

## Lecture : 01

## Chapter : 01

chapter 1 is not that much important  
 (one question of 2/5 marks can come through partnering with other topics)

### Data Communication

↳ can be anything

### Elements of Communication

- i) Device (Sender / Receiver)
  - ii) Message
  - iii) Medium
  - iv) Protocol
- Question जाने का तरीका  
 आज तक दिया गया था।

### Data Flow

3 types.

#### Simplex

One Sided

Sender → Receiver

Radio, monitor, sensor

PC → Monitor

→

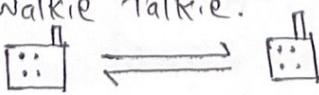
#### Half Duplex

Same time two sided flow can't happen.

First sender then receiver

or vice-versa.

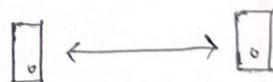
Walkie Talkie.



#### Full Duplex

Some time both ways flow can happen.

Mobile phone call.



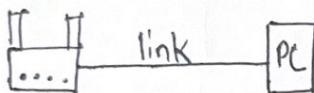
## Type of Connection

2 type

Point - to - Point

just two node connection

Router to PC

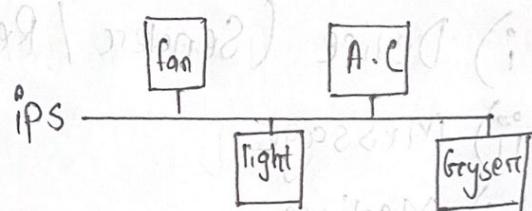
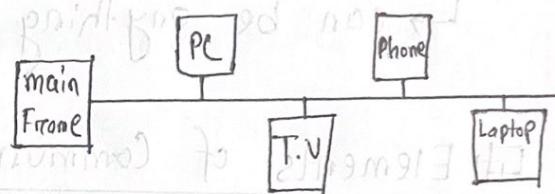


\* If any node doesn't work then the whole connection fails.

Multipoint

connection of more than two nodes.

Wifi to PC / Phone / Laptop / T.V



\* The whole system doesn't work if the main source fails.

\* If any specific station doesn't work, then it doesn't hamper the whole connection.

## Device

2 types:

i) End Device

(we use / phone, pc, laptop etc)

ii) Intermediary Device

(which connects the end devices / router, hub, lan, switches)

{ elements of communication + Device type merge

{ question কোম্পানি, Scenario কোম্পানি

## Effectiveness of a system depends on:

- Delivery
- Accuracy
- Timeliness
- Jitter (Buffering)

### Scenario

জনে রঁই আশি বন্ধুকে চিঠি লিখতে চাই,

i) অফিস address এ মাত্র রয়ে,

ii) অফিস কার্যালয়ে চিঠি রস্তাকুর রয়ে, অফিস চিঠি প্রদান রয়ে রয়ে,

iii) অফিস মহানগরীয়া মধ্যে এপার

রয়ে রয়ে আর না হল কাজে নামিবে না,

proper person → proper info → proper time

## Network Types

Mainly four types of network (PAN, LAN, MAN, WAN)

↳ PAN (Personal Area Network)

Ex: WiFi (Range १० मीटर)

↳ LAN (Local Area Network)

Ex: internet provider {some buildings}

(Range ०.५ किमी तक)

↳ MAN (Metropolitan Area Network)

Ex: Telephone company network.

5 to 50 km

→ WAN (Wide Area Network)

Ex: Internet

50 < 100,000 km

{ काने विट्ठु मान ना थाएलने रालें शाखा घोटाला  
चित्री रप्तां answer रप्तां रप्ता, Loss minimize रप्ता  
राल रप्तां answer रप्तां रप्ता,

Lecture : 02

Date : 01/02/24

## Topology

There are 4 basic topology

↳ Mesh

↳ Star

↳ Bus

↳ Ring

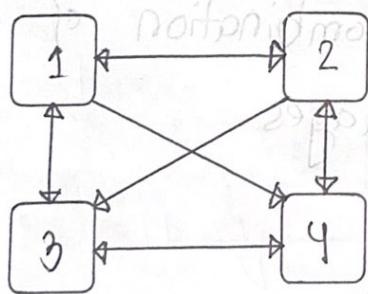
What is Topology?

→ When a network is created through connecting some nodes/devices through wire is known as Topology.

### Mesh Topology

Each device will be connected with each other.

