

Networking -

Cisco Packet
Tracer for
Practical

(1) Network - Communication of computers between two or more.

(2) Basic Types of Network -

- (i) Local Area Network (LAN)
- 150 meters
- (ii) Personal Area Network (PAN)
- buildings
- (iii) Metropolitan Area Network (MAN)
- city
- (iv) Wide Area Network (WAN)
- world
- (v) Campus Area Network (CAN)
- campus
- (vi) Storage Area Network (SAN)
- for storage and Disk mirroring

③ Types of Internet —

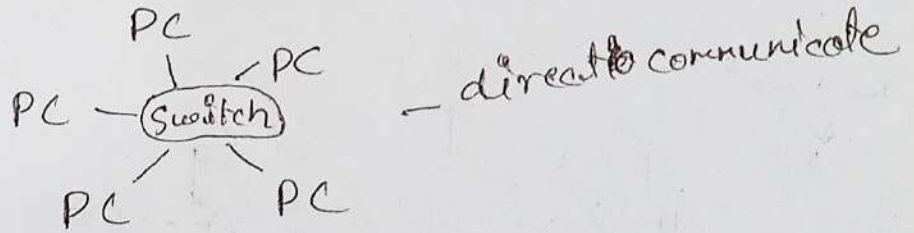
① Satellite — usually 10-12% only for world wide

② Submarine cables — usually 90+% for world

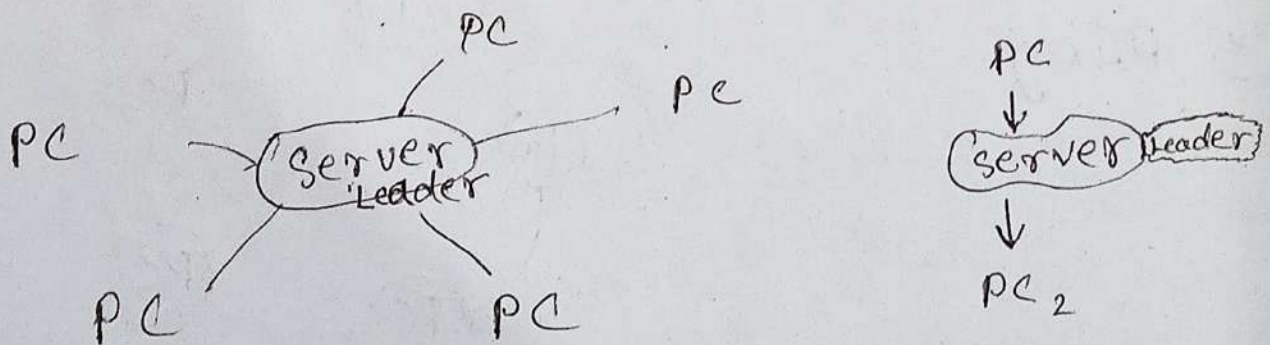
↓
optic fibre cables
↳ Submarine Cable Map for world
Submarine cable maps on internet

