



**Dr./ Ahmed Mohamed Rabie Sayed**

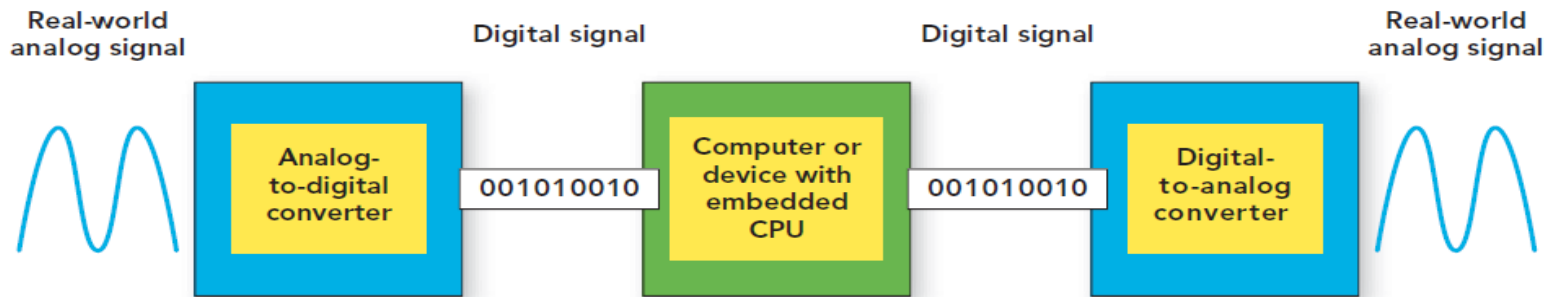
# Chapter 8

## Wired and Wireless Communication

**Communications (data communications or telecommunications) is the process of electronically sending and receiving messages between two or more computers or devices regardless of the distance between those devices**

**Communications** can be split into **two parts** the **message** (data, information, or an instruction) and the **communications channel** (also referred to as the **link**), the transmission media on which the message is sent from one location to the next.

**An analog-to-digital converter (ADC)** is simply a microchip that contains the circuitry to convert an analog signal into a digital signal.



**A digital-to-analog converter (DAC)** is a microchip that contains the circuitry to convert a digital signal to analog.

**Bandwidth** refers to the theoretical maximum amount of data that can be transmitted through a given communications channel at one time (usually per second).

**Two factors affect bandwidth:** the **physical characteristics of the transmission medium** and the **method used to represent and transmit the data.**

For **analog** signals, bandwidth is expressed in cycles per second, or **hertz** (Hz).

For digital signals, bandwidth is expressed in bits per second (bps).

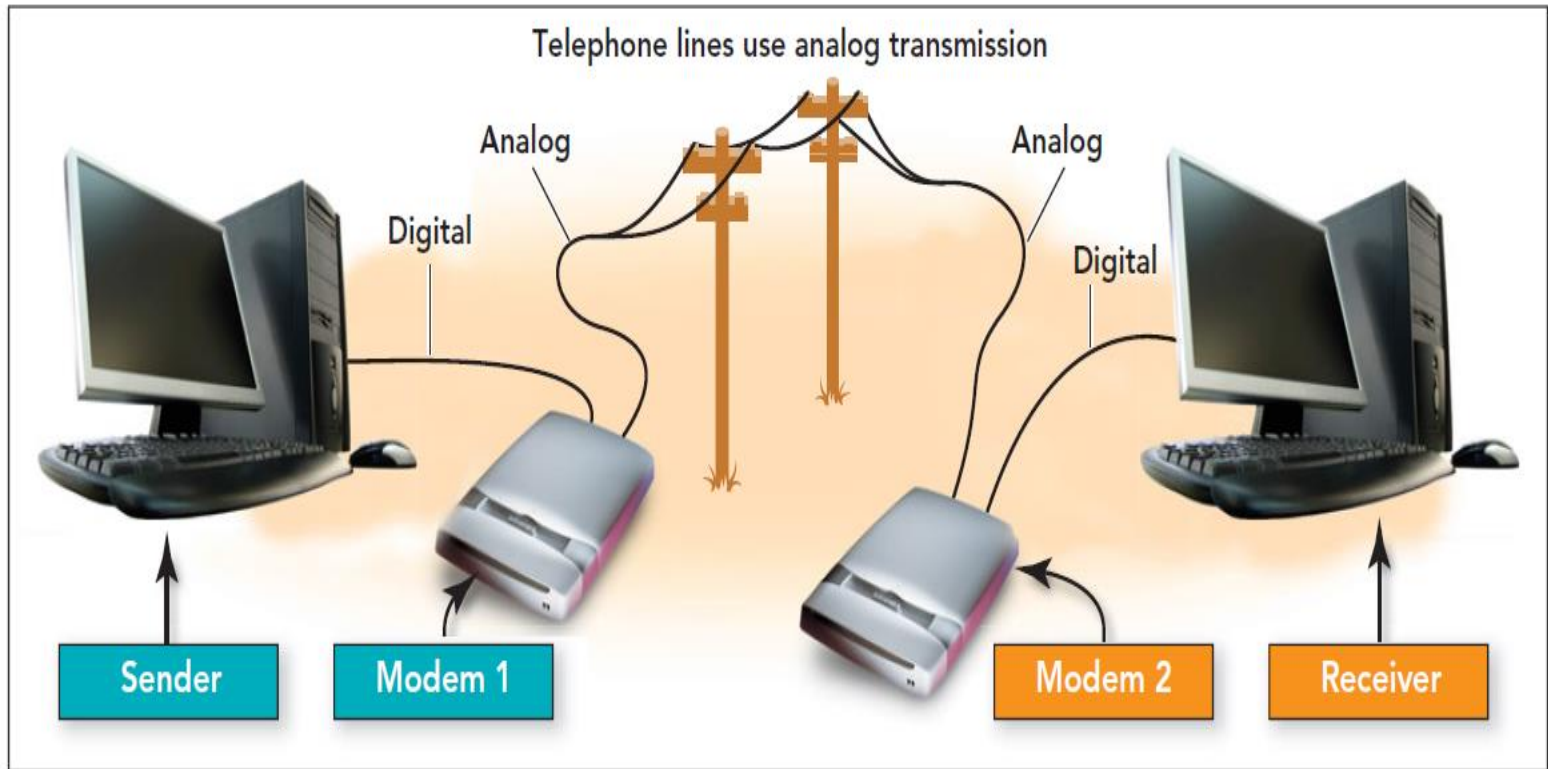
**Throughput**, is the *actual* amount of data that is transmitted. It is almost always lower than bandwidth, especially with wireless communications.

