7-12-2025

LECTURE - 02 :- ETH Week-1

Basics Concept of Networking (1)

Concepts Here

- Types of Computer Network
- Circuit Switching & packet Switching
- Virtual Circuits

Networking Basic Concepts

- Computer Networks
  - A Communication System for Connecting Computers / hosts.

⇒ Why Networking is needed ?

- Better Connectivity
- Better Communications
- Better sharing of resources (ex: AWS).
- Bring people together

Types of Computer Network

→ Local area Network (LAN)

- Connects hosts within a relatively small geographical area
  - Same room
  - Same buildings
  - Same Campus

→ Wide area Networks (WAN)

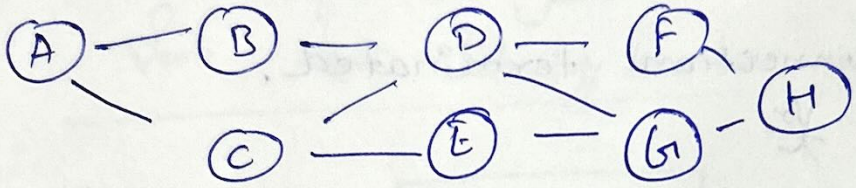
- Host may be widely dispersed
  - Across Campuses
  - Across Cities / Countries / Continents.

Data Communication over a Network

- Broadly two approaches

  (a) Circuit Switching

  (b) Packet Switching.



So if I need to send data from (A) to (H) there is no direct path or way I need to send it through the intermediate ~~path~~ nodes these nodes are called Routers.

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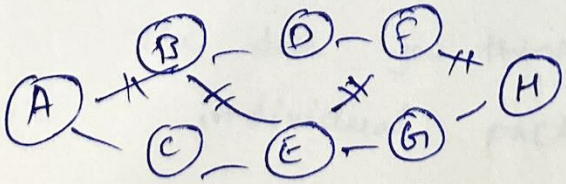
(1) Circuit Switching

- A dedicated communication path is established between two stations.
  - A path follows a fixed sequence of intermediate links (you must follow that same route in between it can't be change)
  - A logical channel gets defined on each physical link. (It is reserved lane created for your communication, so when many users communicate you get your private lane to communicate)



|| ⇒ are the logical lane reserved for private communication

⇒ Three steps that need to be followed. (4)

(1) Connection establishment (when call is getting connected & links are connected)
- required before data transmission.

(2) Data transfer (when call is connected & both of them are talk is data transfer).
- Can proceed at maximum speed

(3) Connection terminated.
- Required after data transmission is over.
- Now that logical links & connections are established so all the resources can be used by others.

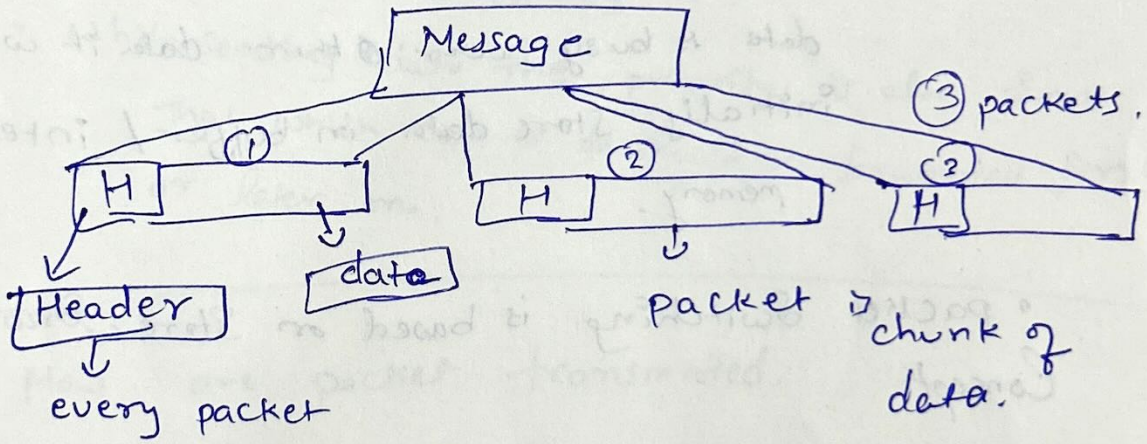
⇒ Drawbacks. (Disadvantages)

- channel capacity is dedicated during the entire duration of communication.
  - * Acceptable for Voice Communications
  - * Very inefficient for busty traffic like data.
- * There is an initial delay for connection establishment.

