

# Networks and Communications Technologies

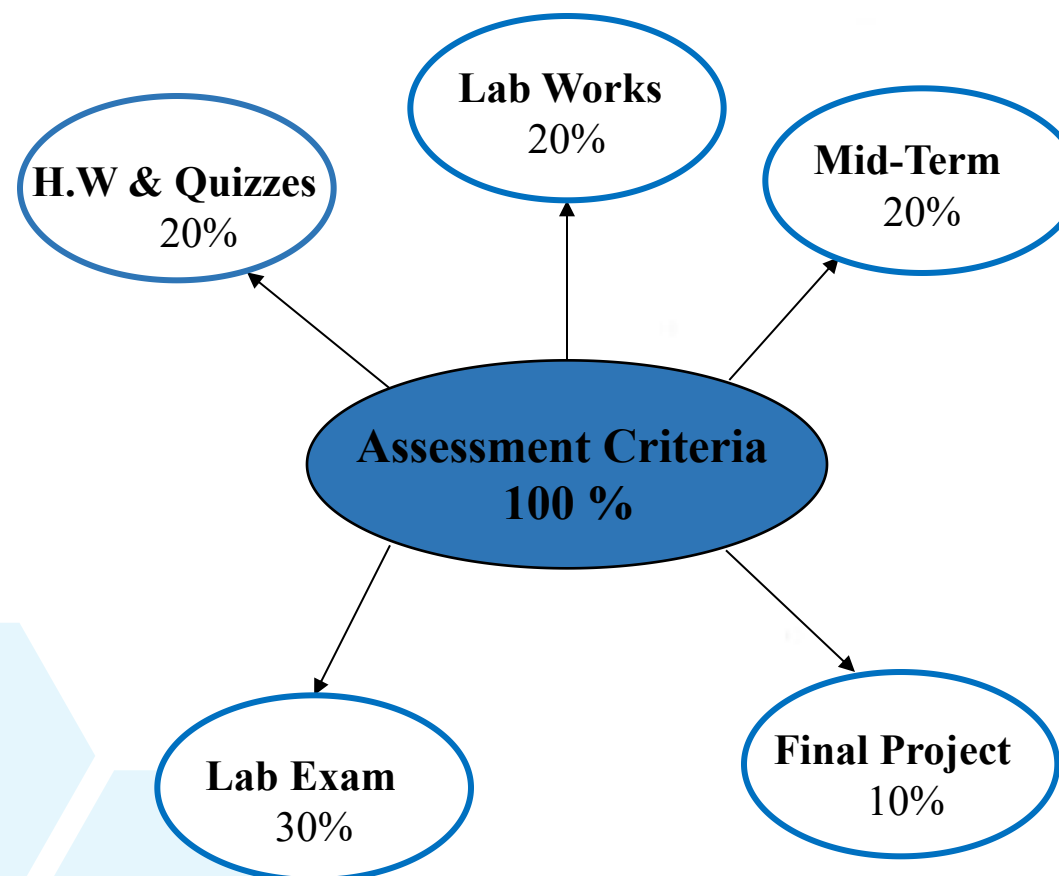
Course code: ECT 141

Introduced by: **Dr. Sara Mahmoud**

# Outlines

- Assessment Criteria and Reference
- Data Communication Overview
- Data Communication Components
- Data flow
- Network
- Network Criteria
- Physical Structure and Topology
- Network Categories
- Internet
- Protocols and Standards

# 1. Assessment Criteria



**Reference:** William Stalling, "Data and Computer Communications", 10th Ed., Prentice-Hall, 2013.

## 2. Data Communication Overview



face to face



over distance

**Data Communication is the exchange of data between two devices via some form of transmission medium.**

## 2. Data Communication Overview (Cont.)

**Communication:** sharing information.

Sharing can be local (face to face) or remote (over distance)

**Telecommunication** (tele: far) means communication at a distance (telephone, television, telegraphy).

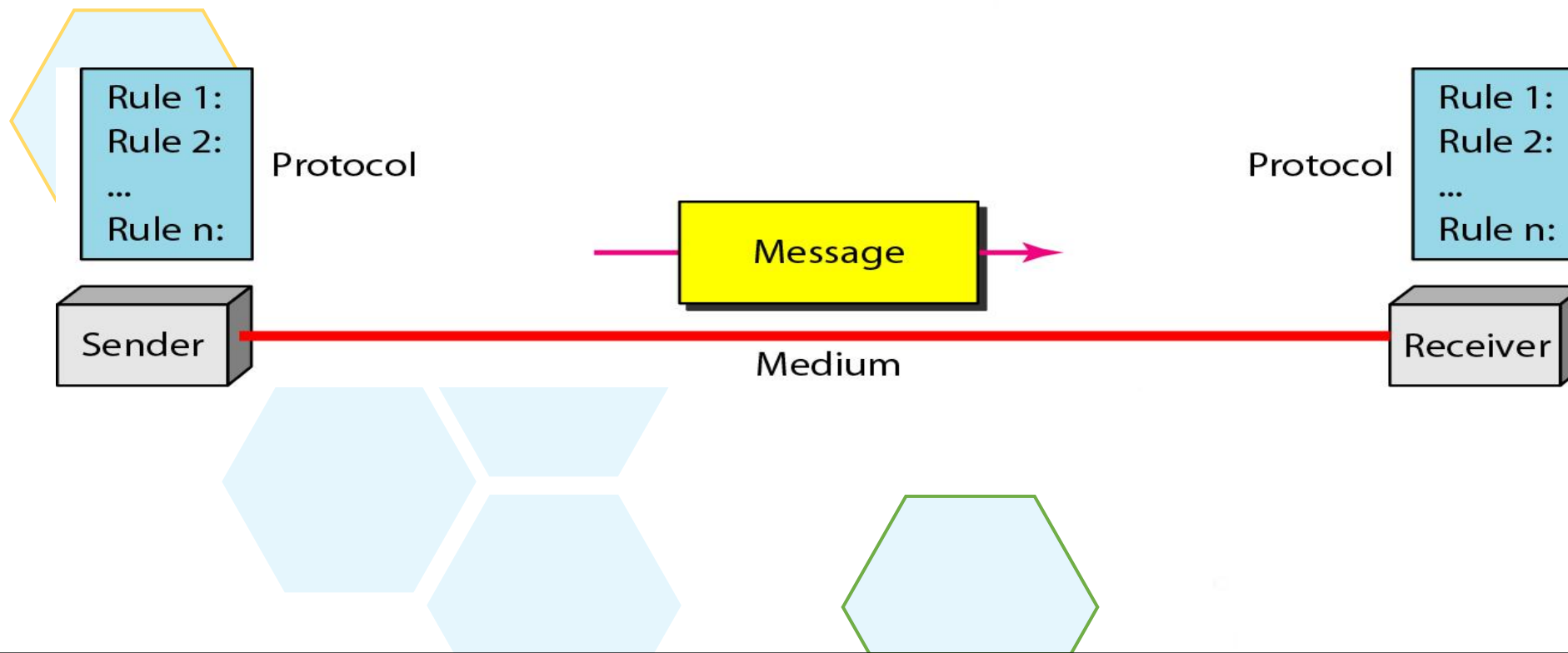
**Data** refers to information presented in whatever form is agreed upon by the parties creating and using the data.

