

# COMPUTER NETWORK

- *A computer network is an interconnection of various computer systems located at different places*
- Two or more computers are linked together with a medium and data communication devices for the purpose of communicating data and sharing resources
- *The computer that provides resources to other computers on a network is known as **server**.*
- *Individual computers in the network, which access shared network resources, are known as nodes.*

# Introduction To INTERNET

- **What is the Internet?**
  - The internet in simple terms is a network of the interlinked computer networking worldwide, which is accessible to the general public. These interconnected computers work by transmitting data through a special type of packet switching which is known as the IP or the internet protocol.



# Internet Service Providers (ISPs)

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The Internet today is run by private companies, not the government.

□ There are four levels of ISP:

□ international service providers

■ connect nations together.

□ national service providers

■ backbone networks created and maintained by specialized companies.

■ it provide connectivity between the end users, these backbone

■ networks are connected by complex switching station

□ regional service providers

■ smaller ISPs that are connected to one or more national ISPs.

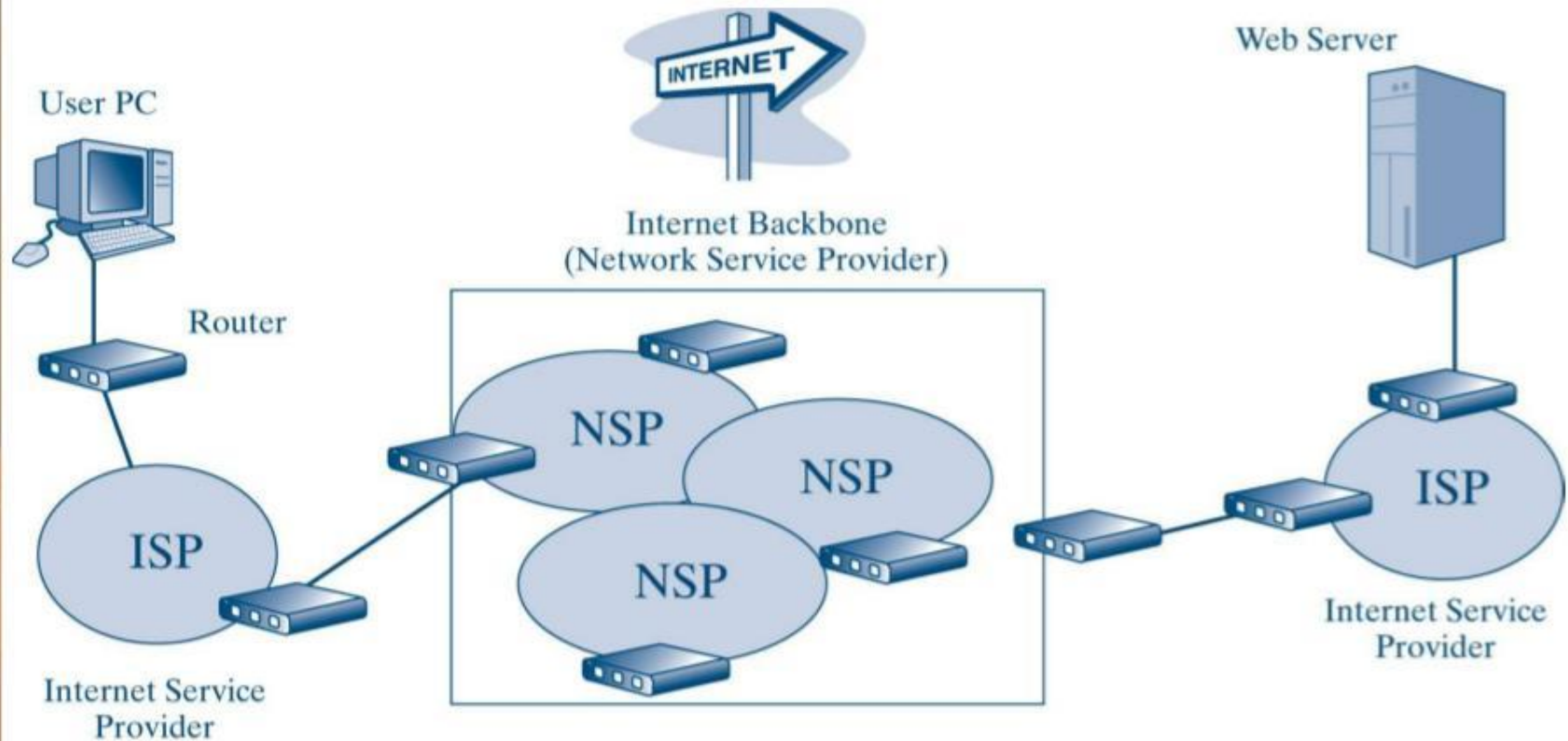
□ local service providers

■ provide direct service to the end users.

Benouzza Elbouzan" Data communications and Networking



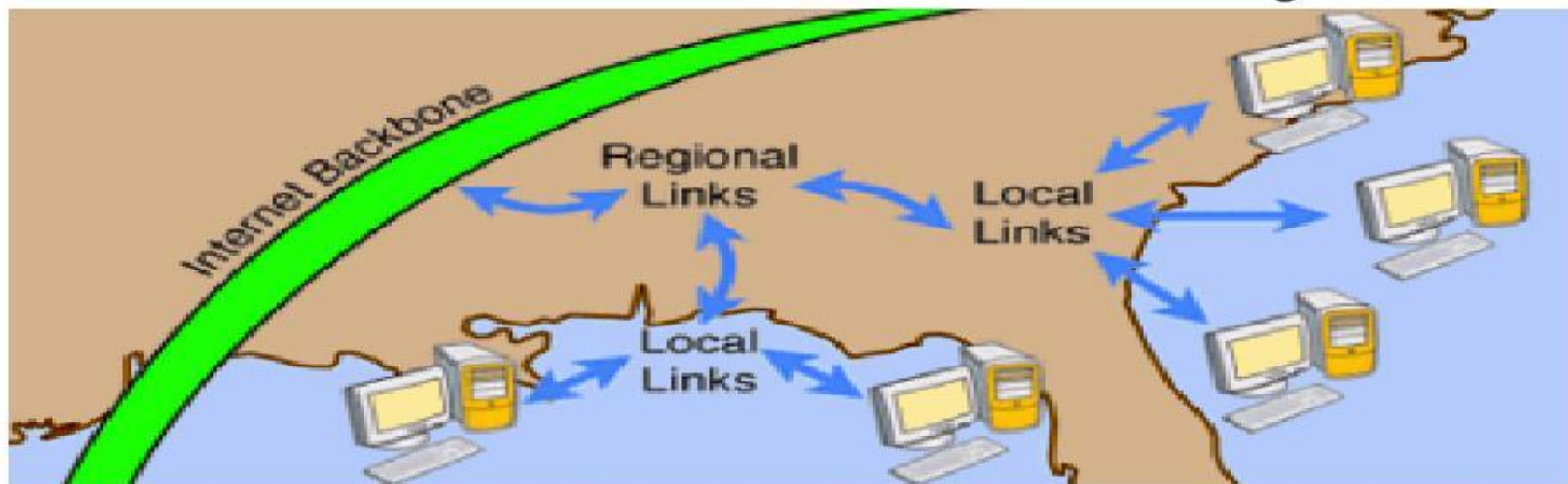
# Internet Service Providers





# The Internet Backbone

- Internet backbone 主干网
  - Major internet communication links.
- Network service provider (NSP 网络服务提供商)
  - Construct and maintain the Internet backbone, such as AT&T
- Network access point (NAP 网络访问点) – point on the Internet where several connections converge



