



PETER NORTON'S®

# Introduction to Computers



- Web integrated activities
- Self-assessments to reinforce main concepts
- Online Resource:  
[www.mhhe.com/peternorton](http://www.mhhe.com/peternorton)

 **Technology  
Education**

# Chapter 9A

## Network Basics

# Network Definition

- Set of technologies that connects computers
- Allows communication and collaboration between users

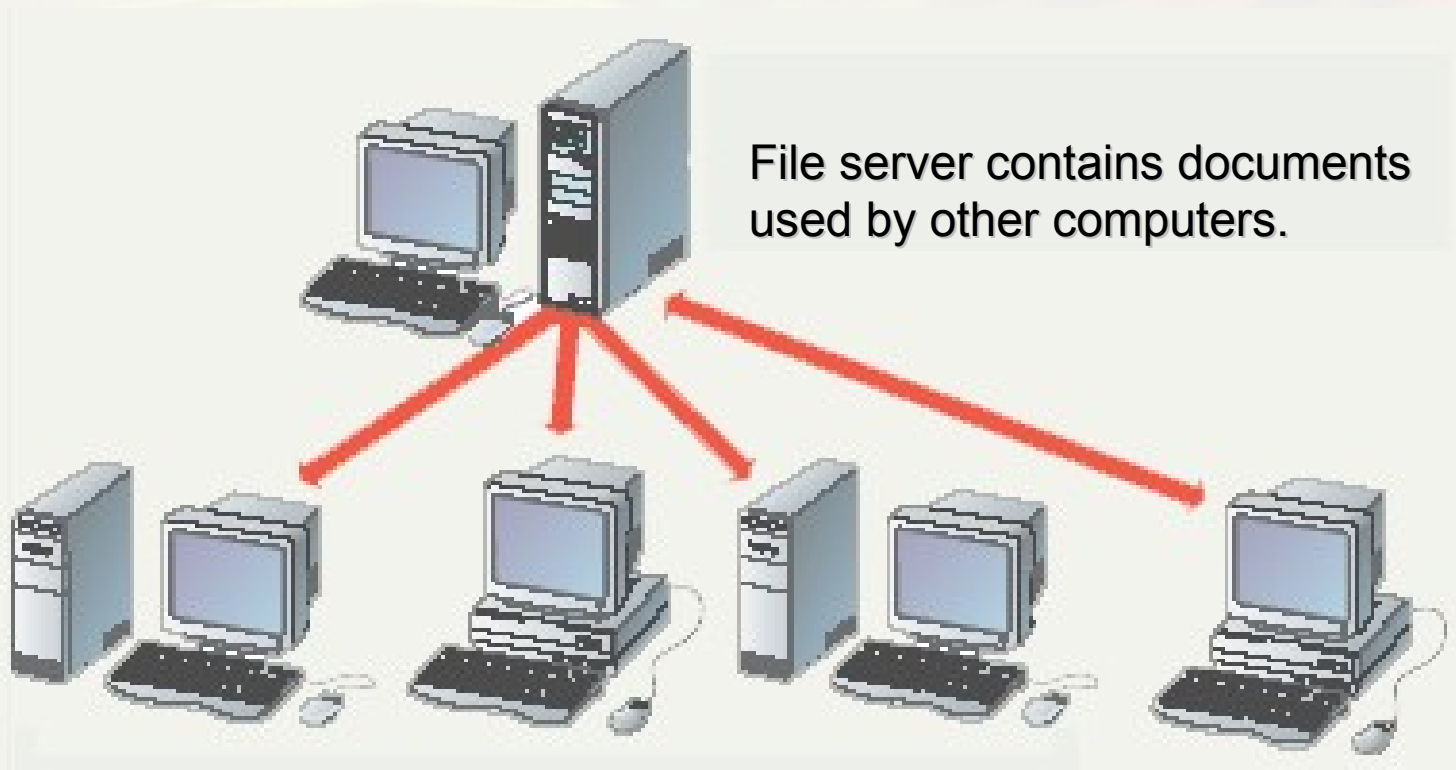
# The Uses of a Network

- Simultaneous access to data
  - Data files are shared
    - Access can be limited
  - Shared files stored on a server
  - Software can be shared
    - Site licenses
    - Network versions
    - Application servers

