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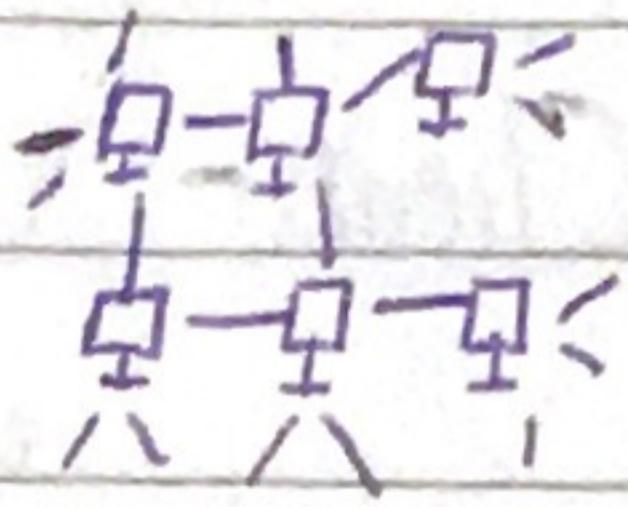
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Computer Networking

Network - Computers connected together.



Internet - Collection of Computer Networks.



WWW (World wide Web) - Developed by Tim Berners-Lee

- project that stores documents.
- we can access documents via www.
- it allows you access to all documents, basically all webpages.

Official Definition →

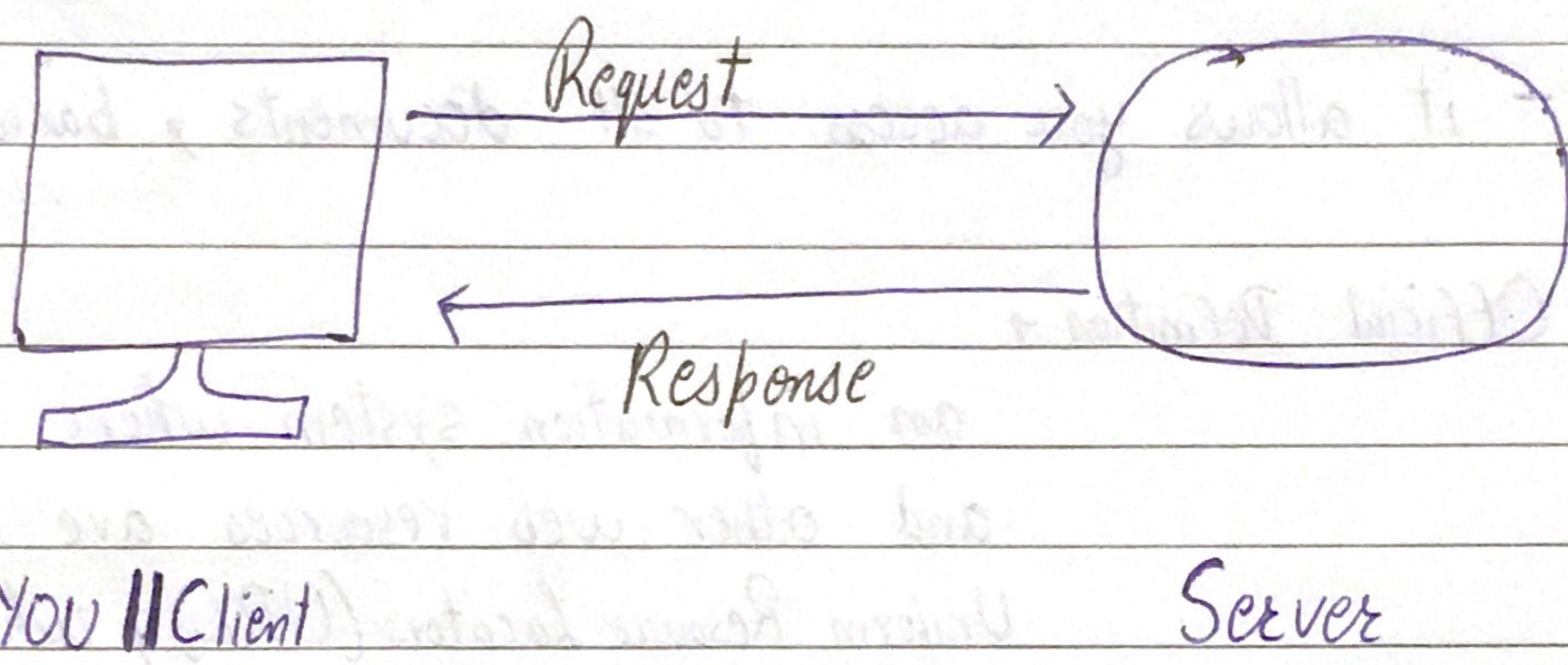
an information system where documents and other web resources are identified by Uniform Resource Locators (URLs), which may be interlinked by hyperlinks, and are accessible over the internet.

