

Data Communication Concepts

Introduction to Networking

- **Introduction**
- **The Elements of Communication**
- **Type of Devices**
- **Network Media**
- **Network Representation**

Introduction

The term computer networking refers to technology that enables two or more computers to communicate using standard network protocols.

Goals of Computer Networks:

- ❑ Sharing Hardware and Software to avoid duplication of resources.
- ❑ Administration, Control and Manage a network.

The Elements of Communication

Communication is the process in which the information is transfer from one point in space called the **source** to another point called **destination**.

Three elements in communication:

- ☐ **Message source** (people, or electronic devices)
- ☐ **Channel** (media)
- ☐ **Message destination** (receive message and interprets it).

The Elements of Communication (Continue...)

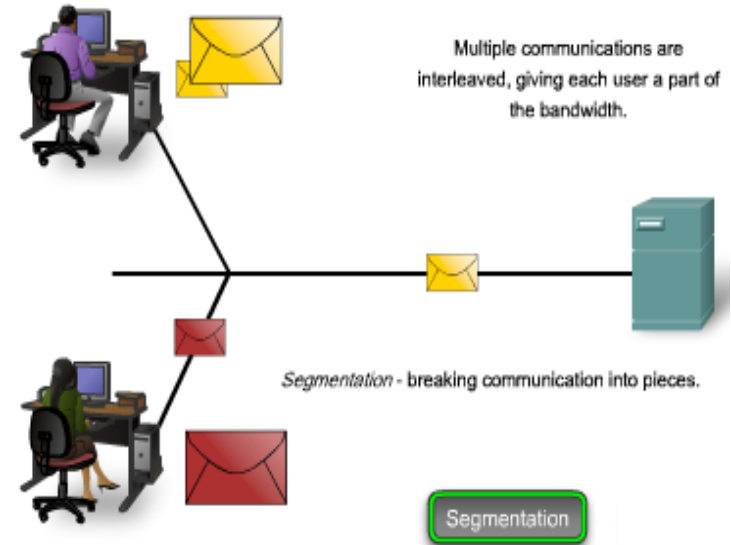
- In theory, a single communication (e-mail message), could be sent across a network from a source to a destination as one massive continuous stream of bits. This means that no other device would be able to send or receive messages while this data transfer was in progress.
- A better approach is to divide the data into smaller, more manageable pieces to send over the network. Multiple pieces are labeled for easy direction and re-assembly. This division of the data stream into smaller pieces is called **segmentation**.

The Elements of Communication (Continue...)

Benefit of Segmenting

- By sending smaller individual pieces from source to destination, many different conversations can be interleaved on the network. (multiplexing), [more one application can be transfer]
- Segmentation can increase the reliability of network communications.
 - Each pieces of message not travel the same pathway across the network from source to destination.
 - If part of the message fails to make it to the destination, only the missing parts need to be retransmitted.