# **The Need for a Computer Network**

- Advantage
  - Communication
  - Resources Sharing
  - Centralized Data Management
  - Software Sharing
  - Backup
  - Centralized Administration

# How many kinds of Networks?

- Depending on one's perspective, we can classify networks in different ways
  - Based on **transmission media**: Wired (UTP, coaxial cables, fiber-optic cables) and Wireless
  - Based on **network size**: LAN and WAN (and MAN)
  - Based on **management method**: Peer-to-peer and Client/Server
  - Based on **topology** (connectivity): Bus, Star, Ring ...
    - :
    - :



# Types of Network



```
graph TD; A[Types of Network] --> B[PAN  
Personal Area Network]; A --> C[LAN  
Local Area Network]; A --> D[MAN  
Metropolitan Area Network]; A --> E[WAN  
Wide Area Network];
```

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**PAN**

Personal  
Area Network

**LAN**

Local Area  
Network

**MAN**

Metropolitan  
Area Network

**WAN**

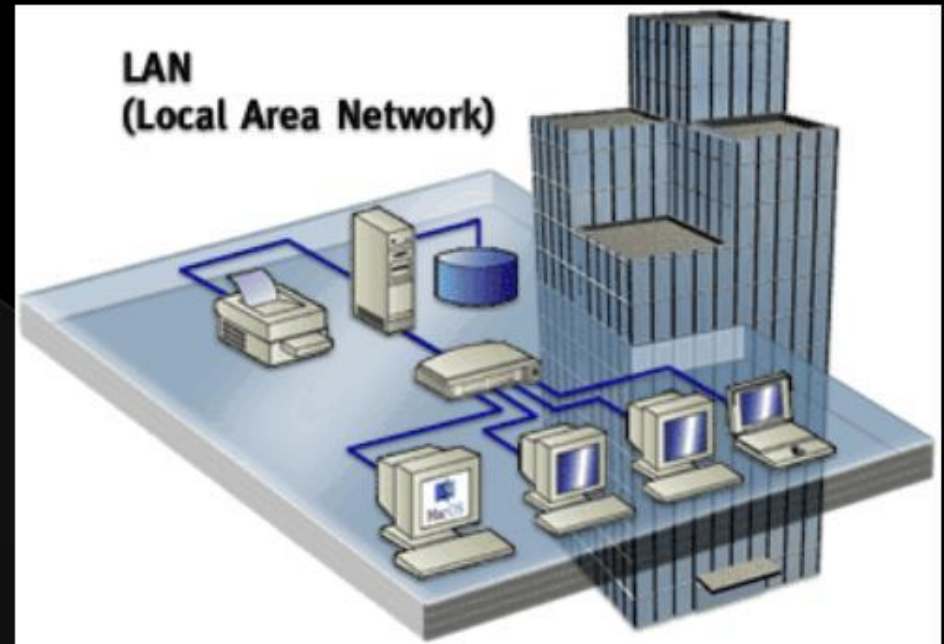
Wide Area  
Network



# TYPES OF NETWORKS

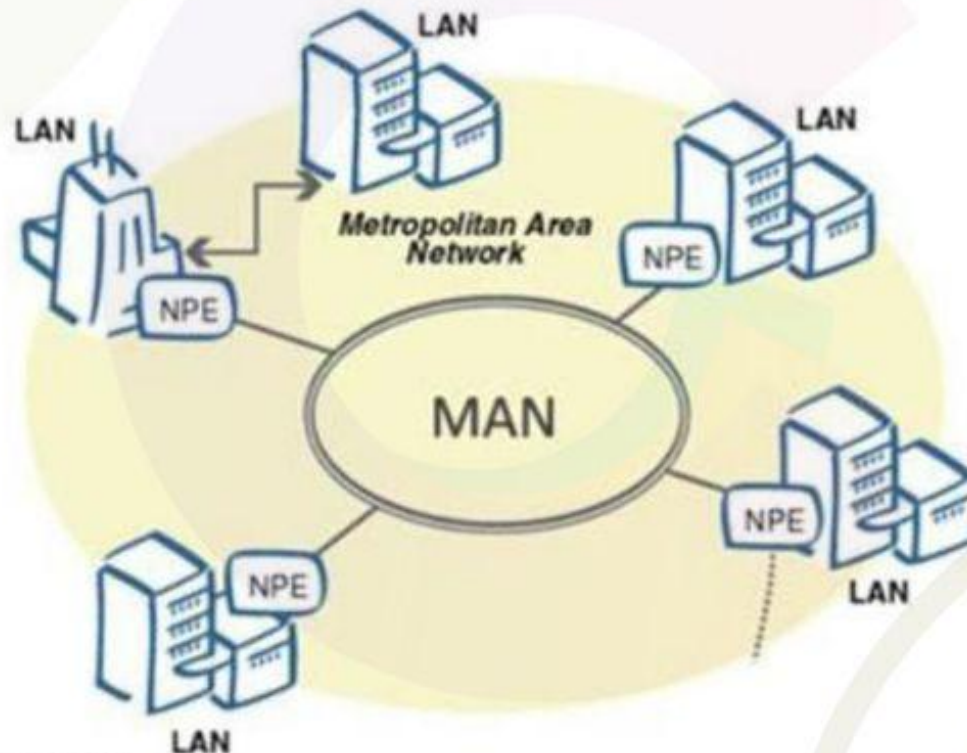
## Local area network:

A computer network that physically links two or more computers within a geographic limited area such as a building. The linked computers are called workstations.

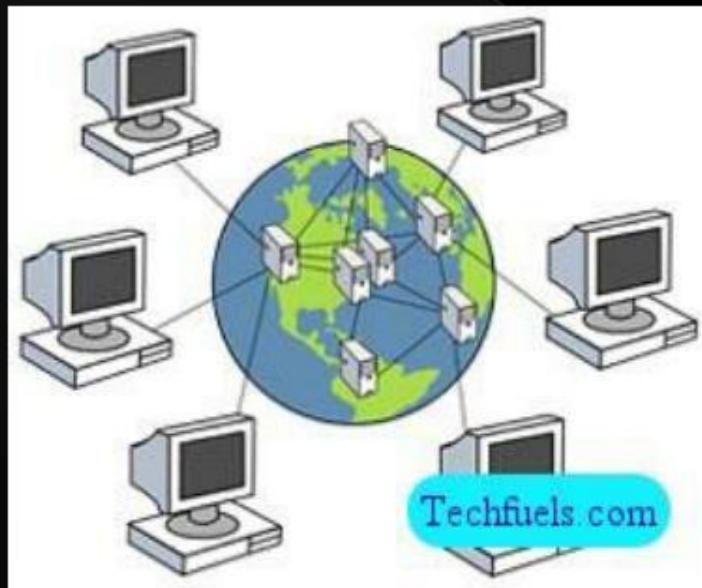


# Metropolitan Area Network (MAN)

A MAN is a computer network that interconnects users with computer resources in a geographic area or region larger than that covered by even a large LAN .