Packet Switching

- A modern form of long-distance data communication
- Network resources are not dedicated
- A link can be shared

* Basic Concepts are ~~just evolved~~ some just some basic technology has been evolved over a time.



every packet Contains an header.

it Contains the information of data like ~~dist~~ destination where this packet is need to send over a time.

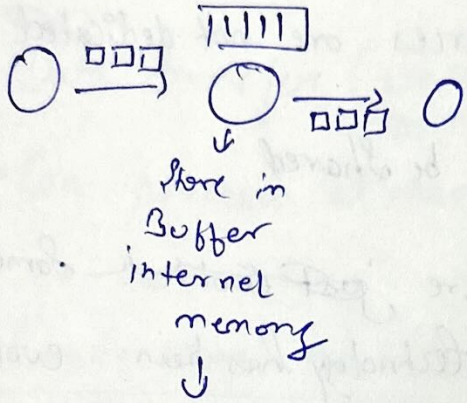
each of packet is send or transmitted seperately.

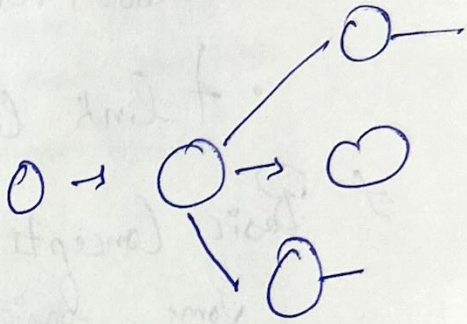
The data you think is send / transmitted but rather the individual packets have been transmitted.

Packet Switching

↓

is based on Store - forword Concept





- used when next node has lot of data is busy over other data it will initially store data in buffer / internal memory.

- packet Switching is based on Store-forword Concept
  - each intermediate network node receives a whole packet.
  - Decides a whole point or route.
  - forword the whole packet along the selected Route.

⇒ - Each intermediate Route/node (Router) maintains a Routing table

Advantages of packet Switching.

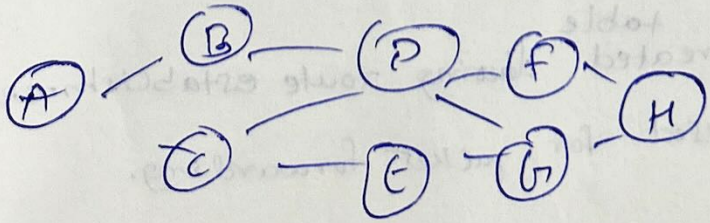
- links can be shared ; so links utilization is better
- Suitable for computer-generated (bursty) traffic
- Buffering & data rate conversion can be performed easily.

  (let suppose the incomming data is faster and outgoing is slower then it stores and forward when time comes).
- While sending data the priority is also given that which data should be forwarded first or later on.

How are packet transmitted.

a. Virtual Circuits
b. Datagram is most used in nowadays.

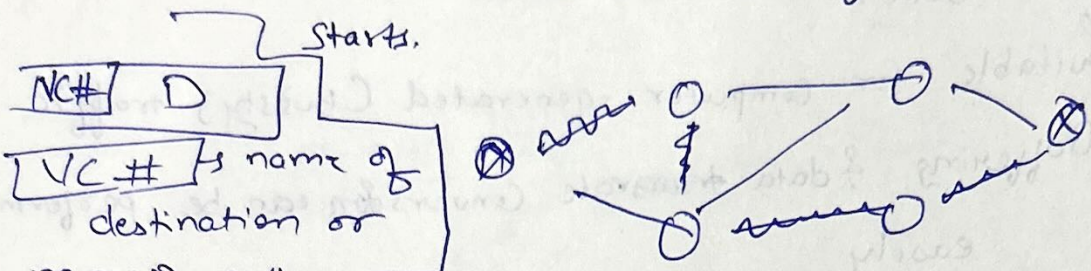
- The abstract model which we will be assuming



② Virtual Circuit approach.

- Similar in Concept to Circuit Switching.

⇒ A route is established before packet transmission starts.



↳ is the followed or given route

So now all the data will be forwarded through the scheduled route only.

⇒ All the packets follow the same route/path

⇒ ~~The links~~

Example :- Telephone System.

How it works ?

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① Route is established a priori.

② packet forwarded from one node to next using Store & forward scheme.

③ only the Virtual Circuit number need to be Carried by a packet.

- each intermidiate node maintains the table
- created during route establishment
- used for packet forwarding.

④ No dynamic routing decision is been taken by the intermediate nodes.