All rules and regulations, to transfer data over the internet, are created, maintained, controlled by the INTERNET SOCIETY.

Client - Server Architecture (A Brief Overview)

Client - A desktop computer that is capable of obtaining information and applications from a server.

Server - A computer or system that provides resources, data, services or programs to other computers known as clients.



Client searches for something, say "google.com", in a search engine.

This sends a request to google's servers, and the server sends back a response, in form of web-page.

A computer can be both server or client.

Protocols -

Set of rules , for routing and addressing packets of data so that they can travel across networks and arrive at the correct destination .

Basically, protocols define how data will be transferred across the internet .

I. Some Basic Protocols -

1. TCP (Transmission Control Protocol) -

It ensures that all data reaches its destination , without any loss or being corrupted .

example - email services .

2.) UDP (User Datagram Protocol) -

It is used when it is not necessary for all data to reach its destination .

Example - video conferencing .

3.) HTTP (Hyper Text Transfer Protocol) -

This is used by web browsers .

This defines the format of the data transferred between client and server .

How Data is Transferred -

All the data sent and received is done as packets.

Data is divided into small chunks/parts and then sent.

It can be imagined as data being sent as machine gun fires bullets. (small but rapid).

data.



server



client

IP address →

An IP address is a unique address that identifies a device on the internet or local address.

Just like contacts in your phone are stored as names leading to a number.

name → 99999999

In the same way, Every single device on the internet that can talk to each other has an IP address.

www. — → X. X. X. X
↓
[0, 255]

IP address is a string of numbers separated by periods.

Example - 192.158.1.132

Range of IP address →

from 0.0.0.0 to 255.255.255.255

IP addresses are mathematically produced and allocated by the Internet Assigned Number Authority (IANA)

A small illustration of Internet

Internet.



Your Internet Service Provider

↓ IP = Global IP address.

when this phone makes
request to google servers

they see the
Global IP address

not Local Phone

Your Modem/ Router

IP = IP₂

IP = IP₃

Desktop

Device 3

These are called
local IP address.

Suppose you make a request to google.com from your phone.

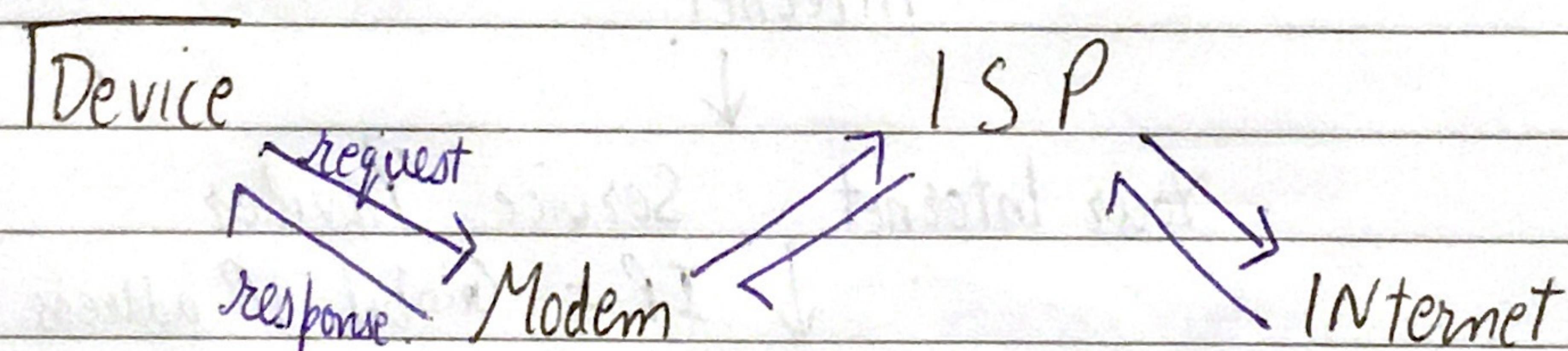
In reality, you are making a request to your modem, which again makes a request to the ISP, which makes a request to internet and which finally reaches google's servers.

