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NESO ACADEMY

COMPUTER NETWORKS

[redacted] Lectures

Lec 1 → Intro to Comp Networks

① → Network is everywhere, we learn, we communicate, we work and the way we play.

② → Lecture (Lvl 1) → Problem Solving (Lvl 2) → Cisco packet tracer is used. (Lvl 3)

④ → Chapters →

1) Fundamentals
2) Data link layer
3) Network layer
4) Transport layer
5) Application layer
6) Network Security.

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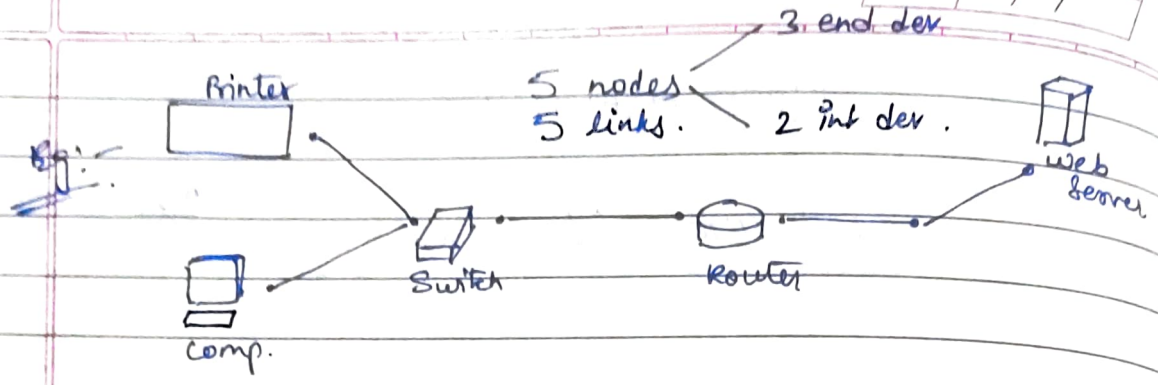
⑤ → Definition →

A computer network is a set of nodes connected by communication links.

Nodes → Security camera, Server, printer, switches, etc. (examples)

com. link → Can be wired (or) wireless
→ can only send information.

Eg:— B/n 2 smartphones.



* A computer network is mainly used for resource sharing

Eg:- One printer + 4 computers.

Lec 2 → Basic Characteristics

(1) 4 basics characteristics
- Fault tolerance
- Scalability
- Quality of service (QOS)
- Security.

(2) Fault tolerance → Ability of comp network to continue working despite failures ensuring no loss of service.

(3) Scalability → Ability to grow as per needs & maintaining performance even after growth.

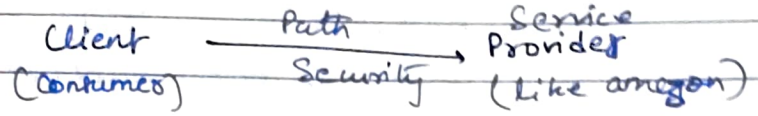
(4) Quality of service → Ability of network to set priorities & manage data traffic to reduce data loss & data delay, etc. (VoIP phone eg:)

Eg: (Real time comm > Normal comm)

Security

→ Prevent :- Unauthorised access
Misue Forgery.

& provide :- Integrity, availability & privacy.



Lec 3 → Network Protocols & Communications

(1) → **Data Communication** → Exchange of data b/n 2 nodes via some form of link.

(2) **Data flow** → How data goes from one node to another.

Types → Simplex
→ Half duplex
→ Full duplex

Simplex → One way communication (keyboard to desktop)

Half duplex → both dir comm, but not at same time
(Walkie Talkie)

Full duplex → both dir comm, comm at same time
(Telephone).

(3) → **Protocols**

→ All comm schemes (sms, email, etc) will have following common :—

1) Source or Sender
2) destination or receiver
3) Channel or media.

} Rules or protocols govern all these methods. to make comm effective & simple.

(4) ⇒ Protocol determine → what is communicated? size?
how it is communicated?
when it is communicated? Security?

Eg:- In Humans
what → info / talk / etc.
how → common lang to be used. & speak slowly.
when → when needed, gossip, etc.

Elements of Protocol
- → Message encoding
- → Message formatting & encapsulation.
- → Message formatting
- → Message size.
- → Message delivery options.

(5) Encoding (why?) ⇒ Source → encode to signal (wire) or wave (wireless) → Transmitter → Transmission medium → Receiver → Decodes → Destination

(6) Message format & encapsulation.

→ format should be same for receiver & sender.

encapsulate → to identify who sent the data & what is the dest.

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(7) Message Size → may involve breaking msg into parts (or) combining.

(8) Message Timing → flow control (How fast msg sent so receiver can identify).
→ Response timeout (Time waiting for acknowledgement)

(9) Message delivery options:-
3 types → Unicast. (one to one)
→ Multicast. (one to selected msg)
→ Broadcast. (one to all).

Part 2 [Lec-4]

(10) A big circuit is taken to explain elements individually again

(11) Peer-to-Peer network
→ All peers are equal
→ No centralized administration.
→ Not scalable
→ only good for small applications.

Client - Server network
→ Centralized administration.
→ Request – Response model (client req) (Server resp)
→ Scalable
→ Server may be overloaded.

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Lec 5 — Components of a computer network.

(1) ⇒ **Nodes**

⇒ Can be end nodes (or) intermediate nodes.
(start & end)

Eg:- Security camera, VoIP, network printers, phones.

