Digital Planet:
Tomorrow's Technology and You

Chapter 8

Networking and Digital Communication

الشبكات والاتصالات الرقمية

Chapter 8 Objectives

- ✓ Describe the basic types of technology that make telecommunication possible
- ✓ Describe the nature and function of local area networks and wide area networks
- ✓ Discuss the uses and implications of several different forms of online communication and collaboration
- ✓ Explain how wireless network technology is transforming the ways people work and communicate

Chapter 8 Objectives (cont.)

- ✓ Describe how wireless phone networks are converging with digital data networks and the impact of that convergence
- ✓ Describe several ways to maximize effectiveness and minimize risks of online communication
- ✓ Describe how online social networks, wikis, and other new tools for creating online communities compare to traditional forms of community building
- ✓ Describe current and future trends in telecommunications and networking

Arthur C. Clarke's Magical Prophecy

- Arthur C. Clarke: predicted the use of geostationary communications satellites
- Considered to be the father of satellite communications

توقع السيد ارثر كلارك باستعمال الاقمار الصناعية للاتصلات الارضية .

Basic Network Anatomy

- ✓ A computer network is any system of two or more computers that are linked together.

الشبكة الحاسوبية هي نظام لربط اكثر من حاسوب

- ✓ Three essential components of every computer system:
  - Hardware
  - Software
  - People

Networks Near and Far

1. ***LAN (local area network, شبكة داخلية):*** computers are physically close to each other

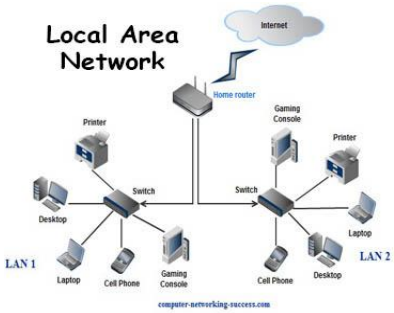
   - ***Nodes:*** connected to hubs or switches, which allow any node on the network to communicate with any other

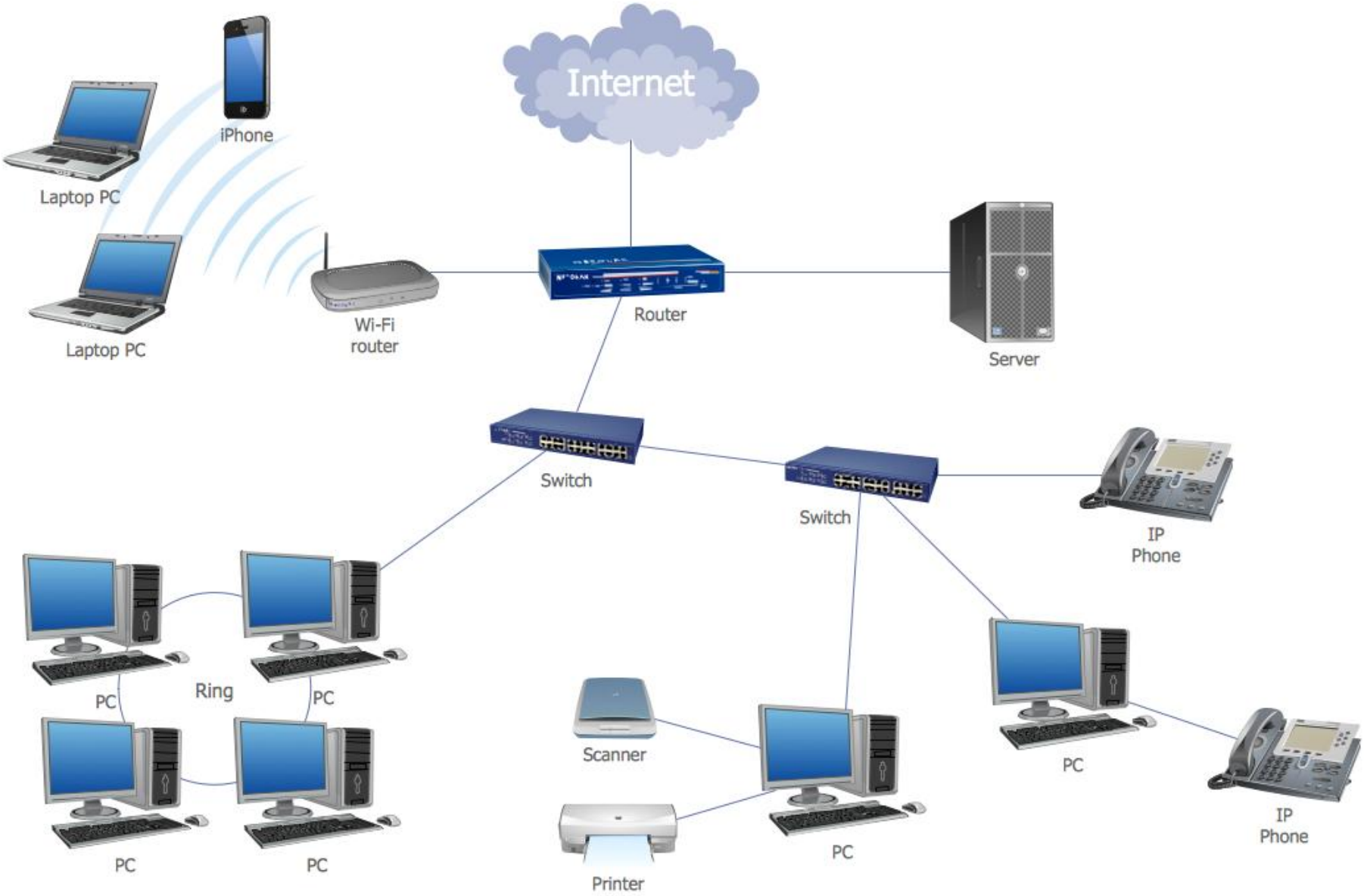
✓ ***Ethernet:*** popular networking architecture developed in the 1970s; now an industry standard

