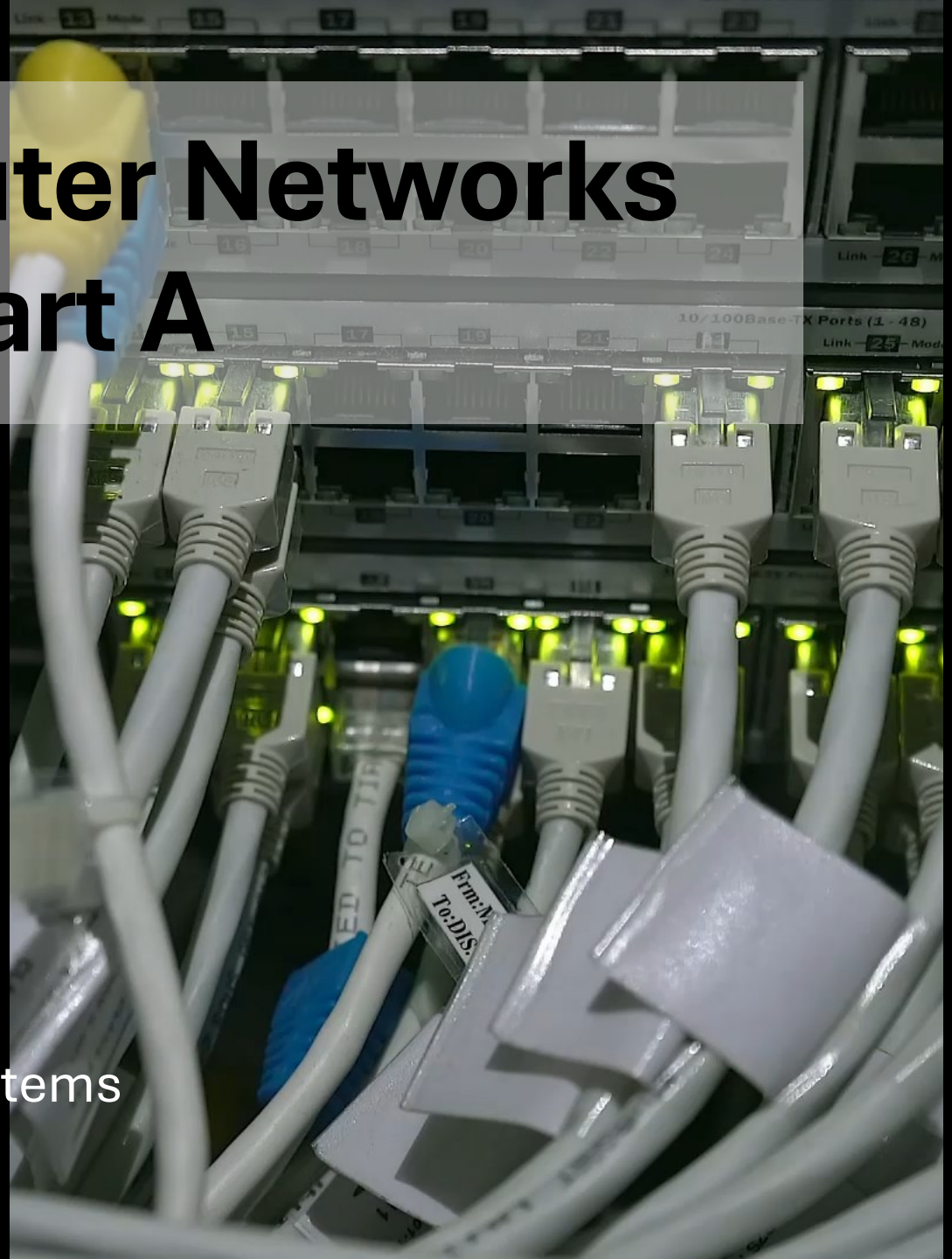
IT1201 Computer Networks
Lecture 01 – Part A



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BSc (Hons) in Information Systems

References

1. Data Communication and Networking – *5 th Edition Behrouz A. Forouzan (Author)*
2. Computer Networking: A Top-Down Approach -*7 th Edition James Kurose (Author), Keith Ross (Author)*

Evaluation Criteria

- Continuous Assessment 40%
  - Assessment 01 (20%)
  - Assessment 02 (20%)
- End Semester Examination 60%
- Number of Credits - 03

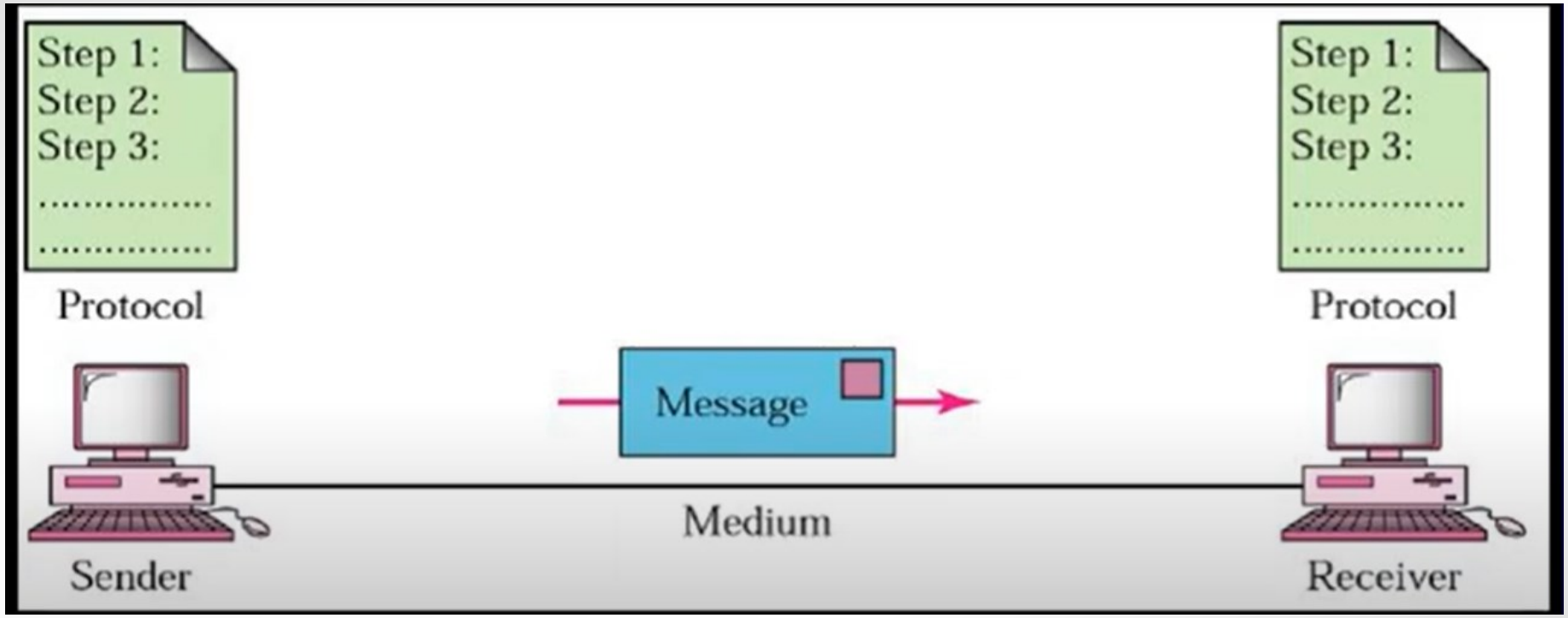
Remember!!!

- 80% attendance should be there to sit for the final examination
- **DO NOT SIGN FOR OTHERS**
- In the 7th week students will be given notices regarding their attendance up to that week
- Pass CA minimum marks that you need to score – 12
- Pass FE minimum marks that you need to score – 28
- **Without doing any CA you can’t sit for the Final Examination**

Data Communication

What is Data Communication?

