Network Models

- **Topology** describes how parts of a whole work together
- **Physical topology** mostly refers to a network's hardware and how computers, other devices, and cables work together to form the physical network
- **Logical topology** refers to how software controls access to network resources
  - It includes how users and software initially gain access to the network
- A **network operating system (NOS)** controls access to the entire network
  - A NOS is required by client-server models

Peer-to-Peer Network Model (1 of 2)

- In a **peer-to-peer (P2P) network model** the OS of each computer on the network is responsible for controlling access to its resources
  - There is no centralized control
- Computers, called nodes or hosts, form a logical group of computers and users
  - Each computer controls its own administration, resources, and security
- Advantages
  - Simple configuration
  - Less expensive compared to other network models
- Disadvantages
  - Not scalable
  - Not necessarily secure
  - Not practical for large installations

Peer-to-Peer Network Model (2 of 2)

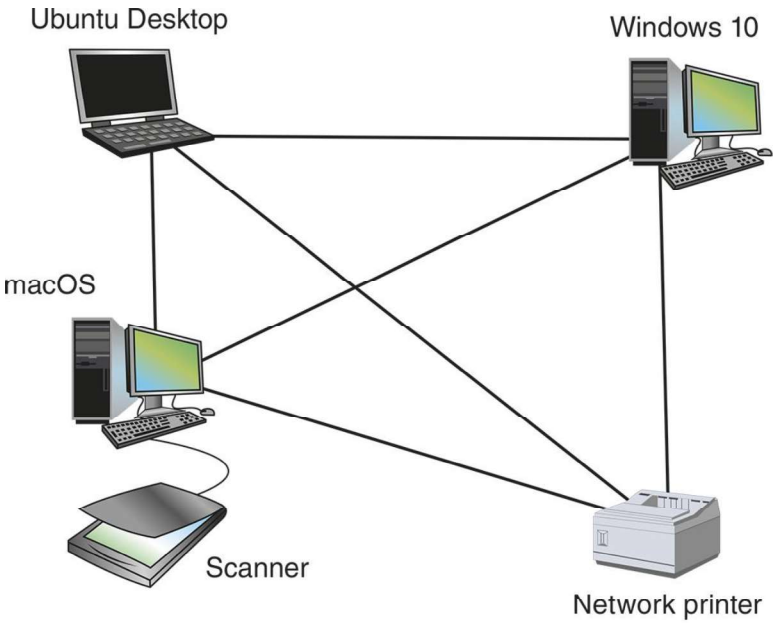

Figure 1-1 In a peer-to-peer network, no computer has more authority than another; each computer controls its own resources and communicates directly with other computers

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Client-Server Network Model (1 of 3)

- Resources are managed by the NOS via a centralized directory database
- A **Windows domain** is a logical group of computers that a Windows Server can control
- **Active Directory (AD)** is the centralized directory database that contains user account information and security for the entire group of computers
- A user can sign on to the network from any computer on the network and gain access to the resources that AD allows
  - This process is managed by **Active Directory Domain Services (AD DS)**
- A computer making a request from another is called the **client**

Client-Server Network Model (2 of 3)