④ Communication Model —

① P2P (Peer to Peer) or (Point to Point)
Independence

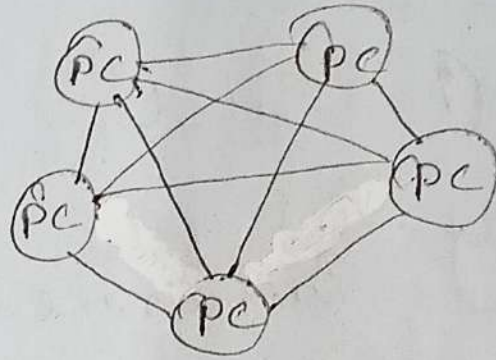


② client server Regulacence

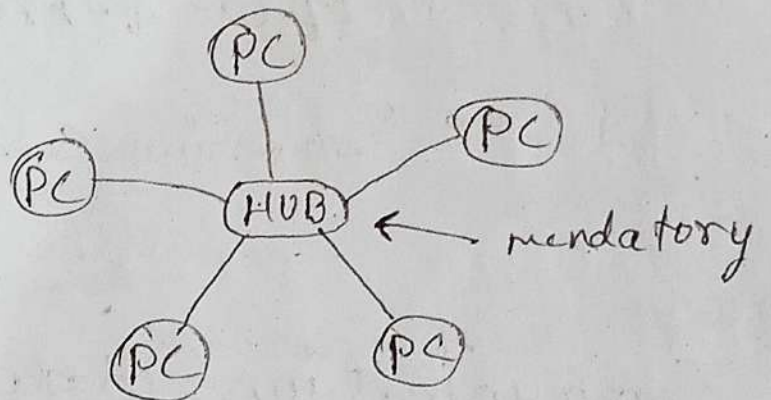


5 Topology - (layout of connected devices)

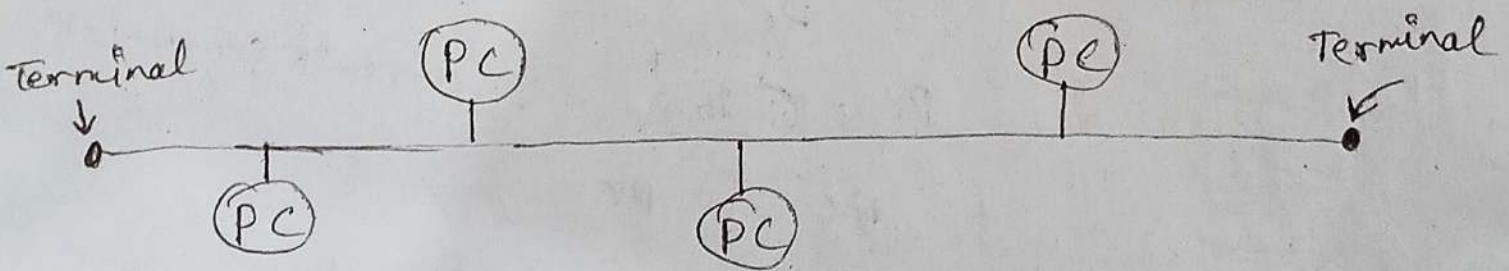
(i) Mesh -



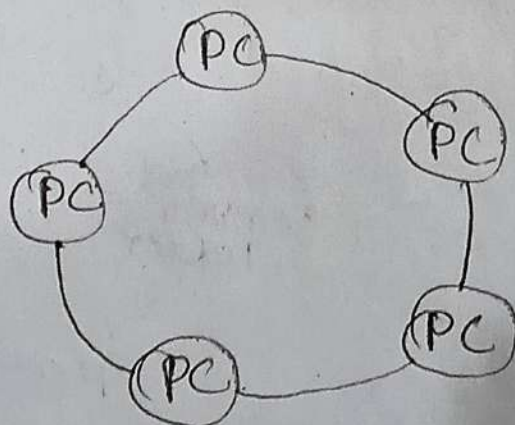
(ii) Star -



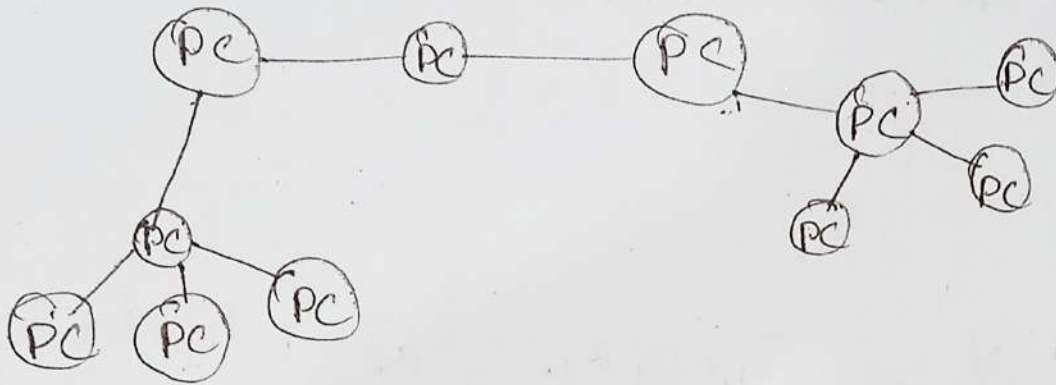
(iii) Bus ~~Line~~ Line -



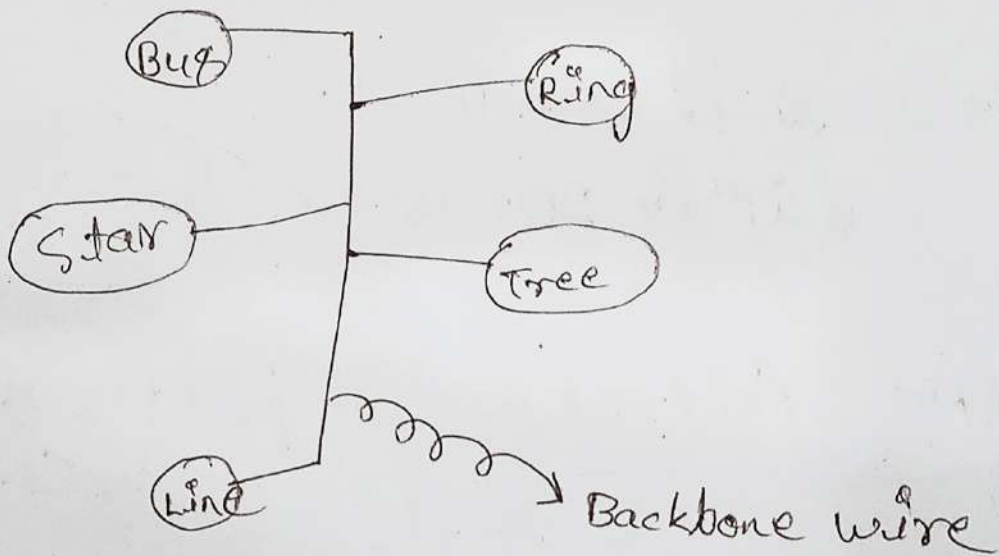
(iv) Ring -



(V) Tree — Bus + ~~Ring~~ Star



(VI) Hybrid — mixup...



(6) ICANN, IANA, IEEE

(i) ICANN — 1998 — security purpose

↳ leader of all DNS

International Corporation
for Assigned Names
and Numbers

(ii) IANA — Internet Assigned Number Authority
↓
Sub department of ICANN

(iii) IEEE — Institute of Electrical and Electronics Engineers
↳ Development, implementation, maintenance of technology over all world

• e.g. — wi-fi 802.11
wiMax 802.16

(7) MAC Address — Media Access Control

7a : 3b : 8d : 7c : 3a : 12 = 8 bytes

Manufactures Physical address of Any device that deserves a Unique Address

i.e. logical Point

8

Ports

Hardware

e.g. - USB, Ethernet, VGA etc.

Software

e.g. - 443 → HTTPS

65,535 port numbers are available

system ports

Reserved Ports → 0-1023

open client

Ports → 1024-65535

About Two Sections

TCP

Transmission control Protocol

UDP

User Datagram Protocol

Port Forwarding

query has resolves to a one client to another at same Port.

9 IPv4 and 10 IPv6 ✓

11 DHCP - (Dynamic Host Configuration Protocol)

1993

12 BOOTP - (BOOT strap Protocol)

1985

Limited Broadcast
• never forwarded

(iii) APIPA - (Automatic Private IP Addressing)

(12) Subnet Mask - It helps to configure network and Hosts.