Data communication is the process of transferring data from one place to another or between two locations.



Components of Data Communication

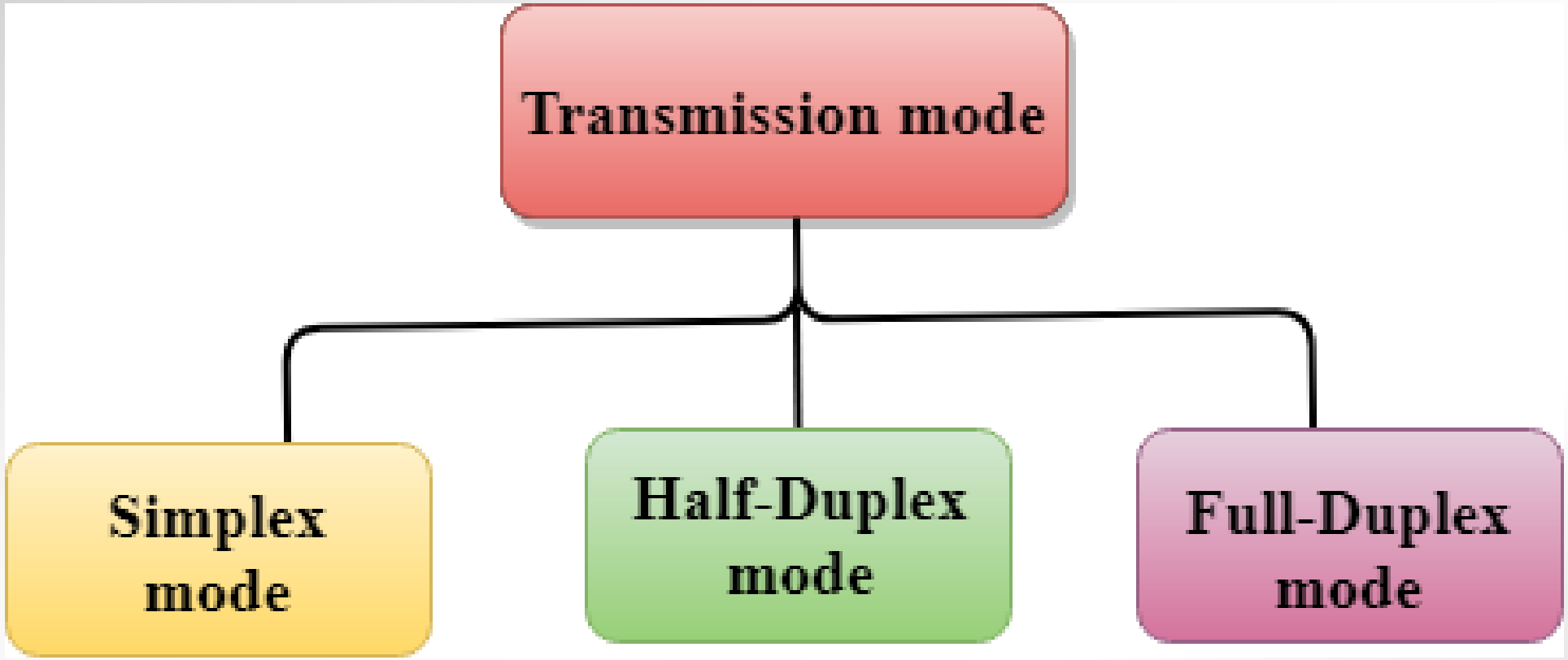
1. **Message**: The data to be transmitted (numbers, text, photos, sound, or video).
2. **Sender:** The computer or device (phone, tablet) that sends the message.
3. **Receiver:** The computer or device that receives the message, which can be different from the sender.
4. **Medium:** The channel through which the message is carried from sender to receiver (twisted pair wire, coaxial cable, fiber optic cable, wireless).
5. **Protocol:** The set of rules that govern the communication between computers. These rules are followed by both the sender and receiver.

Data Transmission

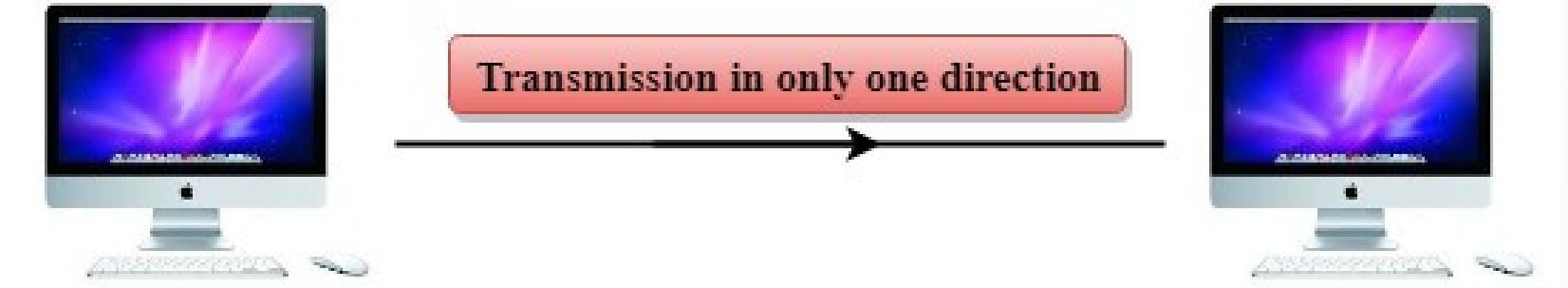
What is Data Transmission

- The way of data is transmitted from one device to another device.
- It is also known as the communication mode.
- It has a direction.
- The transmission mode is defined in the **physical layer.**

The Types of Data Transmission



Simplex Data Transmission



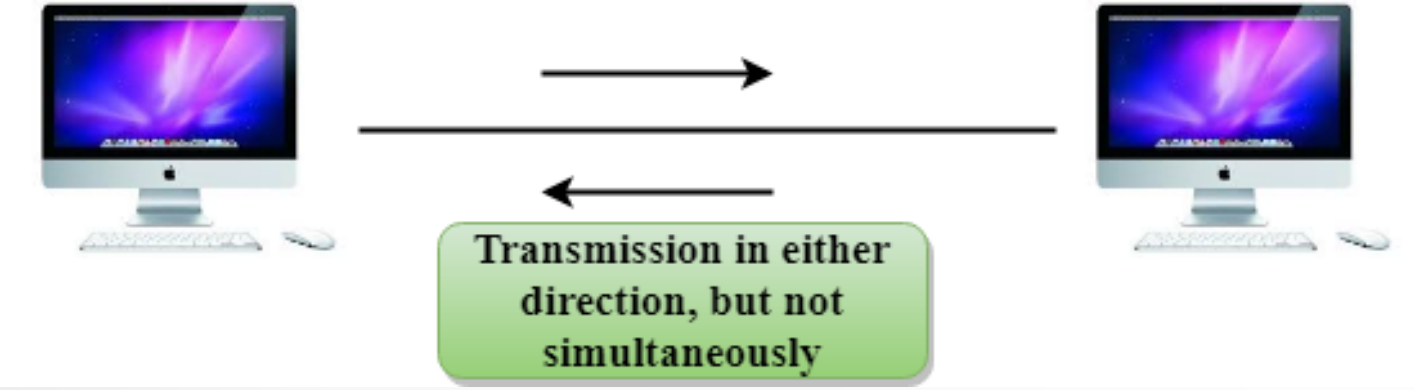
- Transmission can be happened only one direction. (Sending or Receiving)
- Mostly used in the business field.

Advantage: The full capacity of the communication channel can be utilized during transmission.