# TYPES OF NETWORKS



Wide area network:

Wide area network connect larger geographic areas, such as countries.

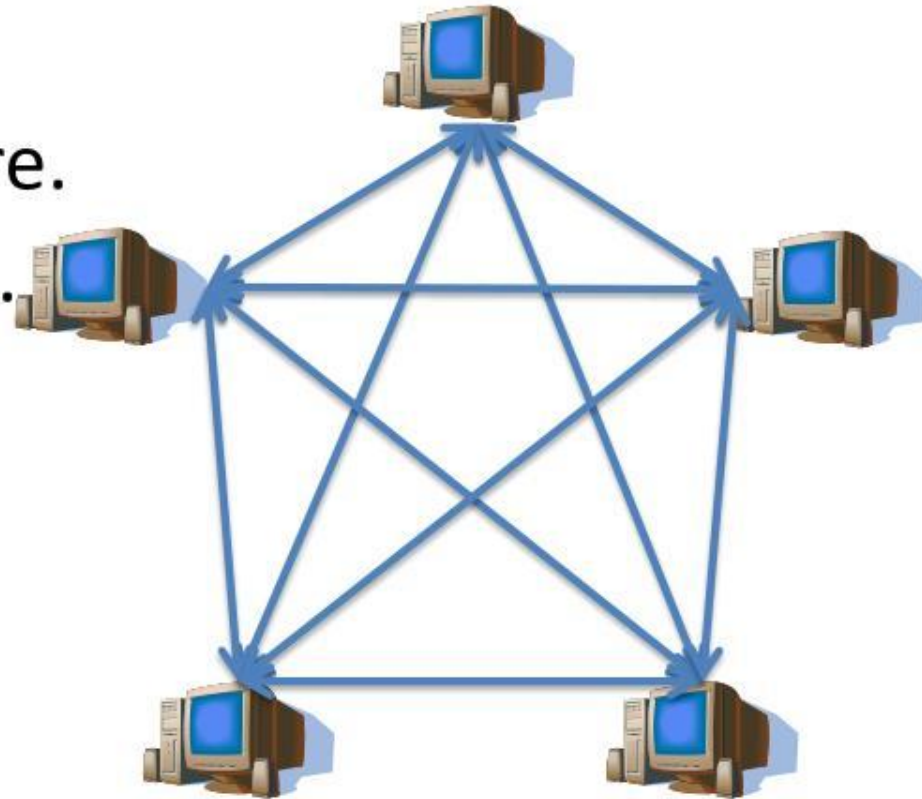
# PEER TO PEER ARCHITECTURE

## Advantages:

- No single point of failure.
- Can scale with demand.

## Disadvantages:

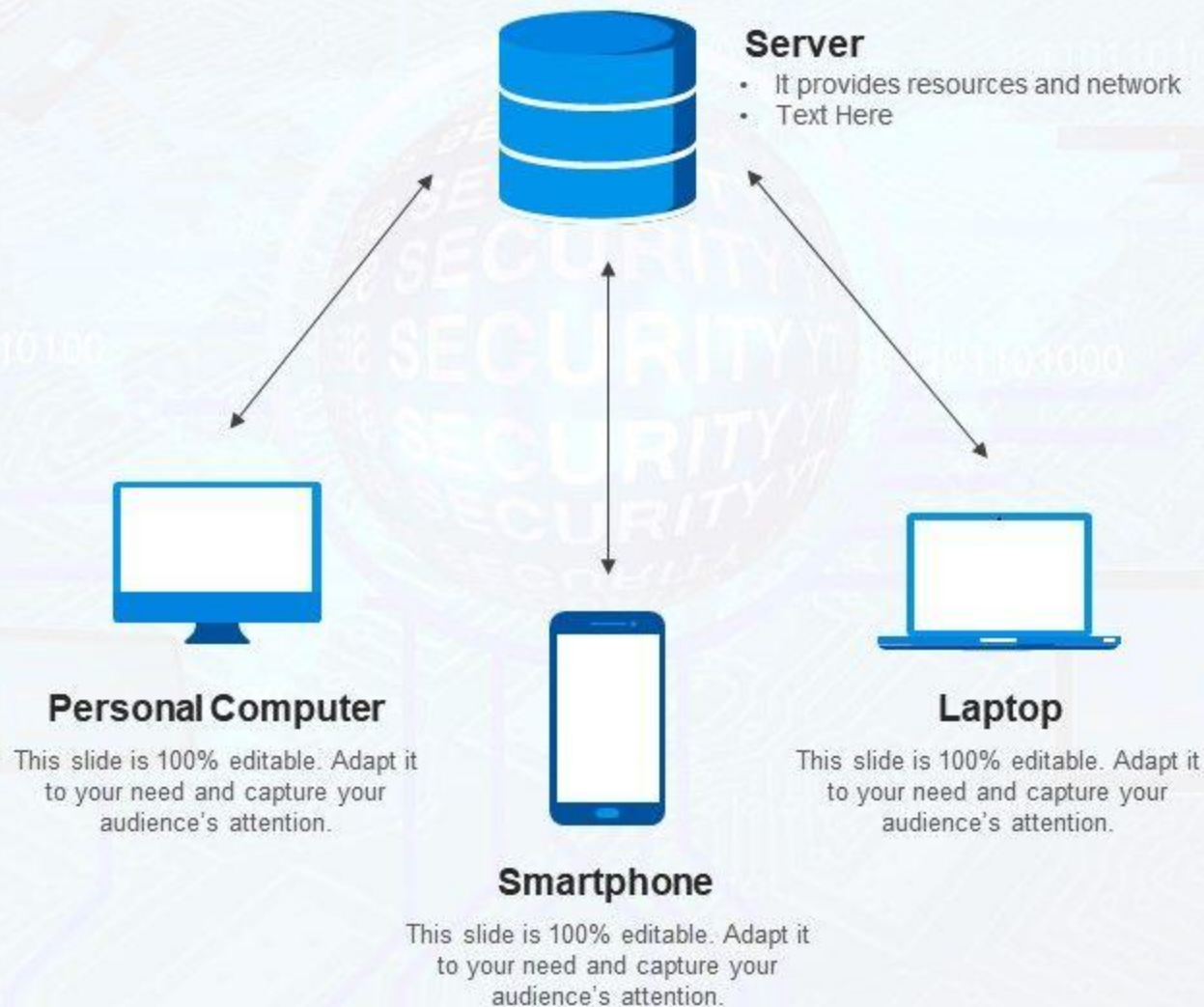
- Gets pretty complex.
- Inefficient communication.





