Exam N10-003

Network+

Mega Guide

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Domain 1.0 - Media and Topologies – 20%

1.1 Recognize the following logical or physical network topologies given a diagram, schematic or description:

- Star
- Bus
- Mesh
- Ring

Star Topology

A star physical topology is used on a LAN (Local Area Network) and usually doesn't look like a star, except on paper. The focal point of this topology is what you'll find at the center, namely a centralized hub or switch to which all the network's nodes/devices are connected. Network devices are easily connected or disconnected to the central hub or switch using network media, such as UTP (Unshielded Twisted Pair (UTP) cable. This topology is commonly used for 10BASE-T, 100BASE-TX, or 1000BASE-T networks.

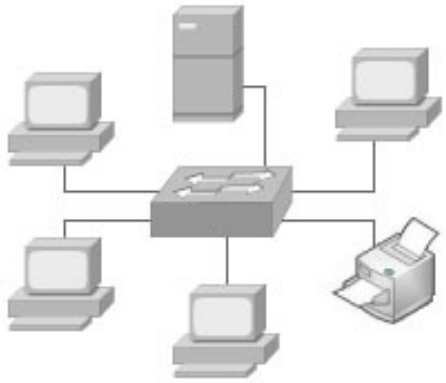

Figure 1 - Star Topology

Advantages

- Cabling is inexpensive and easy.
- Reliable and easy to administer and maintain.
- Locating and repairing bad cables is straightforward.
- Network growth is easily accommodated.

Disadvantages

- All nodes on the network receive the same signal, dividing the bandwidth.
- The maximum number of computers is 1,024 on a LAN.
- If a central media attachment device, such as a switch, fails, the entire network on the switch fails.
- The maximum UTP network cable length is 100 meters (about 330 feet).

Bus Topology

A bus physical topology connects all network devices to a common backbone or bus. PC's connect to the bus by using network cable that attaches or "taps" into the backbone directly. Network signals are sent along the bus in both directions on most buses. This topology was commonly used for 10BASE5 and 10BASE2 networks and is seldom used today.

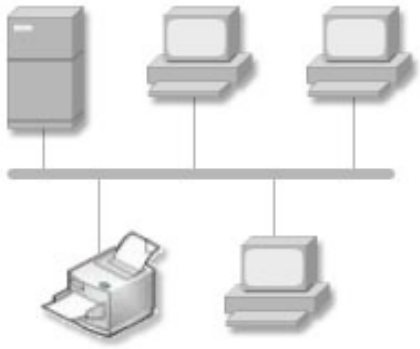

Figure 2 - Bus Topology

Advantages

- Simple to set up. Good for small networks and for quick or temporary LAN installations.
- Additional devices can be added anywhere on the bus.
- Bus topology requires less cable than a star topology.

Disadvantages

- In a physical bus topology, when the network media on one node fails, the entire LAN fails.
- This topology is very difficult to troubleshoot. Locating a break in the cable, or the device causing the fault, when the entire network is down can be time-consuming.
- The length of the bus is limited by cable or signal loss.
- The bus must be terminated at both ends to prevent signal bounce.

Mesh Topology

In a mesh physical topology, every device on the network is connected to every other device on the network. Partial mesh networks don't incur quite the same expense in terms of cabling but, of course, lose some of the redundancy. This topology is most commonly used in WAN (Wide Area Network) configurations for redundancy and maximum fault tolerance.

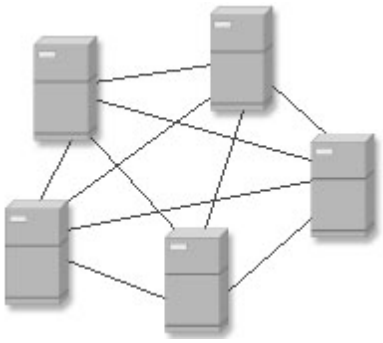

Figure 3 - Mesh Topology

Advantages

- Provides redundancy and fault tolerance. If one device fails, one of the other backup devices takes over with no loss of data.
- A mesh network is reliable. It's easy to find a quick route through the network.
- Can work over great distances.

Disadvantages

- Expensive and complicated, both of which make implementation difficult.

Ring Topology

In a ring physical topology, network devices are wired and connected in a conceptual circle. A ring topology is almost always implemented in a logical ring topology on a physical star topology. Each device is attached to two other devices and uses the same network transmission signal, forming a path in the shape of a ring. Network data flow is unidirectional, and a controlling device, such as a hub or switch, intercepts and manages the data flow to and from the ring. Each device has a NIC (Network Interface Card) that contains a network transceiver, which both sends and receives signals. This topology uses network token-passing access methods referred to as Token Ring. Token Ring is the most common type of ring network.