✓ Each node is connected via

   ➢ wireless network: where a node has a radio transmitter.

   ➢ Wired network: nodes connected via cables.



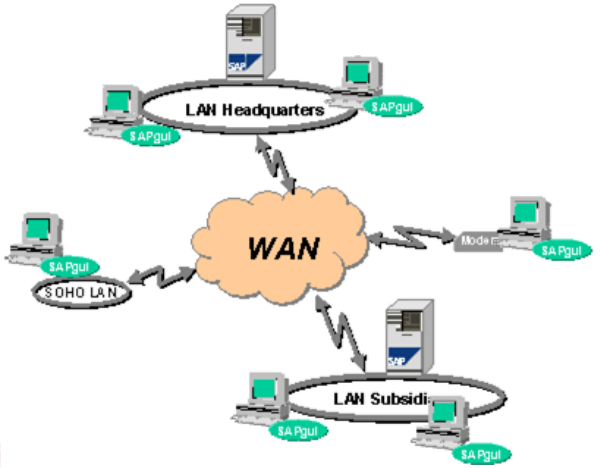


Networks Near and Far (cont.)

2. ***WAN (wide area network, شبكات واسعة):*** extends over a long distance

   - Each networked LAN site is

     a node on the WAN

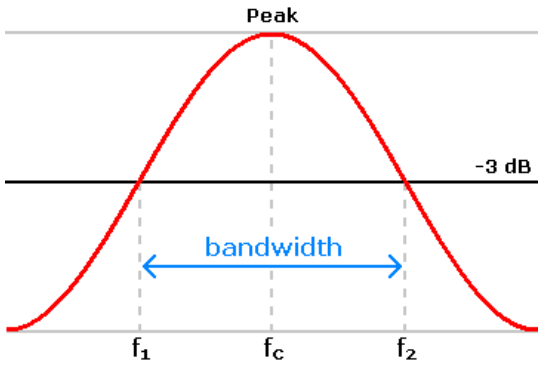


✓ ***Routers (موجهات):*** hardware devices or software programs that route messages between networks

✓ ***Mesh networks:*** alternative to networks that uses centralized(مركزية) routers. Good for small systems.

The Importance of Bandwidth

- ✓ ***Bandwidth (نطاق التردد):*** refers to the quantity of data that can be transmitted through a communication medium in a given amount of time.
- ✓ Typically measured in kilobits or megabits per second



The Importance of Bandwidth (cont.)