**Broadband** refers to any transmission medium that carries several channels at once and thus transports high volumes of data at high speeds, typically greater than 1 **Mbps** (megabits per second, or million bits per second).



**Streaming** is the ability to hear or see content while it is being downloaded from a Web site instead of waiting till the download is complete.

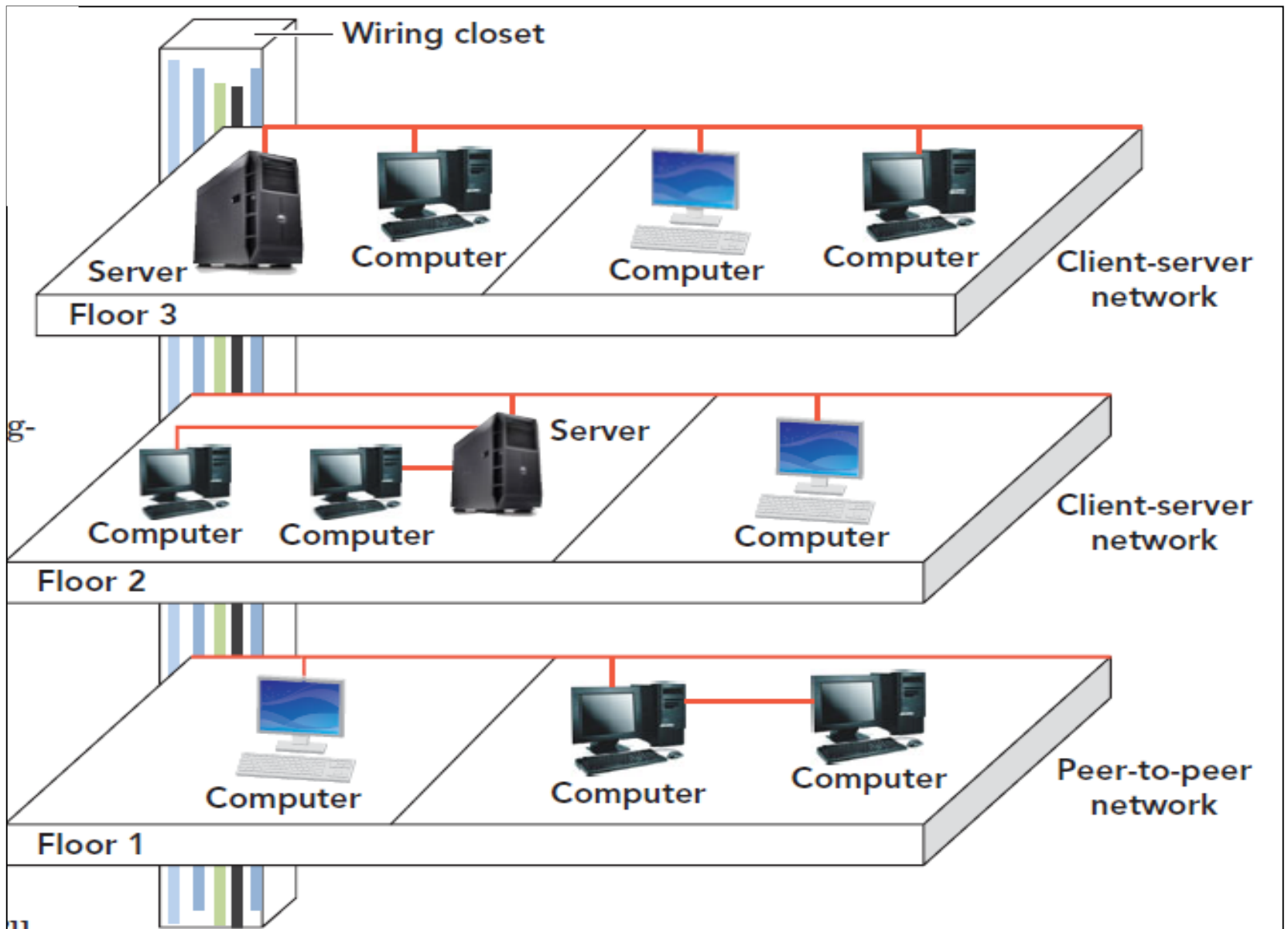
**Modem:** The term modem comes from combining the words **modulate** and **demodulate**. It uses a process called *modulation* to transform the computer's digital signals into signals appropriate for the transmission system being used.