# The Uses of a Network

- Shared peripheral device
  - Printers and faxes are common shares
  - Reduces the cost per user
  - Devices can be connected to the network
  - Print servers control network printing
    - Manage the print queue

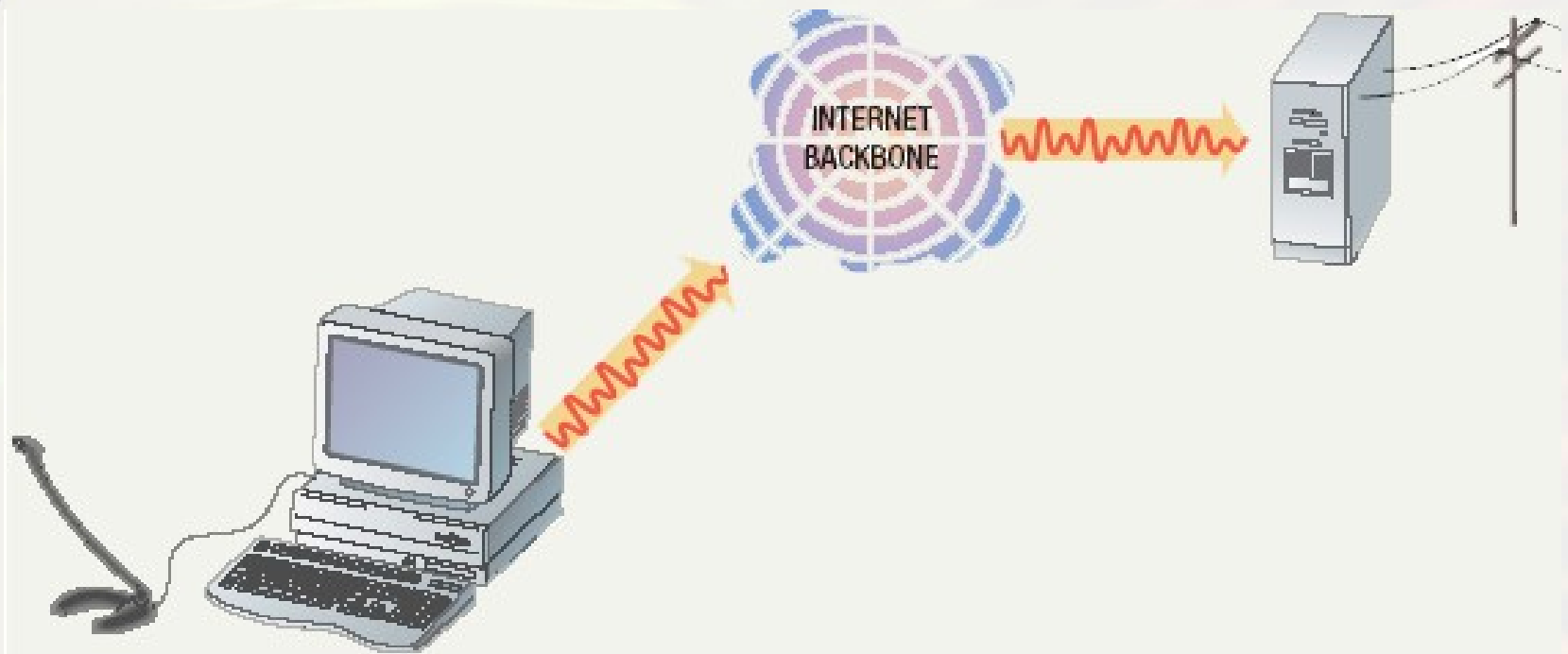
# Sharing Data



# The Uses of a Network

- Personal communication
  - Email
    - Instantaneous communication
  - Conferencing
    - Tele conferencing
    - Videoconferencing
    - Audio-conferencing
    - Data-conferencing
  - Voice over IP
    - Phone communication over network wires

