

23.08.22

Chap - 7, 8

Packet Tracer — ~~not~~ simulator. [LAB]

TOC/T

28.08.22

1. How do networks affect our daily lives?
2. How are host and network devices used?

Connectivity ← Biggest advantage of networking

- Network connects us
- No boundaries

Network Components

1. Host
2. Peer-to-peer
3. End devices
4. Intermediary devices
5. Network media

HOST

- Any device in network connected.
- Client server - provides services to the clients on request.
- Client - requests services to the client-server

Peer-to-peer

No separate client and server.

End devices

source/destination devices

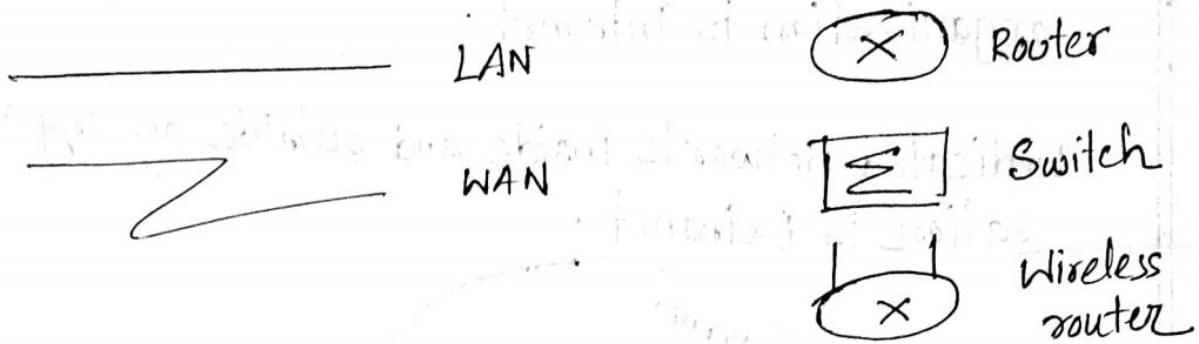
Intermediary devices

devices in between source and destination

Network media

transmission media in network

Hub, Repeater, Router, Switch — works on which layer in OSI model?



NIC — Network Interface Card.

Physical Address of devices

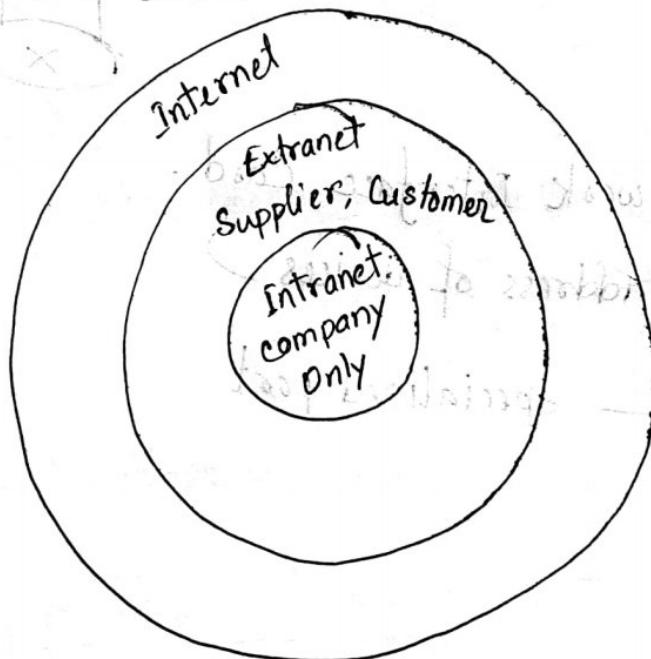
Physical port — specialized port

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Intranet Extranet

Dedicated network with high security in an organization is Intranet.

Dedicated network inside and outside an organization is Extranet.