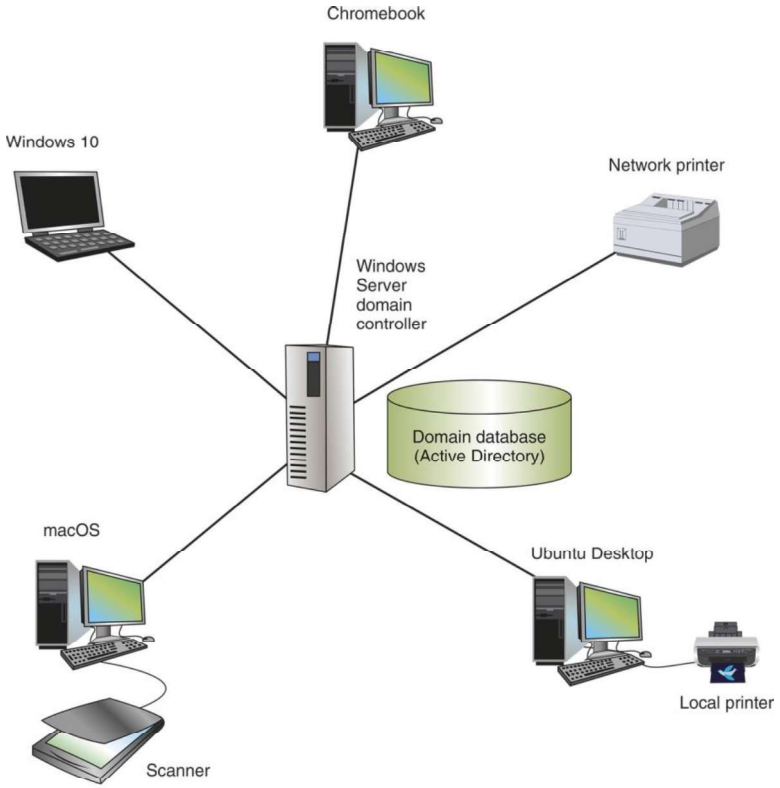

Figure 1-2 A Windows domain uses the client-server model to control access to the network, where security on each computer or device is controlled by a centralized database on a domain controller

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Client-Server Network Model (3 of 3)

- The NOS is responsible for:
  - Managing client data and other resources
  - Ensuring authorized user access
  - Controlling user file access
  - Restricting user network access
  - Dictating computer communication rules
  - Supplying applications and data files to clients
- Servers that have a NOS installed require:
  - More memory, processing power, and storage capacity
  - Equipped with special hardware to provide network management functions

Client-Server Applications (1 of 2)

- **Network services** are the resources a network makes available to its users
  - It includes applications and the data provided by these applications
- In **client-server applications**:
  - A client computer requests data or a service from a second computer, called the server

Client-Server Applications (2 of 2)

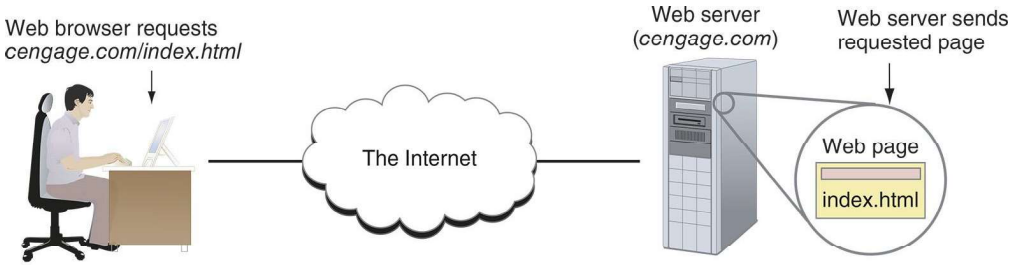

Figure 1-3 A web browser (client application) requests a web page from a web server (server application); the web server returns the requested data to the client

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Network Services and Their Protocols (1 of 2)

- **Protocols** are methods and rules for communication between networked devices
- Two primary network protocols:
  - **TCP (Transmission Control Protocol)**
  - **IP (Internet Protocol)**
- Popular client-server applications include:
  - Web service
  - Email services
  - DNS service
  - FTP service
  - Database services
  - Remote access service

Network Services and Their Protocols (2 of 2)