# Voice Over IP





# The Uses of a Network

- Easier data backup
  - Backup copies data to removable media
  - Server data backed up in one step

# Common Network Types

- Local Area Network (LAN)
  - Contains printers, servers and computers
  - Systems are close to each other
  - Contained in one office or building
  - Organizations often have several LANS

# Common Network Types

- Wide Area Networks (WAN)
  - Two or more LANs connected
  - Over a large geographic area
  - Typically use public or leased lines
    - Phone lines
    - Satellite
  - The Internet is a WAN

# Hybrid Network Types

- Campus Area Networks (CAN)
  - A LAN in one large geographic area
  - Resources related to the same organization
  - Each department shares the LAN

# Hybrid Network Types

- Metropolitan Area Network (MAN)
  - Large network that connects different organizations
  - Shares regional resources
  - A network provider sells time

# Hybrid Network Types

- Home Area Network (HAN)
  - Small scale network
  - Connects computers and entertainment appliances
  - Found mainly in the home

# Hybrid Network Types

- Personal Area Network (PAN)
  - Very small scale network
  - Range is less than 2 meters
  - Cell phones, PDAs, MP3 players

# How Networks Are Structured

- Server based network
  - Node is any network device
  - Servers control what the node accesses
  - Users gain access by logging in
  - Server is the most important computer



# How Networks Are Structured

- Client/Server network
  - Nodes and servers share data roles
  - Nodes are called clients
  - Servers are used to control access
  - Database software
    - Access to data controlled by server
  - Server is the most important computer

# How Networks Are Structured

- Peer to peer networks (P2PN)
  - All nodes are equal
  - Nodes access resources on other nodes
  - Each node controls its own resources
  - Most modern OS allow P2PN
  - Distributing computing is a form
  - Kazaa

# Network Topologies

- Topology
  - Logical layout of wires and equipment
  - Choice affects
    - Network performance
    - Network size
    - Network collision detection
  - Several different types

# Network Topologies

- Packets
  - Pieces of data transmitted over a network
    - Packets are created by sending node
    - Data is reassembled by receiving node
  - Packet header
    - Sending and receiving address
  - Packet payload
    - Number and size of data
    - Actual data
  - Packet error control