Home / small office connections

- Cable connection
- Digital Subscriber Line
- Cellular connection
- Satellite connection
- Dial-up telephone connection

Business connections

High bandwidth

- Satellite

- Business DSL

Metro Ethernet

08.09.22

Converging Network

Converged data network carry multiple services on one link.

- data

- voice

- video

Reliability of Network

① Fault Tolerance - limits the impact of failure

packet switched network → splits traffic into packets

② Scalability : expand quickly and easily

③ Quality of service : No interruption in real time transmission

④ Network security :

- i. Network infrastructure security
- ii. Information Security

- 3 goals -
- 1. Confidentiality
 - 2. Integrity
 - 3. Availability

Network Trends

① Bring Your Own Device -

more opportunities and greater flexibility

e.g.: campus network

② Online Collaboration -

③ Video Communication

④ Cloud Computing

⑤ Powerline Networking

Rules:

Communication Fundamentals

1. Sender
2. Destination
3. Channel

Communication Protocols — Rules that govern data communication.

Rule Establishment

Individuals must use rules/~~or~~ agreements to govern the conversation.

- identified sender and receiver
- common language and grammar
- Speed, timing
- Confirmation / Acknowledgement

Computer Protocols

- Message encoding
- Message formatting and encapsulation
- Message size
- Message timing
- Message delivery options
 - single receiver/multiple

adding redundancy
and encapsulating
the data with
the extras;

Message Encoding

1. Encoding
2. Decoding

Message Timing

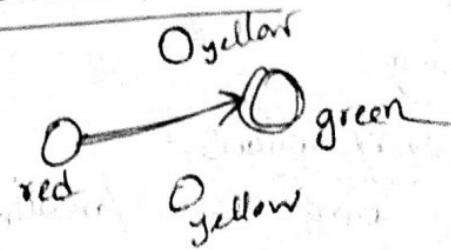
1. Flow control - manages the rate of data transmission
how much information can be sent, speed
2. Response Timeout - how long a device waits when it does not receive response from destn
3. Access method - when someone can send a message

Issues → Collision

Message delivery Options

- Unicast
- Multicast
- Broadcast

Nodes ~~Icon~~



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Protocols ^{are} interrelated to each other

Protocol Suite

TCP/IP Protocol Example for MCQ

- Name the highly used protocol in application layer
- Mainly 4 Layers in TCP/IP
- Communication process in TCP/IP
- Encapsulation: Adding redundancy for data security and reliability.

2.4 Standard Organizations

2.5 Reference Model

Why layered model is used?

Relationship between TCP/IP and OSI .

Benefits of using layered mode:

- Helps to define protocol
- Does not affect another layer

* Details of OSI model

* Comparison

* Local Area Network

→ purpose of data link layer

2.6 Data Encapsulation

Segmenting Message
Sequencing

- Application → data
- Transport → segment
- Internet → Packet
- Datalink → Frame
- Physical → Bit Stream

* nearly 30% → IPv6

* end device communication establish TCP (some network)

Logical link control

MAC address

Proving access to media

→ packets exchanged between nodes may experience numerous data link layers and media transistors.