Google's servers then send response to your ISP, which sends it to your modem, which sends it to your phone.

The router decides which device sent the request and sends the response through NAT

NAT (Network Access translator):

process that enables one, unique IP address to represent entire group of devices.



Now, the Device received the response, but which application made the request.

IP address defines which device to send data to.

Ports decide which application should receive data.

All application on a device have the same IP address.
they differ from each other using port numbers.

Port number is a 16-bit number.

This means that total port numbers available are

$$2^{16} = 65536$$

Some port numbers are reserved for specific tasks/apps.

e.g.

HTTP = 80

Port 0-1023 → Reserved for tasks

mongoDB = 27017

1024-49152 → for Specific apps

SQL = 1433

Remaining → for personal use.

All countries are connected with wires laid on Ocean beds.

(no, sharks don't eat those wires,
the wires are heavily guarded)

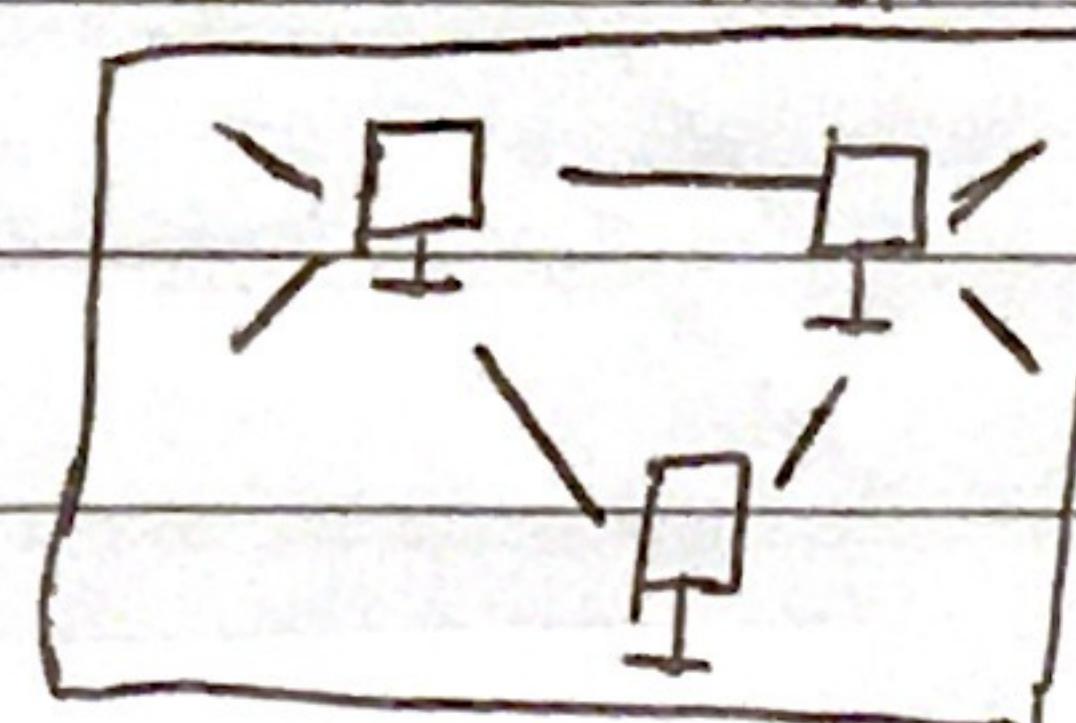
Within a country, various things/devices are connected as-

1) Local Area Network :

Collection of devices connected together in one physical location, such as a building, office or home.