Eg:- ~~Int~~ nodes → wireless ~~access~~ points, Hubs, Switches, Cell towers, Security devices (like firewall).

(2) **Media**

⇒ Wired medium (Guided) → Cable (Fiber optic, etc).
Unwired medium (Unguided) → Air

Cables → Ethernet straight-through cable → (used to connect diff devices).
Ethernet crossover cable (same dev)
Fiber optic cable (light waves)
Coaxial cable (audio or video) & USB cable. (charges) [Universal serial bus].
→ Wired. egs.

Unwired media

→ Infrared (short range — TV remote)
Radio (Bluetooth, wifi)
Microwaves (cellular system)
Satellite (long range — GPS).

(3) **Services** → WWW, email, file sharing, storage, Online games, VoIP, video calls.

Lec 6 → Classification of Computer networks.

① → 3 types → LAN (Local)
→ MAN (metropolitan)
→ WAN (wide).

② **LAN (Local Area Network).**

- School, labs, campus (or) house.
- Limited Area.

- Wired lan (Ethernet → Hub, Switch)
  Unwired lan (wifi).

③ **MAN (Metropolitan Area Network)**

- Size is bigger than LAN → City.
- Has (Switches & Hubs to connect devices in a LAN.) + (Routers & Bridges to connect LANs together)

④ → **WAN (Wide Area Network)**

- Some authors will refer it as Internet.
- Connects two LANs b/n continents, diff part of country.

⑤ → **New Trends**

→ Bring your own device
→ Online collaboration.
→ Cloud computing.
} in office or home.

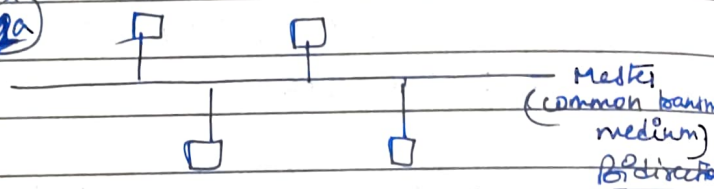
Lec 78 → Network Topology

① → Topology (Layout) → Arrangements of nodes in a computer network.

② Divided into 2 broad categories → logical [how data flows]
→ Physical [where nodes are placed]

Types → Ring, Bus, Star, Mesh, Hybrid.

2a

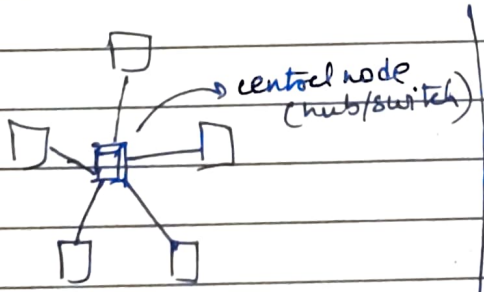


Bus

Adv
- Less expensive
- Temporary.
- Node failure doesn't affect others.

Disadv
- Main link fails the all network.
- Limited cables.
- No security.

2b

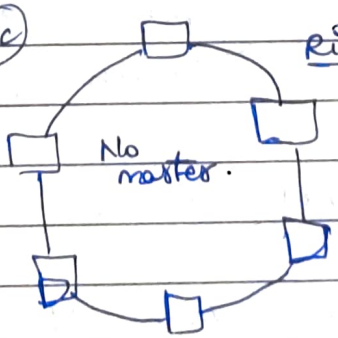


Star

Adv
- Easy to implement
- Centralized
- Scalable

Disadv
- Hub failure brings whole net down.
- Hub can be overloaded.
- Increased cost.

2c



Ring [Peer to Peer]
[Unidir flow]
Token used.

Adv
- Better performance than bus.
- Equal to all.

Disadv
- No security
- Unidirectional
- ↑load ↓perfor
- One failure then network gone.

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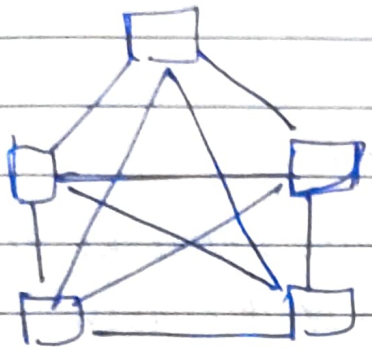
(2d) Mesh



Each node connected to all other nodes.

(2e) Hybrid

Mix of other topology.

Adv	Fault tolerent
Disadv	Issues with broadcasting. Not scalable & Expensive

(3) Ring topology Question

$N_1 \times N_2 \times N_3$

$N_1 \rightarrow$ no: of nodes

$N_2 \rightarrow$ no: of cables

$N_3 \rightarrow$ no: of ports/devices.

($N_3 \rightarrow 2$ always)

$N_3 \times N_1$ (or) $N_3 \times N_2$. [$N_1 = N_2$ bcs]

∴ Total no: of ports. $= 2N_1$

[cables = devices].

↳ Simi for star topology.

(2 × No: of cables).

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Lecture 9 → Basics of IP Addressing..

(1) IP Address → Internet Protocol Address.

→ Every node in computer networks is identified with help of IP address.

Eg:- 172.15.150.2

(2) 2 types → IPv4 and IPv6 (discussed later).

IPv4 characteristics

→ Every node has an IP address
→ Can change for a device based on it's location
→ Assigned manually (or) dynamically.
→ Represented in decimal [0.0.0.0 to 255.255.255.255 (32bit) address.

(3) In a real device. → ip config command in cmd gives the ip-address.