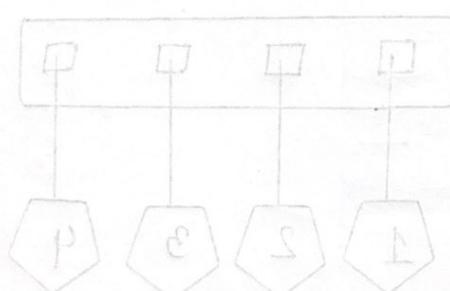
{ connection - Duplex use }



\* Number of wire in Duplex connection =  $\frac{n(n-1)}{2}$

\* Half duplex connection,

wire numbers =  $n(n-1)$ .



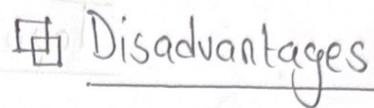
relation to star

so mutual



## Advantages

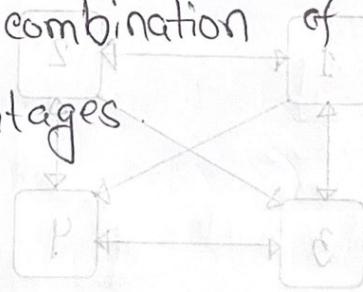
- i) Easy connection
- ii) Data transfer easy
- iii) All are connected to each other
- iv) Security & Privacy good; as connection to individual nodes.
- v) Robust system; the whole system won't fall down.



## Disadvantages

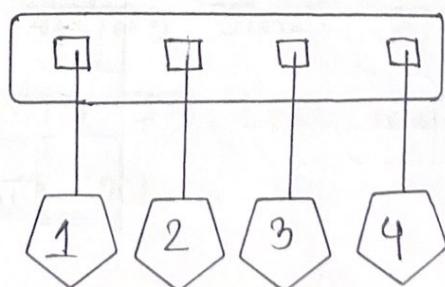
- i) Lot of wires
- ii) Expensive connection (due to wires).
- iii) Lot of connection.

Questions can be a combination of the Diagram, Advantages and Disadvantages.



## Star Topology

All the nodes are connected to a central device (controller  $\rightarrow$  hub).



## Advantages

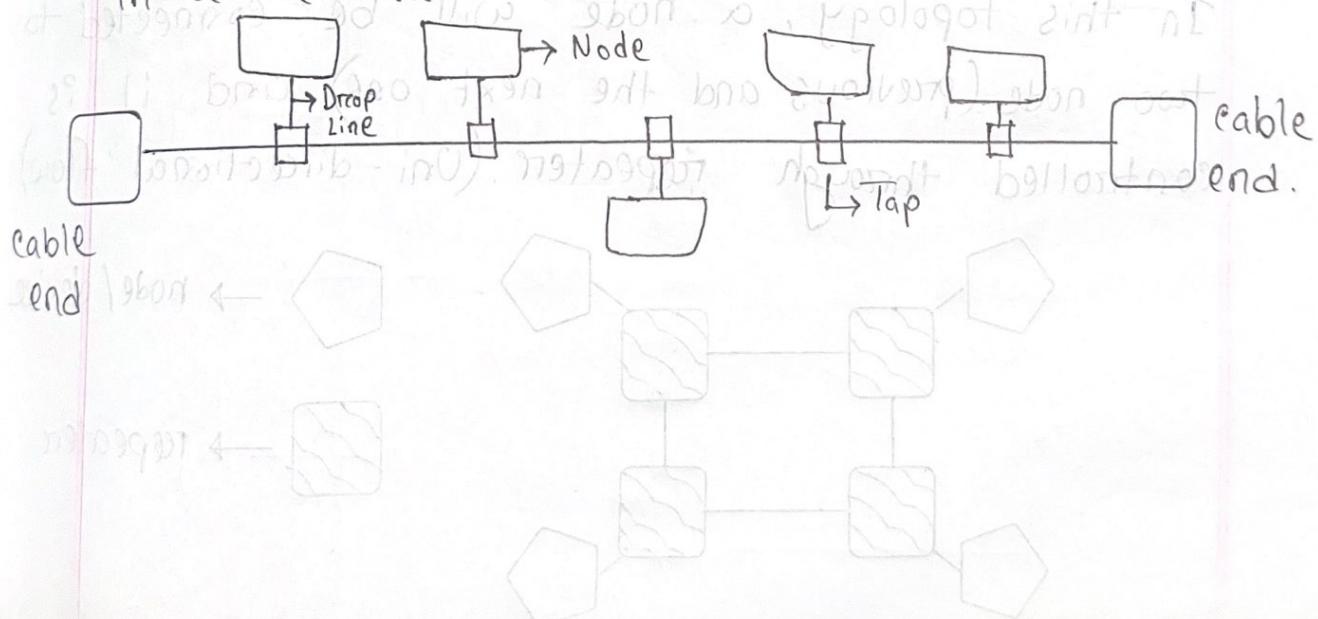
- i) Easy installation.
- ii) Less expensive.
- iii) fault detection very easy