(13) DNS - Domain name System/Server

It converts a name to IP Address for server.

Third-level domain	Second-level domain	Top-level domain
↑	↑	↑
www.webhostinggeeks.com		

A Subdomain of "webhostinggeeks.com"

Top-level Domains

□ Organizational / generic
• .com, .org etc

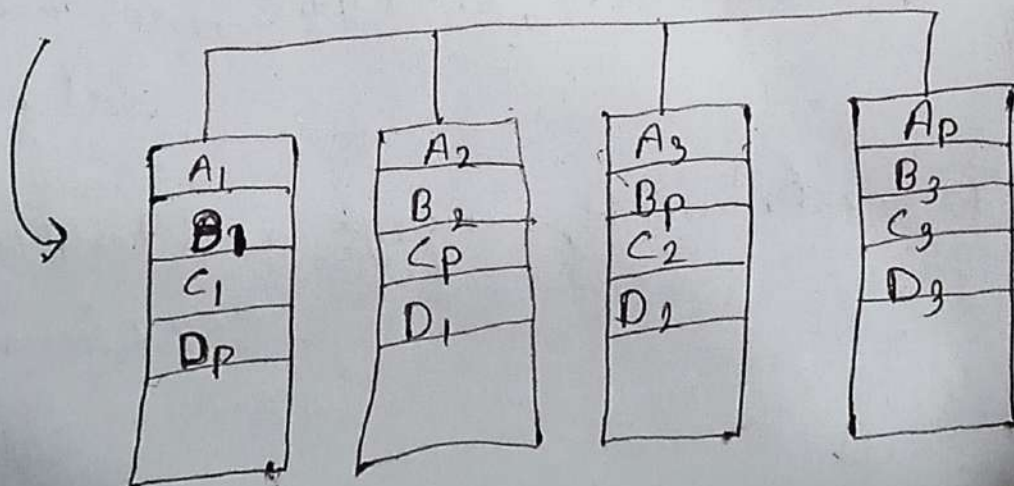
□ Geographical / country
• .uk, .pk, .in etc

□ Reverse domains
• .xyz, .kp etc - unauthorised

(14) RAID - Redundant Array of Independent disks (0, 1, 2, 3, 4, 5, 10)
For Backup data

* Parity_p - (1) Drive + (2) Drive + (3) Drive + ... = Parity of Drive

* RAID 5 is most popular



(15) NAT — Network Address Translation on

(is a way to conserve IP addresses.

• convert Public IP to Private IPs.

For example - It used in routers.

* It configure LOAD BALANCING in Server or Inter. net.

(16) OSI Model — (Open System Interconnecti^on)

It has 7 layers, which produced by

It is for Researches only. ISO

OSI LAYER	Activities
① Application ↓ layer ⑦	To allow access to network resources
② Presentation ↓ layer ⑥	To translate, encrypt and compress data
③ Session ↓ layer ⑤	To establish, manage and terminate session

④ ↓ Transport Layer ④ Segment	To provide reliable process message delivery and error recovery
⑤ ↓ Network Layer ⑤ Packet	To move packets from source to destination; to provide Internetworking
⑥ ↓ Data Link Layer ⑥ Frame	To organize bits into frames; to provide Hop-to-hop delivery
⑦ Physical Layer ⑦ Bits	To transmit bits over a medium; to provide Mechanical and electrical specification

①⑦ TCP — Transmission control protocol
 (TCP/IP Model)

It has 4 layers to transmit a data.
 Developed by ARPANET for Implementation model of OSI.
 It is for Practical Users.

TCP/IP Conceptual Layers	OSI
Application	App - present - Session - Transport -
Transport	Transport
Network	Network
Network Interface	Data link Physical

⑱ TelNet - Telly communication Network

For Remote Access to other devices.
Only commandline be used not as graphical.

