Chapter 6

Computer Networks

OBJECTIVES

- Understand the rationale for the existence of networks.
- Distinguish between the three types of networks: LANs, MANs, and WANs.
- Understand the OSI model and TCP/IP.
- List different connecting devices and the OSI layers in which each device operates.
- Understand client-server models.

6.1 NETWORKS, LARGE AND SMALL

Definitions

- A **computer network** is a combination of systems (computers) connected through transmission media (cables, wire, air)
- A **model** is the specification set by a standards organization as a guideline for designing networks (we'll discuss Open Systems Interconnection model)
- A **protocol** is a set of rules that controls the interaction of different devices in a network (we'll discuss TCP/IP protocol)

6.2 OSI MODEL

Note:

The Open Systems Interconnection model is a theoretical model that shows how any two different systems can communicate with each other.

Figure 6-1

The OSI model

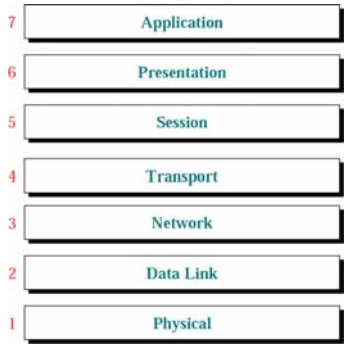
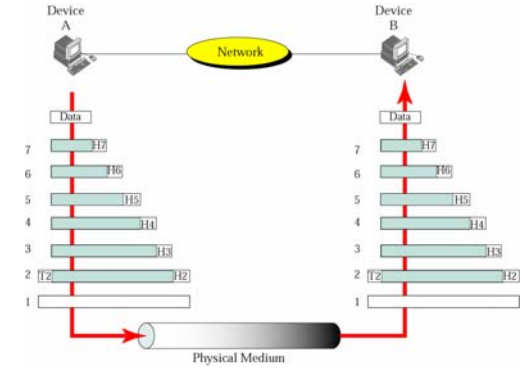


Figure 6-2

Flow of data in the OSI model



Functions of the layers in OSI model

- **Physical layer**: transmits a bit stream over a physical medium; transforms a stream of bits into a signal
- **Data-link layer**: organizes bits into logical units, frames. Addressing information is added. It's responsible for node-node delivery
- **Network layer**: responsible for delivery of a packet between original source and destination; it included source and destination addresses (IP addresses)
- **Transport layer**: responsible for delivery of a whole message (not just a packet); message can be made of more that one packet; it sees the message as an integral entity that must be delivered to the destination

Functions of the layers in OSI model

- **Session layer**: designed to control the dialog between users; it adds synchronization points
- **Presentation layer**: is concerned with the syntax (format) and semantics (meaning) of the information exchanged between two systems
- **Application layer**: enables the user with common software to access the network

6.3 CATEGORIES OF NETWORKS

Figure 6-3

Categories of networks

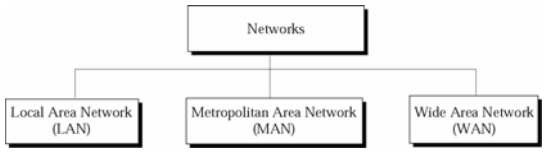


Figure 6-4

LANs

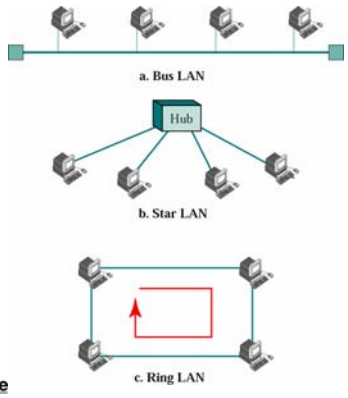


Figure 6-5

MAN

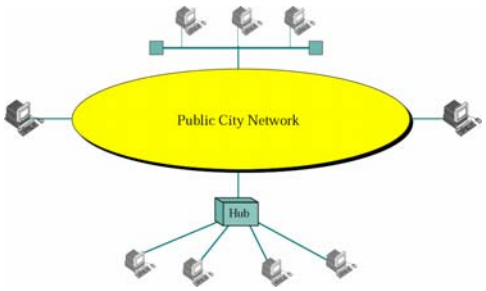
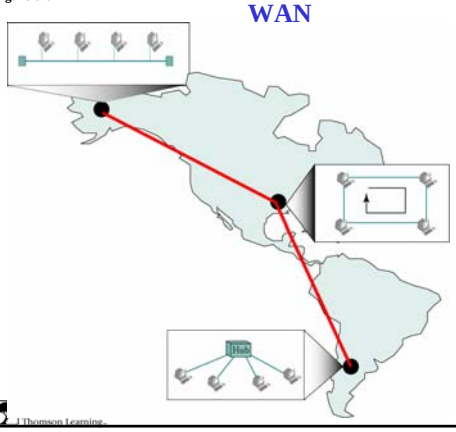