✓ Bandwidth can be affected by :

- Physical media of the network
- Amount of traffic on the network
- Type of network connection

✓ ***Fast Ethernet:*** carries traffic at 100 megabits per second; provided all devices are fast Ethernet compatible

✓ ***Gigabit Ethernet:*** standard is capable of transferring 1 gigabit of data per second

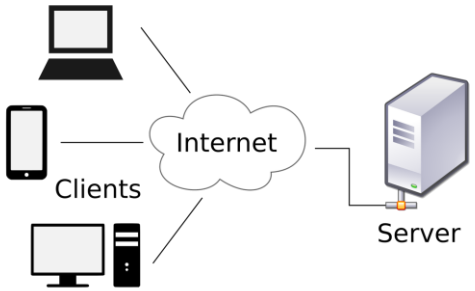
Communication Software

- ✓ ***Protocol:*** set of rules for the exchange of data between devices (طريقة الاتصال)
  - Computers must follow the same protocols to understand each other.
- ✓ ***TCP/IP:*** most famous protocol for computer networking
  - TCP/IP controls the exchange of data.

Communication Software (cont.)

✓ Communication software takes many forms:

- ***NOS (network operating system):*** system handles communications among many workstations
- ***Client/server model:*** one or more computers act as dedicated servers and all the remaining computers act as clients
- ***Peer-to-peer model:*** every computer on the network is both client and server

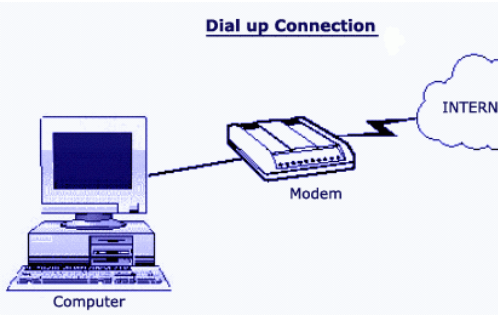


Linking In: Internet Connection Technologies

✓ ***Direct connection to LAN:*** faster than other options

✓ ***Dial-up connection:*** uses modem and standard phone lines

- Modem stands for modulator/demodulator.
- Also called narrowband connections

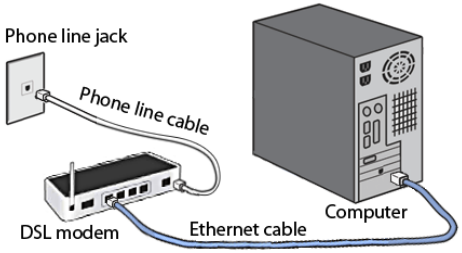


✓ ***Broadband connection:*** greater bandwidth than modems

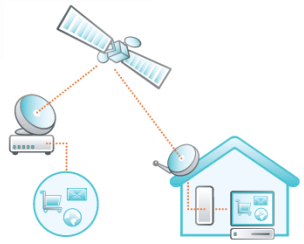
Linking In: Internet Connection Technologies (cont.)

✓ Most common broadband alternatives:

- ***DSL (digital subscriber line):*** uses telephone lines that carry voice calls



- ***Cable modems:*** use same network of coaxial cable as television signals



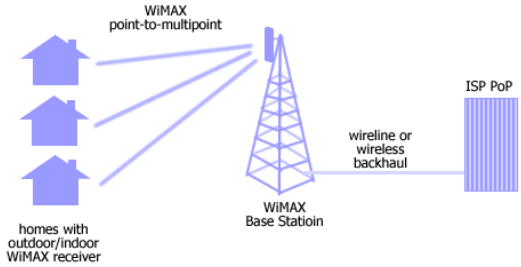
- ***Satellite connections:*** use dishes that provide television channels
- ***Wireless connections:*** used by growing numbers

Wi-Fi and WiMax Technology

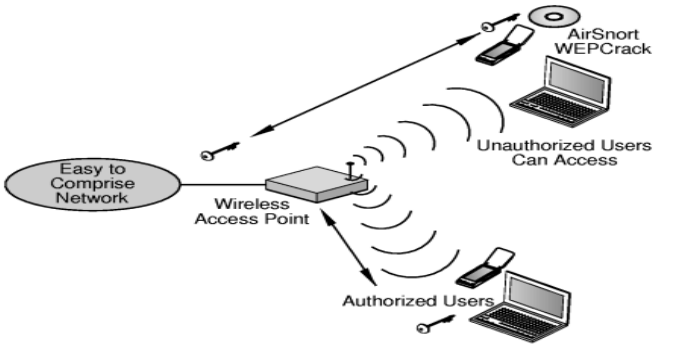
- ***Wireless access point (WAP):*** central connection point wireless devices
- 802.11n: standard IEEE 802.11 specifications for wireless local area networks

Wi-Fi and WiMax Technology (cont.)