⑲ ARP - Address Resolution Protocol

what is Protocol - A set of rules in which computer communicate with each other.

ARP - Mac to Ip in routers

RARP - IP to Mac

(19) PING - Packet Internet Grooper
- Mr. Mike Muss
1983.

It is a software utility used to determine whether a given IP address is accessible or not.

(20) SSL/TLS - Secure Sockets Layer
certificate

It provides security key to the network.

(21) Proxy Server / VPN - It made a

tunnel to your node and other without any IP resolution.

(22) Transmission Media

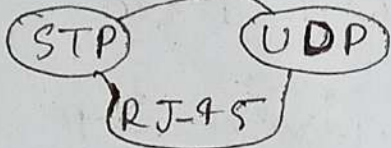
Guided

Unguided (Wireless)

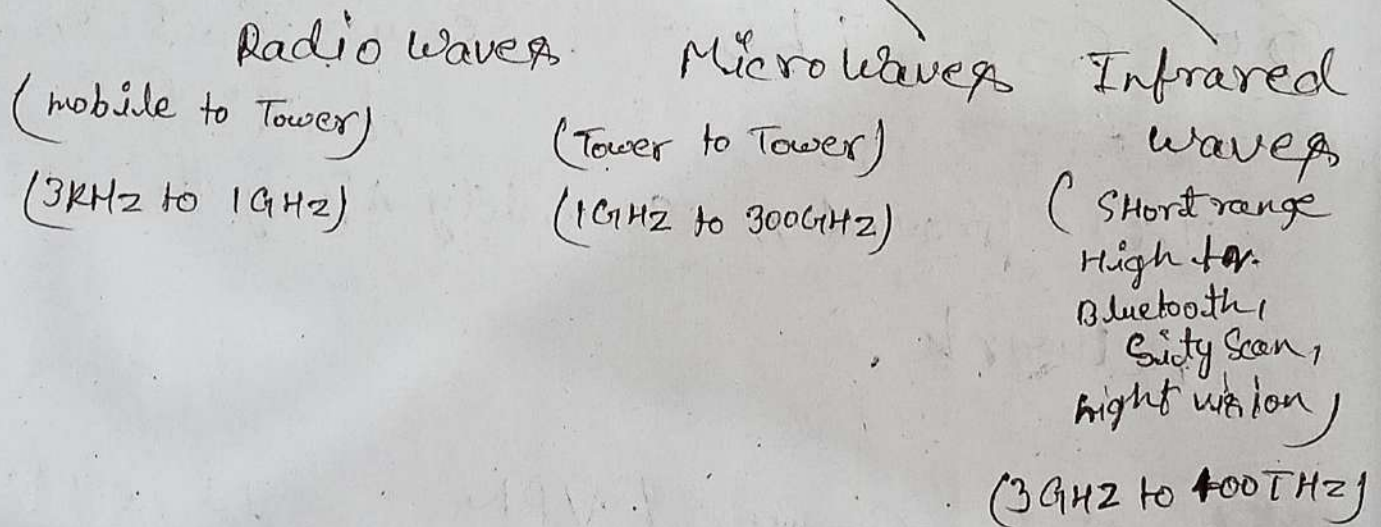
* Computers work on digital signals
and wires work on analogue signals.

Guided Media -

- ① Twisted-Pair cables
- ② Coaxial cable (BNC connector)
- ③ Optic-fibre (SC/ST/Lucent connectors)



Unguided Media - Free space



②③ VPN - Virtual Private Network

Same as proxy.

① Intranet VPN - single private network

② Extranet VPN - Multiple

(24) CSMA - Carrier Sense Multiple Access

CSMA/CA
collision
Avoidance

CSMA/CD
collision
Detection

(25) Server - Provides Service to Nodes

- Software or a computer (Super Computer)
- It resolves web queries.

e.g. - A typical PC + Apache HTTP Server (Software)

= web Server

(26) Data Center - It stores everything of nodes like

Server. It has super computers at/ with many powerful accessories.