Communicating the Message

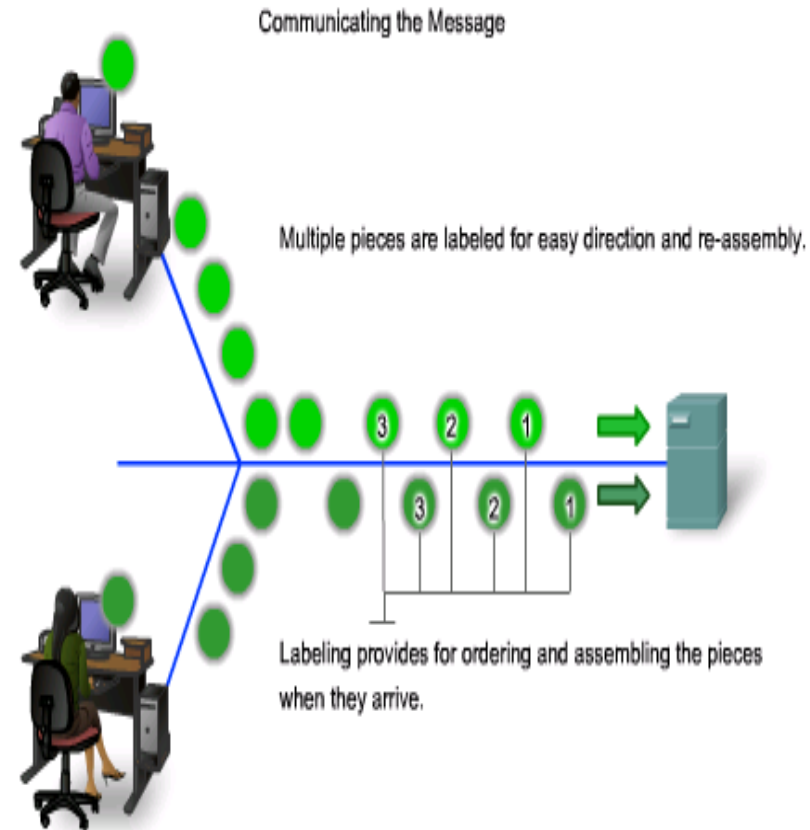


The Elements of Communication (Continue...)

While the **downside** to using segmentation and multiplexing to transmit messages across a network is the level of complexity that is added to the process.

❑ Imagine if you had to send a 100- page letter, but each envelope would only hold one page.







❑ The process of addressing, labeling, sending, receiving, and opening the entire hundred envelopes would be time-consuming for both the sender and the recipient.



Type of Devices

Equipment that connects directly to a network segment is referred to as a device. These devices are broken up into two classifications.

The first classification is end-user devices. **End-user devices** include computers, printers, scanners, and other devices that provide services directly to the user.

End User Devices	
PC 	Printer 
MAC 	File Server 
Laptop 	IBM Mainframe 

Type of Devices (Continue...)

- **End-user devices** that provide users with a connection to the network are also referred to as hosts.
- These devices allow users to share, create, and obtain information. The host devices can exist without a network, but without the network the host capabilities are greatly reduced.
NICs are used to physically connect host devices to the network media.
- A NIC is a printed circuit board that fits into the expansion slot of a bus on a computer motherboard. **NICs are sometimes called network adapters.** Each NIC is identified by a unique code called a **Media Access Control (MAC)** address, Physical Address. This address is used to control data communication for the host on the network. The following figure shows NIC.

Type of Devices (Continue...)



PCMCIA
Laptop NIC



1 BNC & 1 RJ-45 port
Ethernet NIC



Wireless NIC



4 RJ-45 ports Ethernet NIC



Token Ring NIC



Single RJ-45 Port NIC









Type of Devices (Continue...)

➤ A host device is either the source or destination and **a host can act as a client, a server, or both depend on the software installed on the host.**

- **Client** (enable host to request and display the information obtained from the server).
- **Server** (provides information and services, like e-mail or web pages, to other hosts on the network).

Type of Devices (Continue...)

➤ The second classification is **network devices**. Network devices include all the devices that connect the end-user devices together to allow them to communicate.