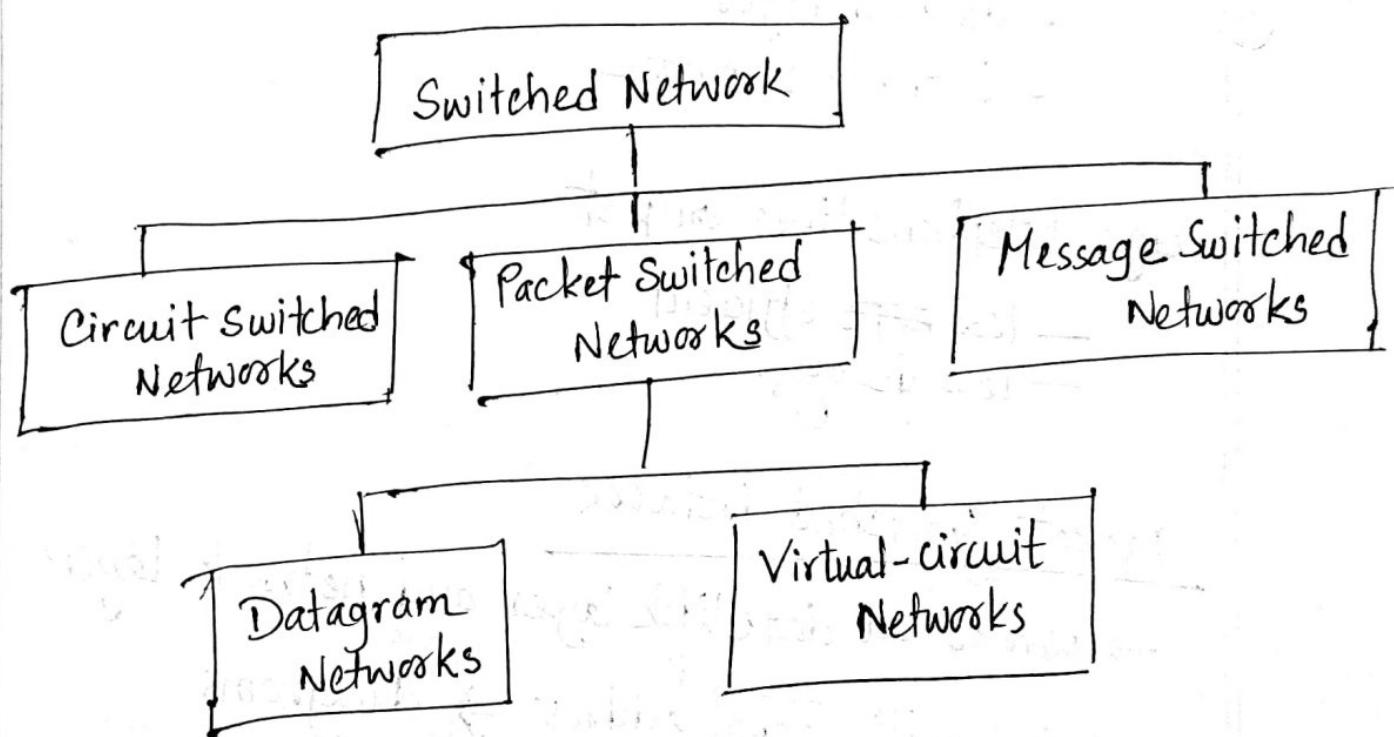
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Chap-08 : Switching

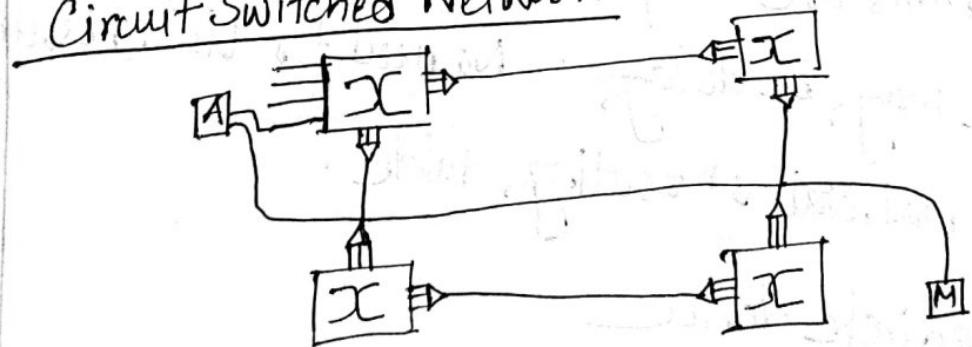
Switches are devices capable of creating temporary connections between two or more devices. on demand

3 types:

- Circuit switching
- Packet switching
- Message switching



Circuit Switched Network



- dedicated path
- expensive
- fast
- works on physical layer (full system)

Three phase

- setup phase
- data transfer
- teardown phase

e.g.: telephone lines on past

- less ~~exp~~ efficient
- less decay.

