

Chapter Topics

- Networking advantages
- Client/Server Networks
- Classifications of Client/Server Networks: LANs, WANs, MANs, and PANs
- Servers
- Network Topologies

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Chapter Topics (cont.)

- Transmission Media
- Network Operating Systems
- Network Adapters
- Network Navigation Devices
- Network Security for Client/Server Networks

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A print ____ is a software holding area for print jobs.

1. Tank
2. Container
3. Manager
4. Queue

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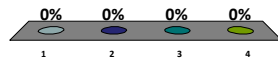
Which of the following is not a benefit of a network?

1. Increased productivity
2. Allows for resource sharing
3. Facilitates knowledge sharing
4. Enables power sharing

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Nodes connect to a switch in which type of topology?

1. Ethernet
2. Ring
3. Star
4. Bus



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Networking Advantages

- Network is group of two or more computers
- Networks:
 - Increase productivity
 - Enable expensive resources to be shared
 - Facilitate knowledge sharing
 - Enable software sharing
 - Facilitate Internet connectivity
 - Enable enhanced communication

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Networking Disadvantages

- Business networks are often complex
 - Require additional personnel to maintain them
 - Require special equipment and software
- Most companies feel cost savings outweigh additional cost of network administrators and equipment

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Client/Server Networks

- Client/server networks contain servers as well as client computers
- Server is computer that stores and shares resources on a network
- Client is computer that requests those resources
- Servers respond to requests from large number of clients

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Classifications of Client/Server Networks

- Networks are classified according to size and distance between physical parts
- Four popular classifications:
 - Local area networks (LANs)
 - Wide area networks (WANs)
 - Metropolitan area networks (MANs)
 - Personal area networks (PANs)

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Local Area Networks

- LAN
 - Group of computers and peripherals linked together over a small geographic area
 - Computer lab at school is probably a LAN

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Wide Area Networks

- WANs comprise large numbers of users over a wider physical area
- Businesses use WANs to connect two or more geographically distant locations
- Separate LANs that are miles apart

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Metropolitan Area Networks

- Organizations or groups establish WANs to link users in a specific geographic area, such as within a city or county

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Personal Area Networks

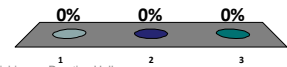
- A PAN is a network used to connect computing devices that are in close proximity to each other
- May feature wired or wireless connectivity
- PANs work within the personal operating space of an individual, generally defined to be within 30 feet of one's body

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Which is an example of a LAN?

1. Two networks connected together in a city
2. Two networks connected together anywhere in the world
3. One network within a single business



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Other Networks

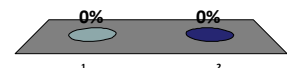
- Intranet
 - Private network of business or organization
 - Not accessible by unauthorized individuals
- Extranet
 - An area of an intranet that only certain corporations or individuals can access
 - Useful for enabling electronic data interchange

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I understand what a server is and what it does.

1. True
2. False



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Servers

- Workhorses of the client/server network
- Interface with many network users
- Assist with a variety of task
- Small networks have just one server
- Large networks use dedicated servers
 - Fulfill one specific functions
 - Reduce load on main server

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Print Servers

- Manage client-requested printing jobs for all printers on a network
- Helps client computers complete more productive work
- Frees the CPU to do other jobs
- Organize print jobs into orderly sequence
- Can prioritize print jobs

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Application Servers

- Act as a repository for application software
- Avoids installing software on thousands of personal computers
- Eases task of installation and upgrading
- Application is installed and upgraded only on the application server

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Database Servers

- Provides client computers with access to database information
- Many people can access a database at the same time through the network

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E-Mail Servers

- Volume of e-mail on large network could overwhelm a server
- Sole function of an e-mail server is to process and deliver e-mail
 - Incoming
 - Outgoing

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Communications Servers

- Handles all communications between the network and other networks, including managing Internet connectivity
- Often the only device on the network directly connected to the Internet
- E-mail servers, Web servers, and other devices route traffic through the communications server

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Web Servers & Cloud Servers

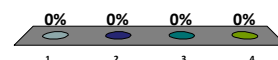
- Web servers
 - Host a Web site that will be available on the Internet
 - Many colleges and businesses use a third-party Web hosting company
- Cloud servers
 - Servers that are maintained by hosting companies, and are connected to networks via the Internet

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Which of the following is *NOT* an example of a dedicated server?