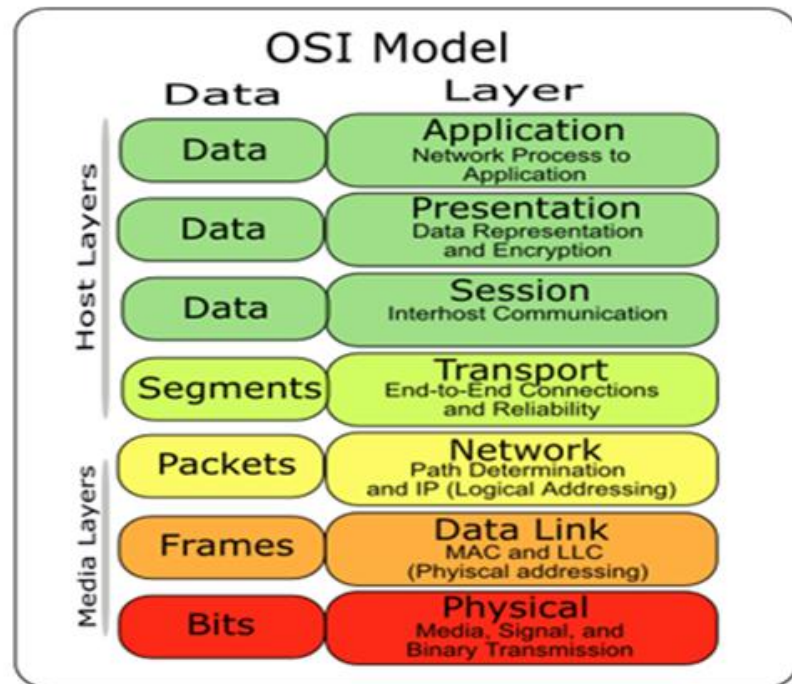
# Examples of Client Server Model

This slide is 100% editable. Adapt it to your need and capture your audience's attention.



# What is OSI Reference Model ?

- The OSI reference Model consist of seven layers that represent a functional division of the tasks required to implement a network.
- A layer is a collection of conceptually similar functions.



## OSI Model

7	Application	FTP, TFTP, HTTP, SMTP, DNS, TELNET, SNMP
6	Presentation	Very little focus
5	Session	
4	Transport	TCP (the Internet)
3	Network	IP (the Internet)
2	Data Link	Ethernet
1	Physical	





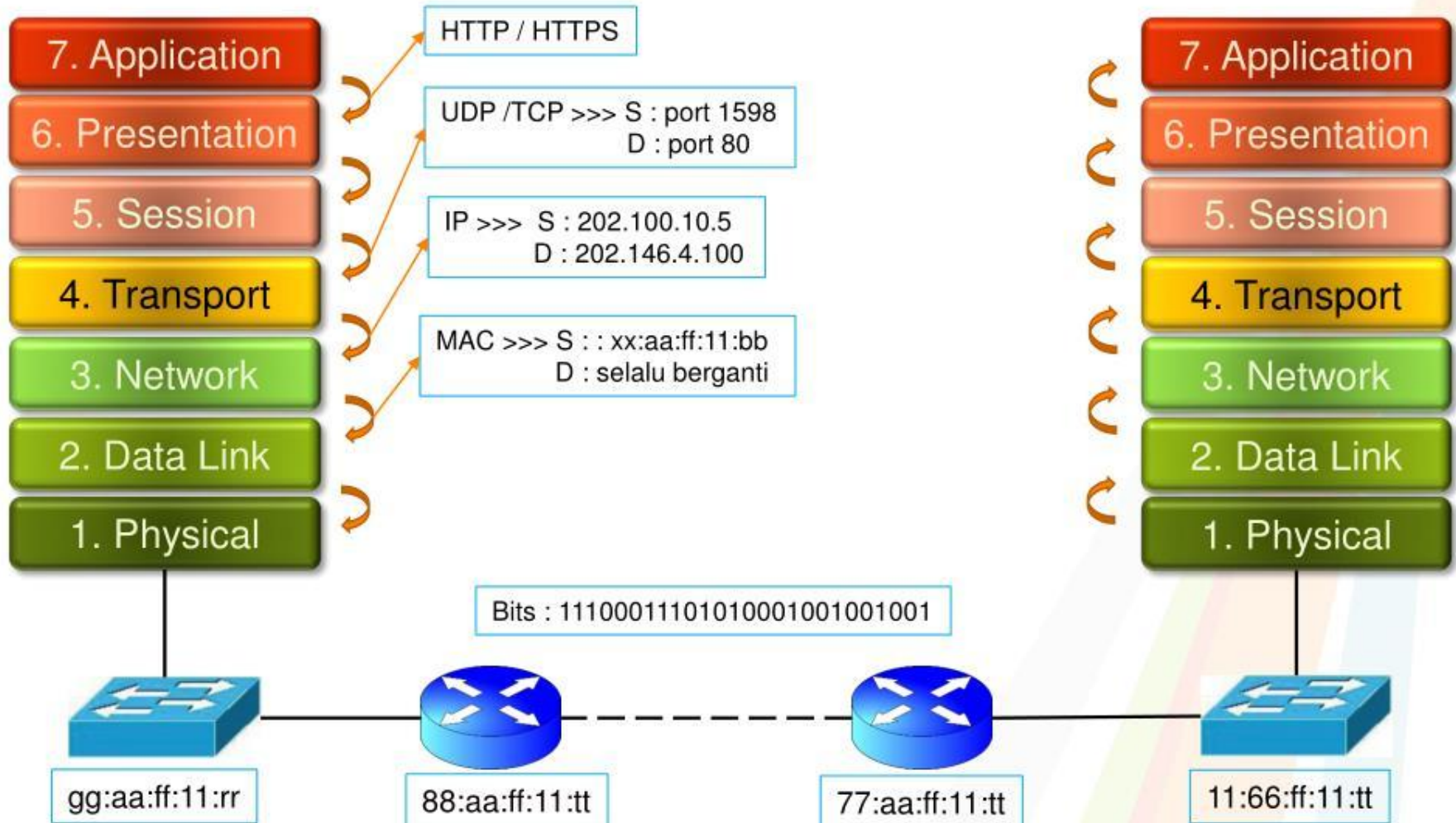
# Penerapan OSI Layer



Ip : 202.100.10.5  
Go to : [kompas.com](http://kompas.com) (DNS)  
MAC : xx:aa:ff:11:bb