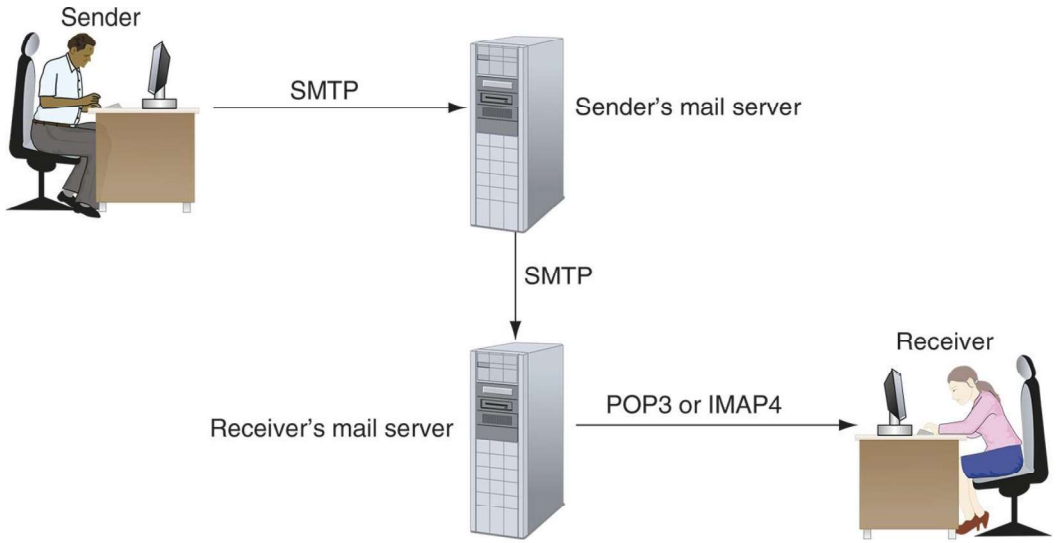

Figure 1-5 SMTP is used to send email to a recipient's email server, and POP3 or IMAP4 is used by the client to receive email

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Knowledge Check Activity 1-1

Which of these protocols could *not* be used to access a server in a nearby building?

a. Telnet

b. RDP

c. TLS

d. SSH

Knowledge Check Activity 1-1: Answer

Which of these protocols could *not* be used to access a server in a nearby building?

Answer: c. TLS

TLS (Transport Layer Security) adds encryption to other protocols, such as HTTP, but does not provide remote access to a computer

Network Hardware

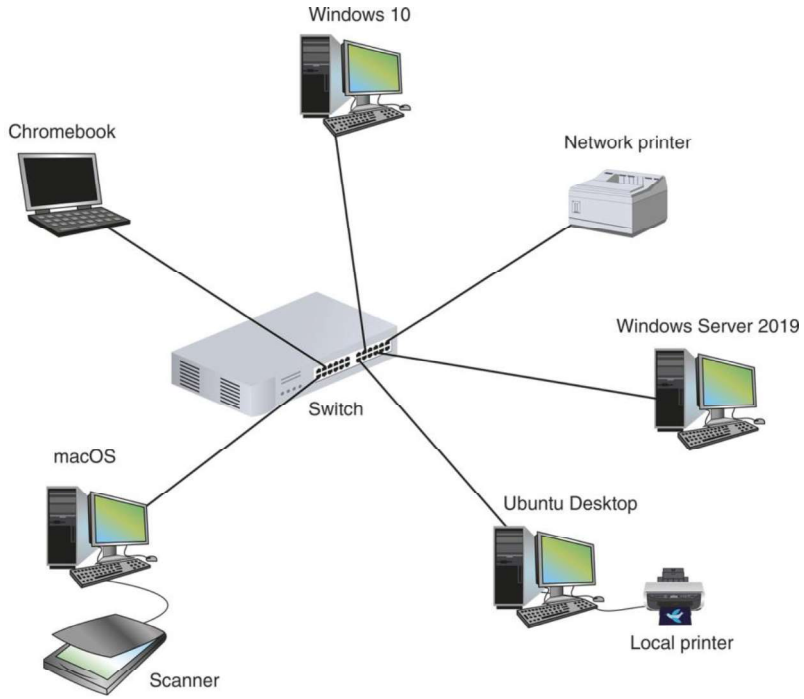

Figure 1-7 This LAN has five computers, a network printer, a local printer, a scanner, and a switch, and uses a star topology

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LANs and Their Hardware (1 of 4)

- A **LAN (local area network)** is usually contained in a small space
- A **switch** receives incoming data from one of its ports and redirects it to another port or multiple ports
  - Will send the data to its intended destination
- The physical topology used by this network is called a **star topology**
  - All devices connect to one central device (usually a switch)
- A **NIC (network interface card)** is a network port used to attach a device to a network
  - Also called a network adapter
- A LAN can have several switches
- A **backbone** is a central conduit that connects the segments (pieces) of a network

LANs and Their Hardware (2 of 4)

