**Chapter 7**

1. Forwarding table: A switch uses a forwarding table that is very similar to a routing table used in a router
2. Access Point: A radio transceiver that plays the same role as a hub or switch in a wired network and connects the WLAN to the wired network
3. 802.11g: Maximum data rate is 54 Mbps
4. 802.11ac: Runs on 2.4Ghz and 5Ghz simultaneously
5. 802.11ad:Maximum data rate of the WLAN is 7Gbps; WiGig is standardized as 802.11ad
6. Types of Ethernet Specifications: 100 Base-T- supports 100 Mbps data rate, is inexpensive, Runs on twisted pair, Is more dominant than token ring, Can run at either full or half duplex
7. Logical topology: How the network works conceptually;

7a. Logical bus topology permits every message to be received by every computer on the bus, even when those message to be received by every computer on the bus, even when those messages are intended for other computers.

1. Media access control: refers to controlling access to a media by more than one computer in a LAN
2. CSMA/CD:

9a. Acronym refers to Carrier Sense Multiple Access with Collision Detection.

9b. Is a contention-based media access control technique

9c. When a collision has occurred, the computers that wish to transmit wait a random amount of time after a colliding message before attempting to retransmit.

9d. Computers on the circuit “listen” before transmitting.

1. RAID: Can provide fault tolerance for the storage space on a server
2. Segmentation: Breaking a network into smaller parts.
3. Wireless NIC: Used in a computer to connect it to a WLAN.
4. Omnidirectional Antennas: Transmit the signal in all directions.
5. Directional Antennas: Project a signal in only one direction and are most often used on the exterior wall pointing to the inside of the building for security reasons.
6. MAC address Filtering: AP permits the owner to provide a list of valid addresses that can connect.
7. Managed APs:

**16a.** are wired into a Wi-Fi Controller.

**16b.** Report what devices are attached to them and how busy they are to the controller, which balances traffic across the APs it manages.

**16c.** Provides Ethernet over the existing electrical power wires in your house at rates up to 1 Gbps.

1. Load Balancer: Acts as a router at the front of the server farm
2. Warchalking: Refers to practice of writing symbols in chalk on sidewalks and walls to indicate the presence of an unsecured WLAN
3. Server Virtualization: The process of creating several logically separate servers on the same physical computer
4. Data Center: where the organization housing its primary servers.
5. Storage Area Network: Has a set of high-speed storage devices and servers that are networked together a very high speed network.
6. Hidden Node Problem: When a computer transmits at the same time because it cannot sense that another computer on the WLAN is currently transmitting.
7. Determined by a Site Survey:

23a. Feasibility of the desired coverage.

23b. Potential sources of interference.

23c. Estimated number of access points needed to provide coverage.

23d. Current locations of the wired network into which the WLAN will connect

1. Bottleneck for LAN performance

24a. Number and speed of hard disks in the server.

24b. Amount of memory in the server.

24c. Speed of server’s CPU

24d. Network interface card

1. Effective ways to reduce LAN network demand

25a. Move files to client computers.

25b. Use disk caching on the client machines.

25c. Find an application that places a large demand on the network and run it a time when the network is lightly loaded.

25d. Shift the users’ routines.

1. To increase the volume of simultaneous messages the LAN circuit can transmit from network clients to the server, you can upgrade to a bigger circuit.
2. Many organizations today are installing traditional wired Ethernet for desktop users and install Wi-Fi as overlay networks.
3. Each of the full duplex circuits connected to a switch is a separate point-to-point circuit connecting the switch to a device on the network.

**Chapter 8**

1. Backbone network:

1a. High-speed network that connects many networks

1b. One basic component of a backbone network is the hardware device that connects other networks to the back bone.

1c. Switches and routers are devices that can connect networks to the BN.

1d. Distribution layer of a backbone connects LANs together.

1e. Typically provide connections to other BNs, WANs, MANs, and the internet.

1f. May also be called enterprise networks if the connect all networks within an organization.