## Disadvantages

- i) Data transfer using hub (between devices).
- ii) Main controller is the hub. Can affect the whole system.
- iii) Security & privacy less (if the hub is faulty).
- iv) Partial traffic (very minor).

## Bus Topology

A bus topology is a multipoint, connected to a long cable as a backbone to link all the devices in a network.



### Advantages

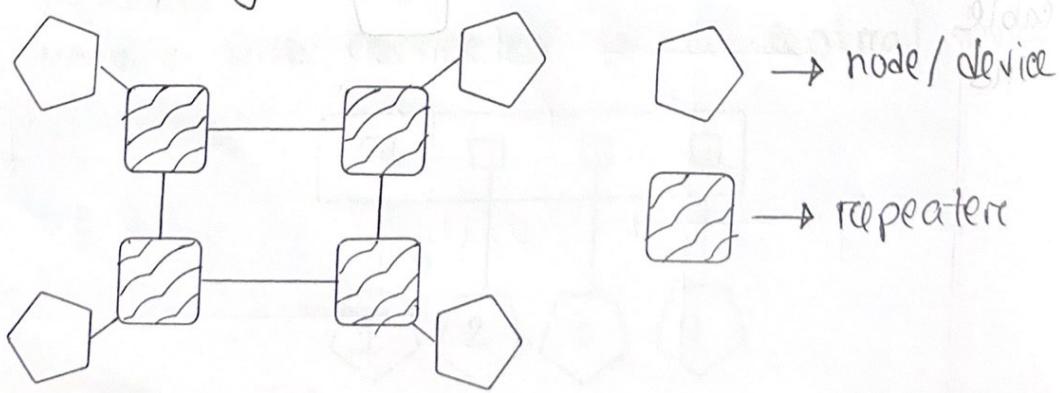
- i) Installation easy (one cable as main).
- ii) No hub.
- iii) Less cable.
- iv) Affordable than mesh and star.

### Disadvantages

- i) When the backbone (cable) fails, the whole topology fails.
- ii) A lot of traffic.
- iii) Wire heating problem (due to traffic).
- iv) Less privacy & security.
- v) Data loss / corrupt → extra heat issue.
- vi) Device reinstallation is hard, the whole backbone cable needs to be turned off.

## Ring Topology

In this topology, a node will be connected to two nodes (previous and the next one) and it is controlled through repeaters. (Uni-directional flow).



## Advantages

i) repeater receives the data and when it realises that the data is not for him, then it will regenerate the data and send to next one.

ii) Installation easy  
iii) Good privacy and security.

iv) If repeater fails, fault detection is easy.

v) If any repeater doesn't receive any data for a certain period of time, then it will ring an alarm.

## Disadvantages

i) In a one-directional ring, if a break occurs, then the whole system falls down.

•  $\rightarrow$  (normal) position

•  $\rightarrow$  (abnormal) position

•  $\uparrow$  (normal)  $\downarrow$  (abnormal)