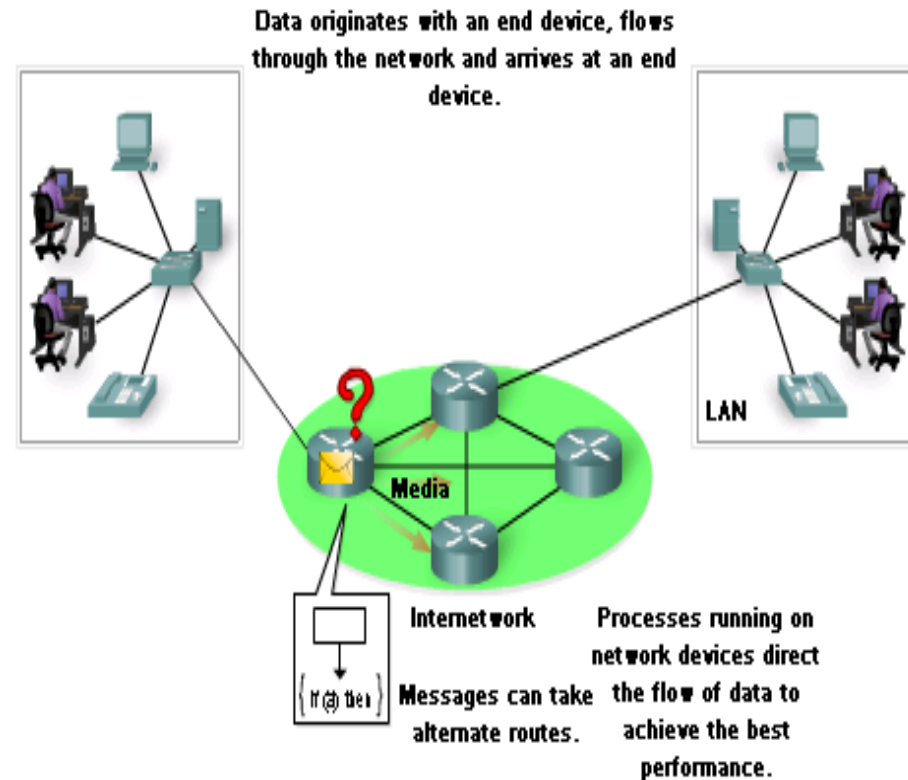
Network Devices	
Repeater 	Bridge 
10BASE-T Hub 	Workgroup Switch 
100BASE-T Hub 	Router 
Hub 	Network Cloud 

Type of Devices (Continue...)

Intermediary Devices (Network devices):

devices that connect the end-user devices together to allow them to communicate. These devices determine the path of the data (Not generate or change the data). Examples of intermediary network devices are:

- ☐ **Network Access Devices** (Hubs, switches, wireless AP)
- ☐ **Internetworking Devices** (routers)
- ☐ **Communication Servers and Modems**
- ☐ **Security Devices** (firewalls)



Type of Devices (Continue...)

- A **repeater** is a network device used to regenerate a signal. Repeaters regenerate analog or digital signals that are distorted by transmission loss due to attenuation. A repeater does not make intelligent decision concerning forwarding packets like a router or bridge.
- **Hubs** concentrate connections. In other words, they take a group of hosts and allow the network to see them as a single unit. This is done passively, without any other effect on the data transmission. Active hubs concentrate hosts and also regenerate signals.



Repeater



Hub

Type of Devices (Continue...)

➤ **Switches** add more intelligence to data transfer management. They can determine if data should remain on a LAN and transfer data only to the connection that needs it.



2960 Cisco Switch

Type of Devices (Continue...)

➤ **Routers** have all the capabilities listed above. Routers can regenerate signals, concentrate multiple connections, convert data transmission formats, and manage data transfers. They can also connect to a WAN, which allows them to connect LANs that are separated by great distances. None of the other devices can provide this type of connection.



1841 Cisco Router

Network Media

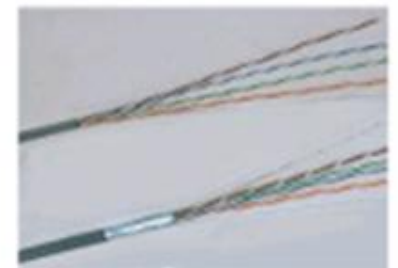
The medium provides the channel between the source and destination. These media are:

1. Copper Media (V)
(coaxial (thinnet and thicknet), UTP, STP, ScTP)

electrical impulses



Copper



pulses of light



Fiber Optics



2. Optical Media (Light)
(single, multi mode)

Network Media (Continue ...)

3. Wireless Media (RF)

electromagnetic waves



Criteria for choosing a network media are:-

- The **distance** of the media can successfully carry a signal.

(↑Optical, wireless, cable)

- The **environment** in which the media is to be installed.

(↑Optical – noise immunity), (↑wireless – cannot run cable).

- The **cost** of the media and installation.