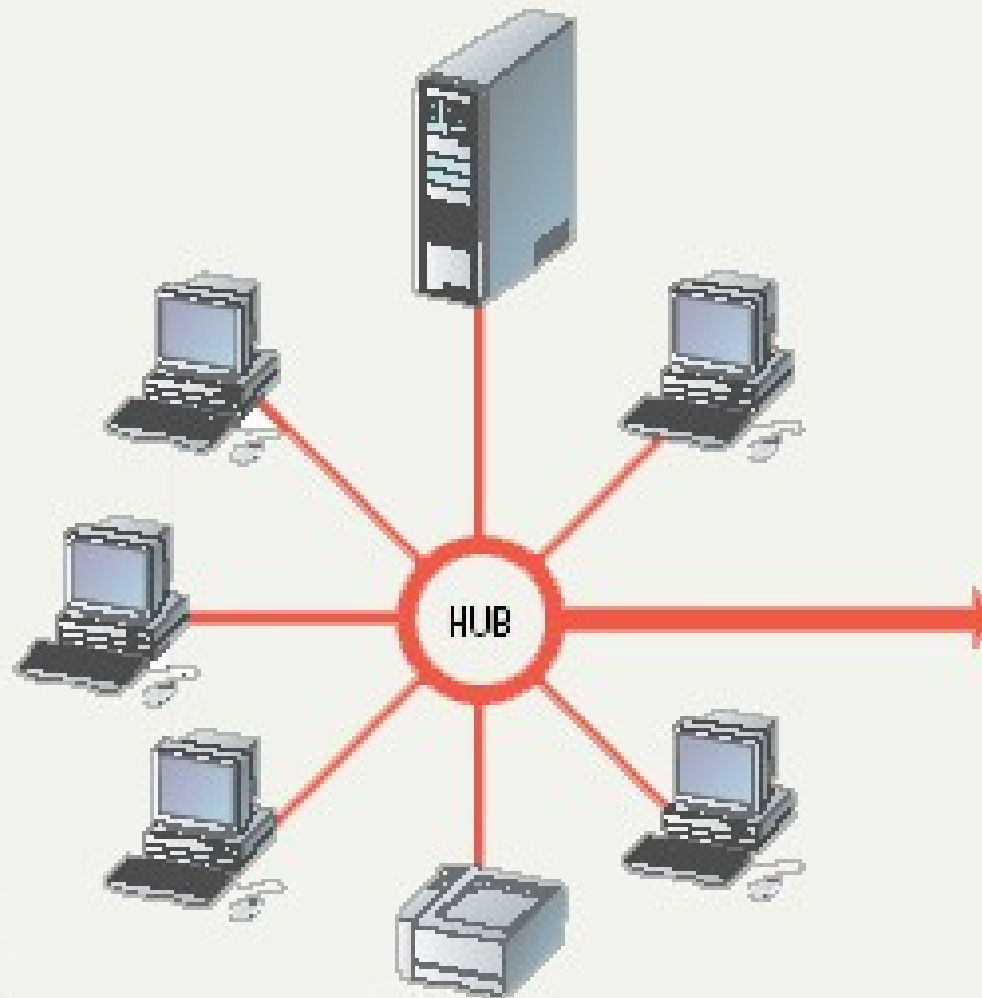
# Network Topologies

- Bus topology
  - Also called linear bus
  - One wire connects all nodes
  - Terminator ends the wires
  - Advantages
    - Easy to setup
    - Small amount of wire
  - Disadvantages
    - Slow
    - Easy to crash

# Network Topologies

- Star topology
  - All nodes connect to a hub
    - Packets sent to hub
    - Hub sends packet to destination
  - Advantages
    - Easy to setup
    - One cable can not crash network
  - Disadvantages
    - One hub crashing downs entire network
    - Uses lots of cable
  - Most common topology

