Information Systems
ISM 3011

Unit 6A

Telecommunications and Networks

Chapter 6

Principles and Learning Objectives

- Effective communication is essential to organizational success.
  - Define the terms communication and telecommunications and describe the components of a telecommunications system.

Principles and Learning Objectives

- An unmistakable trend of communications technology is that more people are able to send and receive all forms of information over greater distances at a faster rate.
  - Identify three basic types of communications media and discuss the basic characteristics of each.
  - Identify several types of telecommunications hardware devices and discuss the role that each plays.
  - Define the term network topology and identify five alternatives.

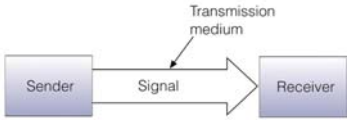
Overview of Telecommunications Systems

Communications

FIGURE 6-1

Overview of Communications

The message (data and information) is communicated via the signal. The transmission medium "carries" the signal.

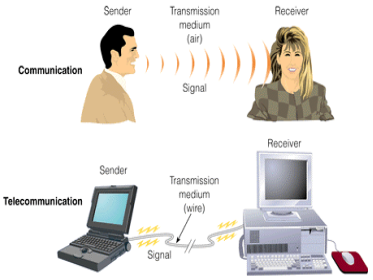


Communications

FIGURE 6-2

Communication and Telecommunication

In human speech, the sender transmits a signal through the transmission medium of the air. In telecommunication, the sender transmits a signal through a cable or other telecommunication medium.

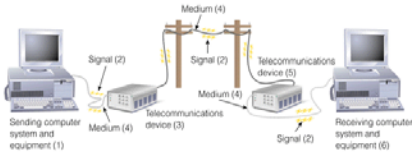


Telecommunications

FIGURE 6-3

Elements of a Telecommunications System

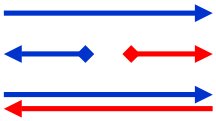
Telecommunications devices relay signals between computer systems and transmission media.



Telecommunications Media

Basic Communications Channel Characteristics

- Simplex channel
- Half-duplex
- Full-duplex channel



Bandwidth

- The range of frequencies that an electronic signal occupies on a given transmission medium.

Broadband

- Telecommunications in which a wide band of frequencies is available to transmit information, allowing more information to be transmitted in a given amount of time.

Shannon's Fundamental Law of Information Theory

- The information carrying capacity of a channel is directly proportional to its bandwidth - the broader the bandwidth, the more information that can be carried.

Types of Media

- Twisted-Pair
- Coaxial Cable
- Fiber-Optic Cable
- Microwave Transmission

Twisted-Pair Wire Cable

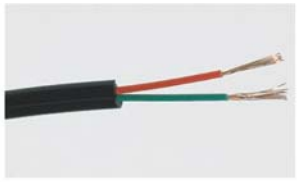


FIGURE 6.4

Twisted-Pair Wire Cable

(Source: Fred Bodin.)

Coaxial Cable

FIGURE 6.5

Coaxial Cable

(Source: Fred Bodin.)

Fiber Optic Cable

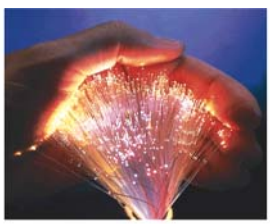


FIGURE 6.6

Fiber-Optic Cable

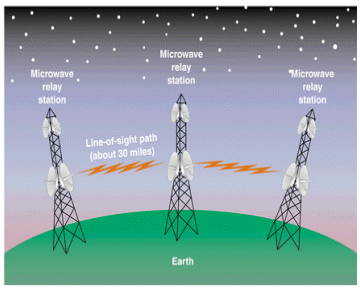
(Source: Stone/Greg Pease.)

Microwave Transmission

FIGURE 6.7

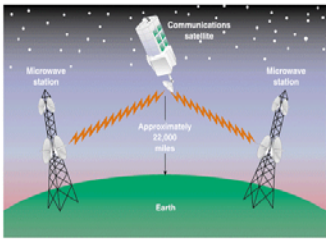
Microwave Communications

Because they are line-of-sight transmission devices, microwave dishes must be placed in relatively high locations such as atop mountains, towers, and tall buildings.



Satellite Transmission

FIGURE 6-8
Satellite Communications
Communications satellites are relay stations that receive signals from one earth station and rebroadcast them to another.



Dr. Martin Hepp 19

Cellular Transmission

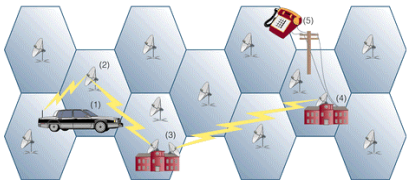


FIGURE 6-9
A Typical Cellular Transmission Scenario
Using a cellular car phone, the caller (1) dials the number. The signal is sent from the car's antenna to the low-powered cellular antenna located in that cell (2). The signal is sent to the regional cellular phone switching office, also called the mobile telephone subscriber office (MTSO) (3). The signal is switched to the local telephone company switching station located nearest the call destination (4). Now integrated into the regular phone system, the call is automatically switched to the number originally dialed (5), all without the need for operator assistance.

