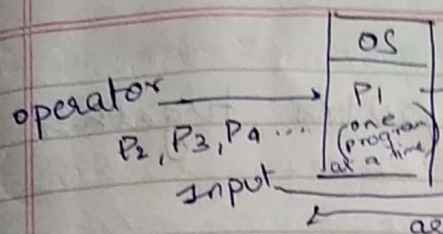
Operating System

Booting (Bootstraping)
init() is called
↓↳ stored in ROM
Activates hardware → memory, CPU, I/O
by bootstrap module
Load Os into main memory (RAM)
Then loaded passed on to CPU for executing.
CPU executes Os.
Desktop is seen.

Before Os

→ Switch to provide 0 & 1 as input.
→ Punchcard – input – normal as 0
hole as 1
↳ output – card reader
Based on light, calculate is & read info.
Then passed to printer to print.
– Group punchcards on basis of calculations & printing.
→ Batch operating system ☺ → 1st Os
↳ Bunch punch cards together based on requirement → batches
Batches were put in cardreader, processed & give output.
– Drawbacks – Time consuming
↳ Not user friendly
↳ Limited memory capacity.

→ Single programming Os
– Os module was created which was stored in memory



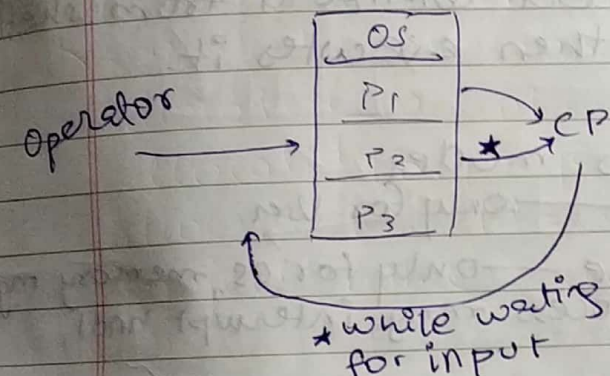
ask input - processor is idle till it gets input

↓

Drawback - not utilizing CPU ~~speed~~ properly

To overcome this, multi-programing Os was introduced

→ multiprogramming Os



*Now P_2 will start processing.

Now when P_2 is wating for an input, P_1 starts again from where it was stopped.

*while waiting for input

Drawbacks — If P_2 is of 1s & P_1 is 20s, then for P_2 to execute, we need to wait 20s. So CPU & user speed not matching.

→ Timesharing Os

↳ + multiprogramming.

Each program is executed for a short amount of time.

For

Cluster → Grid → Cloud.

Cluster
connect computes together.

Grid
connect another cluster together.

Cloud.
All grids combined together.
Cloud → high processing servers used to access & process data.

OS
- shell — user requests/command get here first
- kernel – Get command from shell & then executes it.

OS works in two modes
- User mode — only for user
- Kernel mode — only for OS, memory mgn, process mng, interrupt hndl,

Functions of OS
- Process management
- memory management
- Interrupt handling
- Disk management
- Scheduling
- Control unit
- I/O management
- hardware management.

CPU works in 2 modes
- User → when user types/clicks - initial mode
- kernel → during interrupt generation

* Trap interruption — converts CPU from user mode to kernel mode.

```
void main() {
printf("hello");
}
```

single click.

OS → s/w handling
→ h/w handling

mouse → USB controller.

Interrupt controller

processor ← | | | | | | | | |

pins for various devices / softwares with priority order

passes to

OS (kernel)

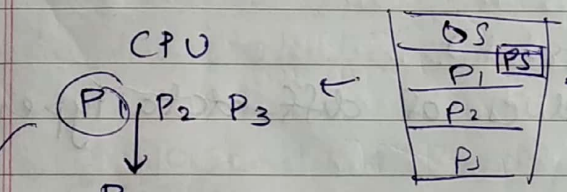
do_IRQ() Interrupt Request Routine (All processes have a code)

→ Is there an interrupt handler

Yes

OS brings P_5 process to main memory

while CPU continues to process instruction in P_1.



P_5 → higher priority, CPU processes it

back to main memory

→ Now CPU processes this.

software interrupt ex → printf

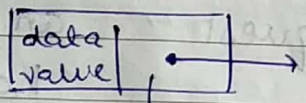
printf → system call → goes to processor & same process as above.

Data Structure

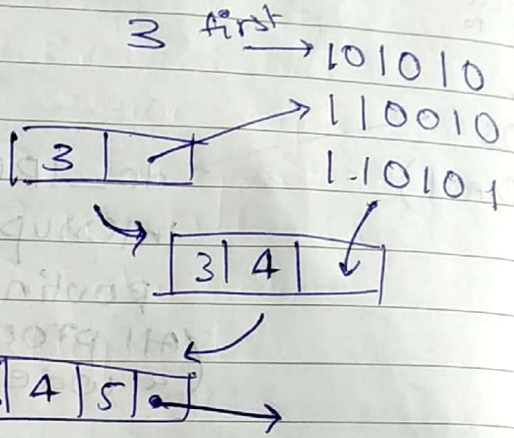
Array → ~~stac~~ static memory allocation
Linked list → for dynamic memory allocation.
↓
with help of pointers
↳ Represents memory location.
int *a; → stores address

Link list

node.