1g. May also be called campus networks if they connect many BNs spanning several buildings as a single location.

1. Routed Backbone:

2a. Also called subnetted or hierarchical backbone.

2b. Move packets along the backbone based on their network layer address.

2c. Disadvantages of routed backbone network.

1. Routers in the network impose time delays
2. Routers are typically more expensive and require more management than switches
3. Switched Backbone:

3a. Has a star topology with a switch at its center resulting in all devices on the BN segment being part of the same IP network.

3b. Each connection into the switch is a separate point-to-point circuit which supports simultaneous access by the LANs connected to the switch

3c. Network latency (delay) is decreased in comparison to traditional (bridged or routed) backbone networks.

3d. The backbone (essentially) exists in the switch; there is no backbone cable

3e. They place all network devices for one part of the building physically in the same room, often in a rack of equipment. Devices in a rack are connected together using patch cables.

1. Routers

4a. Connect different IP networks or subnetworks.

4b. May also be called TCP/IP gateways.

1. Switches: learn addresses by reading the source and destination addresses.
2. Types of hardware device that can be used to interconnect networks

6a. layer 2 switches

6b. layer 3 switches

6c. Routers

1. Layer-3 switches:
2. Switch messages based on their IP address
3. Can be used in place of routers
4. Function faster than routers
5. Have more simultaneously active ports than routers
6. How Routers are different from Switches
7. Routers only process messages that are specifically addressed to it while switches process all messages.
8. Routers operate at the network layer.
9. Routers perform more processing on each message than switches do.
10. Routers can choose the “best” route between networks for forwarding a packet.
11. VLAN (virtual LAN)
12. New type of LAN/BN architecture made possible by intelligent, high speed switches that assign computers to LAN segments via software, rather than by hardware.
13. Fundamental backbone network architecture
14. Are the most secure type of backbone because they enable ACL and other security measures to be applied at the switch.
15. Biggest drawbacks to VLANs- cost management complexity
16. Multi-switch VLAN
17. several switches are used to build a VLAN
18. The switches in the VLAN can send packets among themselves in a way that identifies the VLAN to which the frame belongs.
19. In some multi-switch VLANs, the Ethernet frame is modified based on the emerging IEEE 802.1q standard
20. In some multi-switch VLANs, a new VLAN packet encapsulates the Ethernet packet.
21. Qos: Network managers can connect VOIP phones directly into a VLAN switch and configure the switch to reserve sufficient network capacity so that they will always be able to send and receive voice messages.
22. Access Control List: As security becomes more important, most routers now have software that enables the network manager to create an access control list that specifies what traffic the router should allow through and what traffic the router should block.
23. Main Distribution Facility (MDF) / Central Distribution Facility (CDF): Room that contains a rack of equipment for a rack-based collapsed backbone.
24. Identify and distinguished between three technology layers to consider when designing backbone networks.
25. Core layer
26. Is the part of the backbone that connects the different backbones together.
27. Distribution layer
28. Is the part of the backbone that connects the LANs together.
29. Access Layer
30. Layer that is closest to the users.
31. Network demand will be reduced by:
32. Restricting (or moving) applications such as desktop videoconferencing.
33. Using network devices to ensure that broadcast messages do not go to other networks.
34. Sending status information to all computers on all LANs in the backbone network.
35. Restricting (or moving) applications such as multimedia
36. Ways to improve circuit capacity on a backbone network
37. Going from 100Base-T Ethernet to gigabit Ethernet.
38. Adding additional circuits alongside heavily used ones.
39. Replacing a shared circuit backbone with a switched circuit backbone.
40. Providing a faster circuit to the server.
41. Device performance on a backbone network can be improved by
42. Using the same protocols in the backbone and the LANs
43. Using static routing in low to moderate traffic conditions
44. Ensuring that backbone device have sufficient memory so that packets do not have to be retransmitted by the sender.
45. Most backbone devices are store-and-forward devices. One simple way to improve performance is to ensure that they have sufficient memory.
46. Ideal backbone designs
47. Access layer composed of 10/100 layer 2 Ethernet switches
48. Distribution layer composed of layer 3 Ethernet switches of 100 (or 1000) Base-T
49. Core layer composed of layer 3 Ethernet switches running 10 (or 40) GbE over fiber
50. Redundant switches
51. Computers can be assigned to a VLAN based on the physical port on the switch.