Disadvantage: Only one side transmission

Ex: Radio Broadcasting, TV channel Broadcasting, Keyboard

Half Duplex Transmission



- Direction can be reversed. It means the station can transmit and receive the data as well but not simultaneously .
- Data can be flowed in both the directions, but not at the same time.
- The entire bandwidth of the communication can be utilized in one direction at a time.

Advantages :

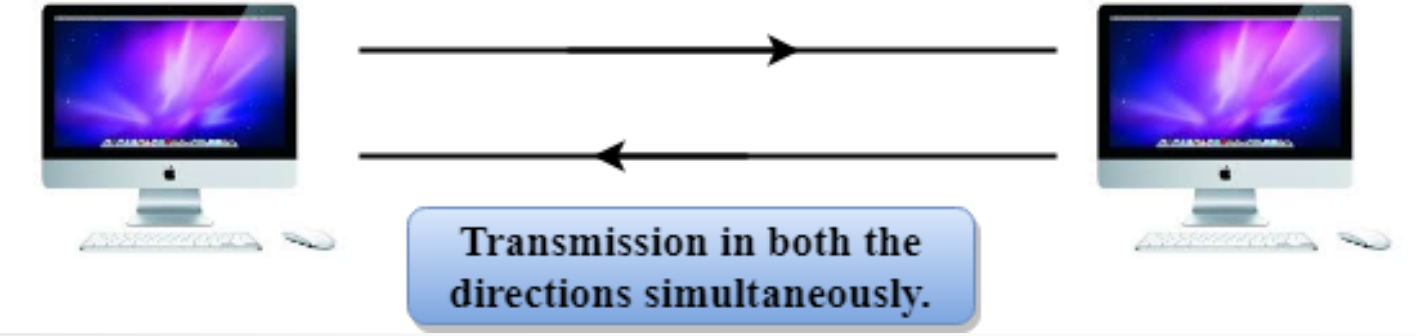
- Both the devices can send and receive the data in one time.
- Can utilize the entire bandwidth of the communication channel during the transmission of data.

Disadvantages :

- When one device is sending the data, then another device will be waiting, hence there may be a delay when sending the data at the right time.

Ex: Walkie-talkie

Full Duplex Transmission



- The data flow in both the directions.
- The fastest mode of communication between devices.

Advantage: Both the stations can send and receive the data at the same time.

Disadvantage : the capacity of the communication channel is divided into two parts.

Ex: Telephone, Mobile Phone

Computer Network

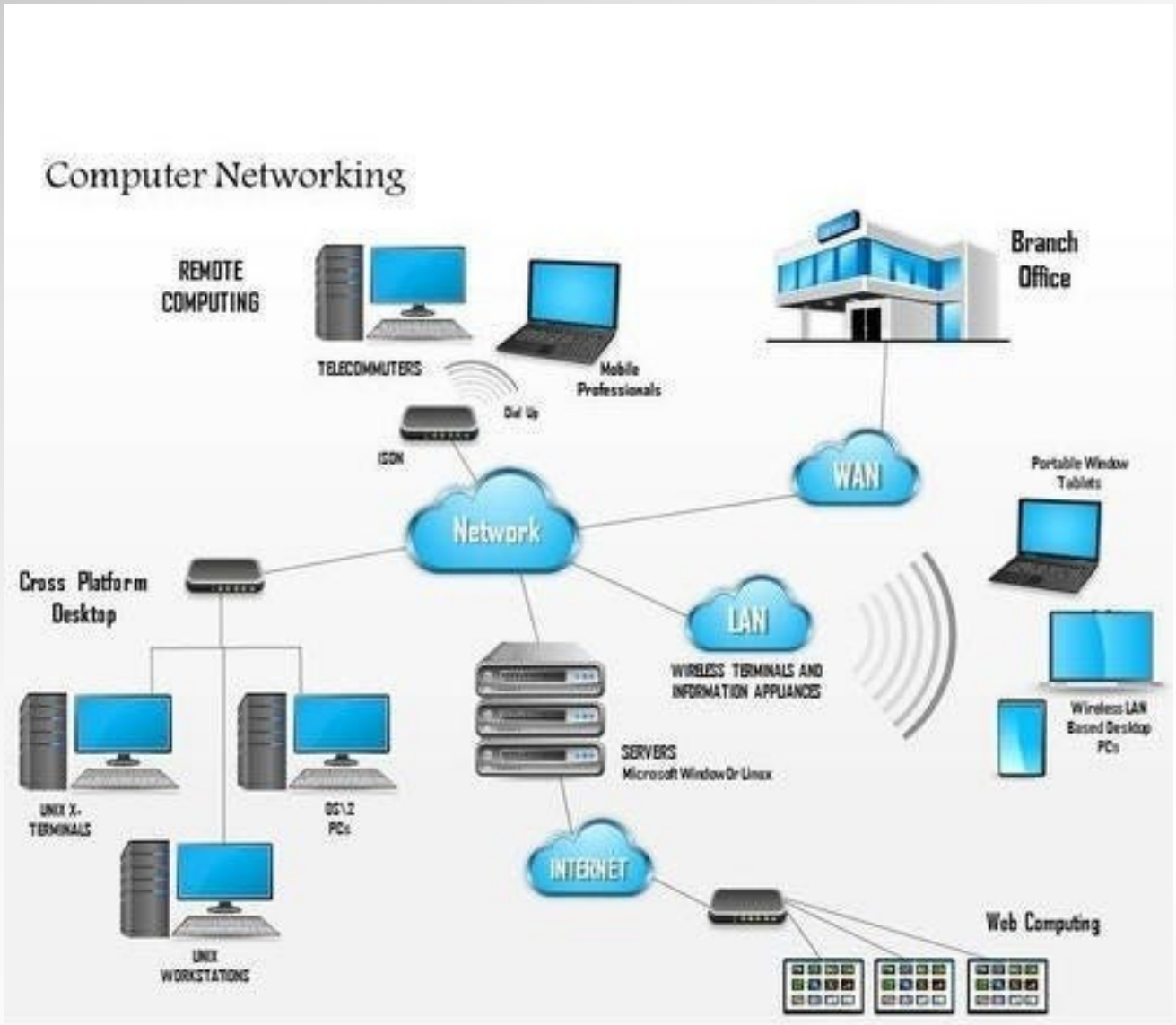
What is Computer Network?

A computer network is created when two or more computers are connected to share information and resources.

