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Lecture 18 → Addressing in Networking.

(1) Giving Examples for better understanding of IP, MAC & Port addressing.

(2) Port → Transport (end to end)
IP → Network (end to end)
MAC → Data link layer [Cannot get MAC of destination ∴ MAC of next node is given].

(3) An example used to explain above point.

Lecture 19 – TCP/IP Suite

(1) → Just four layers in TCP/IP layers. → Application (3)
Transport (1)
Internet (1)
Network Access (2 layers of OSI)

Application → HTTP, DNS, DHCP, FTP
Transport → TCP, UDP
Internet → IPv4, IPv6, ICMPv4
Network → Ethernet, PPP, Frame Relay., interface drivers.

(2) (Protocols of each layer).

(3) Application layer Protocols

Name System	Host Config	Remail	file transfer	Web
DNS	BOOTP	SMTP	FTP	HTTP
	DHCP	POP	TFTP	
		IMAP		

Internet Protocols	IP / NAT	IP Support: ICMP	Routing Protocols: RIP, OSPF, EIGRP, BGP.

Transport Protocols	→ UDP, TCP.

(3) ⇒ PDU (Protocol Data Unit).

⇒ Application layer → Data
Transport layer → Segment (TL + Data)
Network Layer → Packet. (TL + NL + Data)
Data link layer → Frame (DL + TL + NL + Data)
Physical layer → Bits.

} PDUs → medium dependent.

Leeture 20 → Basic Networking commands.

(1) ⇒ Look at basic networking commands in cmd :-

- ⇒ IPconfig
- ⇒ IPconfig/all
- ⇒ NSlookup
- ⇒ Ping
- ⇒ Tracert.

} We already know this.

(2) ⇒ help color

(3) cls → for clearing screen.

NSlookup → DNS server of site you want. IP add of (domain name).

Tracert → tracing the path by which connection happens.

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Lecture 21, 22, 23, 24, 25, 26 → Cisco Packet Tracer

21.

① Cisco Packet Tracer.

⇒ An innovative and powerful network simulation tool. used for practice, discovery and troubleshooting.

⇒ Helps understand networks.

② Downloading Packet tracer shown.
2 PCs taken and peer-to-peer shown. pinging.

------ (crossover cable) → Same devices.

———— (Str through cable) → Diff devices.

22.

③ Hub → Also called network Hub.
(Half duplex) Works in the physical layer, Used in LAN.
Has multiple ports.
Comes under star topology.

Working principle → When packet arrives at one port, it is copied to other ports so that all segments of the LAN can see all packets.

(Drawback) → No matter if other networks want data or not, data sent is broadcast to all devices.
Also no memory
• Other Computers has to deny the packet

23.

(4) Switches → Networking hardware that connects devices on LAN

(Data link layer) → Switch has memory & is more expensive than hub.

(Full duplex) (or) Half. → ∴ Stores MAC Address table.

& only forwards to one destination, but can also broadcast if necessary.

24 25

(5) Router (layer 3 (network))

(full duplex).

⇒ A networking device that forwards data packets between computer networks.

↳ diff LANs (or) WANs.

(or) ~~LAN to Internet~~.

⇒ Working → Has different interfaces having ip-addresses, connected to diff networks.

Works on network layer.

∴ Stores Routing table, and takes decisions based on IP addresses.

26.

(6) Repeater (layer 1 device).

⇒ The data signals generally become too weak (or) corrupted if they tend to travel long distances.

∴ A repeater regenerates the signal over the same network.

↓ Not diff networks.

⇒ Only 2 ports.

Eg:- A organisation has 2 buildings.

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Lecture 27 → Basics of Bridges

(1) ⇒ A repeater + functionality of reading MAC address.

(2) ⇒ Layer 2 device. & 2 ports

(3) ⇒ Used for interconnecting 2 LANs of same protocol.

(4) ⇒ Types → Transparent (Stations/nodes unaware of bridge existence. -: config unnecessary.
→ Source Routing (Routing operation is performed by source station & frame specifies which route to follow).

(5) Working of bridge shown.
Diff b/n router & bridge shown.

Lecture 28, 29 → Network Devices.

28.

(1)
- Repeater
- Hub
- Switch
- Bridge
- Router

} Seen.

- Multi-layer switch (Router + Switch)
- Brouter (Bridge + Router)
- Modem → Analog carrier signal. i.e acts as modulator.
- Firewall → Security device.