LAN can be small or large, ranging from home network with one user to an enterprise network with thousands of users and devices in an office.

Regardless of size, a LAN's single defining characteristic is that it connects devices that are in a limited area.



2) WAN (Wide Area Network) :

Collection of Local Area Networks or other networks that communicate with each other.

WAN is essentially a network of networks, with Internet, world's largest WAN.

3.) MAN (Metropolitan Area Network) →

Collection of computers within a metropolitan area, which could be a large city, multiple cities or towns.

MAN is larger than LAN but smaller than WAN.

"metropolitan" doesn't apply implies that it has to be an urban area.

"metropolitan" only implies the size of network.

Some Important terms :-

1.) SONET (Synchronous Optical NETwork) :

SONET defines optical signals and a synchronous frame structure for multiplexed digital traffic

Basically, it is used to transfer large amounts of data over optical fibres without optic synchronization problems over large distances.

2.) Frame Relay →

Packet switching network protocol that is designed to work at data link layer of the network.

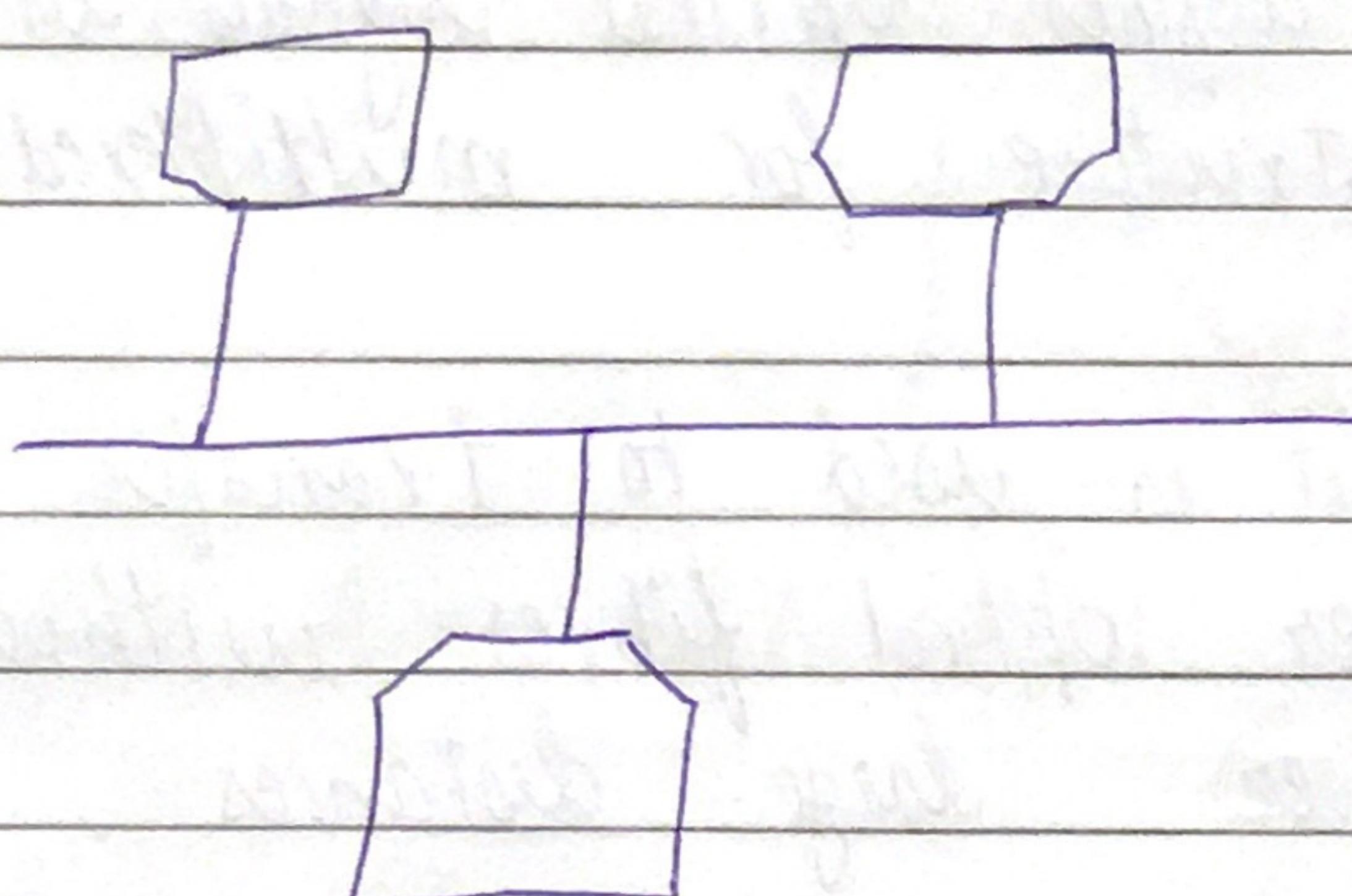
Basically, it is used to connect Local Area Networks (LANs) and transmit data over Wide Area Network (WANs).