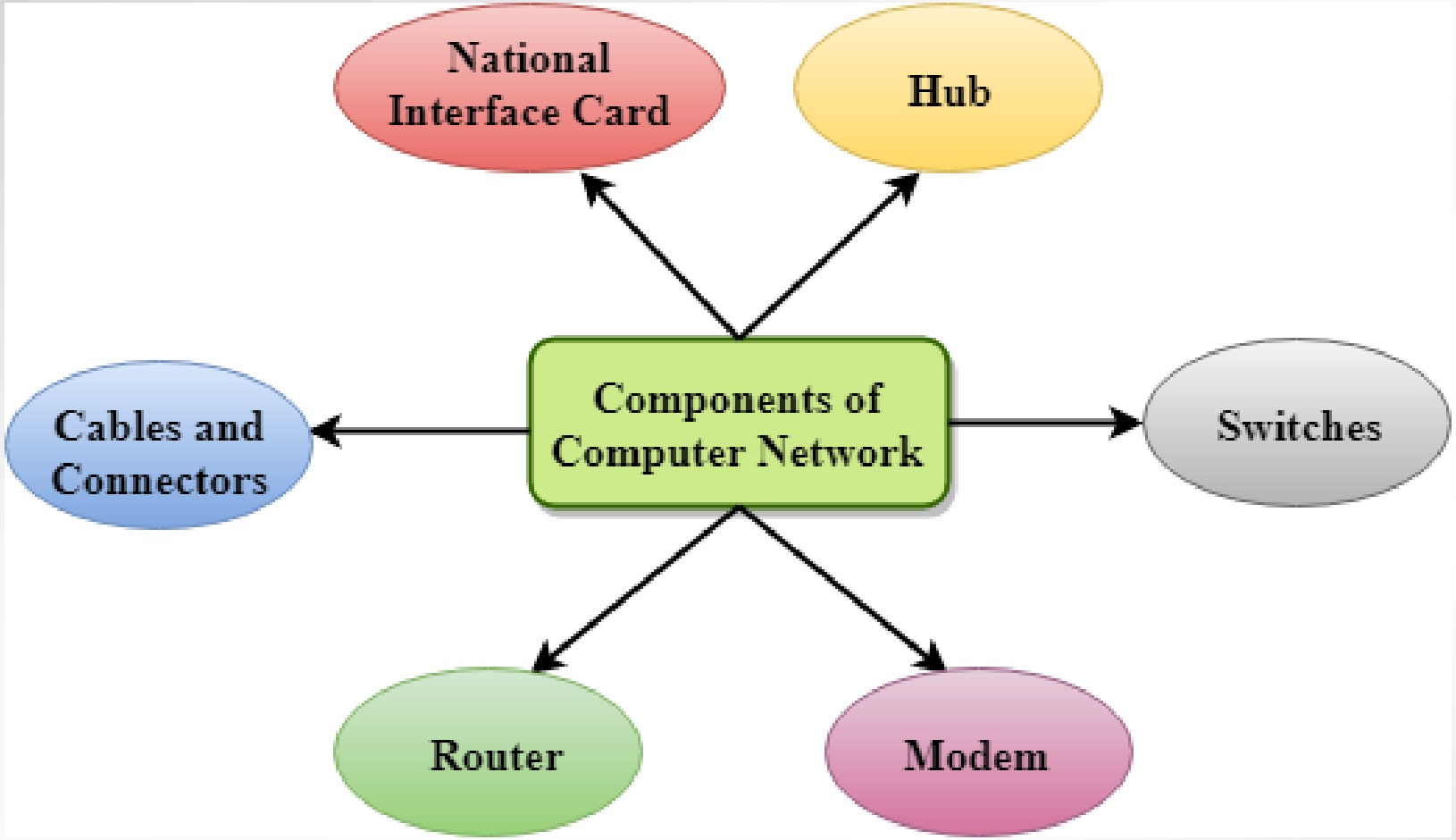
Resource : (Computer Networking: A Survey International Journal of Trend in Research and Development, Volume 2(5), ISSN 2394-9333 www.ijtrd.com)

- The aim of the computer network is the sharing of resources among various devices.
- A set of computers exchanging information by common conventions called protocols over communication media.

Computer Networking

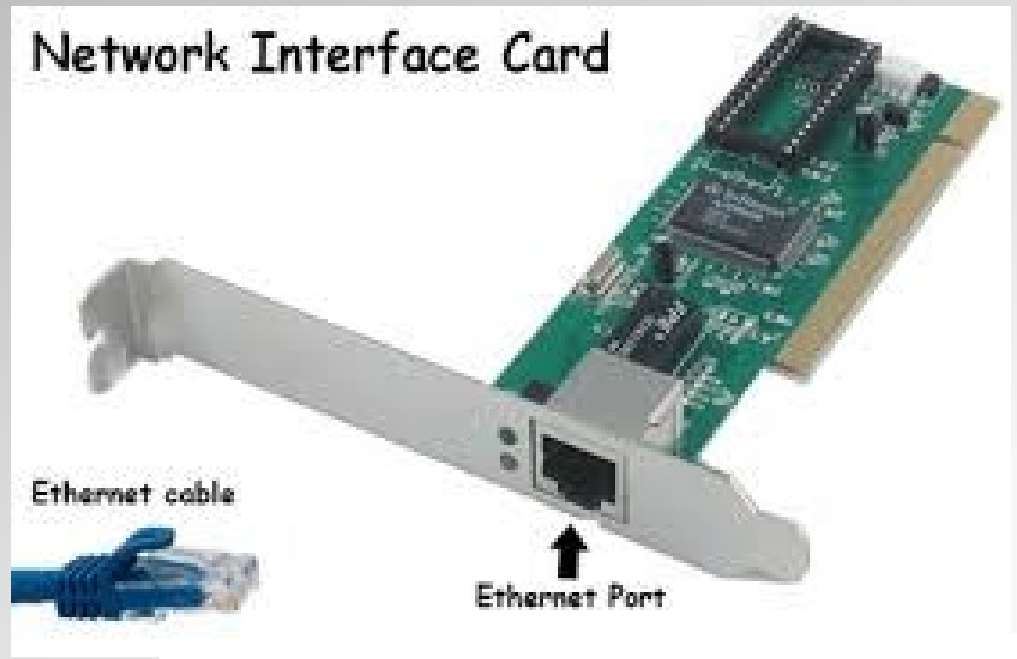


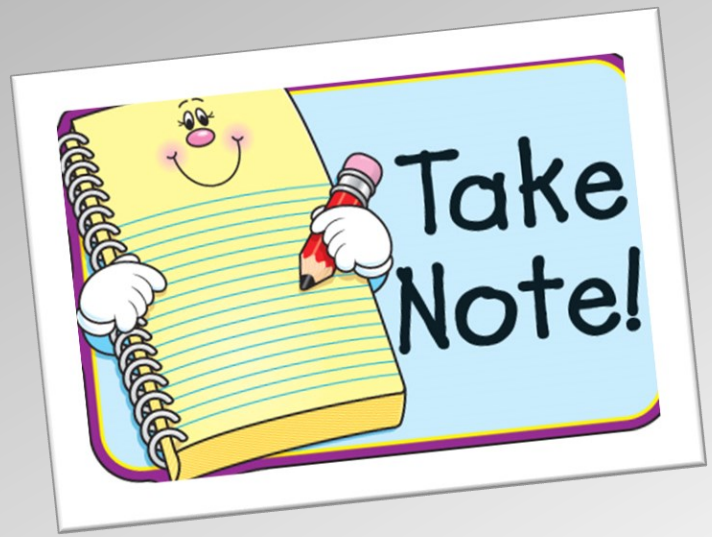
Components of Computer Network



NIC – National Interface Card

Network Interface Card is a hardware device that is installed on the computer so that it can be connected to the internet. It is also called Ethernet Card or Network Adapter. Every NIC has a 48-bit unique serial number called a MAC address which is stored in ROM carried on the card. Every computer must have at least one NIC if it wants to connect to the internet.

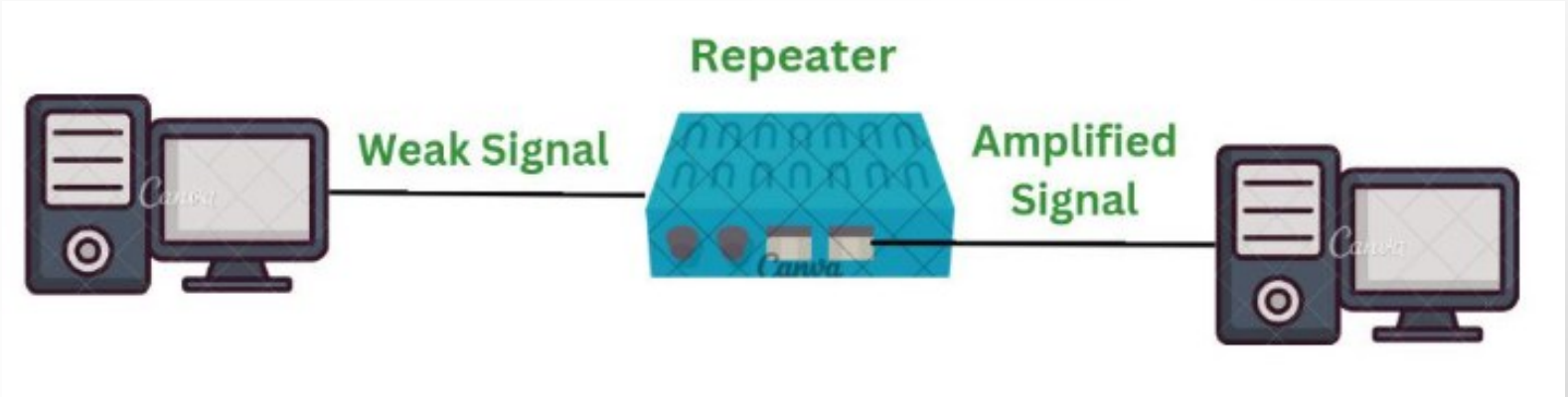

Network Interface Card
Ethernet cable
Ethernet Port



NIC is not the only component that is required to connect to the internet. If your device is a part of a large network and you want it to connect to the internet, then a router is also required. The NIC will connect to the router then this router will connect to the internet.