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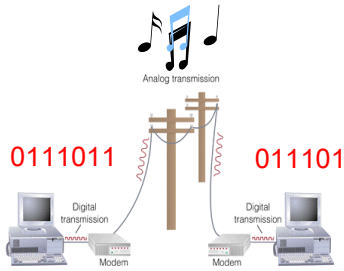
Telecommunications Devices

Dr. Martin Hepp 21

Modems

FIGURE 6-10
How a Modem Works
Digital signals are modulated into analog signals, which can be carried over existing phone lines. The analog signals are then demodulated back into digital signals by the receiving modem.



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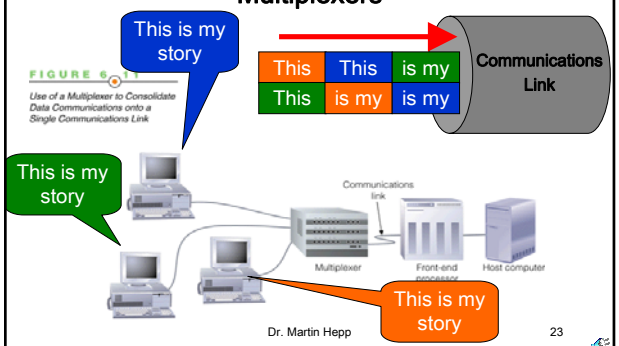
Multiplexers

FIGURE 6-11
Use of a Multiplexer to Consolidate Data Communications onto a Single Communications Link



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Front-End Processors

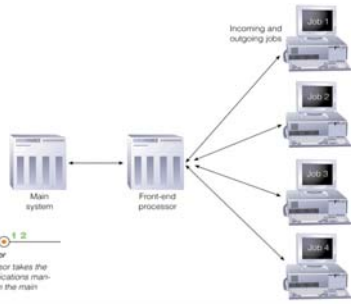

FIGURE 6-12
Front-End Processor
A front-end processor takes the burden of communications management away from the main system processor.

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Carriers and Services

Carriers and Services

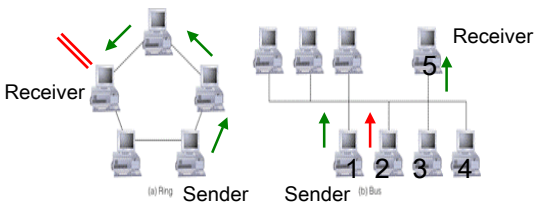
- Common carriers
- Value-added carriers
- Switched and dedicated lines
- Phone and dialing services
- Digital subscriber line (DSL)
- T1 Carrier

Networks

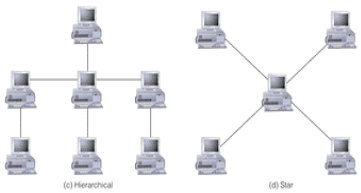
Network Concepts and Considerations

- Network topology
  - Ring network
  - Bus network
  - Hierarchical
  - Star network
  - Hybrid network
- Network types
  - Local Area Networks
  - Wide Area Networks
  - International networks
  - Home and small business networks

Network Topology



Network Topology



Network Topology

Local Area Networks

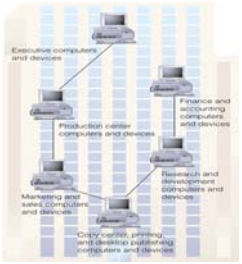


FIGURE 6.15

A Typical LAN in a Bus Topology

All network users within an office building can connect to each other's devices for rapid communication. For instance, a user in research and development could send a document from her computer to be printed at a printer located in the desktop publishing center.

Wide Area Networks

FIGURE 6.16

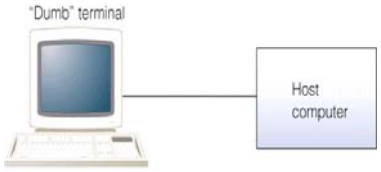
A Wide Area Network

Wide area networks are the basic long-distance networks used by organizations and individuals around the world. The actual connections between sites, or nodes (shown by dashed lines), may be any combination of satellites, microwave, or cabling. When you make a long-distance telephone call, you are using a WAN.

Terminal-to-Host

FIGURE 6.18

Terminal-to-Host Connection

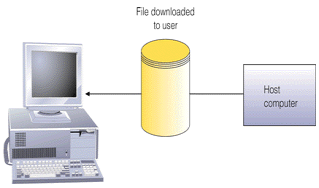


File Server

FIGURE 6.19

File Server Connection

The file server sends the user the entire file that contains the data requested. The downloaded data can then be analyzed, manipulated, formatted, and displayed by a program that runs on the user's personal computer.



Client/Server

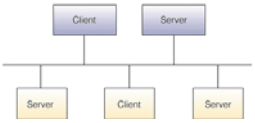
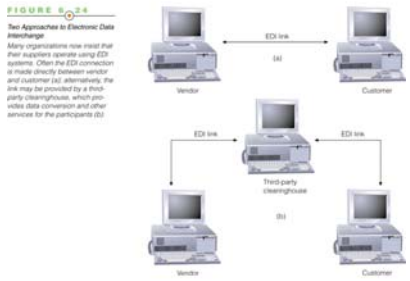


FIGURE 6.20

Client/Server Connection

Multiple computer platforms, called servers, are dedicated to special functions such as database management, data storage, printing, communications, network security, and program execution. Each server is accessible by all computers on the network. A server distributes programs and data files to the other computers (clients) on the network as they request them. The client requests services from the servers, provides a user interface, and presents results to the user. Once data is moved from a server to the client, the data may be processed on the client.

Electronic Data Interchange (EDI)



Thank you!

Any questions? Please send an e-mail to mhepp@computer.org!

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