[www.kompas.com](http://www.kompas.com)

apache  
Ip : 202.146.4.100





# *TCP/IP Reference Model*

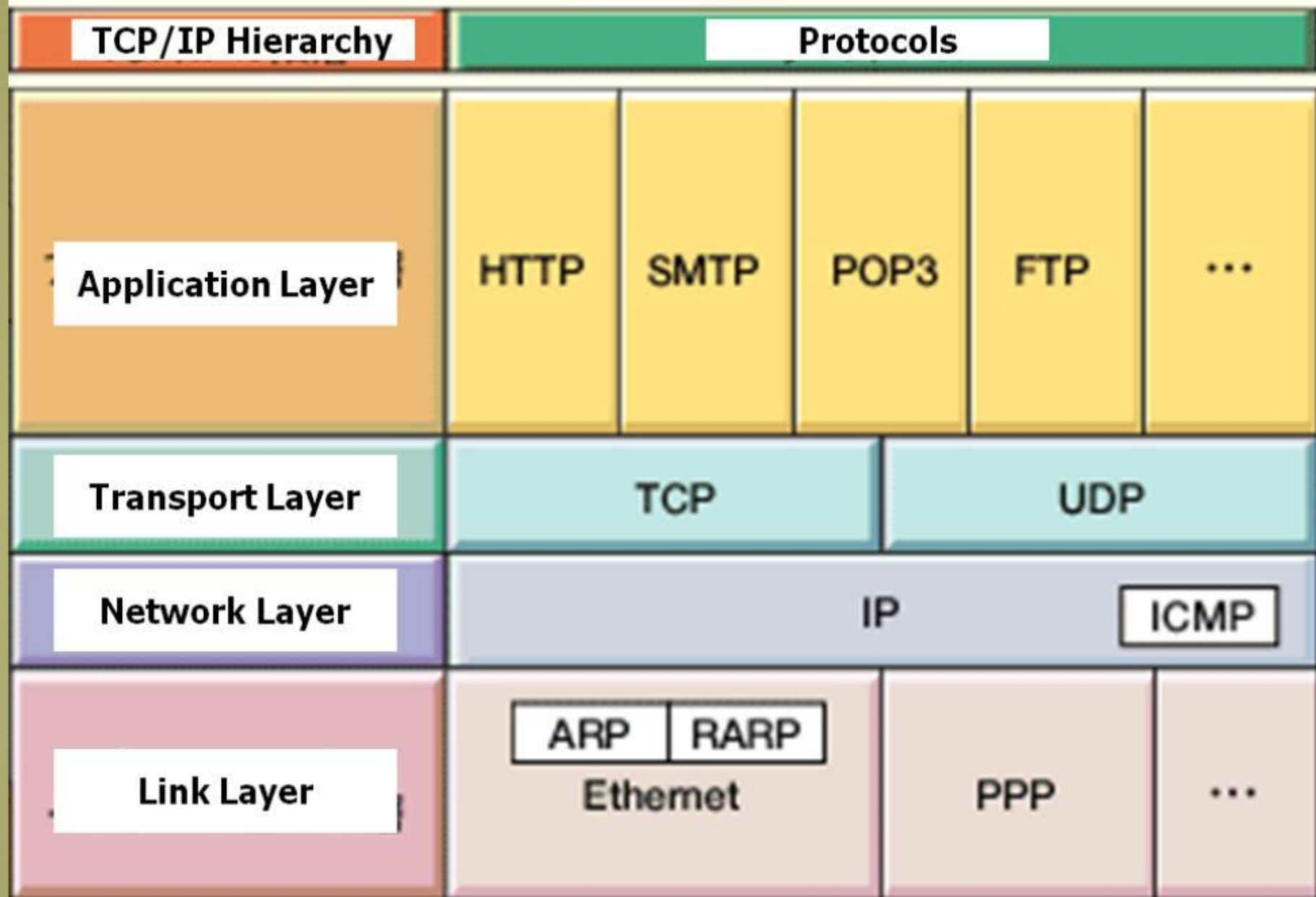


- **TCP/IP** is a set of protocols developed to allow cooperating computers to share resources across a network.
- TCP/IP reference model forms the base of present day Internet.
- **TCP** stands for “Transmission Control Protocol”.
- **IP** stands for “Internet Protocol”.

# Introduction



- TCP/IP is a suite of protocols that enables the Internet to work as it does today.
- It is split into four layers, which work together in order to allow for various devices to communicate with each other over various networks.
- TCP/IP is used in just about every networked device found in modern society, including desktop computers, laptops, cell phones, and gaming consoles.



# Direction of Data Flow

- Simplex



- Half Duplex

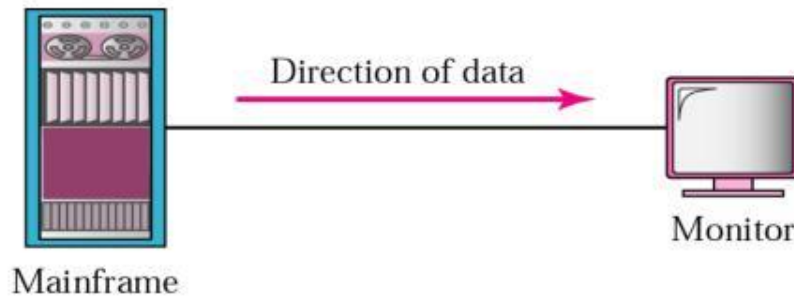


- Duplex (or Full duplex)

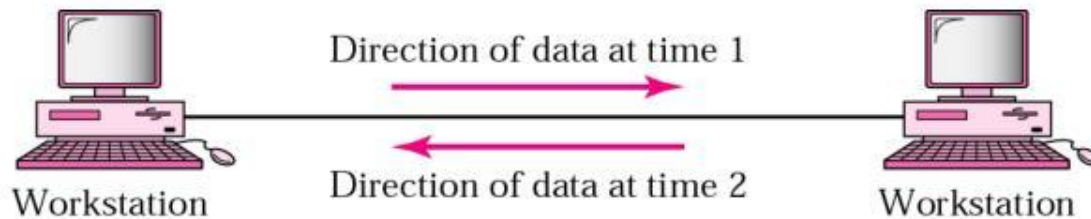




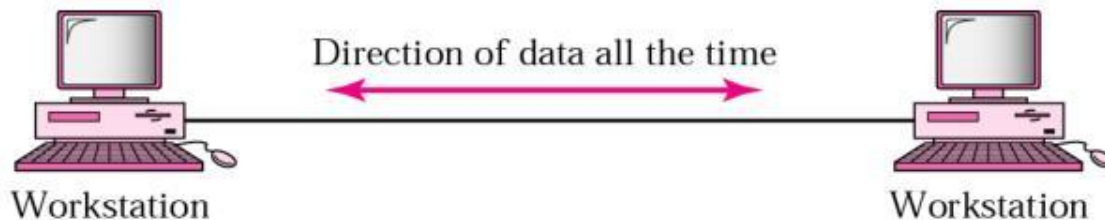
# Direction of data flow



Simplex



Half Duplex



Full Duplex

# Data Flow: Simplex

- ⌘ Transmits in only one direction
- ⌘ rarely used in data communications
- ⌘ e.g., receiving signals from the radio or TV station
- ⌘ the sending station has only one transmitter, the receiving station has only one receiver