•  $\rightarrow$  (normal) position

(abnormal) position

(normal) position

(abnormal) position

(normal) position

Lecture: 03

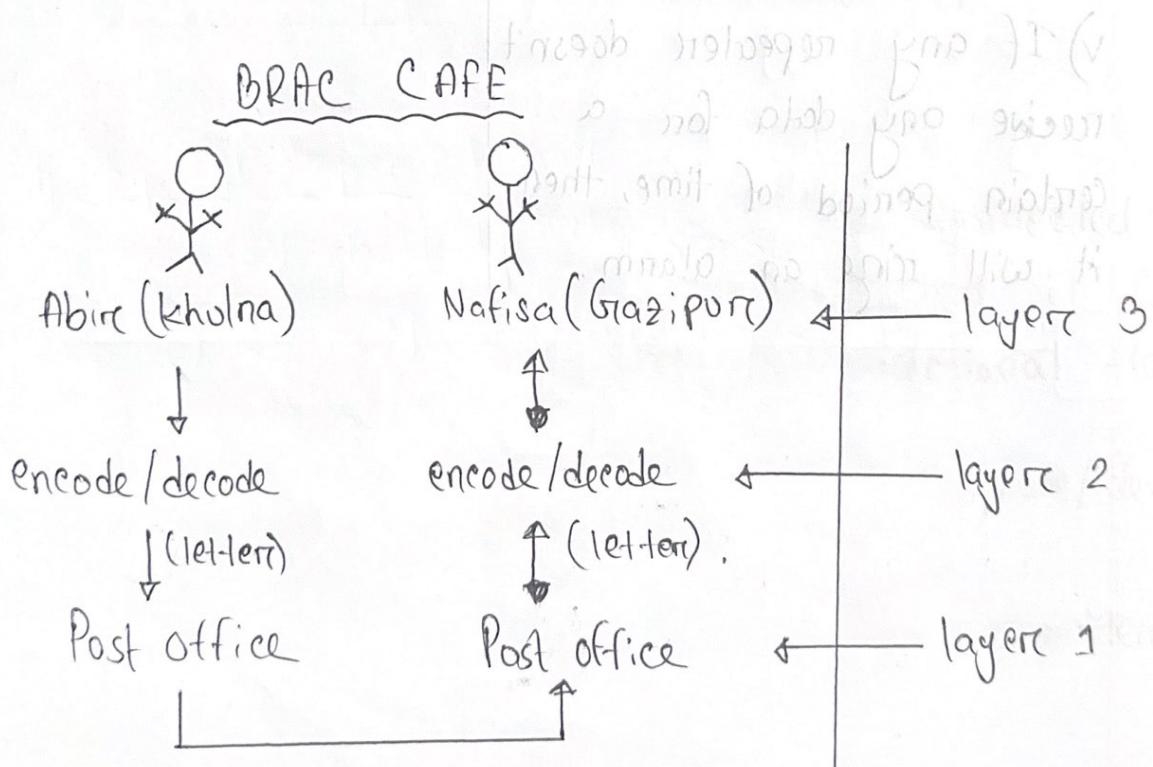
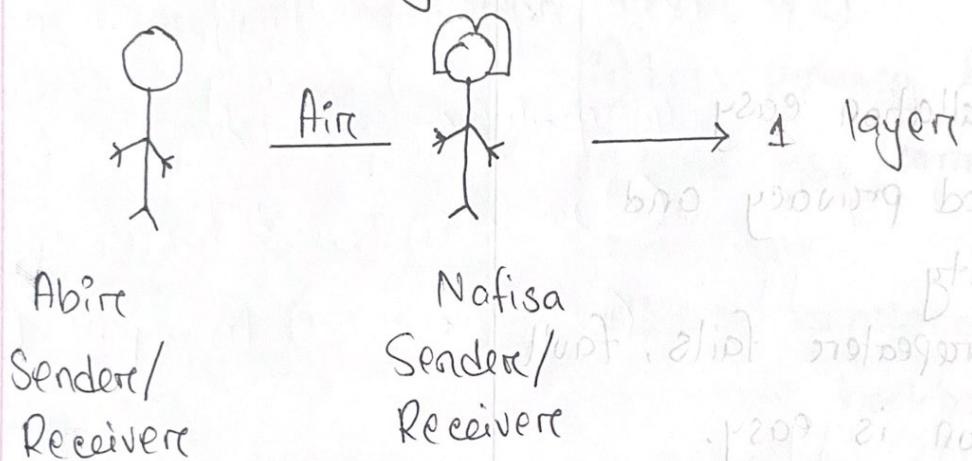
Date: 03/02/2024

Chapter: 02

(Network Models)

Question type: True/False or Layers Name

Protocol layering has some disadvantages.



## Problems

- ১) Layer নঁয় জার্জ ম্বা করলে মশুমা  
Identify কো তুঁগ.
- ২) Fault solve করতে চাইলে, পুরো network এ হাত  
দিবে হো and more complex.

## 2 Principle of Network Layering

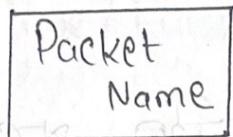
- bi-directional layer
- object শুলো layer এ এমন ভাবে বাস্তুত হবে  
যাতে identify কো মান্ন.

## 2 Protocol Models

- TCP/IP
- OSI

○ TCP/IP → Transmission Comission Protocol.