Packet Switched Network

→ works on data link layer and network layer

Packet with ^{IP} global address → datagrams
datagrams are independent.

There may be delay. No need for link resources.

Router maintains routing table.

intermediate device

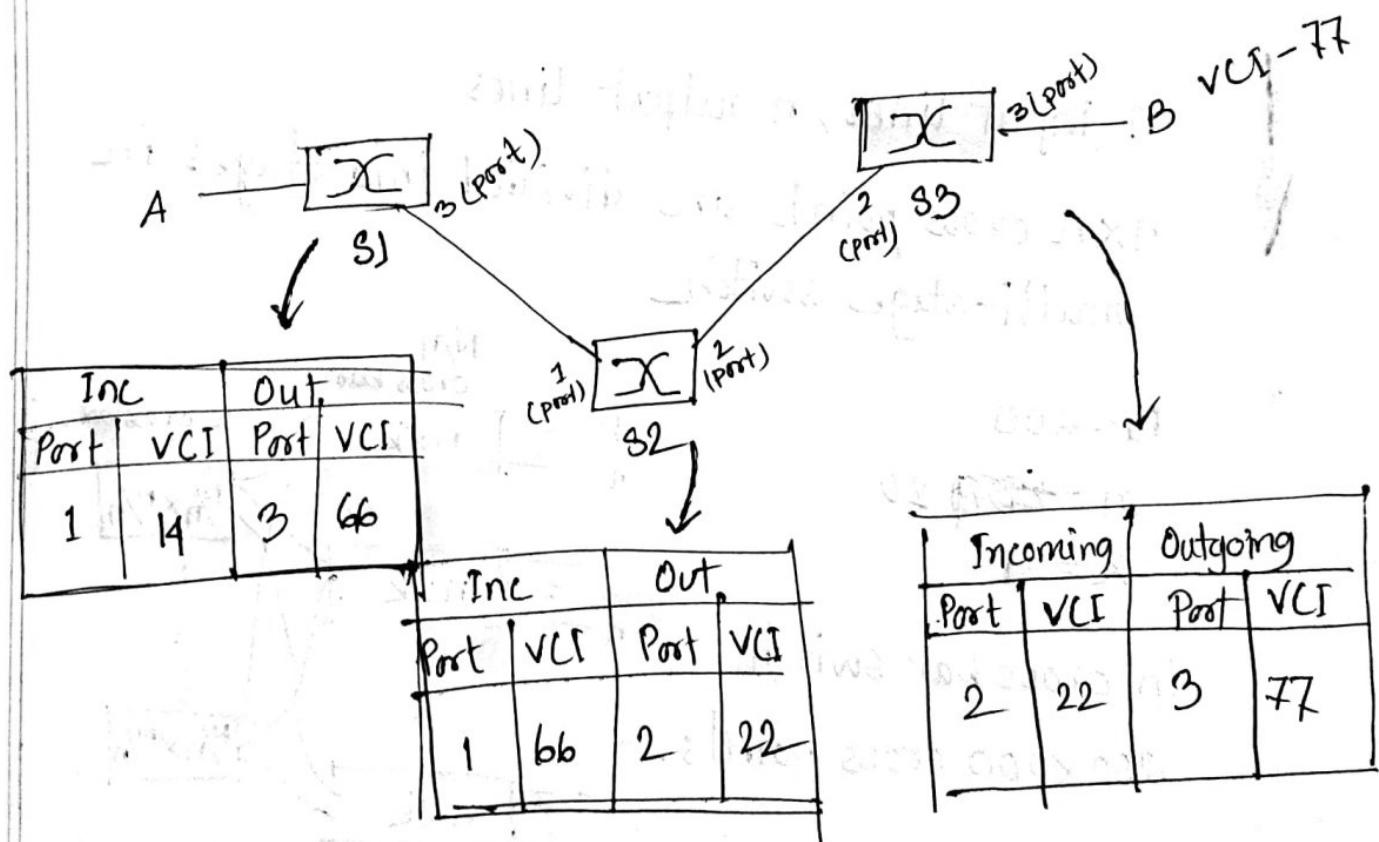
Datagram Networks

Virtual Circuit Network

connection on demand

- setup phase
- data transfer
- teardown phase

Logically setup is done by VCI (Virtual Circuit Identifier)