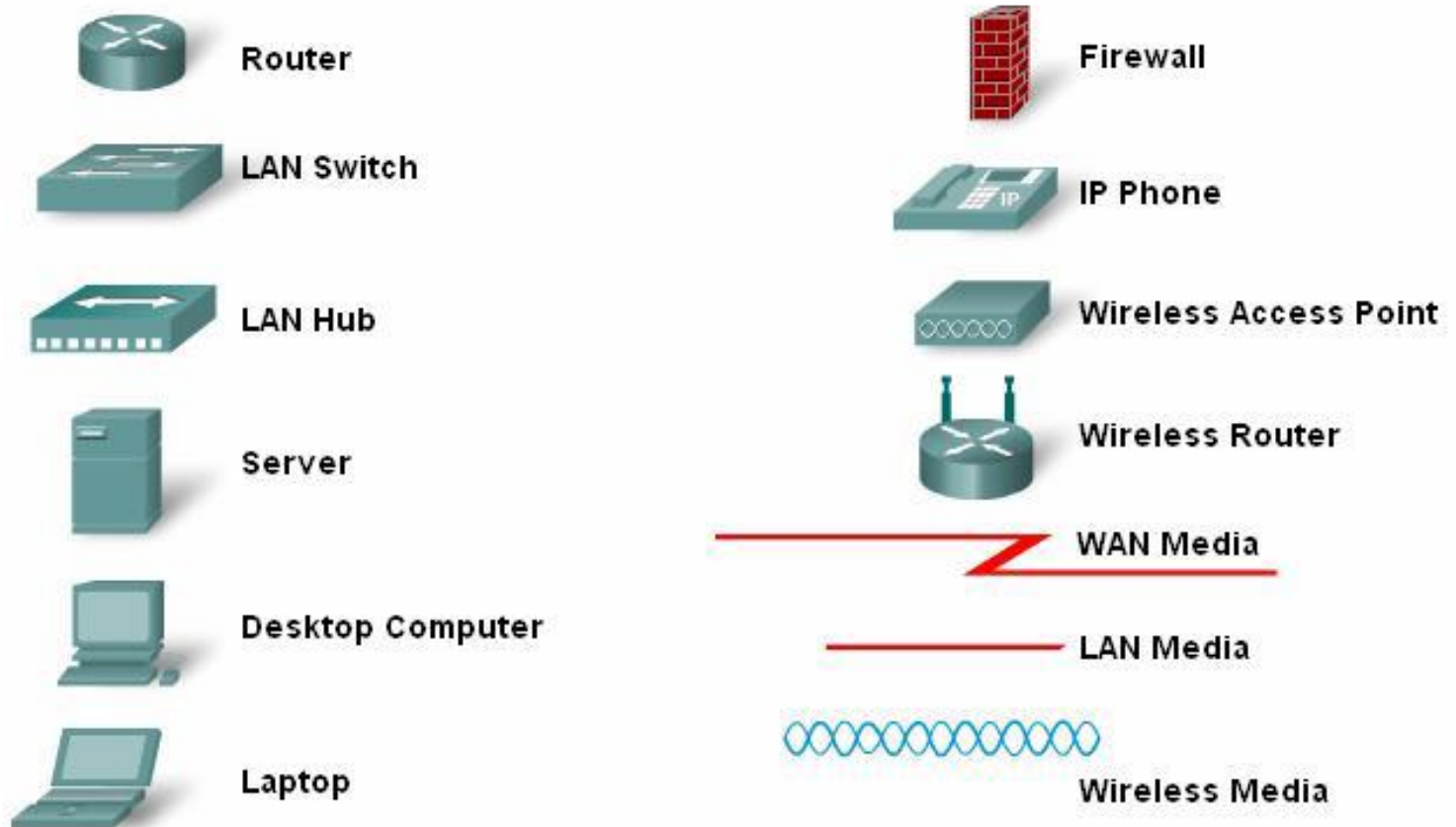
(↑Optical, cable, wireless)

- The **amount of data** and the **speed** at which it must be transmitted.

(↑Optical, cable, wireless)

Network Representation

Common Data Network Symbols



HOMEWORK

Give a description about one type of network media with pictures.



THANK YOU