

18 - 12 - 2025

Lecture : 03

Basic concepts of networking (11)

(2)

## Concepts Covered

- Datagrams
- layered network architecture.

### ⇒ Datagram Approach

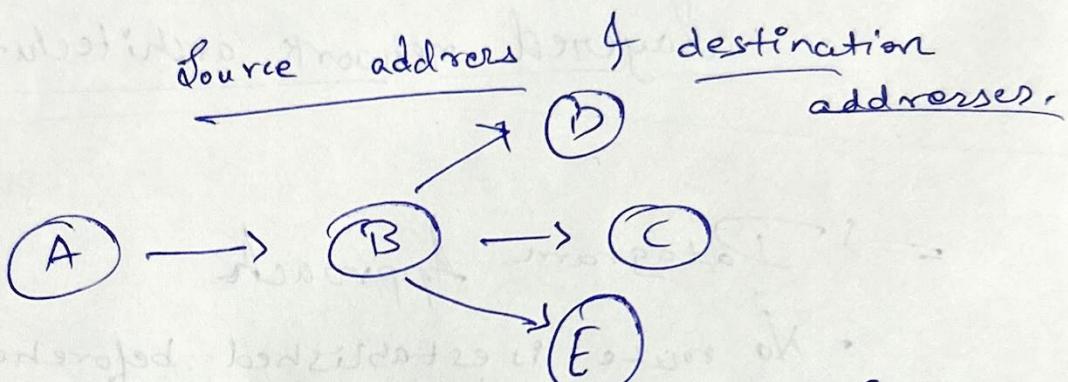
- No route is established beforehand.  
(As we see in the circuit switching there was a way or route or path through which data is been transmitted so we get no initial delays for transmitting data.)
- Seas apart
- Each packet is transmitted as an independent entity, there is not fixed path.
- Does not maintain any history.
- Example :-

Postal System

letter sending from one place to another in 90s, 80s.

- Every intermediate node has to take routing decisions dynamically

- makes use of routing table
- every packet does contains the



I need to send from A to C  
 if it will go to B & then it has multiple  
 way to go for so it will create a use  
 routing table & checks destination address  
 if wrong address it will return or be  
 delivered.

Problems

- packets may be out of order  
 Some packets might take shorter  
 way or longer route
- if a node crashes momentarily all of its  
 queued packets are lost (e.g.: Buffer)
- Duplicate packets may also be generated  
 happens if ACK is not received or delayed,

(3)

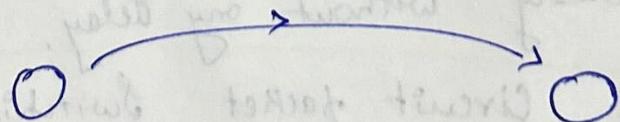
## Advantages of Datagram.

- if packet size is not large then this method is faster than Virtual Circuit method.
  - No route establishment or termination
- More flexible (if some nodes are overloaded then it can dynamically switch to another way which could be more efficient way to transfer).
- packets between two hosts, may follow different paths.

## Comparative Study

- Three kinds of delay must be considered.

### (a) propagation delay

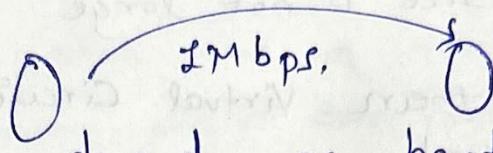


- the signal delay from source to destination

- propose

- Time taken by a data signal to propagate from one node to the next.

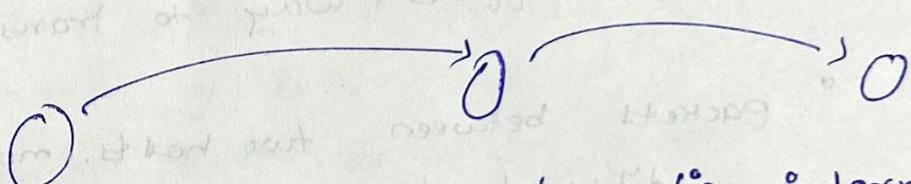
## (b) Transmission Time,



depends on bandwidth

- Time taken to send out a packet by the transmitter.

## (c) processing delay,



if communication is done via intermediate nodes we know that there is a method called store & forward method

- Time taken by a node to process a packet

## Circuit Switching

- After an initial Circuit establishment, data bits sent continuously without any delay.

## Virtual Circuit packet Switching

- The call request packet sent from source to destination
- The call accept packet return back
- packet sent sequentially in a pipelined fashion
  - store & forward approach.

(5)

## Datagram Packet Switching

- No initial delay
- Small amount of data takes less time to be delivered
- Data is been sent individually/independently
- May follow different paths.
- More flexibilities most widely used
- uses store & forward method.

## Layered Network Architecture.

- A networking sys has responsibilities
  - for this there are number of steps
  - to design a network in a way we use layered net archi'
  - layering means to divide an internet or network in a way that each of those has some kind of responsibilities, or well defined.
- well known model is OSI (Open System Interconnection) reference model.
  - Seven layer model.
  - hierarchical set of layers.
- objective
  - systematic approach to design
  - Changes in one layer should not require changes in other layers.