**Data communications** are the exchange of data between two devices via some form of transmission medium such as a wire cable.

**Communicating devices** made up of : H.W( physical equipment )and S.W

### 3. Data Communication components

Transferring data over a transmission medium between two or more devices, systems, or places is known as data communication. Nowadays, computing and telecommunications depend heavily on this data transmission, which makes a variety of applications conceivable, including email, video chatting, the Internet, and many more things.



### 3. Data Communication components (Cont.)

*A communication system is made up of the following components:*

- 1.Message:** A message is a piece of information that is to be transmitted from one person to another. It could be a text file, an audio file, a video file, etc.
- 2. Sender:** It is simply a device that sends data messages. It can be a computer, mobile, telephone, laptop, video camera, or workstation, etc.
- 3.Receiver:** It is a device that receives messages. It can be a computer, telephone mobile, workstation, etc.
- 4.Transmission Medium / Communication Channels:** Communication channels are the medium that connect two or more workstations. Workstations can be connected by either wired media or wireless media.
- 5.Set of rules (Protocol):** When someone sends the data (The sender), it should be understandable to the receiver also otherwise it is meaningless. For example, Sonali sends a message to Chetan. If Sonali writes in Hindi and Chetan cannot understand Hindi, it is a meaningless conversation.



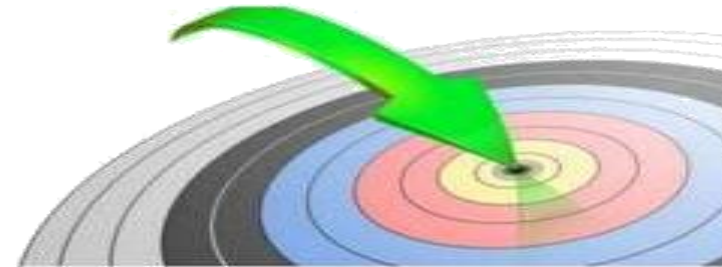
### 3. Data Communication components (Cont.)

#### The effectiveness of data communication:

1. **Delivery** : The system must deliver data to the correct destination
2. **Accuracy** : The system must deliver the data accurately.
3. **Timeliness**: The system must deliver data in a timely manner. Data delivered late are useless.
4. **Jitter** :Jitter refers to the variation in the packet arrival time.



Delivery



Accuracy



Timeliness



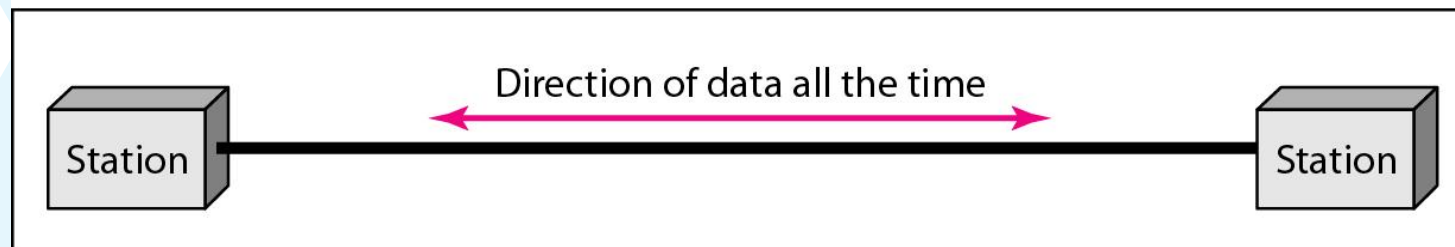
### 3. Data Flow (simplex, half-duplex, and full-duplex)