It has minimum rest at time.

Tier \Rightarrow 1, 2, 3, 4 $\quad 4 = 99.995\%$

e.g. - "Google's Business
lose an average
about 5,000 dollars/
minute in an outage."

Availability of
a year, it means
26 minutes outage
in 365 days.

That's why, What Do these
Classifications Mean ???

(27) ERRORS -

HTTP response status codes -

- ① Informational response (100-199)
- ② Successful response (200-299)
- ③ Redirects (300-399)
- ④ Client errors (400-499)
- ⑤ Server errors (500-599)

Some Important errors - (or not an error):

- 100 continue
- 102 processing (web DAV)
- 202 accepted
- 300 multiple choice
- 302 Found
- 403 forbidden
- 404 not found
- 402 payment required
- 409 conflict (Same IP ke liye)

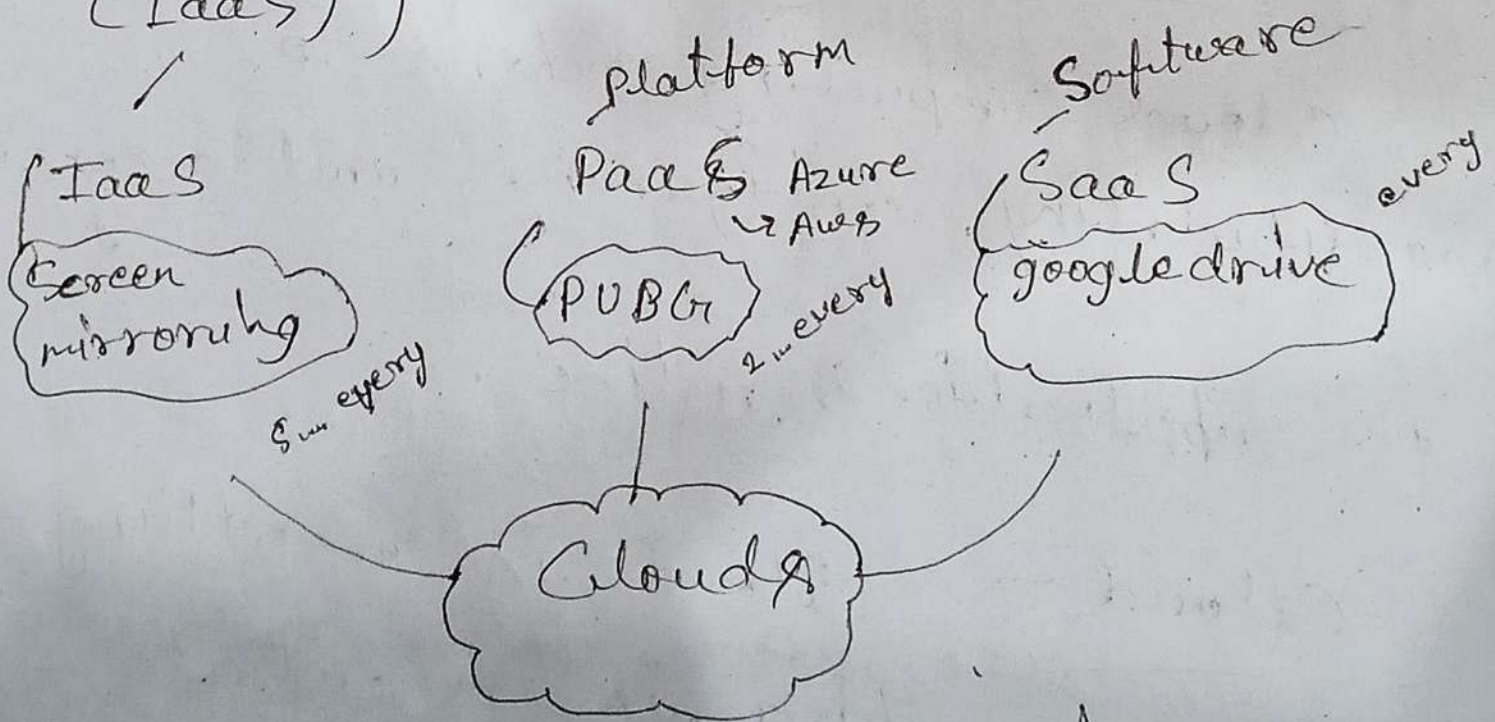
(28) Cloud Computing

cloud computing refers to manipulating, configuring, and accessing the applications online.

Cloud → Cloud is something, which is present at remote location. Cloud can provide

Service over network.

- It offers online data storage, infrastructure and application.
- It has special feature at remote access at other devices which can more powerful to your computer. (Screen mirroring of random RAM of computer with your low end PCs, on paid values.) It called Infrastructure as a Service (IaaS)



☹ Abusable Content

②9 Threats and Exploits —

- ① Malware — "Malicious software" such as ransomware, designed to damage or control a computer system.
- ① Phishing — fake official emails (bank, paypal) link to fake websites where victims log in, giving up their password and more.
- ① Man In the Middle — Hackers insert themselves between your computer and the web server.
- ① DDOS — Distributed Denial of Service: attack to the network of computers overload a server with data, shutting it down.

○ Cross-Site Scripting - Inject malicious code into a website which targets the visitor's browser

○ SQL Injection - Structured Query Language Injection:

Corrupted data to make a server divulge data, such as credit cards numbers, usernames etc.

(30) Network Shields -

(i) Firewall - ~~Such~~ A firewall

establishes a barrier between secured internal networks and outside.