(7)

# The 7-layer OSI Model.

Application

Presentation

Session

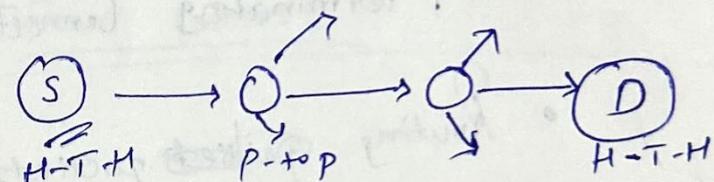
Transport

Network

Datalink

Physical

→ Host to Host  
only visible on the  
nodes of Source & destination  
no visibility on the intermediate  
nodes



→ point to point

Will be visible only to the  
intermediate nodes & ~~also~~  
to the Host.

## Layer functions

Physical, data, network  
are lower level of OSI

Physical Layer

- The ~~3 layers~~ this actually concerns over electrical signals or optical wires, copper, etc.
- Transmits raw bit stream over a physical medium.

## Data links.

- Reliable transfer of frames over a point-to-point link (flow & control, error control).
  - if there is one error in flow it will re-transmit the data again

data unit is known as frames

## Network layer → packet routing, transmitting packets

- Establishing, maintaining & terminating Connections. Routing Packets.

- Routing ~~packets~~ packets through point-to-point links.
- If there are 100 possible ways to transmit data but it should be easily able to transmit data from A to B seamlessly.

Transport, Session, Presentation,

Application are the Upper level of OSI model which are not aware of intermediate nodes. These only communicates with source & destination.

### Transport layer

- These are directly connected with host if i ask that whether i received data or not if not it will resend it again.
- End to End reliable data transfer, with error recovery & flow control.

### Session

#### • Managing Session.

- Many apps or website provides some kind of session. Such as login has been done if app is closed it shutdowns the current session & logs out automatically.

### Presentation.

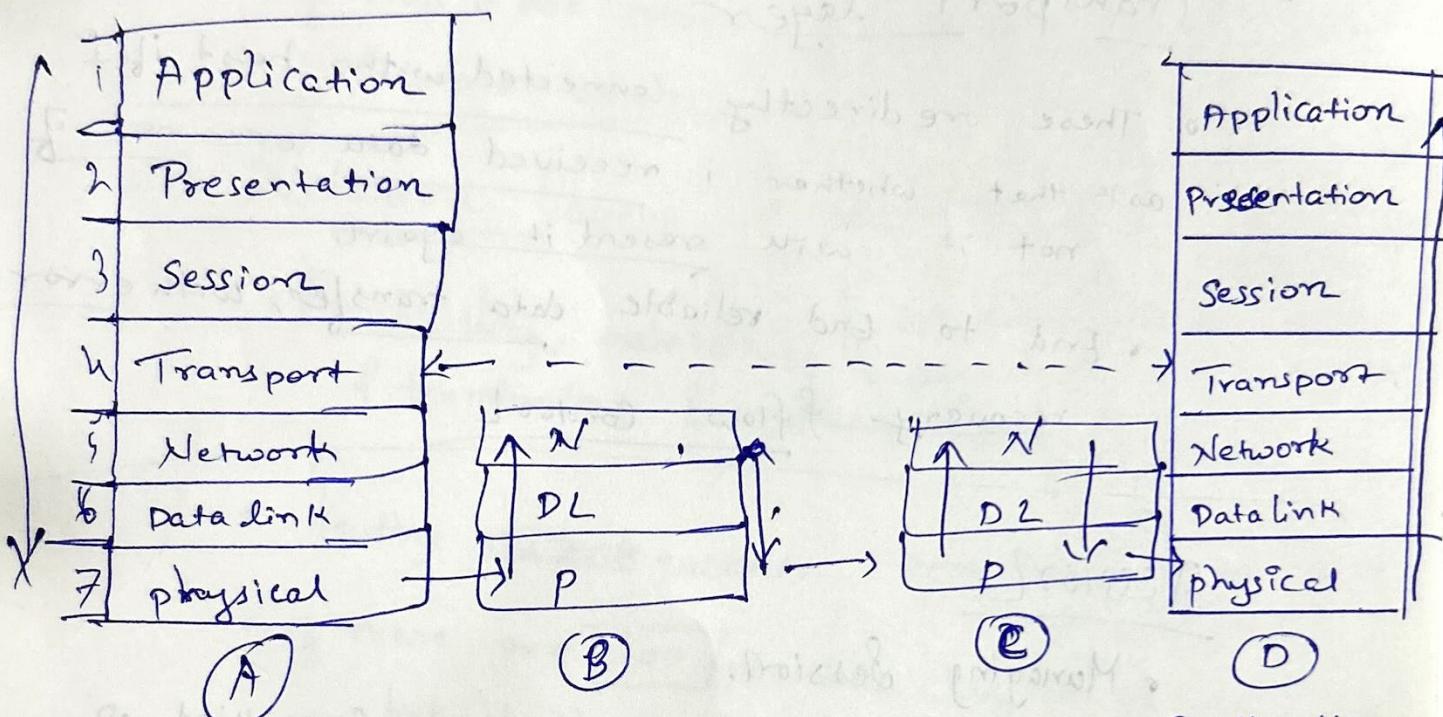
- optional layer.
- we can add extra presentation in this layer.
- if we want to send data by encrypting it it will be adding it into ~~that~~ presentation layer.

## Application

(10)

- is almost same network for user for data
- interface point of user application / transmission

## How Data flows.



Source

## Internetworking Devices

→ HUB

↳ extends the Span of single LAN

→ Bridges / layer-2 switch

↳ connects two or more LANs together

↳ works at data link layer

→ Router / layer

→ Router / layer-3 switch.

↳ connects any combination of LANs and WANs.

↳ works at network layer level