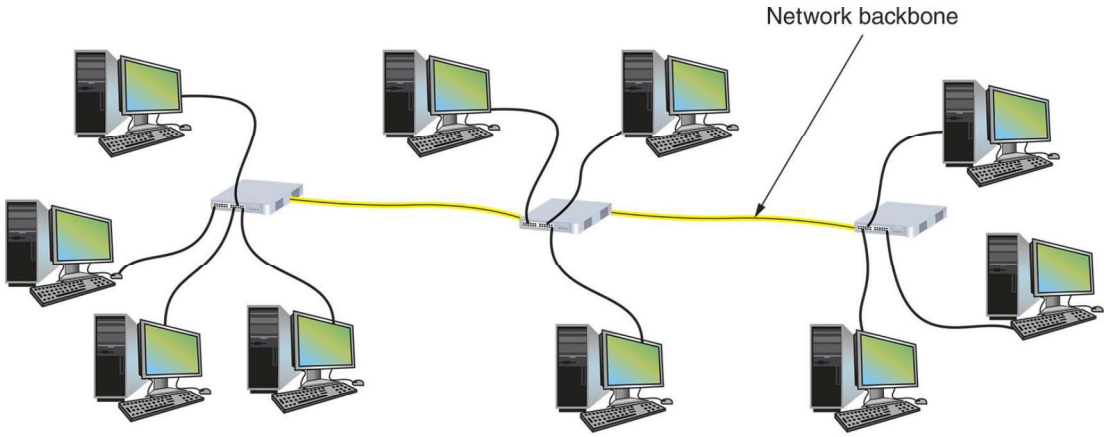

Figure 1-11 This local network has three switches and is using a hybrid topology

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LANs and Their Hardware (3 of 4)

- A **router** is a device that manages traffic between two or more networks
  - Can help find the best path for traffic to get from one network to another
- Routers can be used in small home networks to connect the home LAN to the Internet
  - Called a **SOHO (small office-home office) network**
- Industrial-grade routers can have several network ports, one for each network it connects to
- Difference between router and switch:
  - A router is like a gateway between networks and belongs to two or more local networks
  - A switch belongs only to its local network

LANs and Their Hardware (4 of 4)

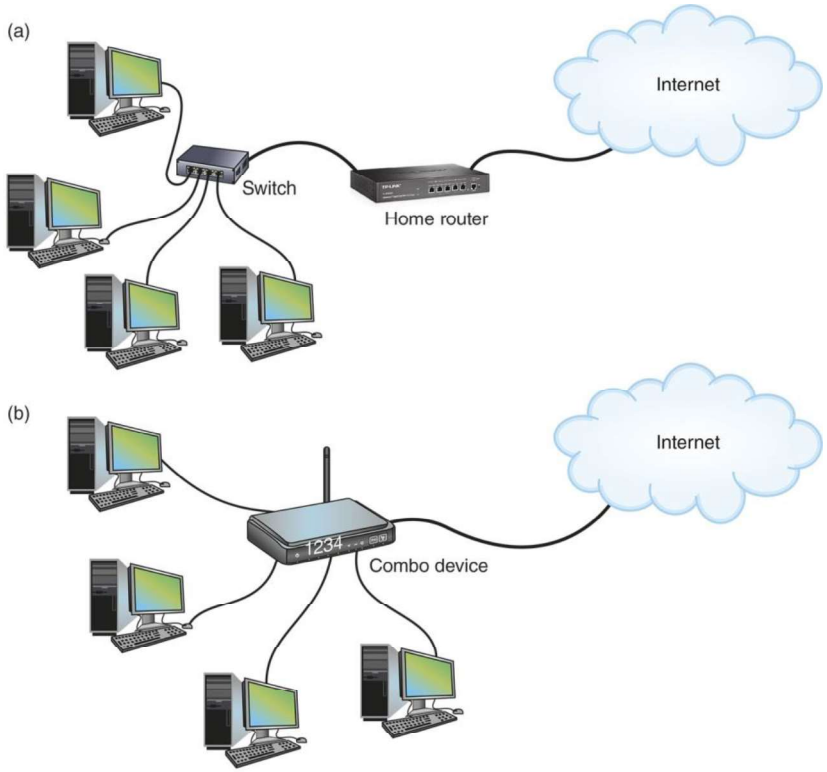

Figure 1-14 (a) A router stands between the LAN and the Internet, connecting the two networks; (b) Home networks often use a combo device that works as both a switch and a router

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