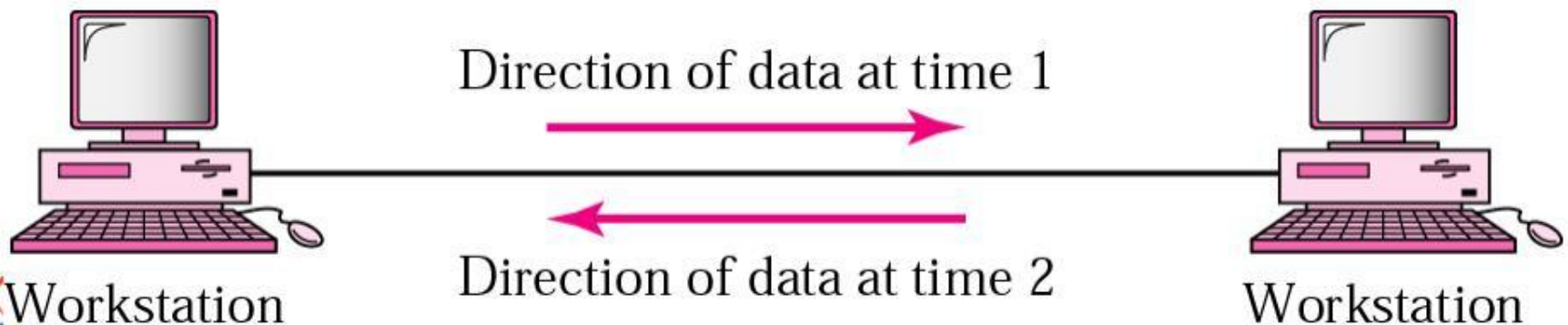


# Direction of data flow

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## 2. half duplex :

Each station can both transmit and receive , **but not at the same time**. When one device is sending the other can receive and vice versa. one-lane road with two direction).



# Data Flow: Full Duplex

- ⌘ complete two-way simultaneous transmission
- ⌘ faster than half-duplex communication because no turnaround time is needed



# Simple Physical Topologies

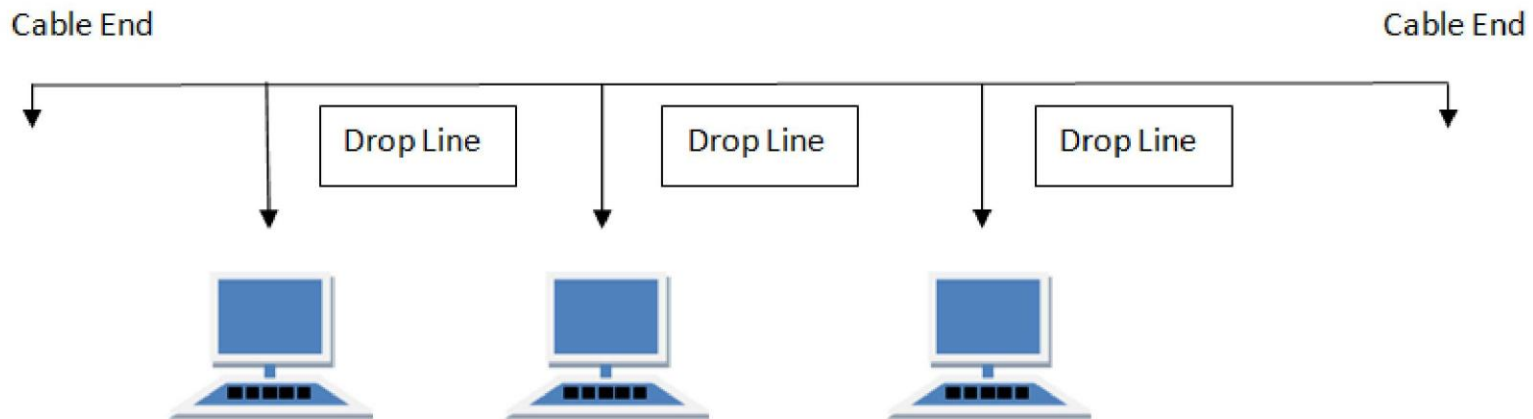
- Physical topology: physical layout of nodes on a network
- Three fundamental shapes:
  - Bus
  - Ring
  - Star
- May create hybrid topologies
- Topology integral to type of network, cabling infrastructure, and transmission media used

# Bus Topology

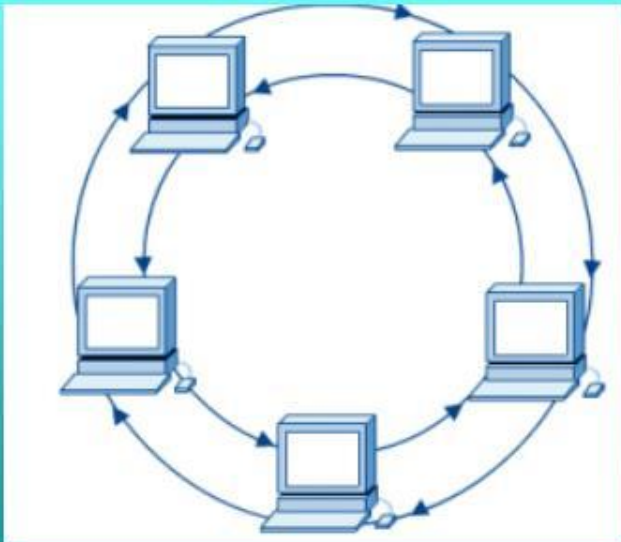
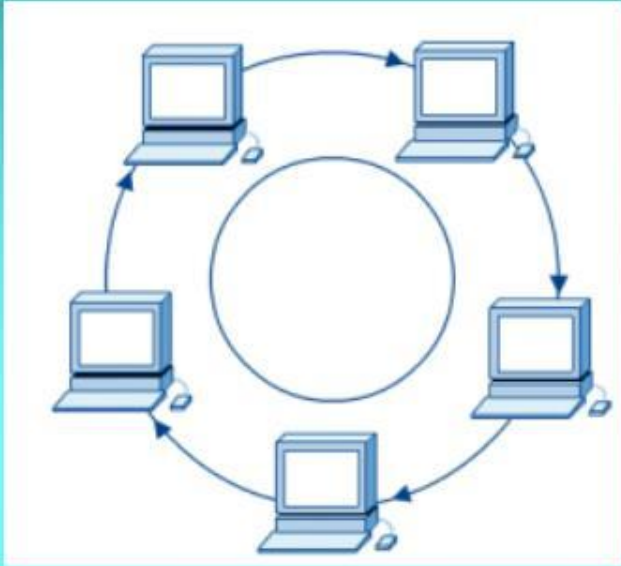
- Bus topology is a network type in which every computer and network device is connected to single cable. When it has exactly two endpoints, then it is called **Linear Bus topology**.

## Features of Bus Topology

- It transmits data only in one direction.
- Every device is connected to a single cable



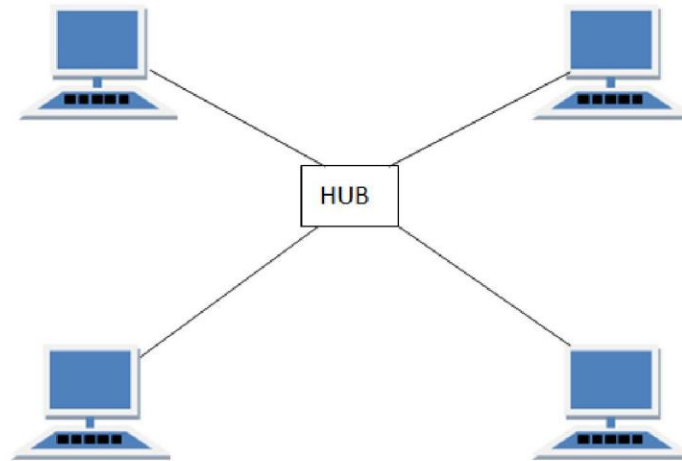
# Ring Topology



- A frame, called a token, travels around the ring and stops at each node.
- If a node wants to transmit data, it adds that data and the addressing information to the frame.
- The frame continues around the ring until it finds the destination node, which takes the data out of the frame.
- The advantage of using this method is that there are no collisions of data packets.