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Paper with codes

Structure of a switch

Space Division

Time Division

Crossbar switch

Multi-stage switch

m input lines, n output lines

$m \times n$ cross points in crossbar switch

n input lines, n output lines

$n \times n$ cross points are divided into stages in multi-stage switch

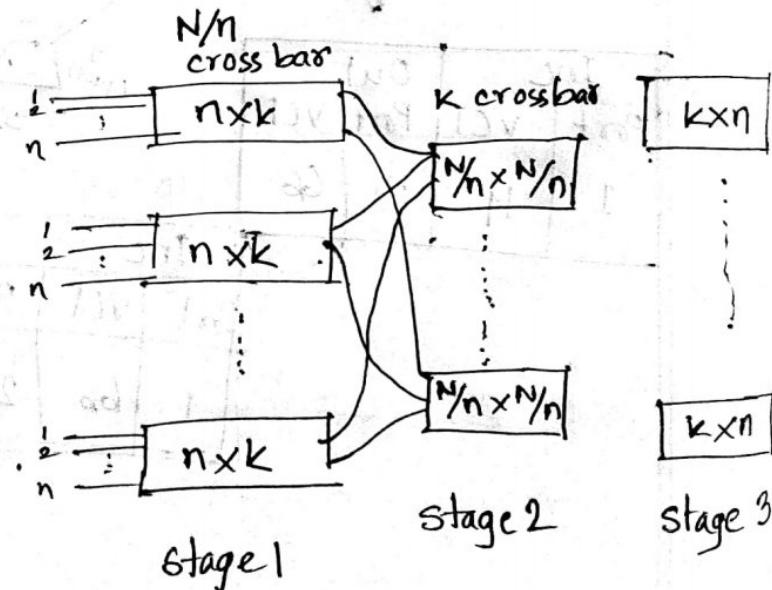
$$N = 200$$

$$n = 20$$

$$K = 4$$

in cross bar switch

200 x 200 cross points.



Multistage switch

$$N/n = 10$$

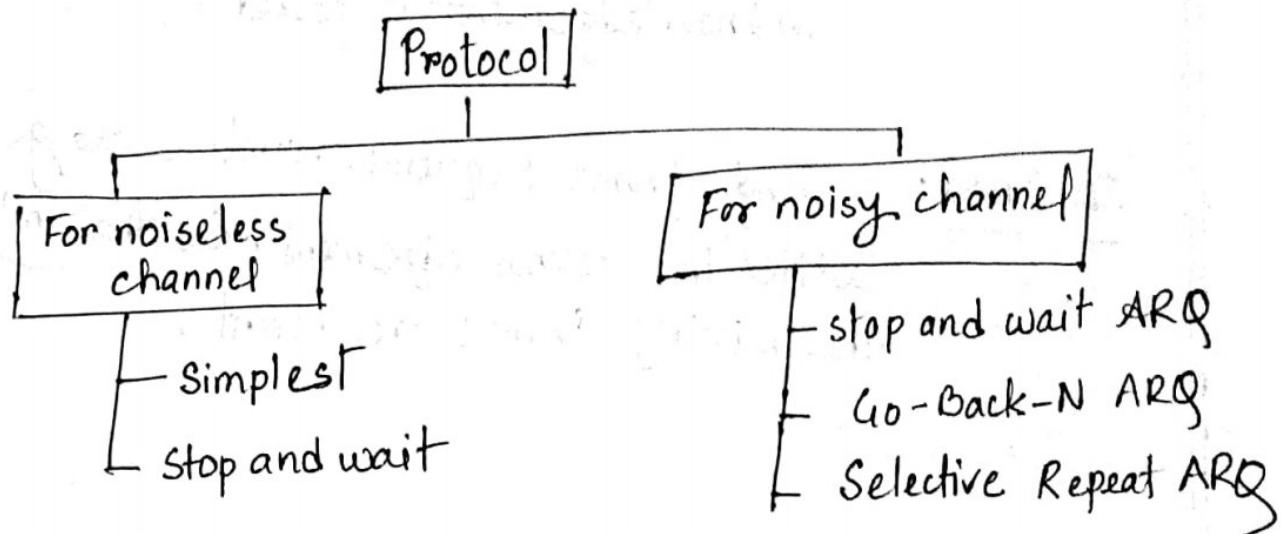
$$2kN + k \left(\frac{N}{n}\right)^2 \leftarrow \text{total calculations}$$