Topologies →

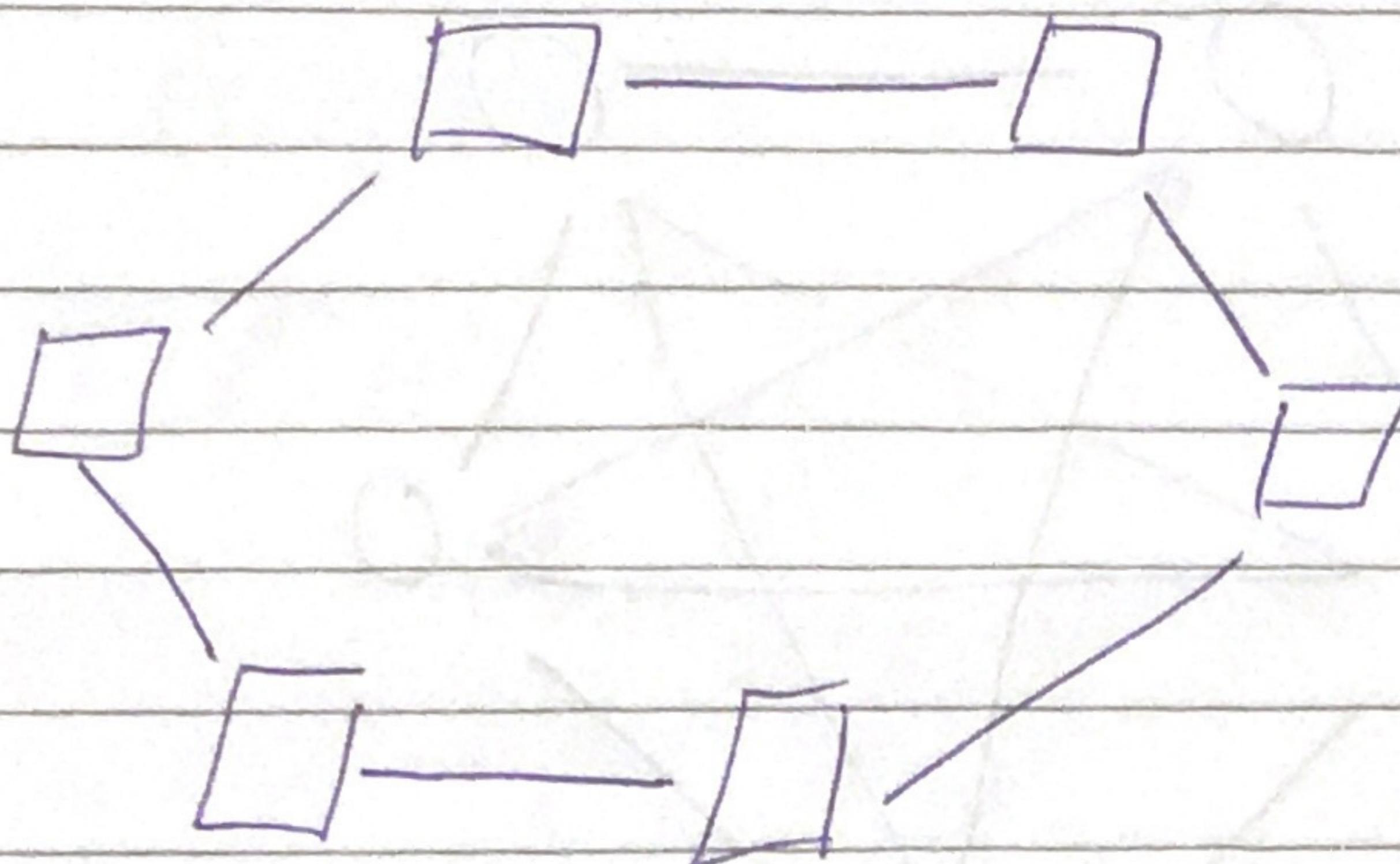
The arrangement of networks that comprises nodes and connecting lines via sender and receiver is referred to as network topology.