There are 5 layers in TCP/IP



Address

5. Application → Message → Name

4. Transport → Segment (\*) → Port Address (\*)

3. Network → Datagram → Logical Address (\*)

2. Data link → Frame (\*) → Layer Link Address

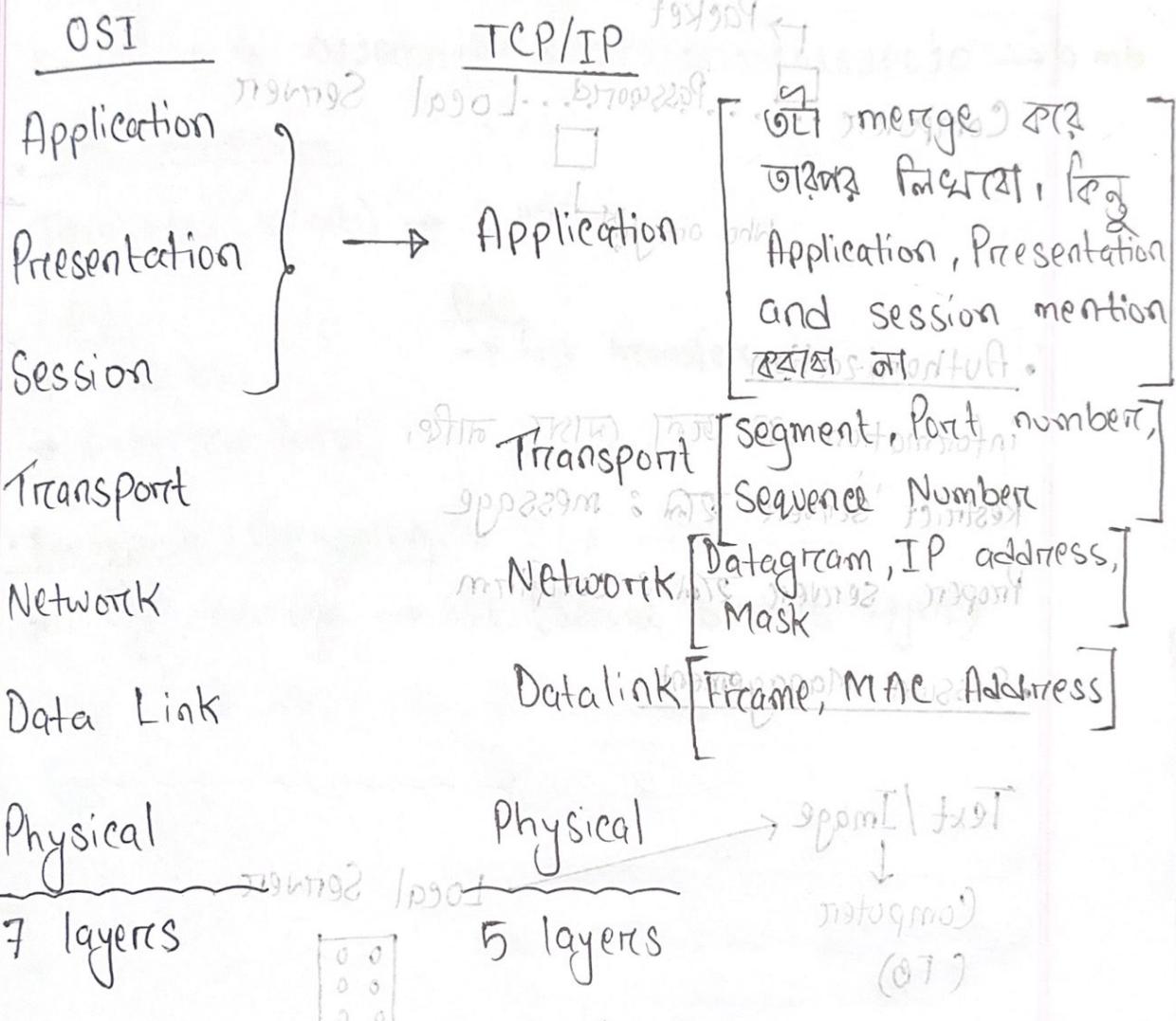
1. Physical → Bits (\*)

■ Physical layer : Frame ରେ bits ରେ convert କରିଲୁ ଏବଂ hiddenly transmission ହୁଏ (cable / medium) ଏବଂ ଗାନ୍ଧି, But bit ହିମ୍ବାର ମାତ୍ର ନା, signal ହିମ୍ବାର ମାତ୍ର।

Lecture: 04

Date: 10/02/2024

There are 7 and 5 layers in OSI and TCP/IP respectively and they are: Application, Presentation, Session, Transport, Network, Data Link, Physical.