# Star Topology



# Network Topologies

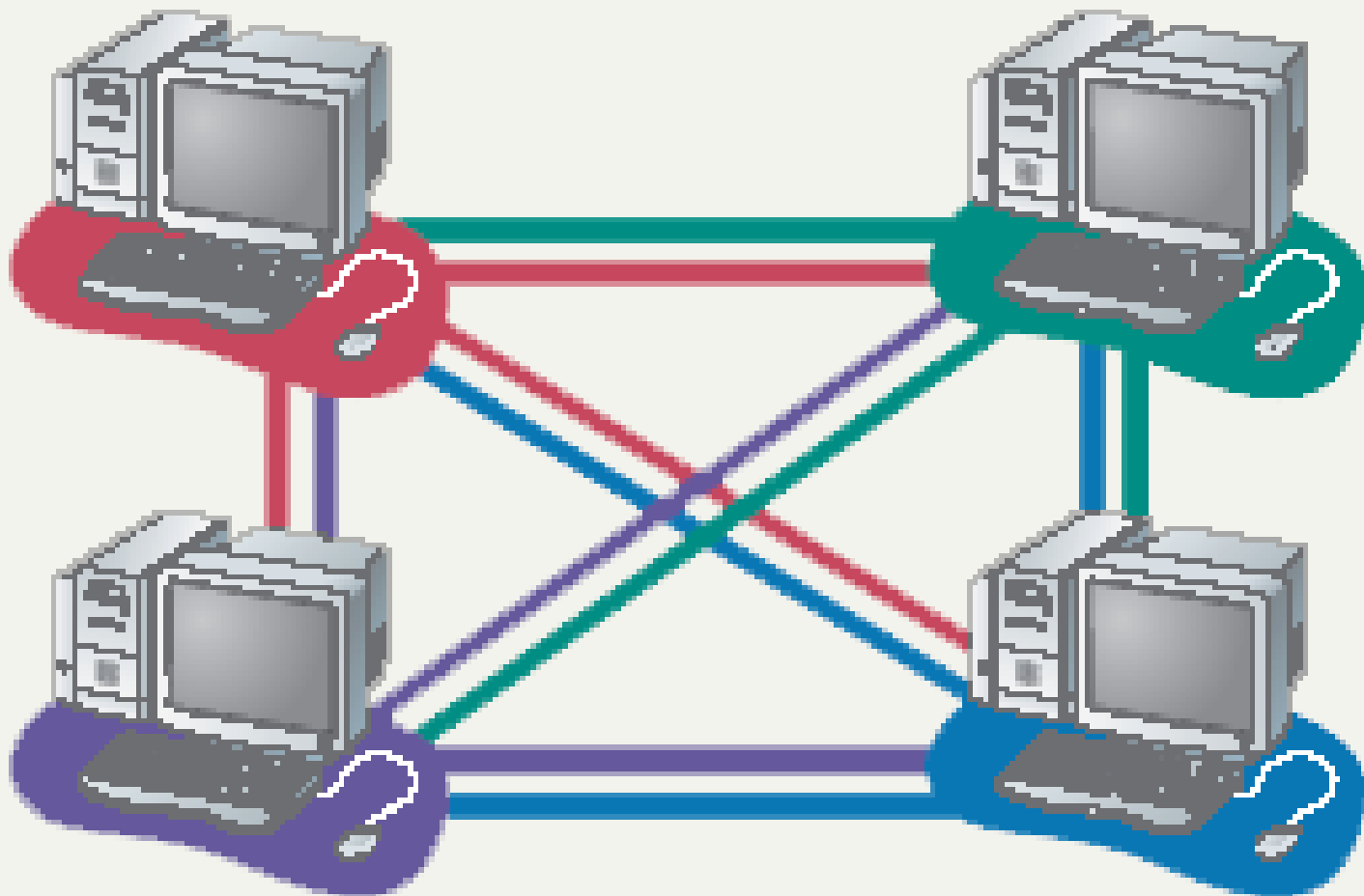
- Ring topology
  - Nodes connected in a circle
  - Tokens used to transmit data
    - Nodes must wait for token to send
  - Advantages
    - Time to send data is known
    - No data collisions
  - Disadvantages
    - Slow
    - Lots of cable



# Network Topologies

- Mesh topology
  - All computers connected together
  - Internet is a mesh network
  - Advantage
    - Data will always be delivered
  - Disadvantages
    - Lots of cable
    - Hard to setup