**The data transfer rate, the rate at which two modems can exchange data, is measured in bits per second and is referred to as the bps rate.**

# Wired Transmission Media

**Wiring closet**, a central location that extends through all floors of the building in which the appropriate wiring is housed to support most types of data transfer that the individuals or companies that occupy the building might want to access.

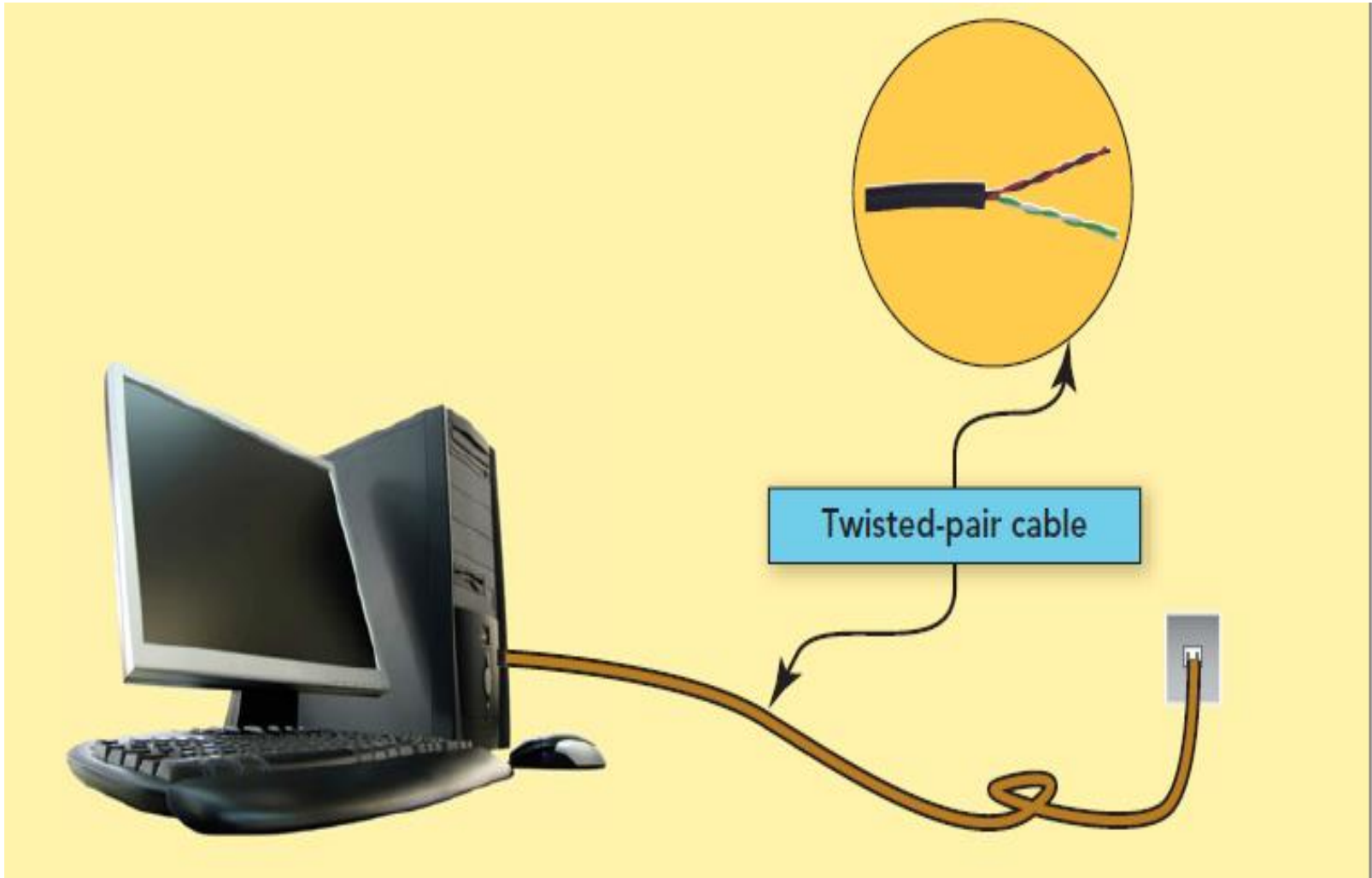


# Forms of Wired Media

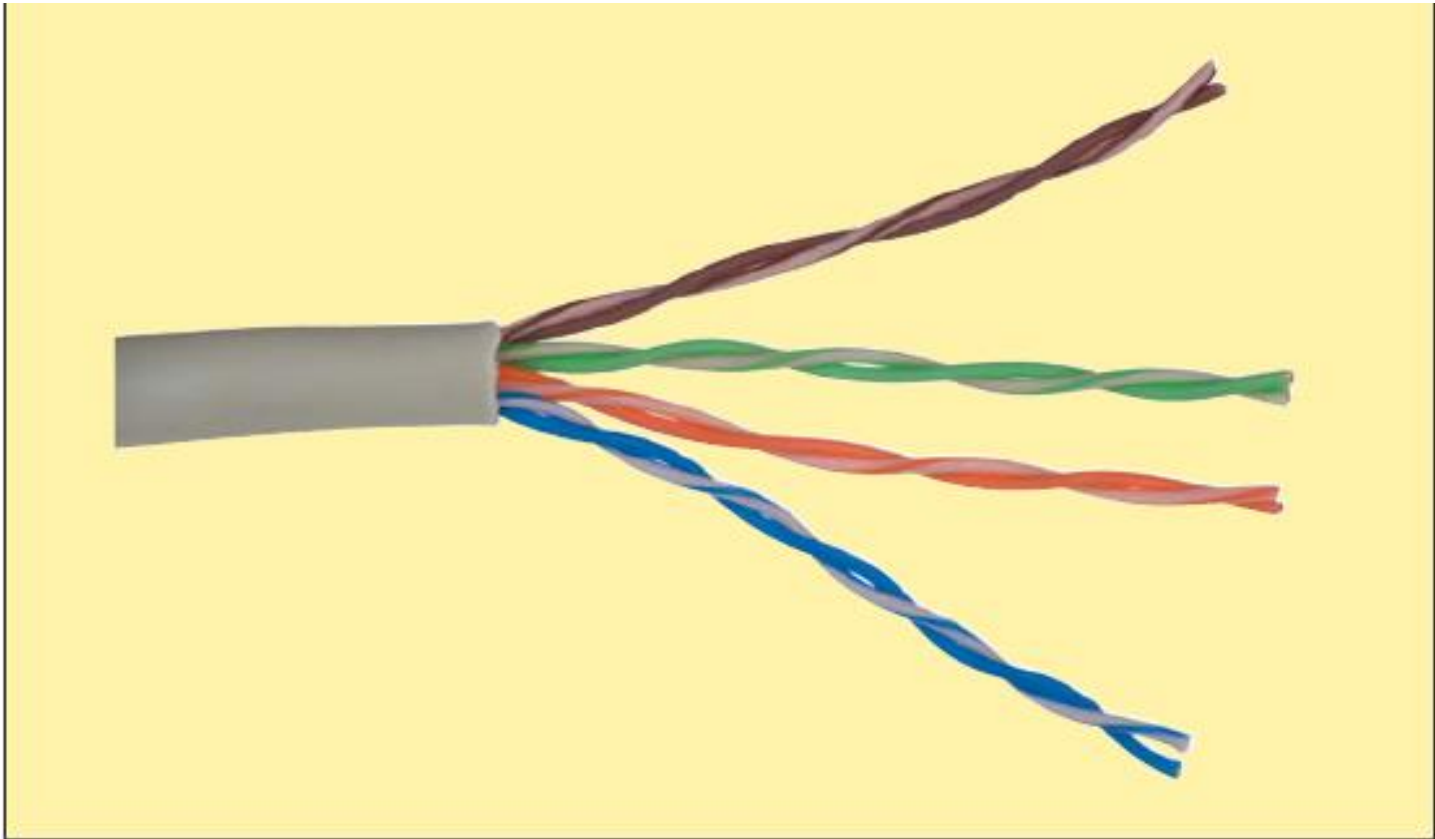
1- **Twisted-pair wire** is a copper cable used for telephone and data communications.