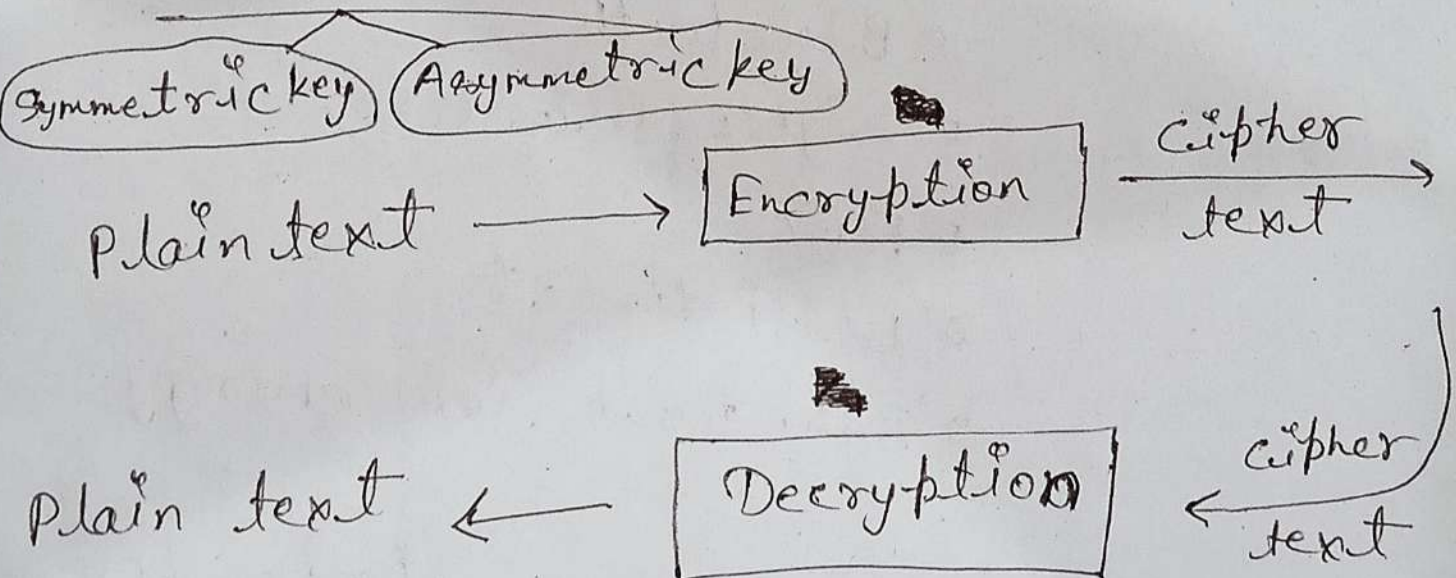
(ii) Network Access Control (NAC) :-

NAC helps enterprises implement policies for controlling devices and users access to their Networks.

e.g. - unknown resources

(iii) Anti-Malware

(3) Cryptography - Confidentiality



⊙ Symmetric key - Same keys to Decrypt the data.

It follows DES and AES algorithm.

DES = Data Encryption Standard
AES = Advanced Encryption Standard

(32) IOT Devices - Internet of Things

IOT refers to the collection of all those devices that have the ability to connect to the Internet and collect and shared data.

e.g. - smart home, cars etc.

IOT Mediums -

- o wi-fi
- o Bluetooth
- o Zigbee wireless
- o NFC
- o Wifi direct
- o Bluetooth low energy

(31) Cryptography - Asymmetric key -

It is also called public key cryptography. It has two keys, "a pair of keys for encryption and

decryption. which is public and private key.

(33) 2G, 3G and 4G Cellular Network

G_n = Generation

- 1G Technology - Introduced in 1980s and completed in early 1990s. It uses analog signals and speed upto 2.4 kbps.

- 2G Technology — Since 1991.

It uses digital signals and speed upto 64 kbps. (Intro to Internet)

- 2.5G Technology — It has 64-199 kbps.

↳ $2 < 2.5 < 3$

- 3G Technology — 2000s.

It has 199 kbps — 2mbps speed to transmit a data. (Intro to 3D games)
(Touch screen mobiles)

- 4G Technology — 2000s.

It has 100mbps — 1Gbps \ominus ! speed to transmit a data.

- 5G Technology — 2010s.

It has 1Gbps — 20Gbps speed.

③4 Networking Device —

Switch —

- Multipoint Networking Device
- Connect Multiple Devices
- Intelligent Device
- Maintains a routing and MAC Address table.