# Mesh Topology

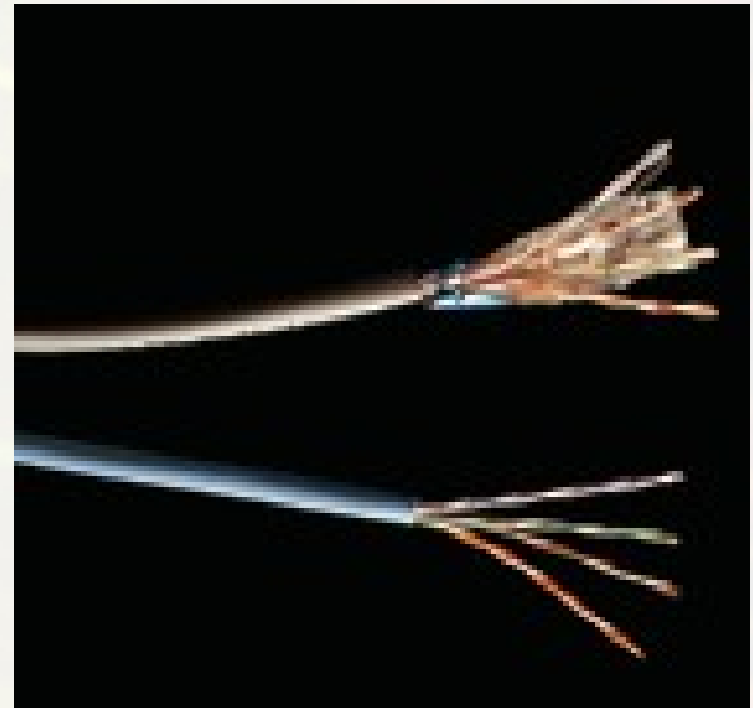


# Network Media

- Links that connect nodes
- Choice impacts
  - Speed
  - Security
  - Size

# Wire Based Media

- Twisted-pair cabling
  - Most common LAN cable
  - Called Cat5 or 100BaseT
  - Four pairs of copper cable twisted
  - May be shielded from interference
  - Speeds range from 1 Mbps to 1,000 Mbps

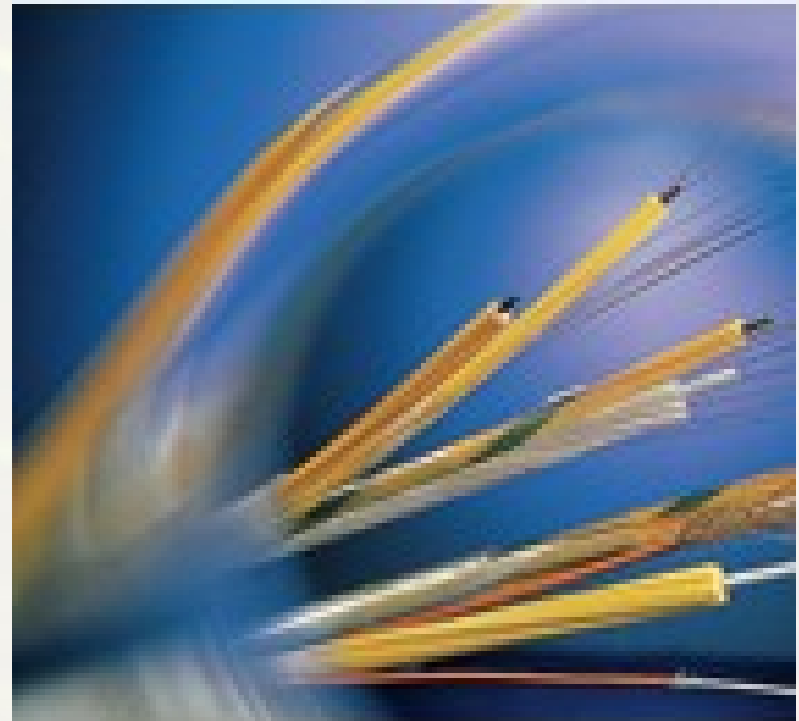


# Wire Based Media

- Coaxial cable
  - Similar to cable TV wire
  - One wire runs through cable
  - Shielded from interference
  - Speeds up to 10 Mbps
  - Nearly obsolete