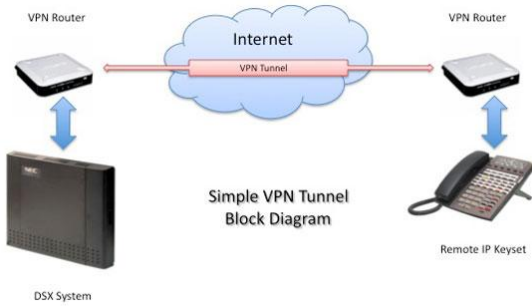
- ***WiMAX:*** new radio-based wireless standard in which a single tower can provide access to a 25-square-mile area



- Security Issues
  - ***WEP (wired equivalent privacy):*** encryption scheme(نظام التشفير) improves the security of wireless networks



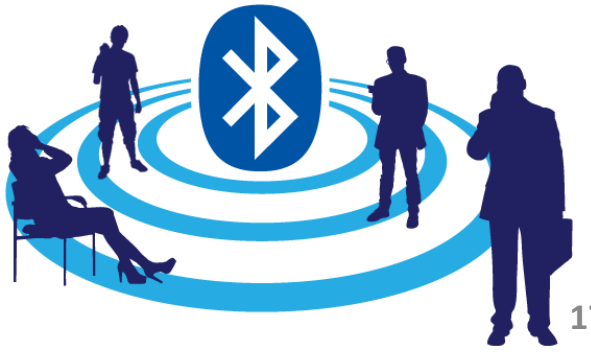
  - ***VPN (virtual private network):*** electronic "tunnel" through the Internet that helps to prevent eavesdropping التنصت



Bluetooth Technology

✓ ***Bluetooth technology:*** named for Danish king who overcame his country's religious differences

- Overcomes differences between mobile phones, handheld computers, and PCs, allowing communication between different operating systems
- ***PAN (personal area network):*** links a variety of electronic devices using Bluetooth technology شبكة باستخدام بلوتوث



3G and 4G Technology

✓ ***3G and 4G technology:*** 3G networks carry multimedia data and voice communications simultaneously(الوقت ذاته)

- Lack true broadband speeds
- 4G networks have gigabit broadband speeds
- ***Tethering :*** (نقطة الوصول المحمولة) cabling a laptop to a mobile phone so it can send and receive Internet data through the phone's wireless Internet connection

Wireless Network Technology

Wireless Network Standards

Technical Name	Popular Name	Range	Technology	Approximate Speed	Typical Use
IrDA-Data	IrDA	1 meter	Infrared	9600 bps	Exchange data between PDAs
802.15	Bluetooth	10 meters	Radio	1 Mbps	Room-sized personal area network
802.11	Wi-Fi	30 meters or more	Radio	54 Mbps	Local area network
802.16	WiMAX	5 miles (no line of sight) to 30 miles (line of sight)	Radio	70 Mbps	Linking Wi-Fi networks
3G	3G	Varies widely depending on type of data being transmitted and location of relay towers	Radio	Up to 3.1 Mbps (much slower while moving)	Mobile phone Internet access
4G	4G	Varies widely depending on type of data being transmitted and location of relay towers	Radio	Up to 14.4 Mbps (much slower while moving)	Mobile phone voice, Internet access

Specialized Networks: From GPS to Digital Money

- ***GPS (Global Positioning System,*** ***نظام التموقع العالمي*****):** specialized network of the U.S. Department of Defense
- GPS receiver uses signals broadcast by satellites to determine its position.

The Network Advantage

✓ Networks enable people to:

- Share computer hardware resources
  - Print servers: accept, prioritize, and process print jobs
- Share data and software programs
  - Site licenses reduce costs for multiple copies of software
- Work, play, and communicate together
  - Groupware enables several users to work on the same document at the same time.

A Home Computer Network