1. Authentication
2. File
3. Token
4. print



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Network Topologies

- Arrangement of computers, transmission media, and other network components
- Physical topology
 - Layout of “real” components of network
- Logical topology
 - Virtual connections among network nodes
- Protocol is set of rules for exchanging communication

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Bus Topology

- All computers are connected in sequence on a single cable
- Used in peer-to-peer networks

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Bus Topology Comparison

Advantages

- It uses a minimal amount of cable
- Installation is easy, reliable, and inexpensive

Disadvantages

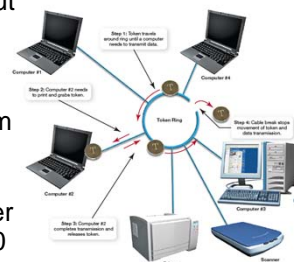
- Breaks in the cable can disable the network
- Large numbers of users will greatly decrease performance because of high volume of data traffic

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Ring Topology

- Nodes are laid out in a ring
- A token (data packet) flows in one direction from device to device
- Recent versions have data transfer rates of up to 100 Mbps



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Ring Topology Comparison

Advantages

- Allocates access to the network fairly
- Performance remains acceptable even with large numbers of users

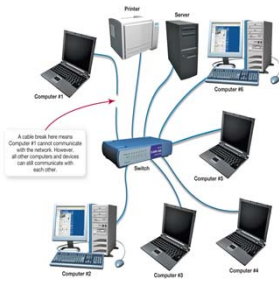
Disadvantages

- Adding or removing nodes disables network
- Failure of one computer can bring down the entire network
- Problems in the ring can sometimes be difficult to find

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Star Topology

- Most widely deployed client/server network layout
- Nodes connect to a central communications device (switch)
- Switch receives a signal and retransmits it
- A node accepts only signals addressed to it



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Star Topology Comparison

Advantages

- Failure of one computer does not affect other computers on the network
- Centralized design simplifies troubleshooting and repairs
- Adding computers or groups of computers is easy.
- Performance remains acceptable even with large numbers of users

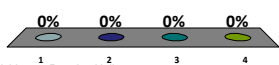
Disadvantages

- Requires more cable (and possibly higher installation costs) than a bus or ring topology
- The switch is a single point of failure
- If it fails, all computers connected to that switch are affected

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Which topology passes data using a token?

1. Ethernet
2. Ring
3. Bus
4. Star



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Transmission Media

- Network engineers can use different type of media
- Transmission media comprise the physical system that data takes to flow between devices on a network
 - Wired connections
 - Wireless connections

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Wired Transmission Media

- Popular in business networks
- Generally provide higher throughput than wireless connections
- Types of wired connections
 - Twisted-pair cable
 - Coaxial cable
 - Fiber-optic cable

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Choosing a Cable

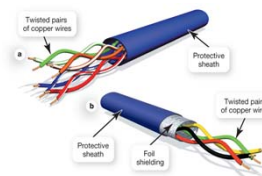
- Maximum run length
- Bandwidth
- Bend radius (flexibility)
- Cable and installation costs
- Susceptibility to interference
- Signal transmission methods

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Twisted-Pair Cable

- Pairs of copper wire twisted around each other
- Twists make the wires less susceptible to outside interference
- Two types
 - Shielded twisted-pair (STP)
 - Unshielded twisted-pair (UTP)



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Coaxial Cable

- Four main components
 - Copper core
 - Nonconductive insulating material
 - Braided metal shielding
 - Plastic cover

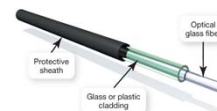


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Fiber-Optic Cable

- Components include
 - Glass or plastic fibers
 - Cladding
 - Outer jacket
- Transmission in only one direction
- Signals converted to light pulses
- Immune to interference

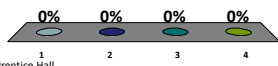


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The _____ of a cable defines how many degrees a cable can be bent in a one-foot segment before it is damaged.

1. Crimp radius
2. Angle radius
3. Cable radius
4. Bend radius



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Wireless Media Options

- Usually add-ons that extend access to wired network
- Often provided to give employees a wider working area
- Corporate networks are often a combination of wired and wireless media

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Comparing Transmission Media

Cable Characteristics	Twisted Pair (Cat 6)	Twisted Pair (Cat 6a)	Fiber-Optic
Maximum run length	328 feet (100 m)	328 feet (100 m)	Up to 62 miles (100 km)
Bandwidth	Up to 1 Gbps	Up to 10 Gbps	10 to 40 Gbps
Bend radius (flexibility)	No limit	No limit	30 degrees/foot
Cable cost	Extremely low	Low	High
Installation cost	Extremely low	Extremely low	Most expensive because of installation training required
Susceptibility to interference	High	High	None (not susceptible to EMI or RFI)

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Network Operating Systems

- Special NOS software must be installed on each client computer and server
- NOS provides a set of common rules that controls communication among devices
- Modern operating systems include NOS client software