- Processes and forwards data.
- Uses packet switching
- Have downlinks and uplinks

Hub —

- It's not an Intelligent Device.
- Half Duplex.
- It used in where you have to create multiple ethernet with the help of a

networking Device. It comes with different port segment like 6, 12, and 24 ...

Router — wired, wireless or Both

Router is a networking device which is ~~given~~ used to provide interaction between two different networks. A router inspects a given data packet's destination IP address and provide connection to nodes with the main network. It gives you wired and wireless both.

* Edge Router * Core Router
High bandwidth End Point of
edge + edge = Core ☹️ Routers

Repeaters — Repeater used to regenerate or replicate a signal. It removes the unwanted noise in an incoming signal. It works on layer 1 of OSI model.

Bridge — Bridge Devices inspect incoming network traffic and determine whether to forward or discard it according to its intended destination. It operates on data link layer. It provides interconnection with other bridge networks that use the same protocol. It stores MAC and Port num. of devices.

Gateway - It is in Routers, which configure two different network. It is a node between public network and private network which makes some security with the help of identification.

NIC Card - It stores MAC.

components - Metal expansion card
Boot ROM chip
32 bit pci controller
Activity LED
RJ-45 LAN PORT

② Ethernet NIC classification -

5 Base T

it means 5mbps about 1000 meters

5 Base 2

it means 5 mbps about 200 meter

modern \Rightarrow Gigabit Ethernet

its about 1000 Base T.