■ Application → Network application

HTTP, HTTPS, FTP, SMTP, Telnet.

File Transfer → FTP

Web Surfing → HTTP, HTTPS

E-mail → SMTP

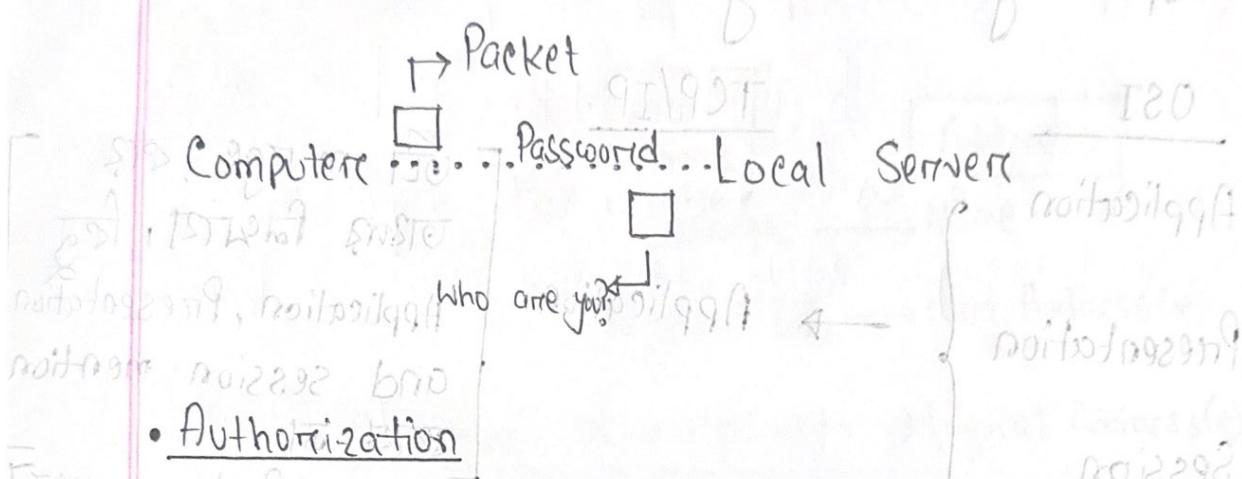
Remote Access → Telnet.

Session Control

Protocol

Session is developed by TCP protocol

### • Authentication



### • Authorization

information (জন নাম, নামি,

Restrict server এর : message

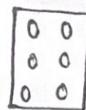
Proper server এর : confirm

### • Session Management

Text / Image

Computer  
(FB)

Local Server



Database

FB server (থেকে image/text নিয়ে computer (রে দেখান)

রের session management

## Presentation

### Translation

String / Character to Binary

Ex: A bit to 01100001011000100110100101110010 → 10 mb.

### Data Compression

Translated (10 mb) → 2 mb (loss of bytes)

### Dis

→ Data loss

→ Data less loss

### Adv

→ fast transfer

longer wait

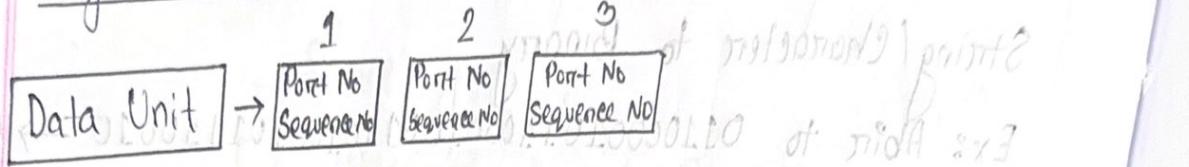
### Encryption / Decryption

Security maintain → SSL (Secure Sockets Layer)



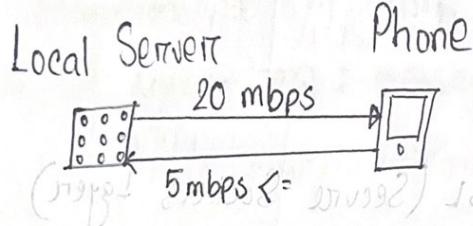
## Transport

### Segmentation



in this layer Port number, sequence number is added to the Data unit after segmentation.