$$2 \times 4 \times 200 + 1 \left(\frac{200}{20}\right)^2 = 2000$$

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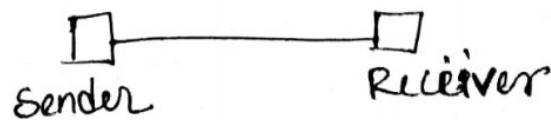
Chap-11 : Data Link Control

- Head, Trailer, Flag < Frame .
- Bits sequence, Byte sequence
- Flow control, Error control, Framing -



ARQ → Automatic Repeat Request -

Simplest : — No flow control



Stop and Wait ARQ waits for acknowledgement
~~if not found send again~~

Stop and Wait : doesn't know if message is received.

GBR ARQ: Requests the message again if no acknowledgement is found.

SR ARQ: Sends frame sequence number along with the acknowledgement. So that only the missing frames are resent.

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Piggybacking

controlling information is sent with data



HDLC - High Level Data Link Control

Transfer modes:

Normal Response Mode

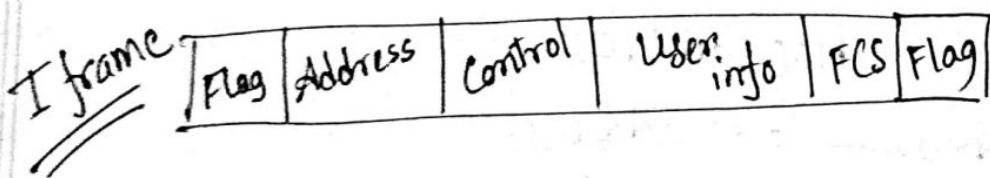
Asynchronous Balanced Mode

Information frames (I frames): used to transport user data and control information related to user data

Supervisory frames (S frames): used only to transport control information

Unnumbered frames (U frames): reserved for system management

→ Framing organization different.



Flag → denote starting and ending. Contains a pattern.

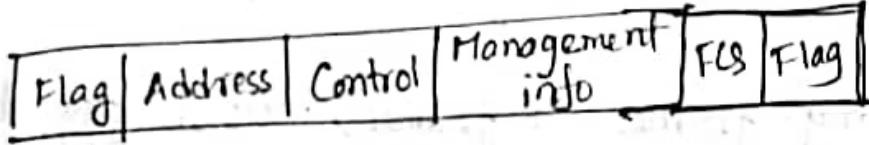
FCS → Frame Check Sequence. It contains CRC.
so that no problem occurs if same pattern is in the data

Control → Flow / error control

S-frame



U-frame



Escape sequence is used if flag bit comes in the data

IP address matching in network layer

Country → IP address

District → MAC address

Area → Port address

Email → Specific address

- Bit oriented protocol
 - Byte oriented protocol
- Point to point protocol

H.Y.