# Star Topology

In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all other nodes are connected to the central node.



## Features of Star Topology

1. Every node has its own dedicated connection to the hub.
2. Hub acts as a repeater for data flow.
3. Can be used with twisted pair, Optical Fibre or coaxial cable.



# Mesh Topology

## Types of Mesh Topology

**Partial Mesh Topology :** In this topology some of the systems are connected in the same fashion as mesh topology but some devices are only connected to two or three devices.

**Full Mesh Topology :** Each and every nodes or devices are connected to each other.

## Features of Mesh Topology

Fully connected.

Robust.

Not flexible.

## Advantages of Mesh Topology

Each connection can carry its own data load.

It is robust.

Fault is diagnosed easily.

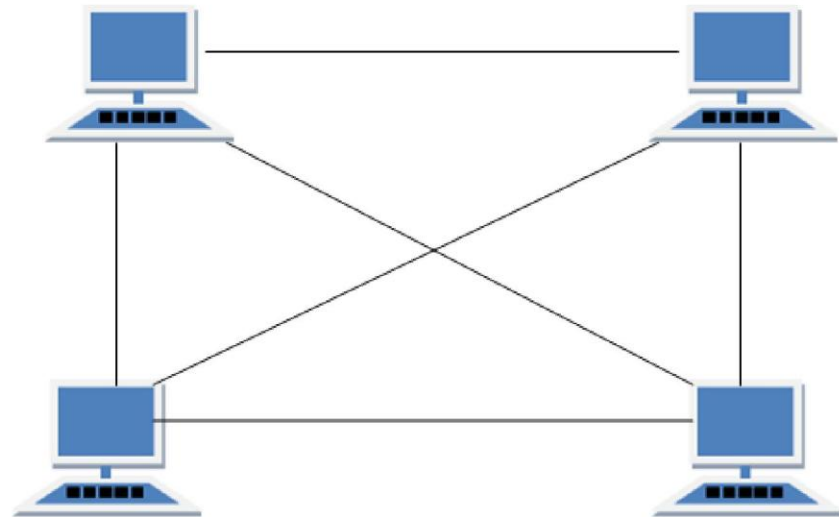
Provides security and privacy.

## Disadvantages of Mesh Topology

Installation and configuration is difficult.

Cabling cost is more.

Bulk wiring is required.



# Tree Topology

It has a root node and all other nodes are connected to it forming a hierarchy. It is also called hierarchical topology. It should at least have three levels to the hierarchy.

## Features of Tree Topology

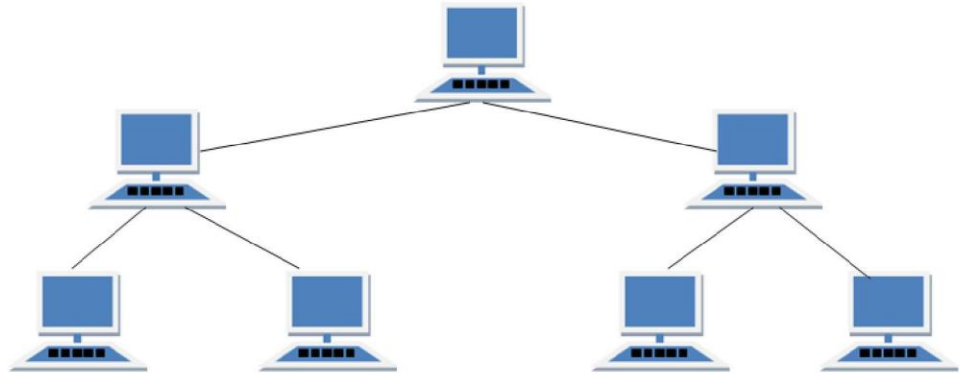
Ideal if workstations are located in groups.  
Used in Wide Area Network.

## Advantages of Tree Topology

Extension of bus and star topologies.  
Expansion of nodes is possible and easy.  
Easily managed and maintained.  
Error detection is easily done.

## Disadvantages of Tree Topology

Heavily cabled.  
Costly.  
If more nodes are added maintenance is difficult.  
Central hub fails, network fails.



# Hybrid Topology

It is two different types of topologies which is a mixture of two or more topologies. For example if in an office in one department ring topology is used and in another star topology is used, connecting these topologies will result in Hybrid Topology (ring topology and star topology).

## Features of Hybrid Topology

It is a combination of two or topologies

Inherits the advantages and disadvantages of the topologies included

## Advantages of Hybrid Topology

Reliable as Error detecting and trouble shooting is easy.

Effective.

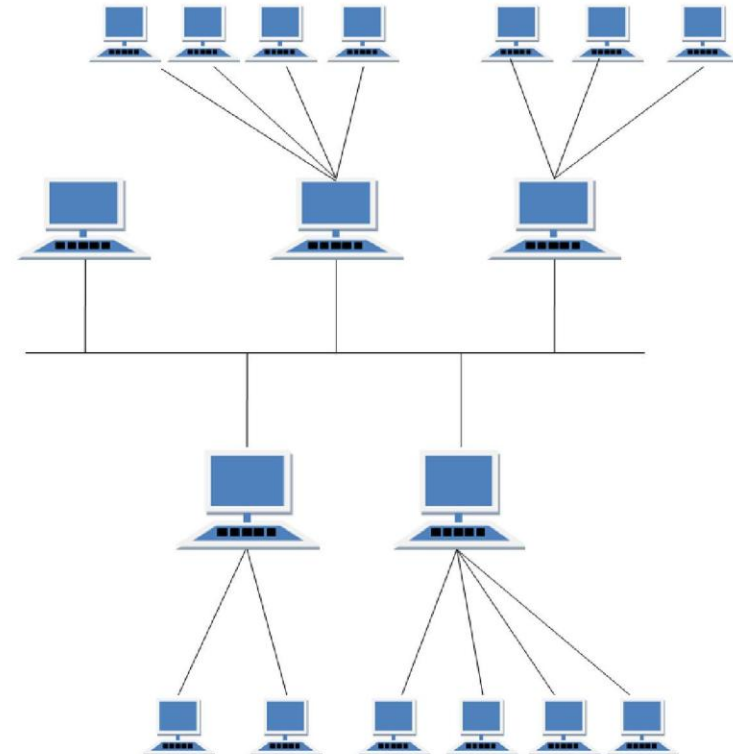
Scalable as size can be increased easily.

Flexible.

## Disadvantages of Hybrid Topology

Complex in design.