The term *twisted-pair* refers to the interweaving of **two pairs of wires** that are **twisted together**, a practice that provides a shield that reduces interference from electrical fields generated by electric motors, power lines, and powerful radio signals.





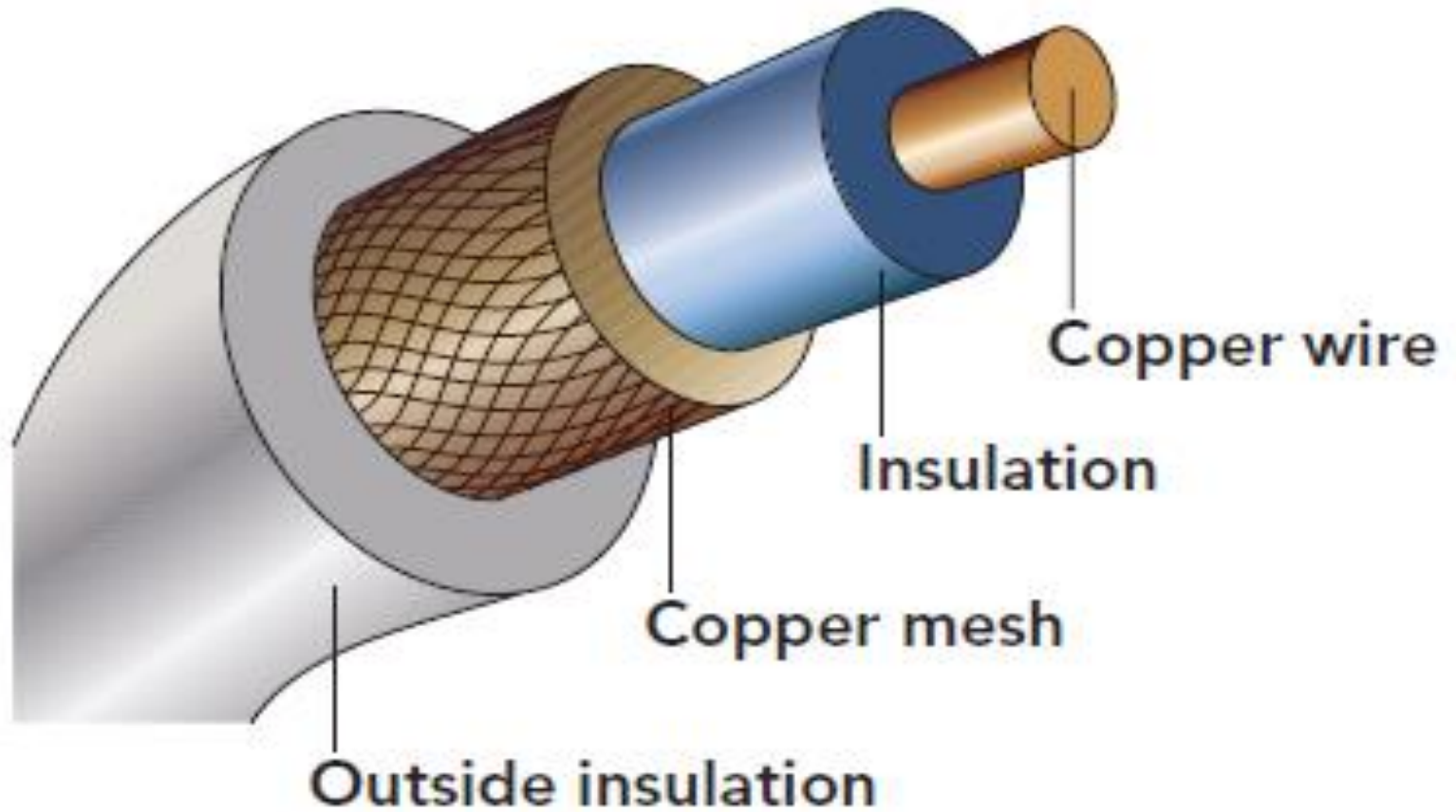
# Cat-5 cable



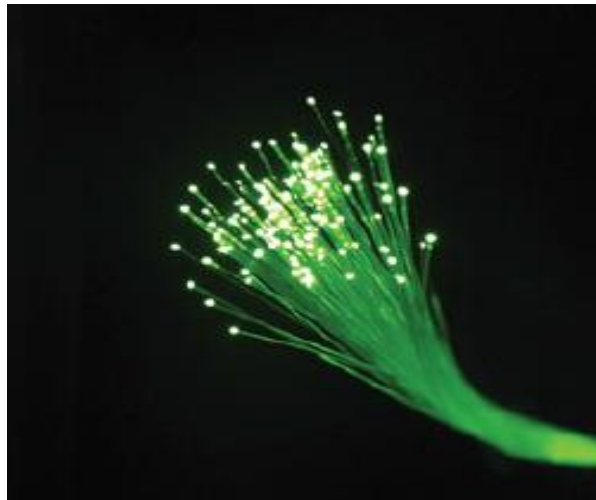
**Coaxial cable**, familiar to cable TV users, consists of a center copper wire surrounded by insulation, which is then surrounded by a layer of braided wire.