} Extra.

29.

(2) NIC Card (Network Interface Card) → Component of PC used in connecting to devices. → Not exclusive like switches, hubs

(3) Gateway → A node used to connect 2 networks with diff ~~transition~~ transmission protocols together.

(4) Switches, Hubs don't have MAC addresses.

Lecture 30, 31, 32 → Physical layer and Media

30.

(1) ⇒ Fundamental principles of physical layers

→ Already seen, creating data + headers into electric signals, waves etc. (01010011)

(2) ⇒ Data & Signals

⇒ Data is to be converted to signals to be transmitted.

(3) A signal is a fn that represents the variation of physical quantity with respect to time.

2 types → Analog [Can take any value in defined range] All real-life signals.

→ Digital [finite values at a given time] discrete values used. ∴ at one time → one value.

(4) Media → Wireless (Radio waves)

→ Wired (Copper cables → electromag signals.
Fiber Optic cables) → light signals

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(5) Wired

→ Copper Cable (Ethernet Cable)
  ↳ Unshielded Twisted Pair (UTP)
  ↳ Shielded Twisted Pair (STP) → metallic shield.
    ↳ if noise present, can be used

→ Copper coaxial cable
  ↳ for audio & video.

→ Fibre optic Cable (fastest) [high bandwidth, range & immune to noise but expensive]

→ Crosstalk → UTP doesn't have shielding to counter effects in EMI and RFI. [EMI/RFI → Electromag, Radio Interference]
  → ~~Can be limited by increasing no: of twists.~~

(6) Wireless

→ Areas of concern (drawbacks) → Coverage Area
  Interference more
  Security is less.

→ Wifi, Wimax, ZigBee, Bluetooth, Satellite, etc.
  - Wifi → CSMA/CA many variations.
  - Wimax → broadband.
  - Bluetooth → 100m range, 3mb/s.

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Lecture 33 → Line Configration

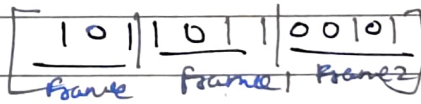
1. → In a network, two or more nodes are connected by communication link which can be wired or wireless.

→ For visual purposes, this connection is seen as line drawn b/n them.

2. → Types → Point to Point connection. 
→ Multi - Point connection. 

Lecture 34 → Link Layer Services

1. → Framing → Data link layer has to pack bits in groups so each group is distinguishable. This method of converting data bits into frames/groups is called framing.



2. Physical Addressing (MAC)

3. Flow & Access Control → Who has more or less access to networks, admin commands etc.

→ Flow is necessary to be regulated as sender can send 100 packets but receiver can only receive 10. Then flow control is nece.

4. Error Control.

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Lecture 35, 36, 37, 38 → Sublayers in DLL & Framing 1, 2, 3.

35.

(1) → Sublayers.

→ LLC sublayer [logic link control].
MAC sublayer

LLC → Also called Data Link Control (DLC)
→ Deals with communication b/n upper & lower layers
→ Also allows flow control. (Everything else by MAC sublayer)

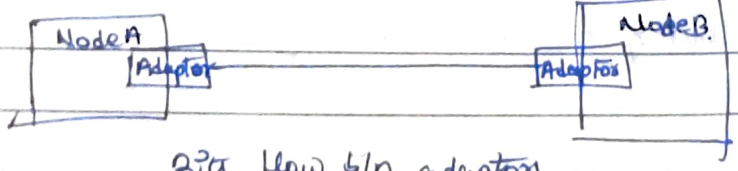
MAC sublayer → Implemented by hardware, typically by computer NIC
(Adds header & trailer to data)
2 responsibilities → Data encapsulation.
→ Media Access Control.

36.

(2) Framing shown by a example.
A bit structure accepted by both computers to identify start & end of frame.
Eg:- 11011 ... 01001 ... 11011 (start + data + end)
* (Used in variable size only)

37.

(3) Framing →



Bits flow b/n adaptors
frames b/n hosts.

→ Framing is used to distinguish one frame from other frames.

(4) Types. → Fixed size framing. (easier as size fixed).
→ Variable size framing **

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38.

(5) Framing approaches

- bit (Views frames as collection of bits). → Convert data into bits → [HDLC Protocol]
- byte. (8 bit together). (Viewed as bytes) → old approaches → [Bi-SYNC, DDCMP, PPP } Protocols].

Note:- Clock based framing also there nowadays.