Costly.



# Transmission Media

- Physical path between transmitter and receiver
- Wired and Wireless
- Communication is in the form of electromagnetic waves
- Characteristics and quality of data transmission are determined by characteristics of medium and signal
- In wired media, medium characteristics is more important, whereas in wireless media, signal characteristics is more important



# Transmission Media

- Guided media, which are those that provide a conduit from one device to another.
- Examples:  
twisted-pair, coaxial cable, optical fiber.
- Unguided media (or wireless communication) transport electromagnetic waves without using a physical conductor.
- Instead, signals are broadcast through air (or, in a few cases, water), and thus are available to anyone who has a device capable of receiving them.

# Twisted Pair

- Separately insulated
- Twisted together
- Often "bundled" into cables
- Usually installed in building during construction



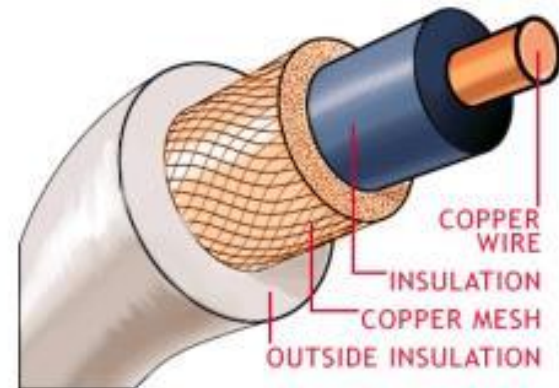
(a) Twisted pair

**Twisted pair is the least expensive and most widely used guided transmission medium.**

- consists of two insulated copper wires arranged in a regular spiral pattern
- a wire pair acts as a single communication link
- pairs are bundled together into a cable
- most commonly used in the telephone network and for communications within buildings

# COAXIAL CABLE

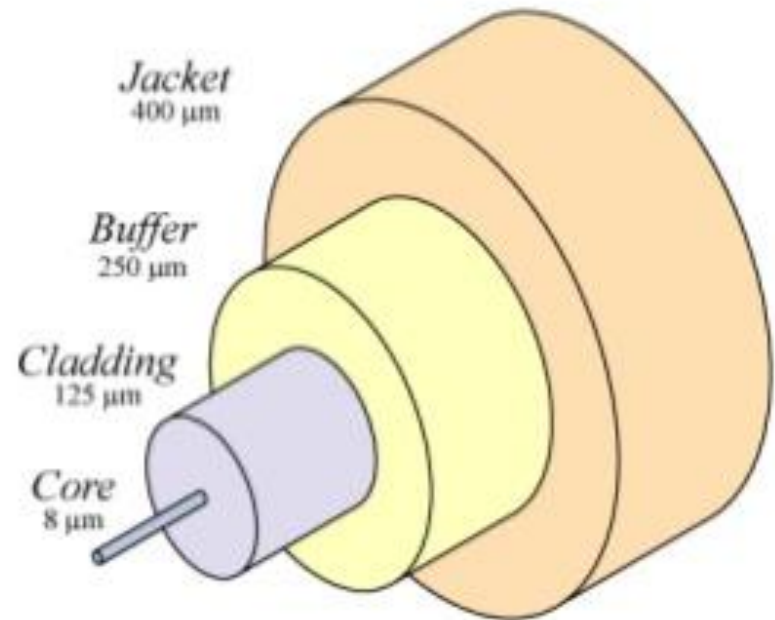
- Definisi: “**Coaxial cable** is an electrical cable consisting of a round, insulated conducting wire, surrounded by an insulating spacer, surrounded by a cylindrical conducting sheath, usually surrounded by a final insulating layer.”- Wikipedia.



- Kegunaan:
  - a) jarak pendek-alatan video rumah, pemasangan stesen radio amatur.
  - b) jarak jauh- penyambungan rangkaian radio dan TV

# Optical Fiber

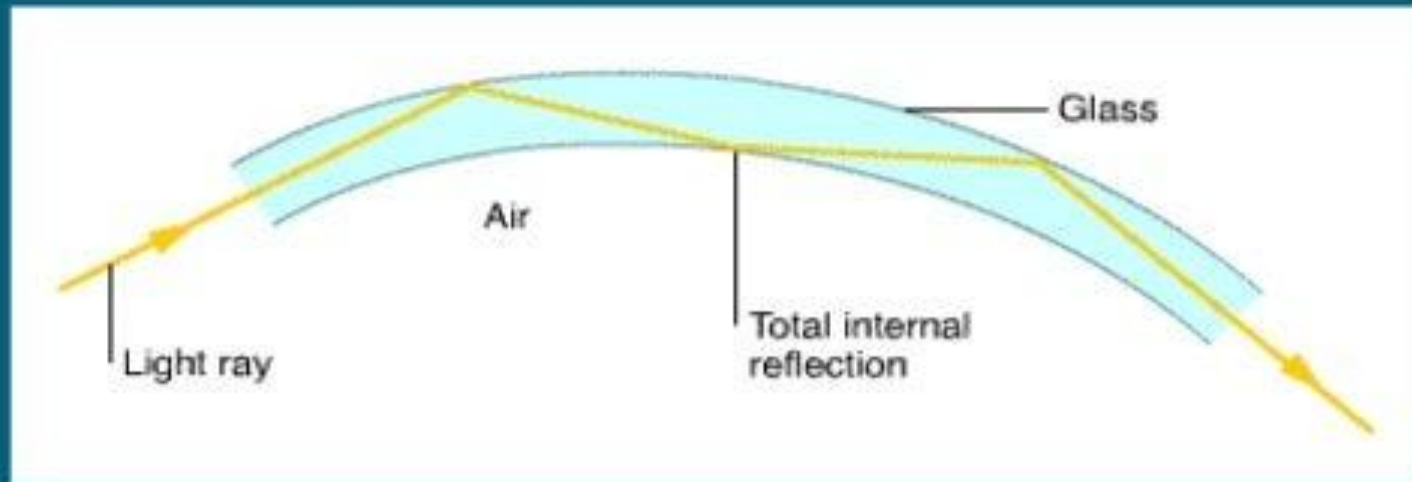
- Core
  - Glass or plastic with a higher index of refraction than the cladding
  - Carries the signal
- Cladding
  - Glass or plastic with a lower index of refraction than the core
- Buffer
  - Protects the fiber from damage and moisture
- Jacket
  - Holds one or more fibers in a cable





# Working principle

- Total Internal Reflection(TIR)



- When an ray of light travels from a denser to a rarer medium such that the angle of incidence is greater than the critical angle, the ray reflects back into the same medium this phenomena is called TIR.
- In the optical fiber the rays undergo repeated total number of reflections until it emerges out of the other end of the fiber, even if fiber is bend.

# Unguided Media

- Wireless.
- Transport electromagnetic waves.
- Signals are broadcast through free space and thus available to everyone.
- Unguided signals can travel from the source to destination through:
  1. Ground Propagation
  2. Sky Propagation
  3. Line-of-sight Propagation
- Wireless transmission waves:
  1. Radio waves
  2. Microwave
  3. Infrared waves