a. Simplex

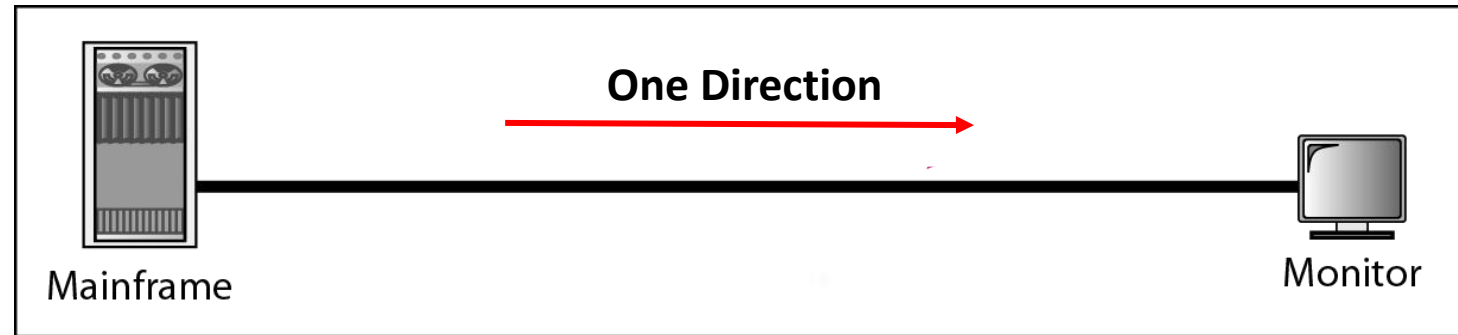


b. Half-duplex

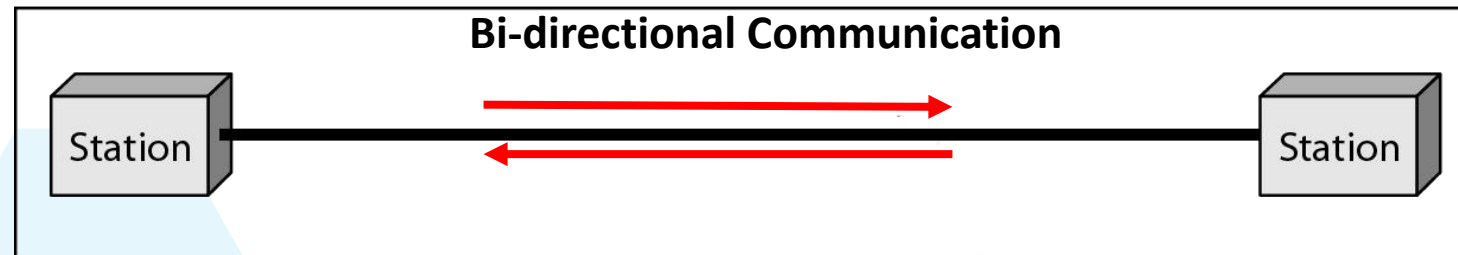


c. Full-duplex

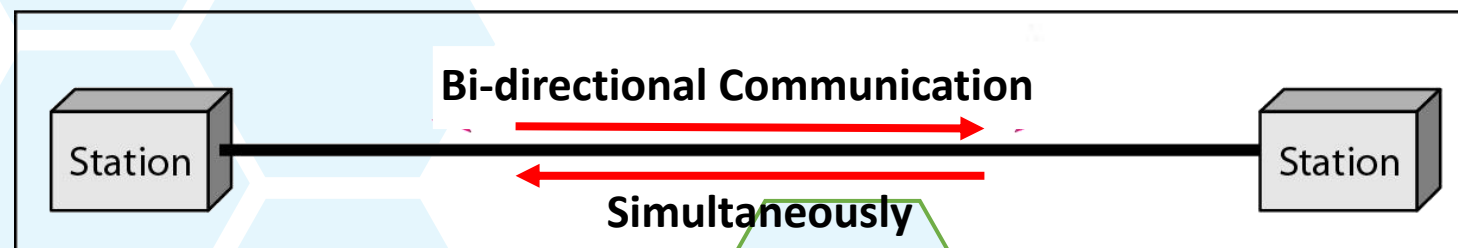
### 3. Data Flow (simplex, half-duplex, and full-duplex)



a. Simplex



b. Half-duplex



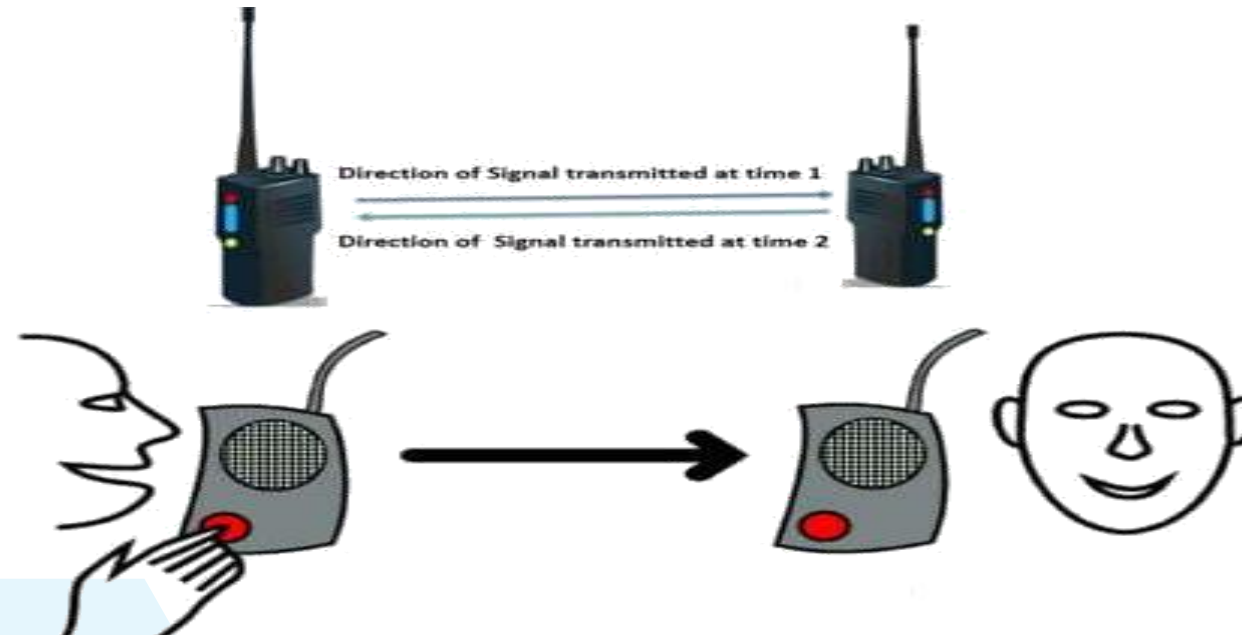
c. Full-duplex

### 3. Data Flow (simplex)



- **The Communication is unidirectional.**
- **Only one device on a link can transmit, while the other can only receive.**
- **Simplex is like Tv and Radio.**

### 3. Data Flow (half-duplex)



- The Communication is Bidirectional.
- Each station can transmit and receive but not at the same time.
- Half duplex is like Walkie Talkie.

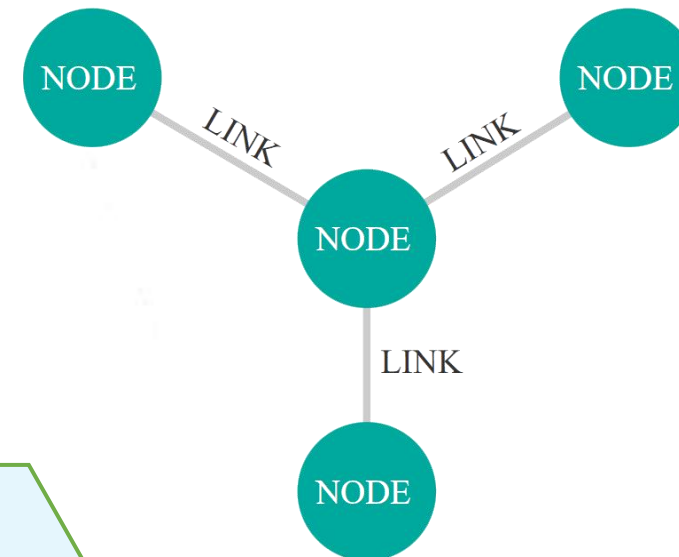
### 3. Data Flow (Full-duplex)



- The Communication is Bidirectional.
- Each station can transmit and receive at the same time.
- Full-duplex is like Cellular phones.

## 4. Network

- **Network** is Considered as a set of devices (often referred to as **nodes**) connected by communication **links**.
- A **Node** can be a computer, printer, or any other device capable of sending and/or receiving data generated by other nodes on the network.