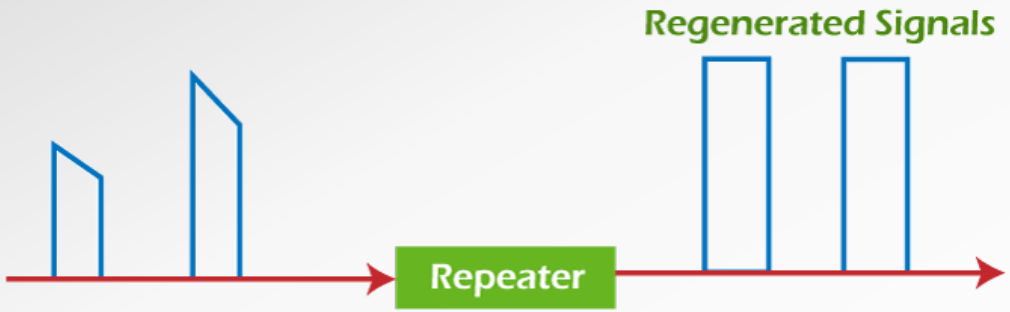
Repeaters

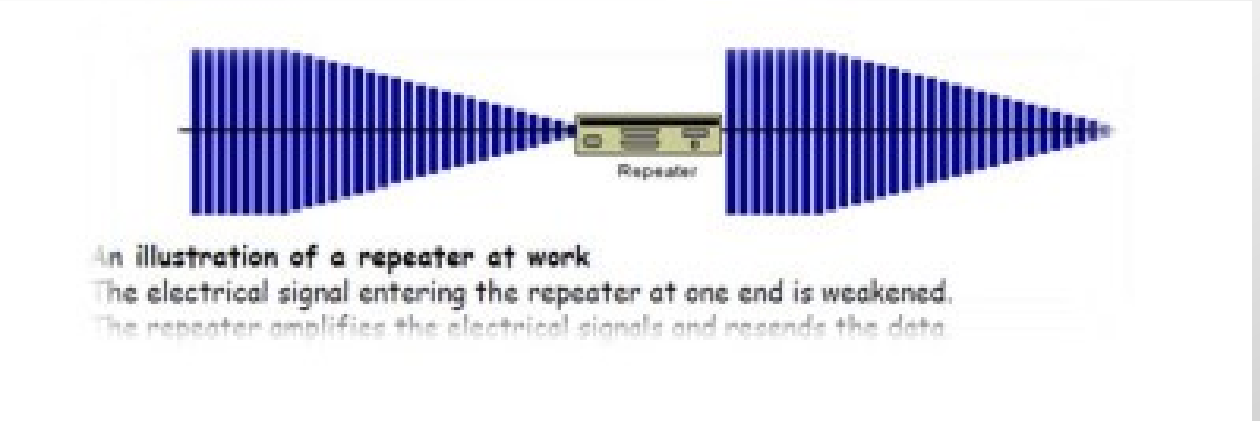
The job of the repeater is to amplifies (regenerating) the signal over the same network before the signal becomes too weak or corrupted to extend the length to which the signal can be transmitted over the same network. When the signal becomes weak, they copy it bit by bit and regenerate it at its star topology connectors connecting following the original strength. It is a 2-port device.



Repeaters contd.

A repeater is connected to two cable segments. Any electrical signal reaching the repeater from one segment, will be amplified and retransmitted to the other segment.





An illustration of a repeater at work
The electrical signal entering the repeater at one end is weakened.
The repeater amplifies the electrical signals and resends the data.

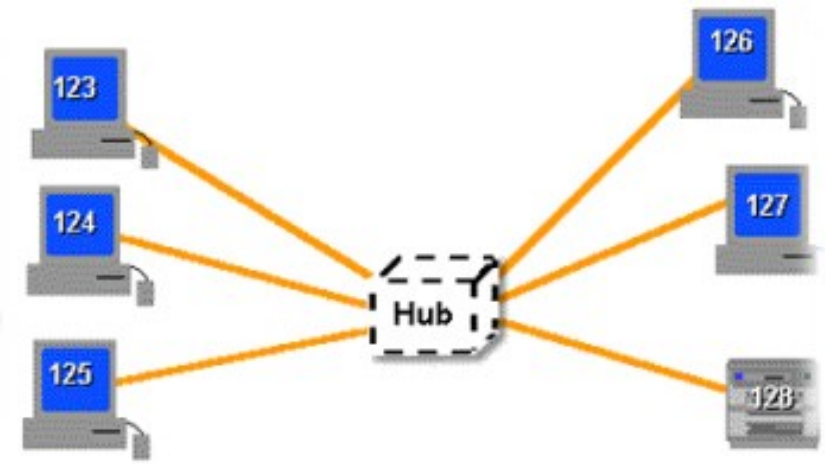
Hub

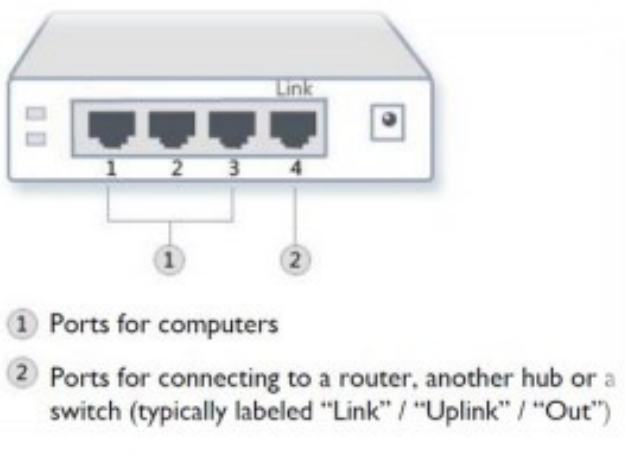
A device that links multiple computers and devices together.

Multi-port repeaters are often called hubs

Hubs are very common internetworking devices

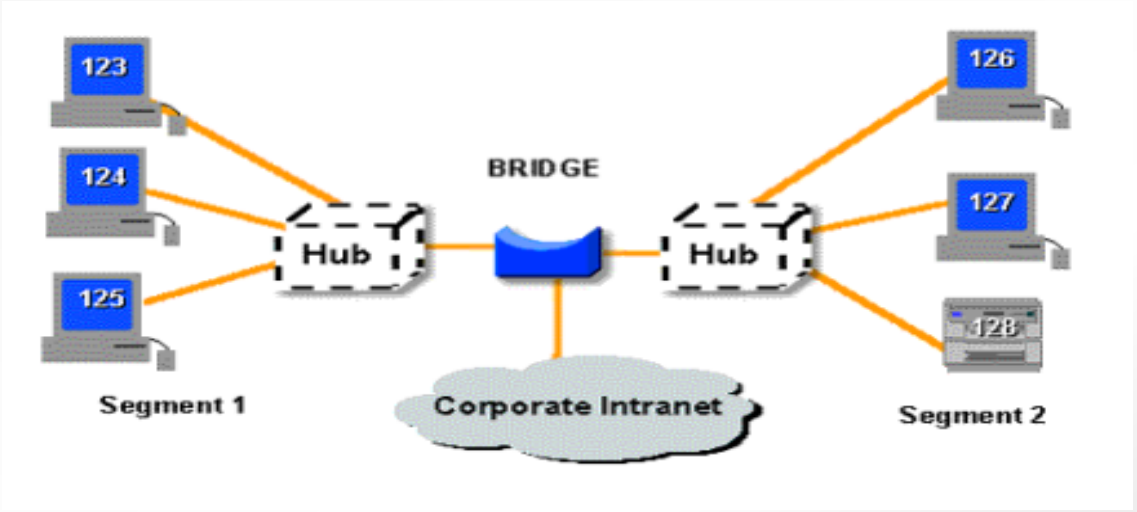
When computer requests for information from a computer, it sends the request to the Hub. Hub distributes this request to all the interconnected computers.