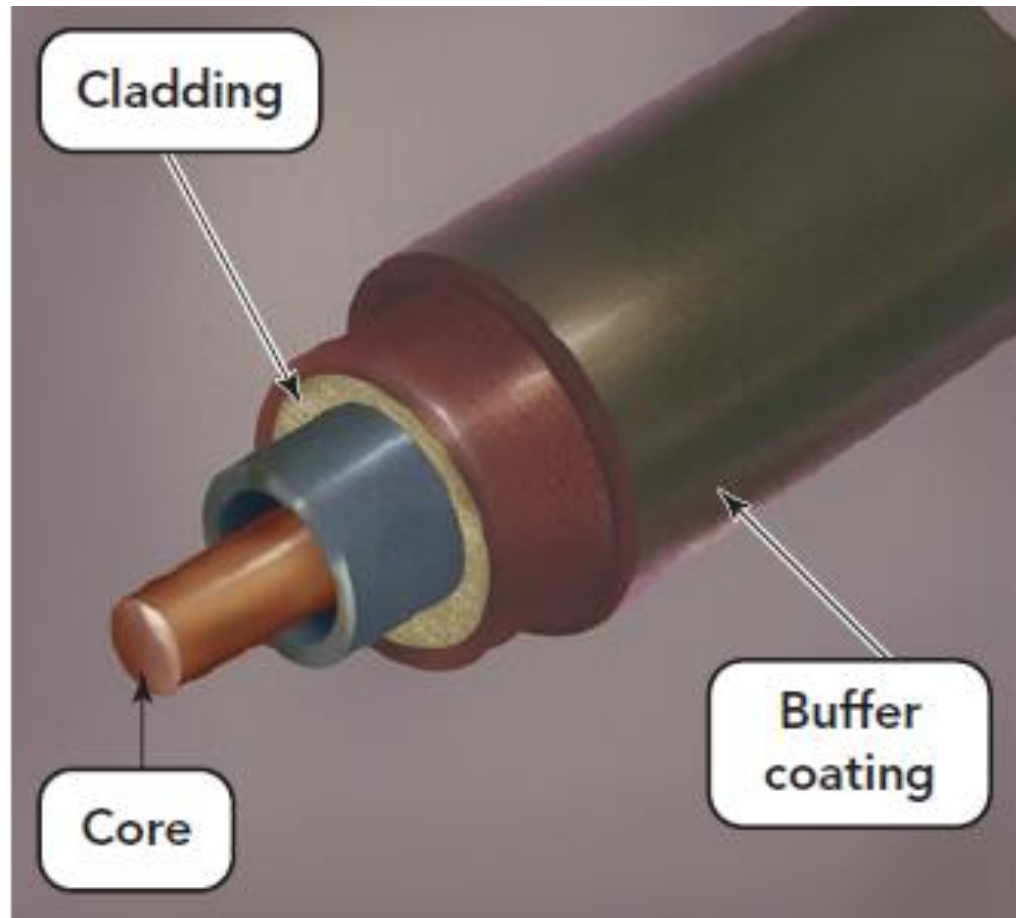
# Coaxial cable



**Fiber-optic cable**, another broadband transmission medium, consists of thin strands of glass or plastic about the diameter of a human hair. This medium is arranged in bundles called optical cables that carry data by means of pulses of light.



# Fiber-optic cable



# Wireless Transmission Media

**Infrared** is a wireless transmission medium that carries data via beams of light through the air.

**Radio transmissions** offer an alternative to infrared transmissions. You probably have experienced one type of radio transmission by listening to your favorite radio station.



**WiFi** : is a popular wireless network technology that uses **radio** waves to provide high-speed Internet and network connections for home systems, notebooks, video game consoles, and other enabled wireless devices.