**Chapter 9**

1. Performance of WANs can be improved by upgrading the circuits between the computers
2. Key issues to be considered when selecting a WAN service
3. Flexibility, capacity, control, reliability
4. Packet switched networks:
5. Enable packets from separate messages or separate organizations to be interleaved for transmission
6. A packet assembly/disassembly device is a user’s connection into a packet switched service
7. In a packet switched network, permanent virtual circuits that look very similar to a cloud-based mesh design (for hardware-based dedicated circuits) move packets through the network.
8. Benefits
9. All circuits are less susceptible to a great deal of noise because they are digital
10. You don’t have to specify all the interconnecting services you need for your WAN when you buy the service.
11. You have the flexibility to send data through a temporary circuit between two connections that will be disconnected as soon as the digital transmission is completed.
12. You don’t have to set up dedicated circuits between each end point from which you wish to transmit and receive data and/or voice.
13. Virtual Private Networks (VPN)
14. Particular type of network that uses circuits that run over the Internet but that appears to the user to be a private network.
15. Primary advantage of VPN over private WAN connection – low cost
16. Types of VPN – Intranet VPN, Extranet VPN, Access VPN (a VPN that enables employees to access an organization’s network from a remote location)
17. Permanent Virtual Circuit
18. Connection-oriented approach to sending packets on a packet switched service
19. With a virtual private network, users create permanent virtual circuits through the Internet called tunnels.
20. Latency: Refers to the time delay in converting input packets to output packets
21. Dynamic Routing: Imposes an overhead cost by increasing network traffic
22. Basic architectures for dedicated circuit networks
23. Ring
24. Star
25. Partial mesh
26. Full mesh
27. Ring
28. Messages can take a long time to travel from the sender to the receiver
29. Failure in one circuit means that the network can most likely continue to function
30. Connects all computers in a closed loop, usually via a series of point-to-point dedicated circuits
31. Star
32. Connects all computers to one central computer that routes messages to the appropriate computer, usually via a series of point-to-point dedicated circuits
33. Dependent upon the capacity of the central computer for its performance
34. Full Mesh: Every computer is connected to every other computer often by point-to-point dedicated circuits.
35. MPLS: WAN technology that is designed to work with a variety of commonly used layer-2 protocols and is sometimes called a layer-2.5 technology because it inserts a 4-byte header that contains its own information between the layer-2 frame and the layer-3 IP packet
36. SONET: Almost identical to the ITU-T standard, synchronous digital hierarchy (SDH)
37. Common Carriers: Companies that build a data and telecommunications infrastructure from which other companies can lease services for WANs and MANs
38. T-carrier Services
39. Dedicated digital circuits that are the most commonly used form of dedicated circuit services in North America today
40. Data rate for a T-1 circuit in North America is 1.544 Mbps
41. A T-1 Circuit has 24 64Kbps channels in North America
42. Data rate for a T-3 circuit in North America is 44.376 Mbps
43. Federal Communications Commission (FCC): United States government agency that regulates voice and data communication
44. Public Utilities Commission: Each state or Canadian Province has its own Public Utilities Commission to regulate communications within its borders.
45. Reduce Network Demand
46. Shifting network usage from high cost times to lower cost times
47. Using data compression techniques for all data in the network
48. Requiring a network impact statement for all application software developed by the organization
49. Shifting network usage from peak to lower demand times
50. Mesh networks typically contain more circuits in the network than in Star or Ring networks
51. Dedicated-circuit networks are sometimes called private line services
52. A datagram is a connectionless method of sending data packets on a packet switched service.