Various topologies are →

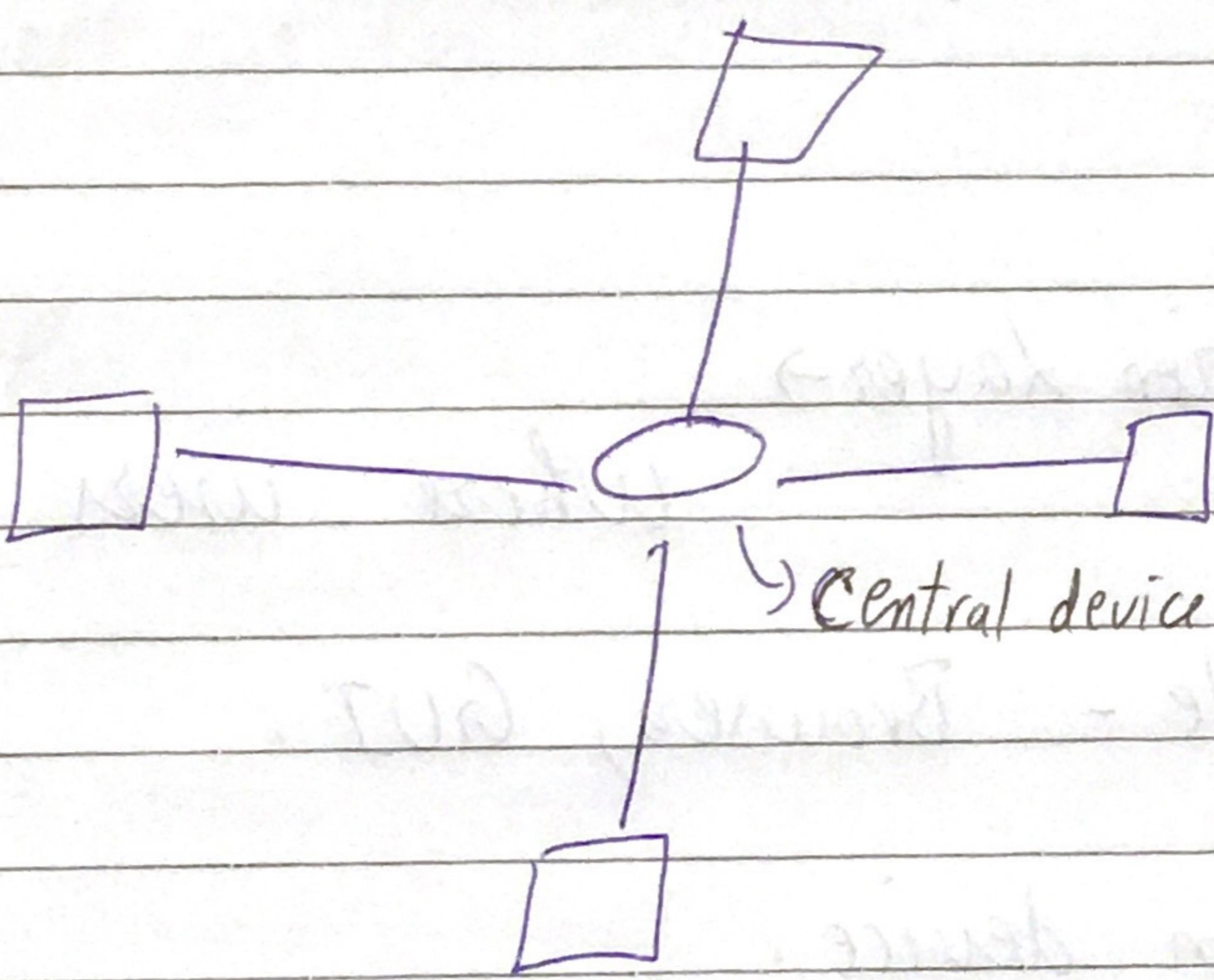
1.) BUS topology →



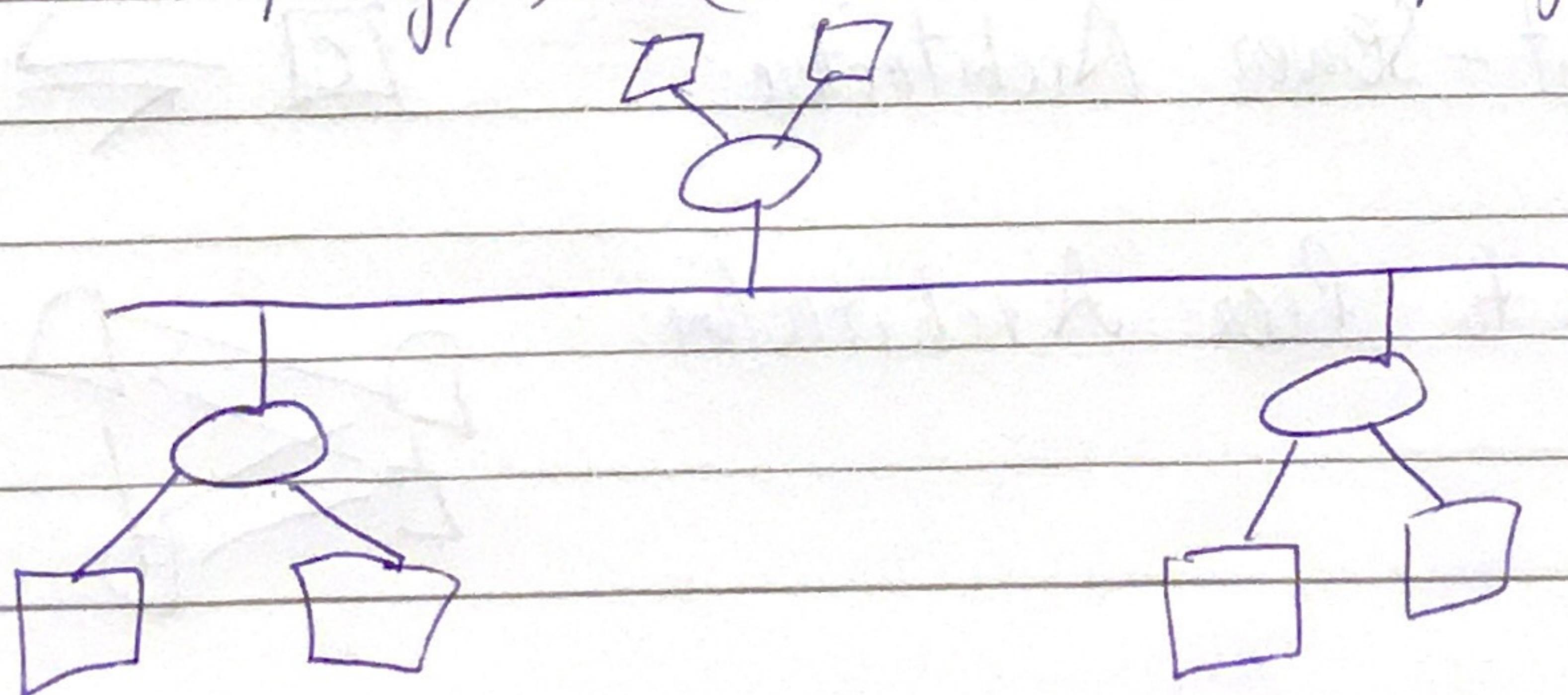
2.) Ring topology →



3.) Star topology →



4.) TREE topology → (BUS + STAR) topology



5.) Mesh topology →