Figure 6-6

WAN



6.4

CONNECTING DEVICES

Figure 6-7

Connecting devices

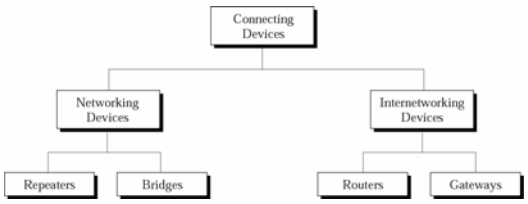
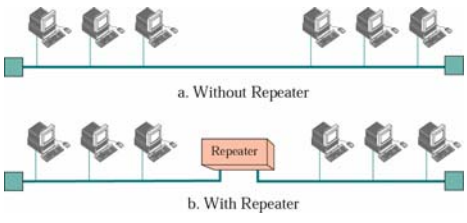


Figure 6-8

Repeater

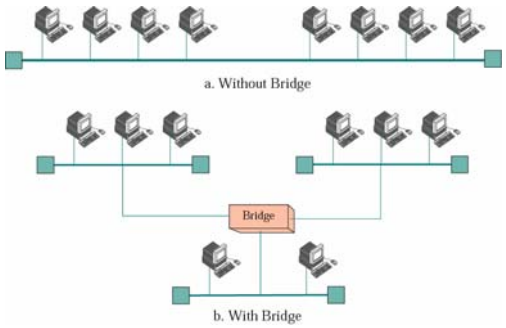


Note:

Repeaters operate at the first layer of the OSI model.

Figure 6-9

Bridge

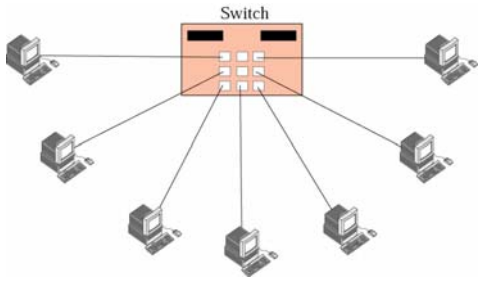


Note:

Bridges operate at the first two layers of the OSI model.

Figure 6-10

Switch



Note:

Routers operate at the first three layers of the OSI model.

Figure 6-11

Routers in an internet

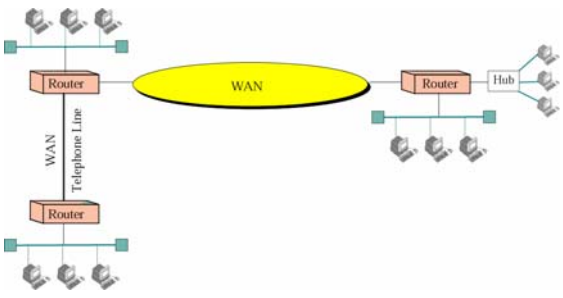
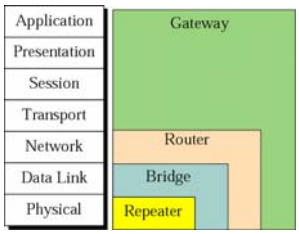


Figure 6-12

Connecting devices and the OSI model



6.5

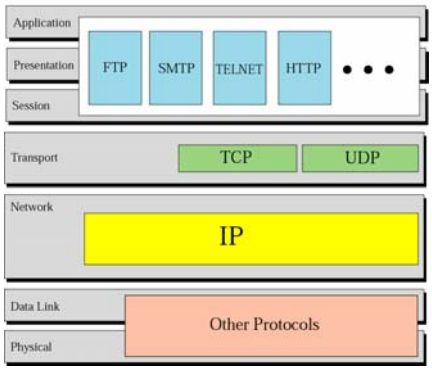
THE INTERNET AND TCP/IP

Internet and TCP/IP

- The most famous network is Internet
- Originally Internet was sponsored by the DARPA
- TCP/IP is a suite (stack) of protocols that officially controls the Internet