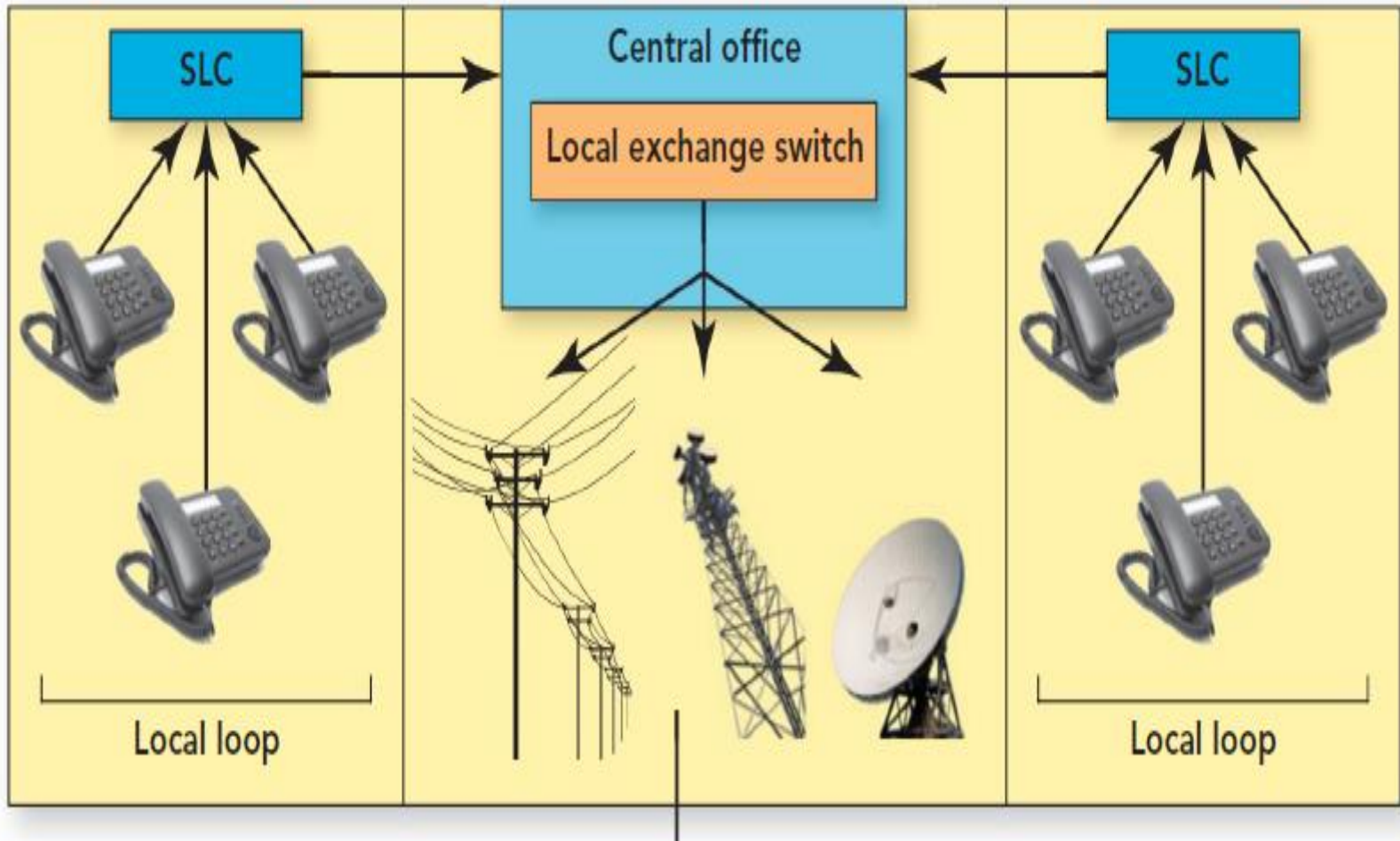
**Bluetooth** is a short-range radio transmission technology that has become very popular in recent years.

**Microwaves** are electromagnetic radio waves with short frequencies that travel at speeds of 1 to 10 Mbps and are used to transmit data from a source to a receiving site.

**Satellites** transmit data by sending and receiving **microwave** signals to and from Earth-based stations.

**Network access point**, which sends and receives data between computers that contain wireless adapters. Access points are usually built into wireless routers.

**The public Switched Telephone Network (PSTN)**  
**the global telephone system, a massive network**  
**used for data as well as voice communications,**  
**comprising various transmission media ranging from**  
**twisted-pair wire to fiber-optic cable.**



**DSL (digital subscriber line)**, also called DSL. This term refers to a group of related technologies, including **ADSL** (asymmetric digital subscriber line), **SDSL** (symmetrical digital subscriber line), **HDSL** (high bit-rate digital subscriber line), and **VDSL** (very high bit-rate digital subscriber line), all forms of Internet access.

**ADSL:** An ADSL modem separates an ordinary copper telephone line into three separate data channels with different capacities and speeds. The lowest capacity transmits analog voice for telephones; the second, medium capacity, uploads data to the network; and the third, highest capacity, downloads data from the network. This means that uploads are slower than downloads on an ADSL connection.