### Flow Control



Local server data পারি 20 mbps এ রিক্ত phone  
data receive হয়ে ৫ mbps এ, তখন phone  
local server কে এবং ৫mbps এ তাই থেকে  
মাত্র হয়ে Data transfer হয়ে।

আবার বেশি কষা speed এ Data Transfer হবল, phone  
local server কে এবং speed বাড়াবাবু জন্য,

### Error Control

data transfer এর ty-time এ Data missing হবল  
পুরা data discard হবে মাত্র checksum/internet checksum  
এর জাপ্তি।

Net  
→  
→ N  
(IP a  
l Port  
Address

Routing  
Layer 3

Path Deter  
মার্জন কোর

In transport layer, there are two protocols:

i) Transmission Control Protocol (TCP)

→ it is slower than UDP

→ it provides feedback

→ it is used when precise information is needed.

ii) User Datagram Protocol (UDP)

→ faster than TCP

→ doesn't provide feedback.

→ used during game.

## Network

→ IP address

→ Mask

(IP address

& Port

Address Calculation)

1	2	3	4	5	tail
---	---	---	---	---	------

Sender IP Address	Receiver IP Address	1	2	3	4	5	tail
-------------------	---------------------	---	---	---	---	---	------

123.123.192.0 → IP Address  
193.192.193.1 → IP Address

Mask ← 171.171.171.0

← local server

→ Receiver

Routing → Receiver → local server → Router → Destination

## Path Determination

আগফ্ট করে path দিয়ে মাঝে,

## Data-link

### • MAC Address

Sender IP	Receiver IP	Port 1	Port 2	Port 3	tail
-----------	-------------	--------	--------	--------	------

↓ adds the MAC address

Sender MAC	Receiver MAC	Sender IP	Receiver IP	Port 1	Port 2	Port 3	tail
------------	--------------	-----------	-------------	--------	--------	--------	------

↳ frame

### • Access the Media

Cable

Fibre Optics

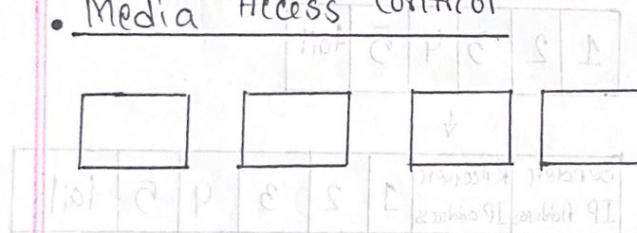
Wireless



light speed

Radio Signal

### • Media Access Control



→ Computers

eye (Control)

CSMA

→ Data computer ରାଶି ମଧ୍ୟ

Free ଥାକେ computer (eye) ସବୁ ଜାଣିବା  
monitor ହେଲା, Same time କିମ୍ବା ଏହି

data same computer ରାଶି ପିଲାଇବା

Lecture: 05

Date: 15/02/2024



## IP Address

internet protocol / logical address (Home Address)

There are two versions of IP Address:

↳ IP version 4

↳ IP version 6

- 32 bits

(Range 0 - 255)

decimal number

### ARP

↳ Specific address resolution

generate MAC address.

### IP version 4

### IP version 6

- 128 bits

hexadecimal numbers

### DNP

↳ Neighbour address

generate MAC address

problem of IP

constraint

Example:

111.56.045.78 → error (leading zero)

221.34.7.8.20 → error (5 decimal)

75.45.301.14 → error (301 out of range)

11100010.23.14.67 → error (binary number).

There are 5 type of IP addresses:-

→ Private

→ Public

→ Dynamic

→ Static

→ Website IP

i) Phone, tablet, tv, router → Private IP

(not a part of internet). Personal space

ii) ISP আজাদের মুক্ত IP address যুক্ত

Problem → hack হওয়ে এবং কাফি সময় IP  
address same.

- iii) Dynamic IP address (continuous change), 
  - Advantage → hack কো করিব।
- ii) Business/Company (বিজ্ঞপ্তি ip address দেন (নে))
  - server বানানু (website বাইকে / email থাকে)
- i) Dedicated ip address → malfunction → system down

Shared ip address → less problem

MAC Address  
 Media Access Control  
 (Physical or Hardware Address)

The address is globally unique for each device.

Manufacturers of the device provides it.

The address → Hexadecimal format.