## 5. Network Criteria

- A network must be able to meet a certain number of criteria, the most important of these are :

1. Performance (Throughput and Delay)

2. Reliability (Network reliability is measured by the frequency of failure)

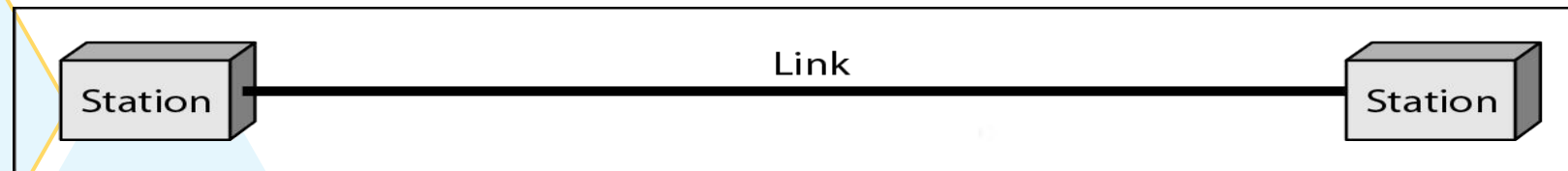
3. Security (Protecting data from unauthorized access, protecting data from damage and development)

## 6. Physical Structure

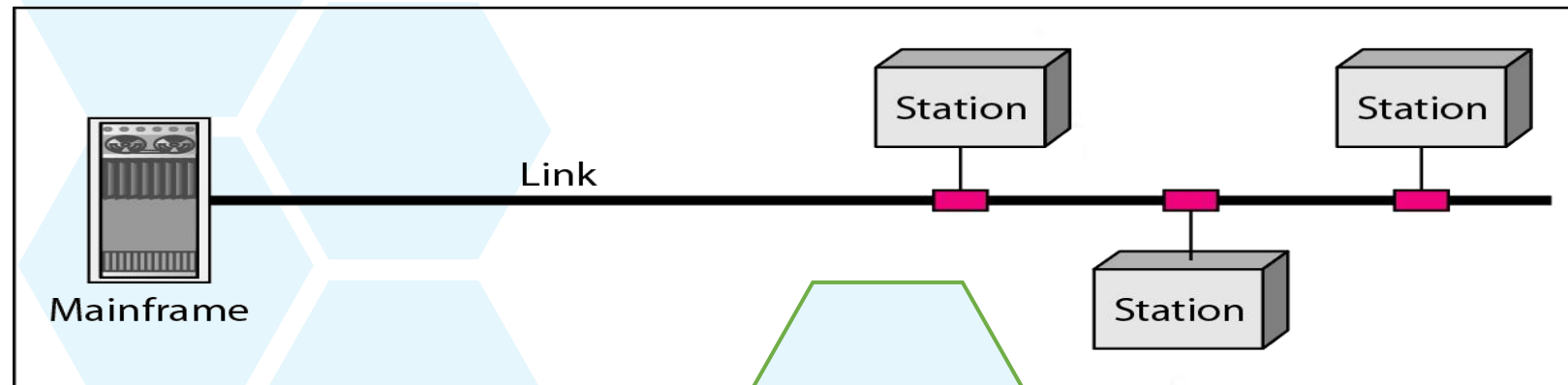
- Before discussing networks, we need to define some network attributes as:

### 1. Type of Connection:

- **Point to Point** - single transmitter and receiver
- **Multipoint** - multiple recipients of single transmission



a. Point-to-point

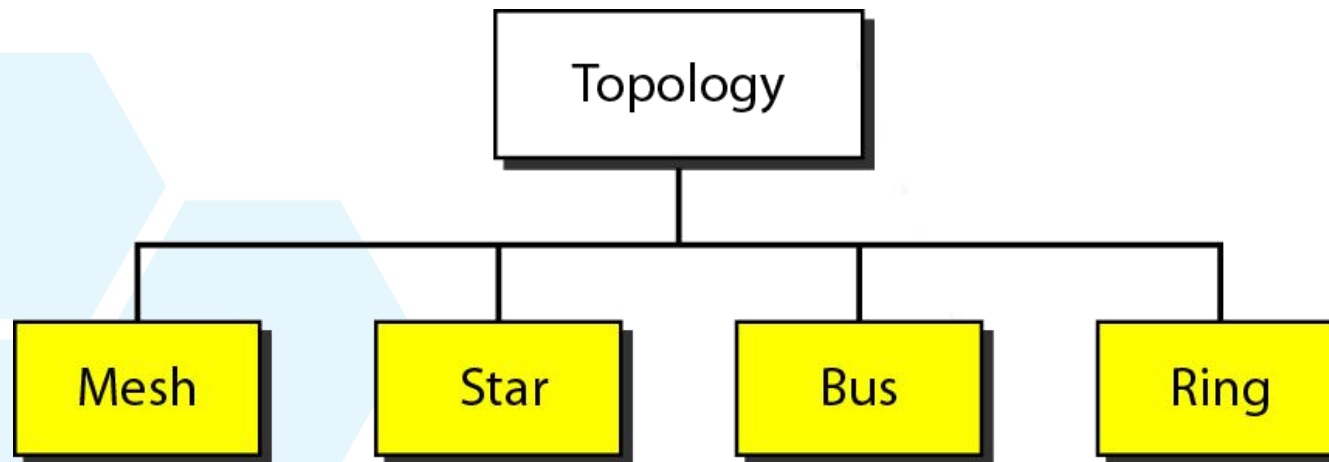


b. Multipoint

## 6. Physical Structure (Cont.)

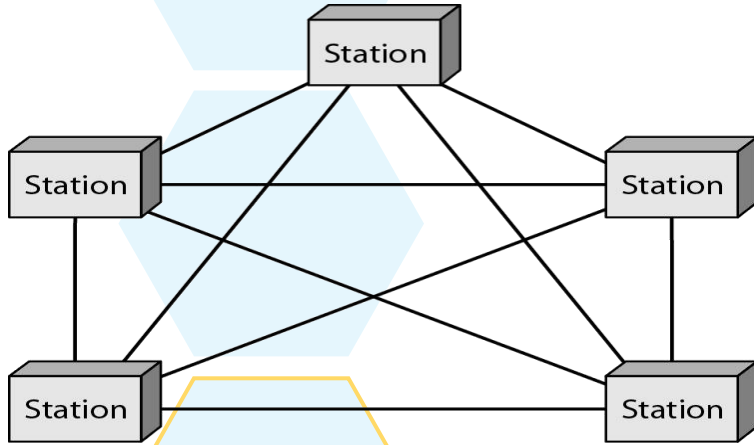
### 2. Physical Topology

- The term *physical topology* refers to the way in which a network is laid out physically since two or more devices (nodes) connect to a link, two or more links form a topology.
- There are four **basic** topologies possible: mesh, star, bus, and ring.

