Technology in Action

Chapter 7
Networking:
Connecting Computing Devices
Chapter Topics

- Networking fundamentals
- Network architecture
- Network components
- Peer-to-peer networks
- Ethernet networks
- Power-line networks
- Configuring software
- Wireless security

Networking Fundamentals

- Computer network
  - Two or more computers connected together
  - Devices connected to networks: nodes
- Benefits of a network
  - Sharing resources and peripherals
  - Transferring files
  - Sharing of broadband connection with use of a router
Network Architecture

- Network designs
  - Locally administered
    - Peer-to-peer (P2P)
  - Centrally administered
    - Client/server

Peer-to-Peer Networks

- Nodes communicate with each other
  - Peers
- Share peripheral devices
- Common in home networks
Client/Server Networks

- **Client computers**
  - Users who make requests
- **Server computers**
  - Provide resources to clients
  - Central network control
- **Internet**
  - A large, multiserver, multiclient network

HANs and LANs

- **Home area network (HAN)**
  - Connects digital devices within a home
- **Local area network (LAN)**
  - Nodes are within a small geographic region
    - Schools
    - Small businesses
**WANs and MANs**

- **Wide area network (WAN)**
  - LANs connected over long distances
    - A few miles to thousands of miles
    - Uses telecommunications lines
- **Metropolitan area network (MAN)**
  - Provides access within a specific geographic region, such as a city

**Network Components**

- Transmission media
- Network communication devices
- Software
Transmission Media

• Provide communications channel between nodes
• Forms of media
  – Twisted pair cable
  – Coaxial cable
  – Fiber-optic cable
  – Radio waves (wireless)
• Bandwidth
  – Data transfer rate
  – Throughput

Network Adapters

• Devices connected to or installed in nodes
  – Network interface cards (NICs)
  – External or internal network adapters
• Enable communication between nodes
Network Navigation Devices

• Devices that help make data flow possible
• Routers
  – Route data between networks
• Switches
  – Receive data and retransmit it to nodes on the same network

Networking Software

• Peer-to-peer software
  – Built into operating systems that support networking
    • Windows
    • Mac OS
    • Linux
Networking Software

• Client/server software
  – Network operating system (NOS) software
    • Windows Server 2008
    • SUSE Linux Enterprise

Types of Peer-to-Peer Networks

• Wired Ethernet networks
• Wireless Ethernet networks
• Power-line networks
Wired Ethernet Networks

• Ethernet network adapters are used to connect nodes
  – NIC card
  – ExpressCard
  – USB adapter
• Computers are connected to each other using unshielded twisted pair cable

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Ethernet Switches

• Keep track of data packets
• Amplify and retransmit signals
• Keep the network running efficiently

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**Ethernet Routers**

- Transfer packets from one network to another
- Home Internet routers transfer data from the Internet to the home network
- Allows for network-ready devices such as network printers or network attached storage (NAS)

**Wireless Ethernet Networks**

- Ethernet networks that use radio waves instead of wires to connect nodes
- Based on the IEEE 802.11 standard, also known as Wi-Fi
- Each node requires a wireless network adapter
  - Transceivers
Wireless Access Point (WAP)

- Device added to a wireless network to extend the range of the network
- Must connect to either a switch, a router, or a node on the network

Power-Line Networks

- Computers are connected to a house’s electrical wiring to create a network
- A power-line network adapter connects nodes to electrical outlets
Choosing a Peer-to-Peer Network

- Things to consider
  - Whether existing wiring is available
  - Whether you want wireless communications
  - How fast you want your network connection to be
  - How much money you can spend on your network

Comparing the Major Types of Home Networks

<table>
<thead>
<tr>
<th></th>
<th>Wired Ethernet</th>
<th>Power-Line</th>
<th>Wireless 802.11g</th>
<th>Wireless 802.11n</th>
</tr>
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<tbody>
<tr>
<td>Maximum data transfer rate (bandwidth)</td>
<td>100 Mbps to 1 Gbps</td>
<td>200 Mbps</td>
<td>54 Mbps</td>
<td>540 Mbps</td>
</tr>
<tr>
<td>Relative installation and equipment costs for networking two computers</td>
<td>$</td>
<td>$$$$</td>
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Configuring Software for Your Home Network

- Windows Vista and later versions
  - Use wizards launched from Network and Sharing Center in Control Panel

- Before running wizards:
  1. Install network adapters on each node.
  2. For a wired network, plug all the cables into the router, network adapters, and so on.
Configuring Software for Your Home Network

3. Make sure your cable/DSL modem is connected to your router and the Internet.
4. Turn on your equipment in the following order:
   a. Cable/DSL modem
   b. Router
   c. All computers and peripherals (printers, scanners, and so on)

Networking Multiple Versions of Windows

• Set up Windows 7 and Vista machines first
  – Automatically detect other computers running Windows on network
  – Windows XP will need adjustment to see other versions of Windows
• Give each Windows computer a unique name
• Place all computers in the same workgroup
Configuring a Router to Connect to the Internet

- Contact ISP for special settings
- Access router from Web browser
- Enter username and password
- Use router’s wizard to set up connection using settings and info provided by ISP
- Test Internet connection speed
  – Speedtest.net

Securing Wireless Networks

- Wireless network range doesn’t stop at the property line
- Default device and network ID settings allow intruders to enter the network
- Internet bandwidth can be stolen
- Computers can be vulnerable to hacker intrusion and takeover
Securing Wireless Networks

• To secure a wireless network, do the following:
  – Change your network name (SSID)
  – Disable SSID broadcast
  – Change the default password on your router
  – Turn on security protocols
  – Implement media access control
  – Limit your signal range
  – Apply firmware upgrades

Chapter 7 Summary Questions

• What is a network, and what are the advantages of setting one up?
Chapter 7 Summary Questions

• What is the difference between a client/server network and a peer-to-peer network?

Chapter 7 Summary Questions

• What are the main hardware components of every network?
Chapter 7 Summary Questions

• What are the most common home networks?

Chapter 7 Summary Questions

• What are wired Ethernet networks, and how are they created?
Chapter 7 Summary Questions

• What are wireless Ethernet networks, and how are they created?

Chapter 7 Summary Questions

• How are power-line networks created, and are they a viable alternative to Ethernet networks?
Chapter 7 Summary Questions

• How do I configure my computer’s software to set up a network?

• Why are wireless networks more vulnerable than wired networks, and what special precautions are required to ensure my wireless network is secure?