00:1B:44:11:3A:B7

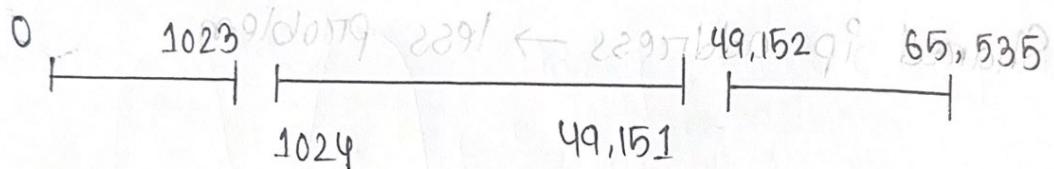
- : (Digit represent (জটি) - 0H - 9H)

Hexadecimal (জটি) - E9

## Port Address (no.)

Port address identifies a specific application or process.

### Port Number Range



Well known

Registered

Dynamic or Private

ICANN

Control

these

Buy them

Ex: FB, IG

Sci-hub

Application (Hop-Hop)

Data Link (Hop-Hop)

Network (Hop-Hop)

Transport (End-End)

Lecture : 06

Date : 22/02/2024

## Chapter : 03 Physical Layers

### Analog and Digital Data

Analog → Continuous value are data

Ex: Weather, normal clock

Digital → Discrete (0,1) changes after a certain interval.

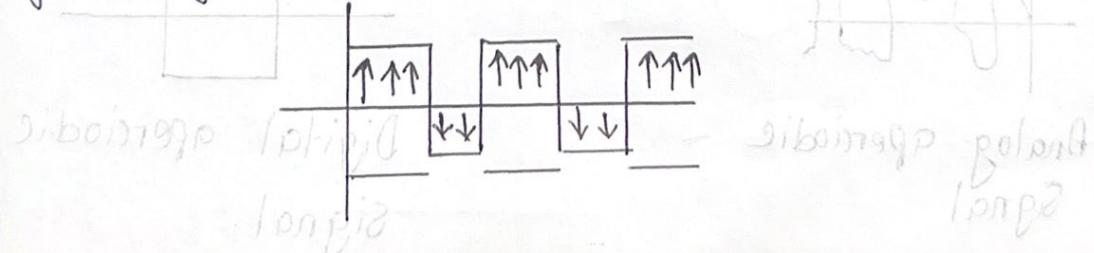
Ex: Digital clock.

### Analog and Digital Signal

Analog signal (continuous change)



Digital signal



new slide 01

20.9.2021

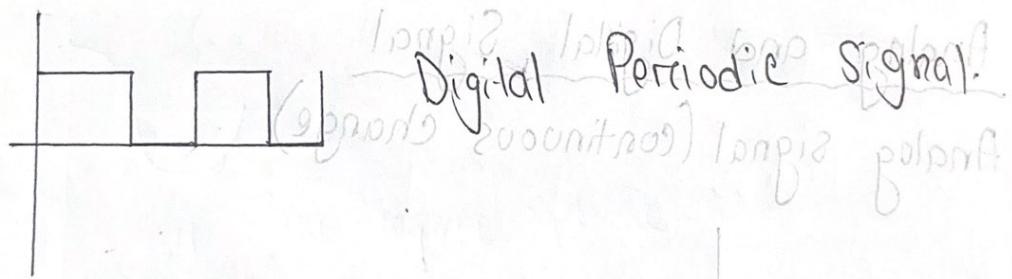
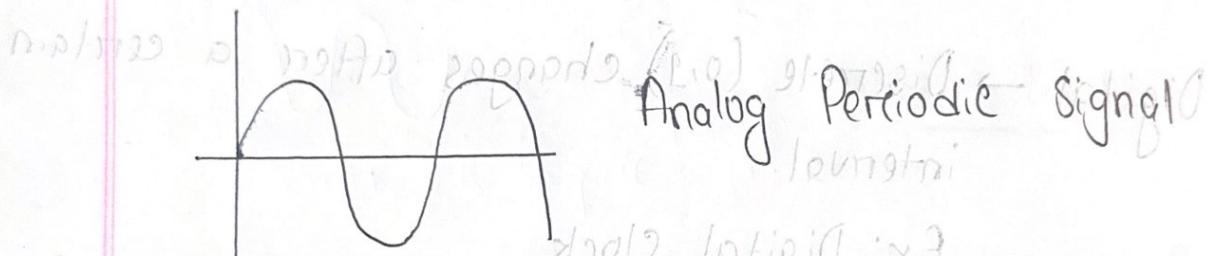


Signal

→ Periodic Signal

→ A. periodic signal

○ Periodic Signal



○ Aperiodic Signal