Bridge

- Device that connects and passes packets between two network segments.
- More intelligent than hub, analyze incoming packets and forwards(or drops) based on addressing information.
- However, when traffic between network segments becomes too heavy, the bridge can become a bottleneck and actually slow down communication.



Switch (Multiport Bridges)

- A network switch is equipment that allows two or more IT devices, such as computers, to communicate with one another.
- Not like the hub, there is no broadcasting here that the switch sends the message directly from source to the destination.

Switch Cont....

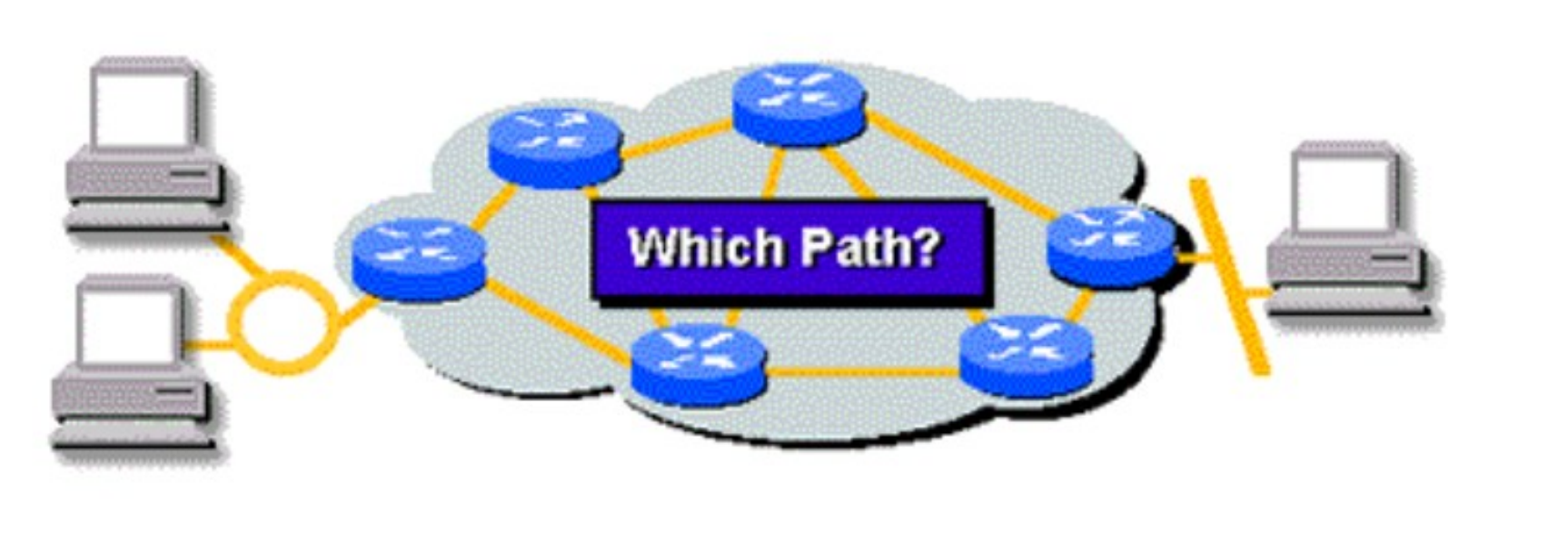
- Most switches come with 24 or 48 ethernet ports
- A switch can have as many as 96 ports.
- Switches filter traffic based on MAC address. Information will only be forwarded to the port that connects to the host with the destination MAC address. To hosts on all other ports of the switch, it appears as though there is no network traffic.

Router

Router is a device that connects the LAN to the internet. The router is mainly used to connect the distinct networks or connect the internet to multiple computers.

Router Cont....

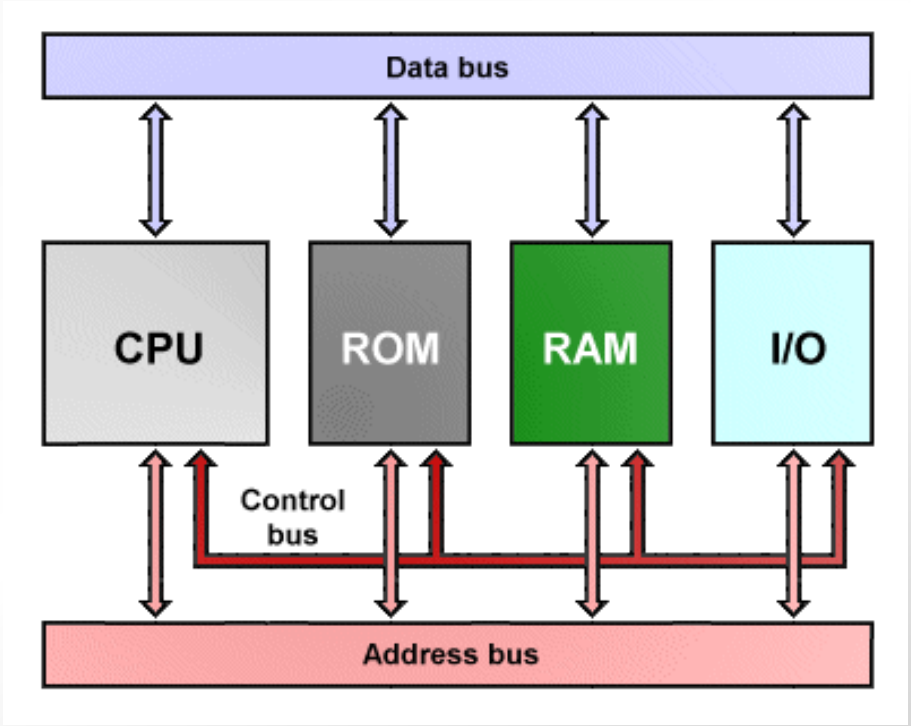
- Routers can make intelligent decisions as to the best path for delivery of data on the network.



What is a Router Made-of?