**A SDSL modem splits the copper telephone line channels into three channels: telephone, upload, and download; On SDSL connections, uploads and downloads occur at the same rate.**

**HDSL** is the most mature DSL technology. It is a form of SDSL that provides T1 connections over two or three twisted-pair copper lines. Unlike most other forms of DSL, HDSL is not a typical consumer service, but it is often used for **private data networks**.

**VDSL** is the next generation DSL with super-accelerated rates of 52 Mbps for downloads and 12 Mbps for uploads. It will provide services like HDTV and Video-on-Demand along with Internet access.

Name	Actual Name	Bandwidth	Users
ADSL	Asymmetrical digital subscriber line	Uploads at speeds of up to 640 Kbps, downloads at speeds of up to 8.1 Mbps	Frequently used with residential users in the United States.
SDSL	Symmetrical digital subscriber line	Supports data exchange rates each way, up to 3 Mbps	Popular with residents in Europe.
HDSL	High bit-rate digital subscriber line	1.544 Mbps of bandwidth each way	PBX network connections, digital loop carrier systems, interexchange point of presence (POPs), Internet servers, and private data networks.
VDSL	Very high bit-rate digital subscriber line	Uploads at speeds of up to 16 Mbps, downloads at speeds of up to 52 Mbps	VDSL is available worldwide in specific regions. Its use is growing all the time, though it's not easily found in the United States.

**SONET (synchronous optical network), is a physical layer of network technology that uses fiber-optic cable and is designed to carry large volumes of data over long distances.**

**WiMAX (worldwide interoperability for microwave access) is a wireless up-and-coming digital communication system designed to deliver high-speed access over long distances, either point to point (both sender and receiver are stationary) or through mobile access (sender or receiver is moving).**

Wireless Technologies	Year	Feature
1G	1981	Analog mobile phone service allowed callers to make their own calls without operator assistance and move seamlessly from cell to cell.
2G	1991	Digital signaling decreased interference, improved reception, and provided better protection from eavesdropping. This generation also increased security features designed to discourage cell phone fraud.
3G	2001	These technologies enabled faster data transmission, greater network capacity, more advanced network services, and allowed transmission of voice, text, images, and video data.
4G (beyond 3G)	2010–2015 (estimated release)	This generation promises even higher data rates as well as real-time (streamed) formatting for voice, data, and high-quality multimedia. 4G is not currently available in all areas.

**A Web-enabled device** is any device that can connect to the Internet and display and respond to the codes in markup languages, such as HTML (Hypertext Markup Language) or XML (Extensible Markup Language), typically used to build Web pages. Web-enabled devices include PDAs, smartphones, and notebook PCs.



**WAP (Wireless Application Protocol):** WAP is a standard that specifies how users can access the Web securely using pagers, smartphones, PDAs, and other wireless handheld devices.

**Video conferencing, also called Web conferencing, the use of digital video technology to transmit sound and video images to facilitate online, virtual meetings through which two or more people can have a face-to-face meeting even though they're geographically separated.**

**A fax modem** is a computerized version of a stand-alone fax machine. This device and software allow your computer to do everything a fax machine can: send and receive documents, print documents, and store documents.

**GPS** Another interesting application of satellite technology is GPS. GPS (Global Positioning System) is a cluster of 27 Earth-orbiting satellites (24 in operation and 3 extras in case one fails). Each of these 3,000- to 4,000- pound solar-powered satellites circles the globe at an altitude of 12,000 miles, making two complete rotations every day.

4 of 24 possible satellites



Locking into three satellites determines location in latitude and longitude.



Locking into a fourth satellite provides altitude and 3D positioning.

GPS receivers



1. A GPS receiver in the vehicle connects to a satellite, establishes the location of the vehicle, and stores that location.

2. When an emergency feature of OnStar is activated, the unit places a call to the OnStar center and transmits the vehicle ID and GPS location.

3. The cellular call is routed to the landline phone system.

4. The call is picked up by a trained OnStar advisor.

**Text messaging, also called SMS (short message service), is similar to using your phone for instant messaging or as a receiver and transmitter for brief e-mail messages.**

**MMS (multimedia messaging system) allows you to send full-color pictures, backgrounds, and even picture caller IDs on your cell phone.**



**A malicious network** is a network set up by a hacker within the operating area of a legitimate hot spot.

Here are a few **precautions** that you can follow to **protect** yourself while surfing on a public hot spot:-

- Use **firewalls** and antivirus software.
- **Ask an employee for the name of the legitimate network**, to prevent connecting to an evil twin.

- **Do not engage in sensitive financial transactions while connected to an unsecured hot spot.**
- **Select the appropriate operating system option to limit sharing of resources and discovery of your computer while connected to a public hot spot**