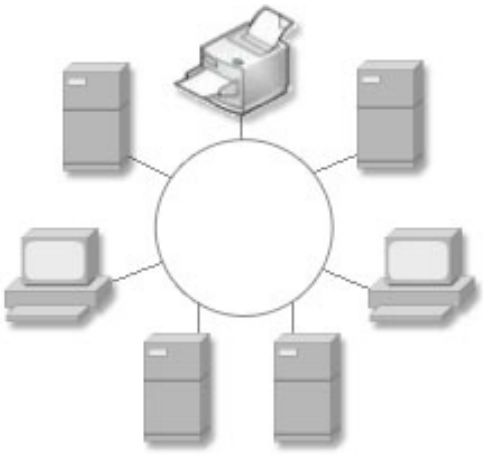

Figure 4 - Ring Topology

Advantages

- Signal degeneration is low.
- Only the device that holds the token can transmit packets of data, which eliminates network packet collisions.

Disadvantages

- Difficult to troubleshoot and locate the problem cable in a network segment.
- Hardware is proprietary and expensive.

1.2 Specify the main features of 802.2 (Logical Link Control), 802.3 (Ethernet), 802.5 (Token Ring), 802.11 (wireless), and FDDI (Fiber Distributed Data Interface) networking technologies, including:

- Speed
- Access method (CSMA / CA (Carrier Sense Multiple Access / Collision Avoidance) and CSMA / CD (Carrier Sense Multiple Access / Collision Detection))
- Topology
- Media

The term 802 refers to the set of network standards and technologies developed by the Institute of Electrical and Electronics Engineers (IEEE). CompTIA's objectives call for you to know 802.2, 802.3, 802.5, 802.11, and the FDDI standards.

Standard	Covers
802.2	LLC (Logical Link Control)
802.3	Ethernet
802.5	Token Ring
802.11	Wireless Networking Family
FDDI	Fiber Distributed Data Interface

Table 1 - Common IEEE Standards

IEEE 802.2 LLC (Logical Link Control)

The IEEE 802.2 standard specifies the Logical Link Control sublayer of the Data Link layer in the OSI (Open Systems Interconnection) network communications model. LLC is one of two layers in the Data Link layer. The second is the MAC (Media Access Control). The MAC layer, which varies in different network types, is defined by IEEE standards 802.3 through 802.5. The LLC sublayer provides the interface between the MAC sublayer and the Network layer above the Data Link layer of the OSI model. The LLC layer's function is to manage network traffic (flow and error control) over the physical medium. The LLC sublayer also identifies the network protocol used for network communications, such as TCP/IP (Transmission Control Protocol/Internet Protocol), NetBIOS (Network Basic Input/Output System), or IPX/SPX (Internetwork Packet Exchange/Sequenced Packet Exchange)—a proprietary protocol in earlier versions of Novell NetWare. The LLC sublayer can also assign sequence numbers to network frames and track network acknowledgements.

IEEE 802.3 Ethernet

The IEEE 802.3 standard specifies any LAN that uses the physical and lower software layers along with baseband signaling and a CSMA/CD access method. 802.3 Ethernet networks are the most popular type of network in use today. Fast Ethernet LANs, which operate at 100 Mbps (megabits per second), are prevalent; many medium-size and large companies use Gigabit and 10 Gigabyte LANs and WANs for backbones interconnecting their networks. Although Ethernet packet network collisions commonly occur, the data speeds of Fast Ethernet and Gigabyte Ethernet more than compensate for the re-transmission of the collision packets. The Ethernet 802.3 IEEE standard includes:

- The original 10Mbps Ethernet LAN
- 100 Mbps, Fast Ethernet - 802.3u standard
- 1000 Mbps Gigabit Ethernet - 802.3z/802.3ab standards
- 10 Gigabit Ethernet - 802.3ae standard

Understand the CSMA/CD Access Signaling Method

CSMA/CD is a contention protocol that defines a set of rules for how network devices compete for sending data along network media. Using CSMA/CD, a computer containing a NIC listens to the network for network communications before sending data. If it doesn't hear another computer sending data, it begins the process of sending its own data. This part is the "Carrier Sense" part. Computers on the same network compete with one another for communication access using similar network media. This is the "Media Access" part. Using CSMA/CD, computers are aware that network collisions can occur, so they are careful