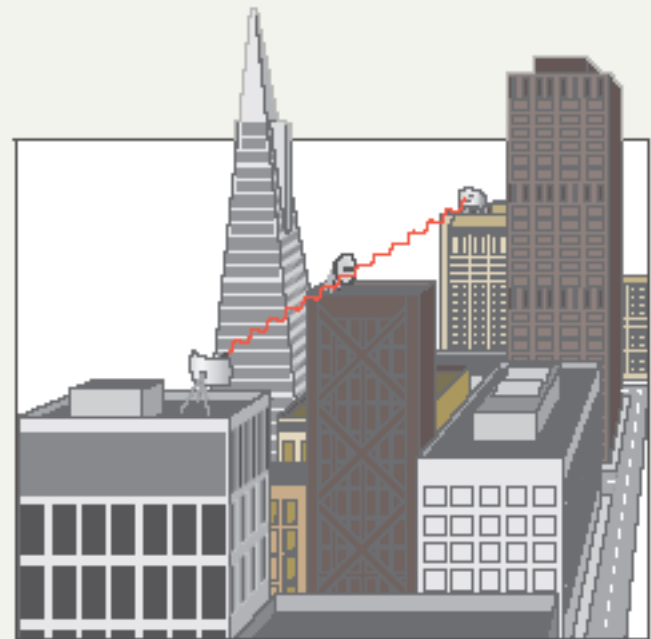
# Wire Based Media

- Fiber-optic cable
  - Data is transmitted with light pulses
  - Glass strand instead of cable
  - Immune to interference
  - Very secure
  - Hard to work with
  - Speeds up to 100 Gbps



# Wireless Media

- Data transmitted through the air
- LANs use radio waves
- WANs use microwave signals
- Easy to setup
- Difficult to secure



# Network Hardware

- Network interface cards
  - Network adapter
  - Connects node to the media
  - Unique Machine Access Code (MAC)





# Network Hardware

- Network linking devices
  - Connect nodes in the network
  - Cable runs from node to device
  - Crossover cable connects two computers

# Network Hardware

- Hubs
  - Center of a star network
  - All nodes receive transmitted packets
  - Slow and insecure

# Network Hardware

- Switches
  - Replacement for hubs
  - Only intended node receives transmission
  - Fast and secure

# Network Hardware

- Bridge
  - Connects two or more LANs together
  - Packets sent to remote LAN cross
    - Other packets do not cross
  - Segments the network on MAC addresses

# Network Hardware

- Router
  - Connects two or more LANs together
  - Packets sent to remote LAN cross
  - Network is segmented by IP address
  - Connect internal networks to the Internet
  - Need configured before installation



# Network Hardware

- Gateway
  - Connects two dissimilar networks
  - Connects coax to twisted pair
  - Most gateways contained in other devices

# Network Cabling

- Cabling specifications
  - Bandwidth measures cable speed
    - Typically measured in Mbps
  - Maximum cable length
  - Connector describes the type of plug

# Network Cabling

- Ethernet
  - Very popular cabling technology
  - 10 Base T, 10Base2, 10Base5
  - Maximum bandwidth 10 Mbps
  - Maximum distances 100 to 500 meters





# Network Cabling

- **Fast Ethernet**
  - Newer version of Ethernet
  - Bandwidth is 100 Mbps
  - Uses Cat5 or greater cable
    - Sometimes called 100Base T
  - Requires a switch

# Network Cabling

- Gigabit Ethernet
  - High bandwidth version of Ethernet
  - 1 to 10 Gbps
  - Cat 5 or fiber optic cable
  - Video applications

# Network Cabling

- Token ring
  - Uses shielded twisted pair cabling
  - Bandwidth between 10 and 25 Mbps
  - Uses a multiple access unit (MAU)
  - Popular in manufacturing and finance

# Network Protocols

- Language of the network
  - Rules of communication
  - Error resolution
  - Defines collision and collision recovery
  - Size of packet
  - Naming rules for computers

# Network Protocols

- TCP/IP
  - Transmission Control Protocol/Internet Protocol
  - Most popular protocol
  - Machines assigned a name of 4 numbers
    - IP address
    - 209.8.166.179 is the White House's web site
  - Dynamic Host Configuration Protocol
    - Simplifies assignment of IP addresses
  - Required for Internet access

# Network Protocols

- IPX/SPX
  - Internet Packet Exchange/Sequenced Packet Exchange
  - Older protocol
  - Associated with Novell Netware
  - Replaced by TCP/IP

# Network Protocols

- NetBEUI
  - Network BIOS Extended User Interface
  - Used by Windows to name computers
  - Transmission details handled by TCP/IP

# Network Protocols

- Token ring
  - Popular in manufacturing and finance
  - Nodes communicate when they have the token



# Chapter 9A

End of Chapter