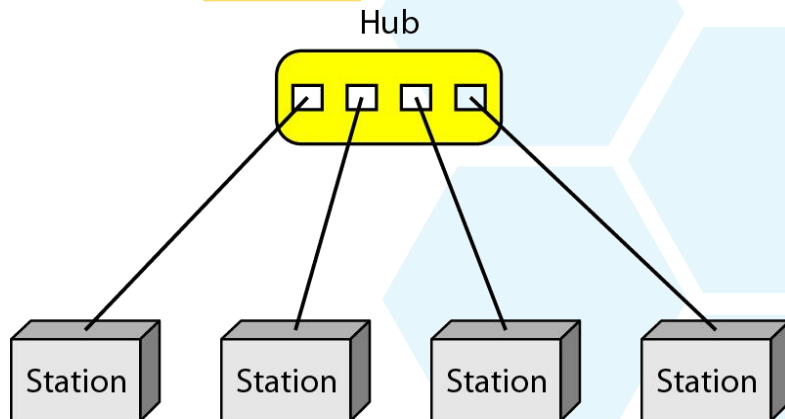


## 6. Physical Structure (Cont.)

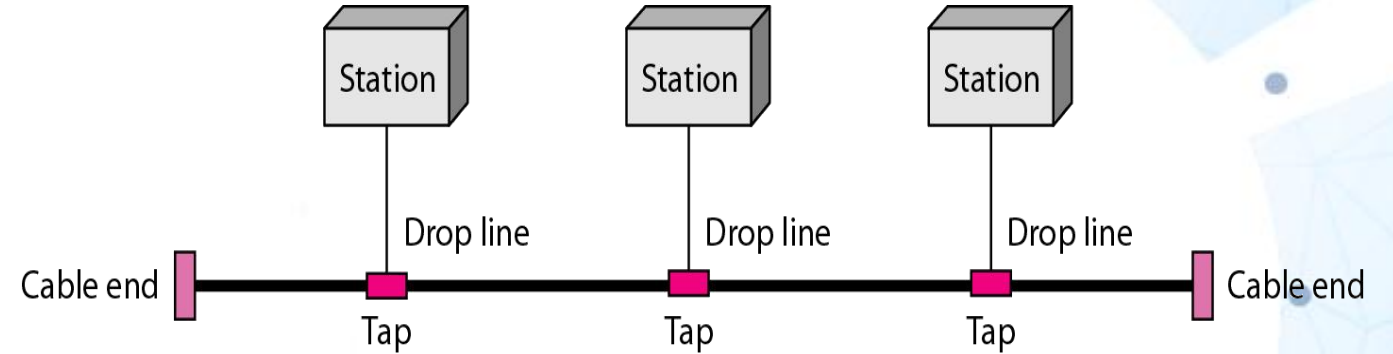
### 1. Mesh Topology



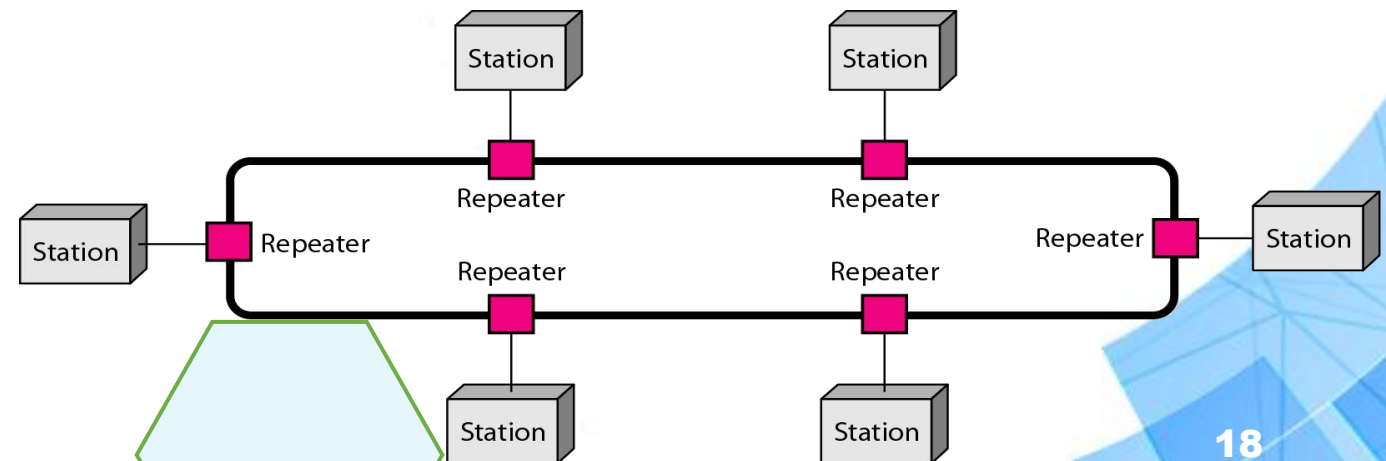
### 3. Star Topology



### 2. Bus Topology

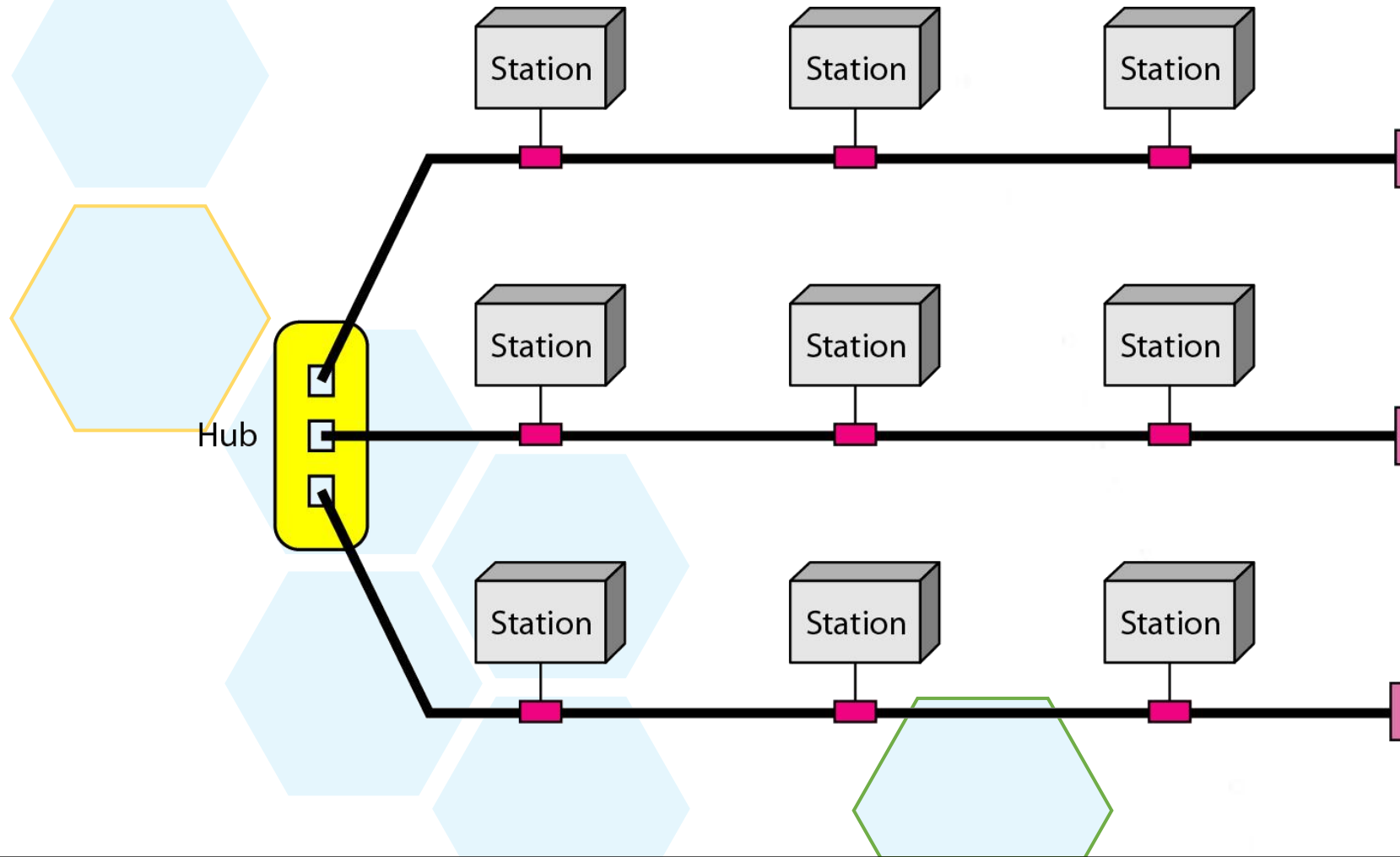


### 4. Ring Topology



## 6. Physical Structure (Cont.)

### 5. Hybrid Topology

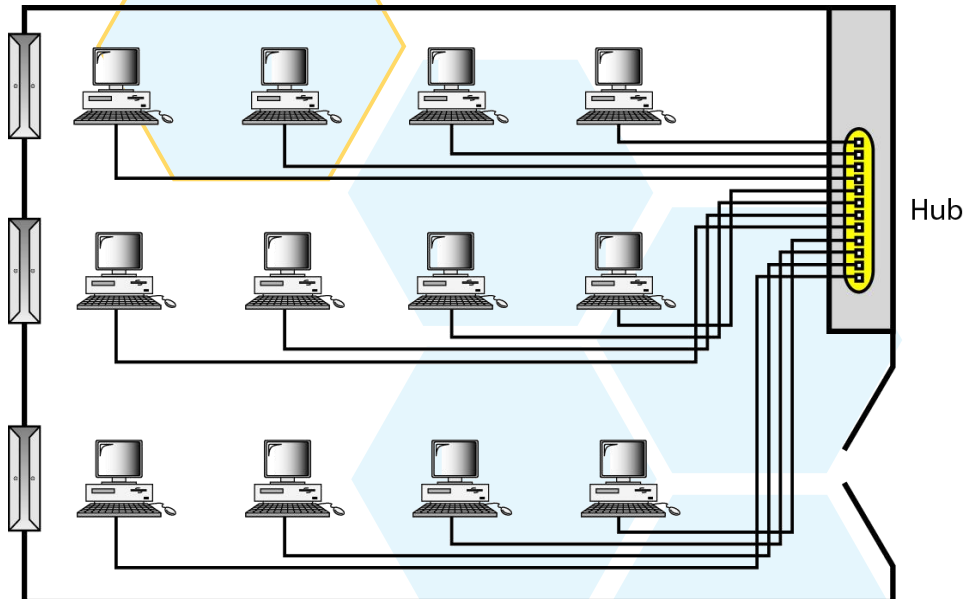


## 7. Network Categories

Networks are generally referring to two primary categories