A router has many of the same components as your computer:

- CPU
- Memory
- I/O Interfaces (mostly network interfaces)
- Operating System

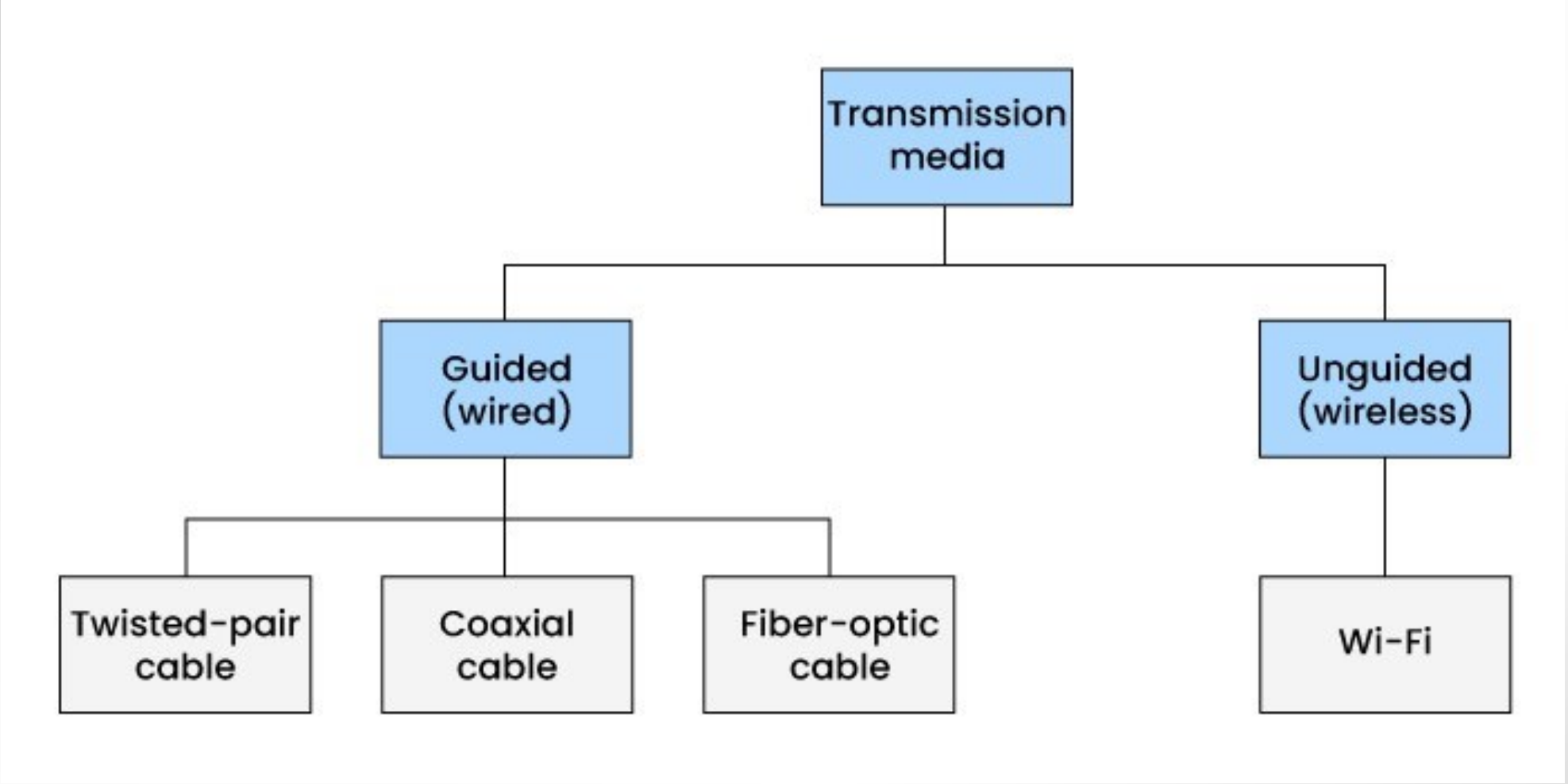


Routers Cont.....

- A router is a device that forwards data packets along networks.
- A router is connected to at least two networks, commonly two LANs or WANs.
- Routers are located at gateways, the places where two or more networks connect.
- Routers are the critical devices that keeps data flowing between networks and keeps the networks connected to the Internet.

Transmission Media

Transmission Media



Cables and Connectors

Cable is a transmission media used for transmitting a signal.

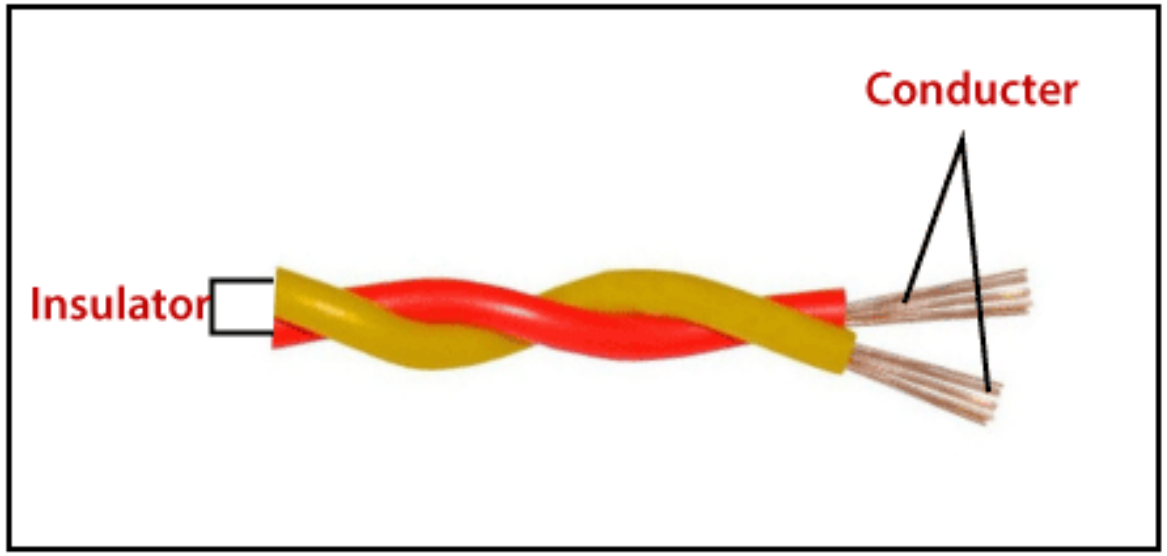
- Twisted pair cable
- Coaxial cable
- Fibre-optic cable

Twisted Pair Cable

- It is a high-speed cable that transmits the data over 1Gbps or more.
- Inexpensive
- Used in telephone systems