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Network Adapters

- Devices that perform tasks to enable computers to communicate on a network
- Network interface cards (NICs) are installed inside computers and peripherals
- Network adapters perform three critical functions:
 - Generate network transmission signals
 - Create data packets
 - Act as information gatekeepers

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Network Navigation Devices

- Data flows through network in packets
- Each network adapter has physical address called a media access control (MAC) address
 - Six two-position characters (such as 01:40:87:44:79:A5)
 - First three sets specify manufacturer
 - Second set makes up unique address

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Switches and Bridges

- Used to send data on a specific route through network
- Switch makes decisions based on MAC address as to where data is sent
- Bridge is a device used to send data between different collision domains

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Routers

- Router is designed to send information between two networks
- Must look at higher-level network addresses such as IP addresses

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Network Security for Client/Server Networks

- Offer higher level of security than peer-to-peer networks
- Security can be centrally administered by network administrators
- Frees individual users of responsibility of maintaining own data security

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Sources of Security Threats

- Human errors and mistakes
 - Incorrect posting
- Malicious human activity
 - Perpetrated by current/former employees or third parties
- Natural events and disasters
 - Hurricanes and other acts of nature

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Network Security for Client/Server Networks

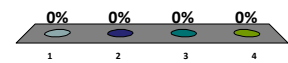
- Offer higher level of security that can be centrally administered
- Threats can be classified into three groups:
 - Human errors and mistakes
 - Malicious human activity
 - Natural events and disasters

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_____ are often equipped to act as hardware firewalls.

1. NICs
2. Routers
3. Computers
4. Printers



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Authentication

- Process where users prove they have authorization to use computer network
 - Provide a user ID and password
 - Biometric devices
 - Possessed objects
 - Identification badges
 - Magnetic key cards
 - Smart keys

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Access Privileges

- When account is set up, certain access privileges are granted to indicate which systems you are allowed to use
- On a college network you might:
 - Have ability to access the Internet
 - View grades and transcripts
- Would not have ability to change grades

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Physical Protection Measures

- Restricting physical access to servers and other equipment is critical
- Devices are secured in ceilings, walls, or closets
- Only authorized personnel have access

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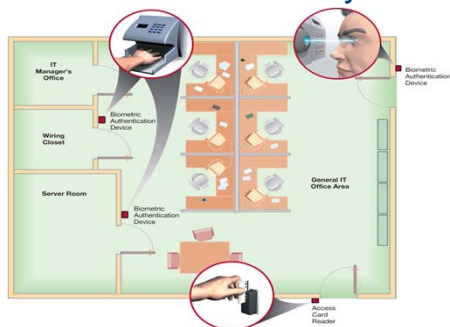
Firewalls

- Firewalls for business networks work on same principles as personal firewall
- Work as packet screeners with external screening router examining incoming data packets
- Unauthorized or suspect packets are discarded

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Network Firewall Layout

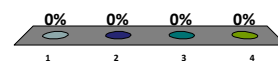


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The main technology for achieving a VPN is called:

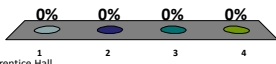
1. Interfacing
2. Topology
3. Tunneling
4. Switching



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_____ is caused when the cable is exposed to strong electromagnetic fields, which can distort or degrade signals on the cable.

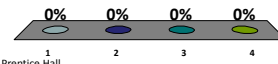
1. VPN
2. EMI
3. EMM
4. RFI



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Which type of cable has glass or plastic cladding?

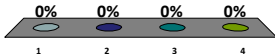
1. Fiber Optic
2. STP
3. Coaxial
4. UTP



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The distance of a PAN is generally defined as _____ feet.

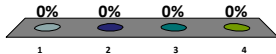
1. 30
2. 5
3. 45
4. 10



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Each network adapter has a physical address similar to a serial number. This address is known as a ___ address.

1. Binary
2. Decimal
3. Media Access Control
4. Adapter



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Chapter 12 Summary Questions

1. What are the advantages of a business network?

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Chapter 12 Summary Questions

2. How does a client/server network differ from a peer-to-peer network?

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Chapter 12 Summary Questions

3. What are the different classifications of client/server networks?

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Chapter 12 Summary Questions

4. What components are needed to construct a client/server network?

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Chapter 12 Summary Questions

5. What do the various types of servers do?

Chapter 12 Summary Questions

6. What are the various network topologies (layouts), and why is network topology important in planning a network?

Chapter 12 Summary Questions

7. What types of transmission media are used in client/server networks?

Chapter 12 Summary Questions

8. What software needs to run on computers attached to a client/server network, and how does this software control network communications?

Chapter 12 Summary Questions

9. How do network adapters enable computers to participate in a client/server network?

Chapter 12 Summary Questions

10. What devices assist in moving data around a client/server network?

Chapter 12 Summary Questions

11. What measures are employed to keep large networks secure?



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