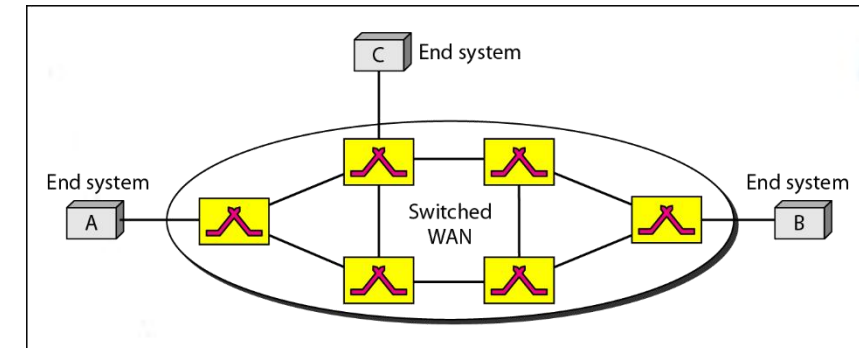
### Local-area networks (LAN)

- LAN normally covers an area less than 2 mi., and usually privately owned and links the devices in a single office, building, or campus.

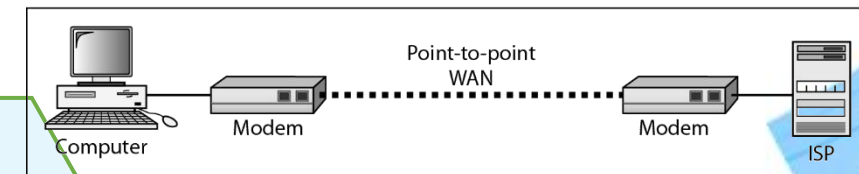


### wide-area networks (WAN)

- WAN provides long-distance transmission of data over large geographic areas that may comprise a country, or even the whole world.