(dynamic memory) where next data is stored



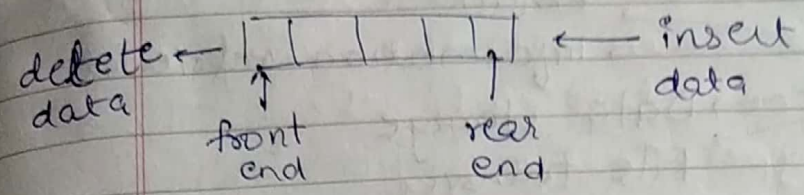
Structure (struct):
can store values of diff data types

```
struct
{ int Roll no.;
  char name[10];
  int age;
  float marks; }
```

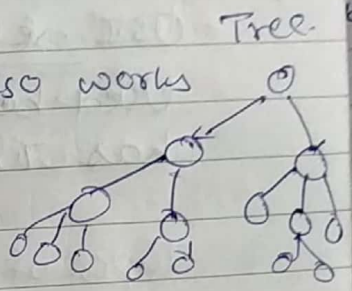
stack → LIFO → Last in First out.
FILO
↳ Push → insert element into stack.
→ Pop → delete an element from stack.

* peep operation ?

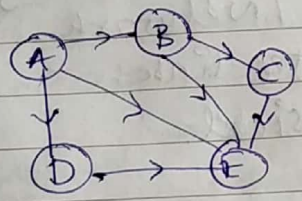
Queue — LILO
FIFO



Tree.
↳ File system
↳ Finding websites on net also works in tree-like structure.



Graph.
Used in networking.



Find route on basis of least distance
least traffic

Network → computer → nodes
All nodes are interconnected.
To send info ← Network Routing ← using this.

Searching — linear search
Binary search

Basics

OS → DS → DBMS → N/W → App.

Computer Network

~~Importance~~

Used for → Email
→ Information retrieval
→ Data storage
→ File transfer.

OSI reference model → only for reference. Not for implementation.

Used before internet.

has 7 layers → Application
→ Presentation
→ Session layer
→ Transport layer
→ IP / Network
→ Data link
→ Physical.

* Network - a medium to share data b/w computers & communicate.

Application layer.

Used for client side.

has protocols → SMTP, POP3, IMAP

FTP, TEINET

HTTP

for sending mail

for opening website.

File transfer protocol.

* TEINET for connectionless
* FTP for connection-oriented.

- IP Network
check IP address, network layer will find out the no. of ways for completing task. Then find best distance & send it.

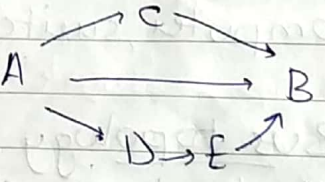
Presentation layer.
manages format to make more compatable
Ex: If word 2010 file is compatable with higher & lower versions.

? Session layer.

Ex: Session expired when not using a ~~ported~~ for a long time.

Transport layer.
To transfer using SMTP, we need
~~Generated~~ IP address ↑ unique
Port no ↓
Also which route will be taken for transfer.

Generalized → logical address
specific port for all protocols



? Data link.
- mac address / hardware address.
- Identify error & give final permission/confirmation

Physical → sends data for transmission.

* TCP/IP ~~for~~ ~~pro~~ network model — used now.

TCP/IP
In beginning there were 5 layers
↳ App
↳ Presentation + Session
↳ Transport
↳ IP network
↳ Data + Physical

Topology

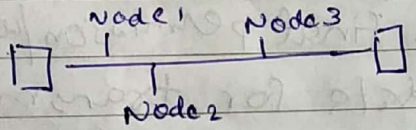
Topology defines the structue of the network of how all the components are interconnected to each other. There are two types of topology:

- physical - geometric representation of all the nodes in a network.
- logical - arrangement of devices on a comp network & how they communicate.
  - describes how signals act on the network.

Types of topology

- Point-to-point
  It has exactly two hosts such as computer, switches or routers.

- Bus topology
  All devices share single communication line or cable. It transmits the data from one end to another in sigle dir.



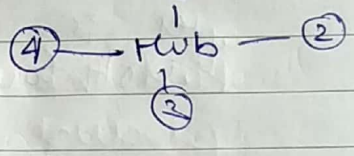
Advantages
- If N devices are connected to each other in bus topology, then only one backbone cable is needed to connect them
- Less cost.

Problems
- If cable fails, whole system crashes.
- If traffic is heavy, collisions in the network.

MAC layer - Medium Access control
↳ Responsible for moving data packets to & from one Network interface card (NIC)

CSMA/CD — Carrier-sense multiple access with collision detection.

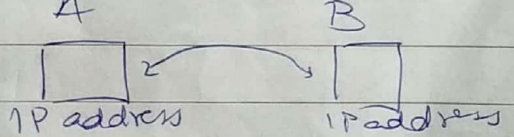
Star Topology
All the devices are connected to a single hub through a cable. This hub is a centeral node & other nodes are connected to this.



Hub — Active / Passive

Network
Connecting comps — wire / wireless
LAN - Local area Network (small area)
MAN - Meterpolitan Area Network
WAN - Wide Area Network

WWW - to acess the info
↳ hosting - renting a space for a website.
Virtual hosting, private hosting
↳ shared hosting
↳ dedicated hosting



URL → finds it & delivers to ~~client~~ user.

DNS - Domain name system
↳ has dedicated list of IP address of all websites.

when searching a url - first check in cache memory
if not, request (ISP) goes to resolver (ISP)
↳ check root server
Name server ← Not found ← TLD ← Not found
Top level Domain (saved here for future use)
give back url

after url found IP of local pc → IP of website.

Comp network is a set a computers