Figure 6-13

TCP/IP and OSI model



TCP/IP

- TCP/IP requires that every computer connected to the Internet be identified by a unique international address
- This address is called the Internet address (or **IP** address)

Figure 6-14

IP addresses in dotted-decimal notation

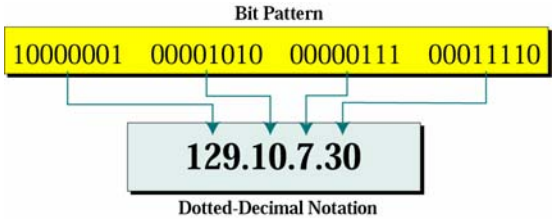


Figure 6-15

Client-server model

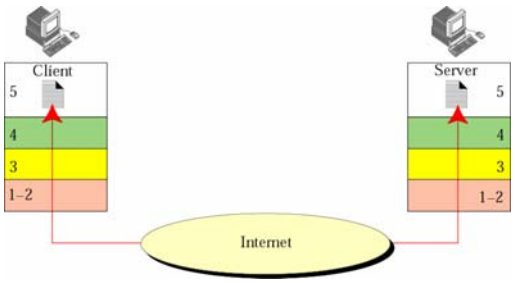


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Figure 6-16

FTP

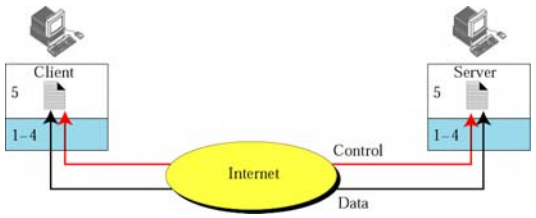

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Figure 6-17

SMTP

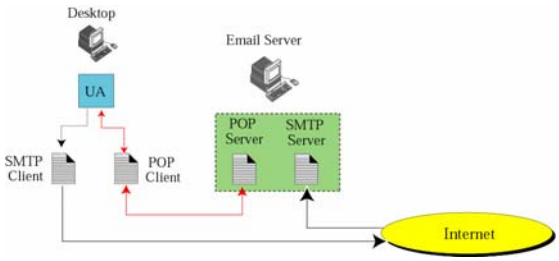

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Figure 6-18

Email address

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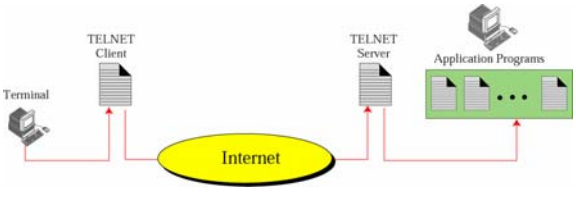
Figure 6-19

TELNET



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Hypertext Transfer Protocol (HTTP)

- HTTP is a client-server program that is used to access and transfer documents on the World Wide Web (WWW)
- HTTP uses a special kind of addressing called the Uniform Resource Locator (URL), which is a standard for specifying any kind of information on the Internet

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Figure 6-20

URL

Summary

- A computer network is a combination of devices connected by transmission media
- OSI model is a theoretical model that shows how two different system can communicate with each other
- The seven layers of OSI models are: physical, data-link, network, transport, session, presentation, application
- Local network allows resource sharing between systems
- There are three topologies of LAN: bus, star, ring
- MAN uses services provided by a common carrier
- WAN is the connection of individual computers or LANs over large area

Summary

- A repeater is a connecting device that regenerates data and extends the physical length of a network
- A bridge is a connecting device that filters traffic
- A router is a connecting device that routes packages
- TCP/IP is a set of protocols used by the Internet
- An IP address identifies each computer connected to the Internet
- FTP is a TCP/IP application for copying files from one host to another
- The protocol that supports electronic mail (email) on the Internet is SMTP

Summary

- TELNET is a client-server application that allows a user to log on to a remote machine
- HTTP is a client-server program for accessing and transferring documents on the WWW
- URL is a standard identifier for specifying information on the Internet