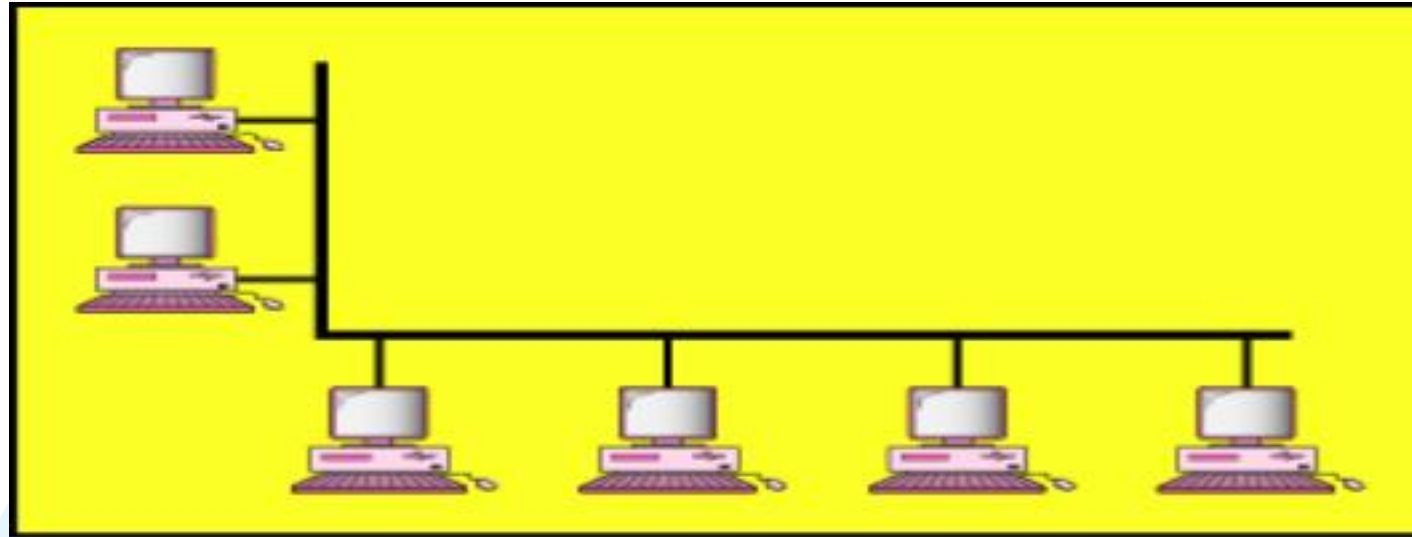
a. Switched WAN



b. Point-to-point WAN

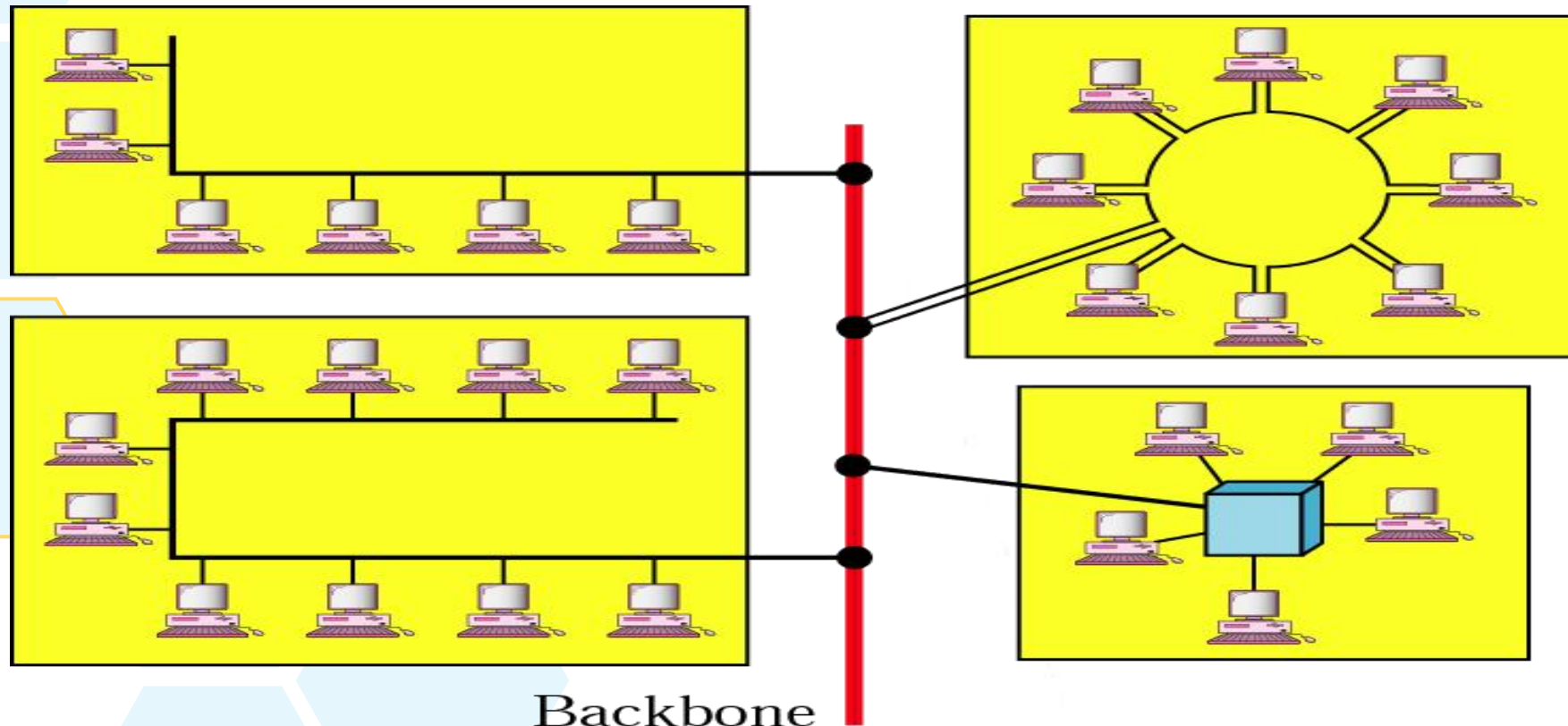


## 7. Network Categories (Single building LAN)



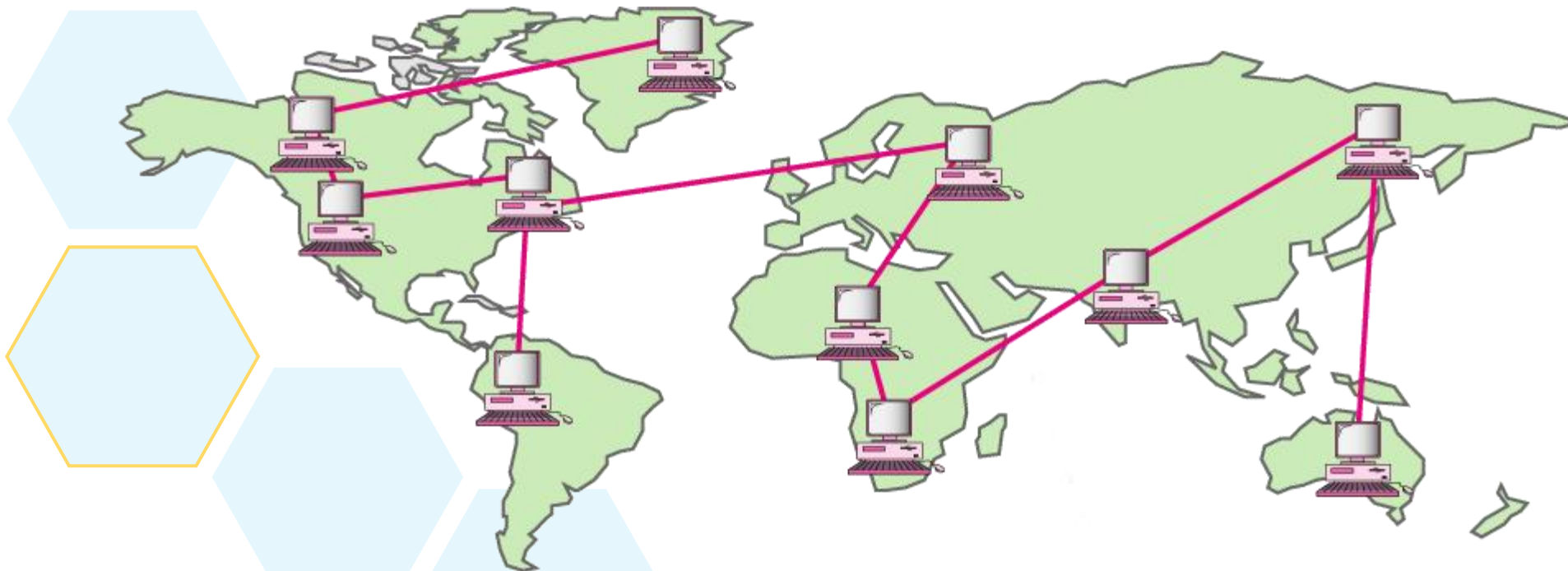
a. Single-building LAN

## 7. Network Categories (Multiple building LAN)



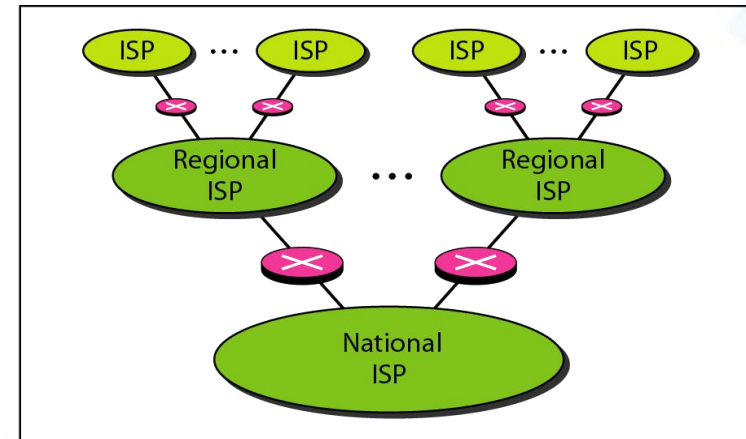
b. Multiple-building LAN

## 7. Network Categories (WAN)

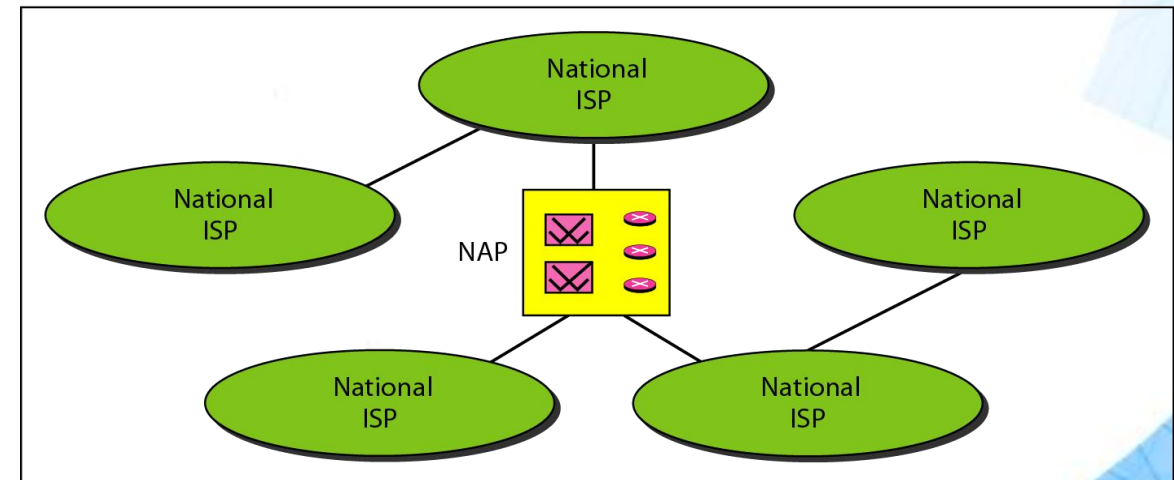


## 8. Internet

- The Internet has revolutionized many aspects of our daily lives. It has affected the way we do business as well as the way we spend our leisure time. The Internet is a communication system that has brought a wealth of information to our fingertips and organized it for our use.
- An internet is a network of networks.
- The Internet is a collection of many separate networks.



a. Structure of a national ISP



b. Interconnection of national ISPs

**Hierarchical organization of the Internet**



## 9. Protocols and Standards

- A protocol is a set of rules that govern data communications. A protocol defines what is communicated, how it is communicated, and when it is communicated. The key elements of a protocol are syntax, semantics, and timing.
- Standards are necessary to ensure that products from different manufacturers can work together as expected.
- The ISO, ITD-T, ANSI, IEEE, and EIA are some of the organizations involved in standards creation.
- Forums are special-interest groups that quickly evaluate and standardize new technologies.
- A Request for Comment is an idea or concept that is a precursor to an Internet standard.

*Thank  
you*