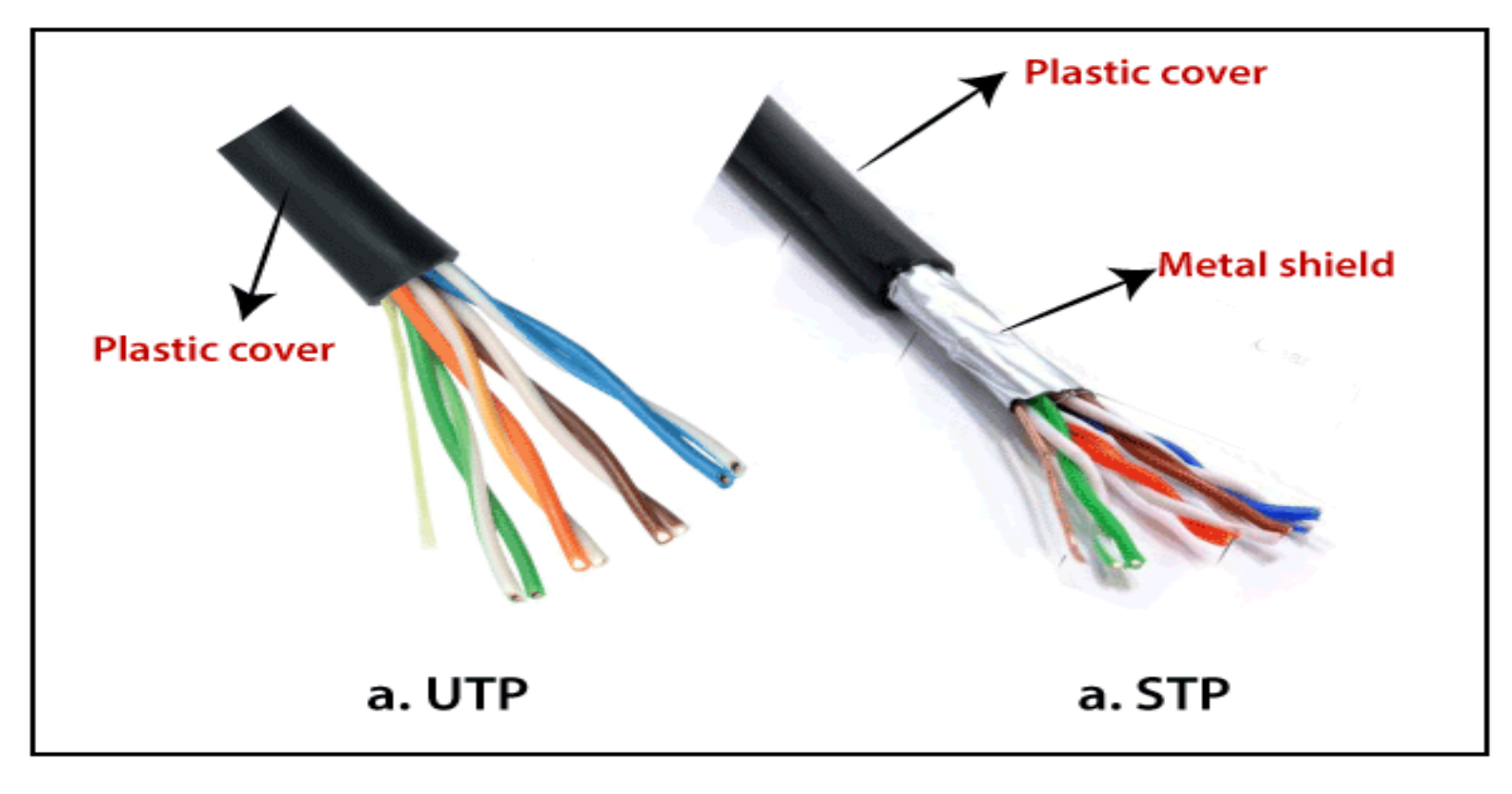
Physical characteristics

- Requires two conductors
- Twisted around each other to reduce electrical interference
- Plastic sheath



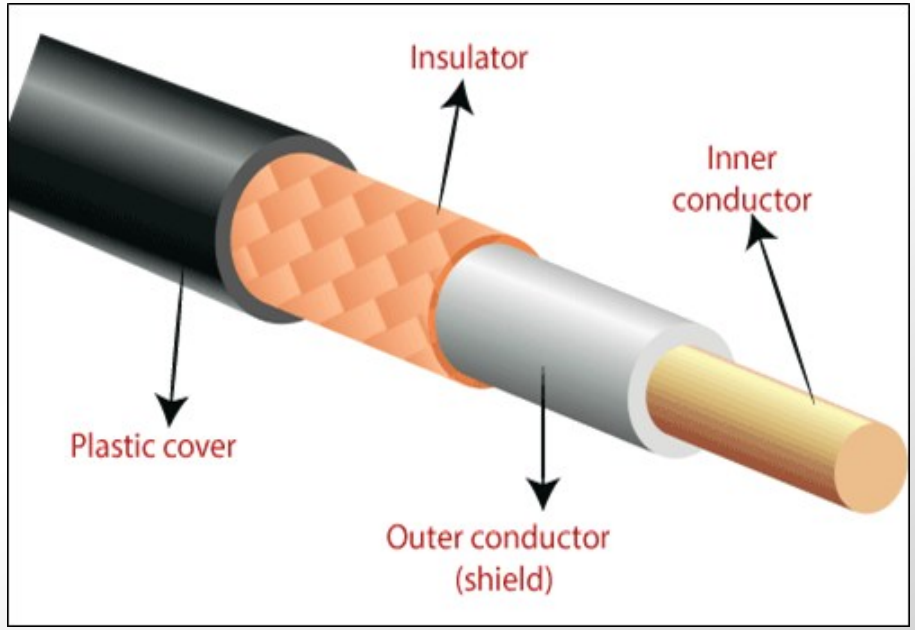
Twisted Pair Cable

1. Shielded Twisted-Pair Cable
2. Unshielded Twisted-Pair Cable



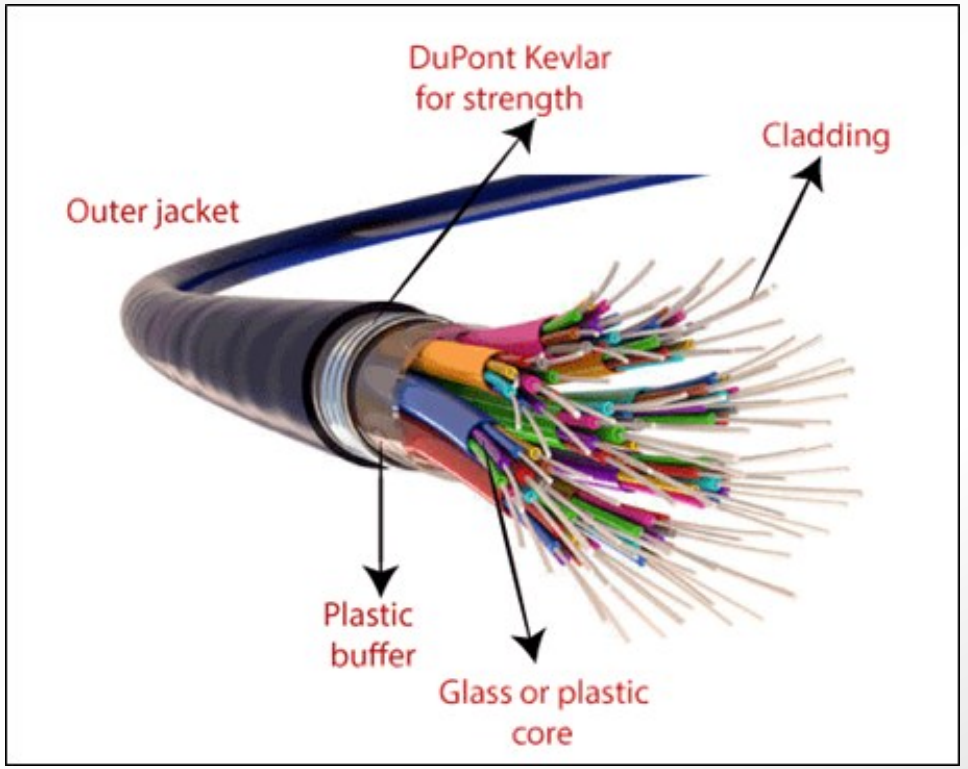
Coaxial cable

- At one time, coaxial cable was the most widely used network cabling.
- Coaxial was relatively inexpensive, and it was light, flexible, and easy to work.
- It was so popular that it became a safe, easily supported installation.
- Higher bandwidth.
- Usage: Television, Internet, CCTV



Fiber-Optic Cable

Fibre optic cable is a high-speed cable that transmits the data using light beams. It provides high data transmission speed as compared to other cables. It is more expensive as compared to other cables, so it is installed at the government level.



Do you know???

Undersea cables are the unseen backbone of the global internet.

Undersea cables, also known as submarine communications cables, are fibre optic cables are laid on the ocean floor and used to transmit data between continents.

Advantages of Computer Networks

- Accessing databases, transferring, processing and retrieval of data can be done on-line
- Online credit card checking, e-commerce and Electronic Fund Transfer are possible.
- Provides an efficient means of communication such as e-mail, Voice mail and Video conferencing.
- Users can be easily added or removed.
- Tasks of distributed nature can be processed by distributed computer systems by exchanging data.
- Provides a way to share data, programs, peripherals, computing power and information.
- Provides data security (Comparing to other communication devices)

Risks of Computer Networking

The security of a computer network is challenged everyday by:

- Equipment malfunctions
- System failures (Note: equipment malfunctions and system failures may be caused by natural disasters such as floods, storms, fires and electrical disturbances.)
- Computer hackers
- Virus attacks

Thank you!