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Module Practice and Quiz

7.5.1

What did I learn in this module?



Ethernet Frame

Ethernet operates in the data link layer and the physical layer. Ethernet standards define both the Layer 2 protocols and the Layer 1 technologies. Ethernet uses the LLC and MAC sublayers of the data link layer to operate. Data encapsulation includes the following: Ethernet frame, Ethernet addressing, and Ethernet error detection. Ethernet LANs use switches that operate in full-duplex. The Ethernet frame fields are: preamble and start frame delimiter, destination MAC address, source MAC address, EtherType, data, and FCS.

Ethernet MAC Address

Binary number system uses the digits 0 and 1. Decimal uses 0 through 9. Hexadecimal uses 0 through 9 and the letters A through F. The MAC address is used to identify the physical source and destination devices (NICs) on the local network segment. MAC addressing provides a method for device identification at the data link layer of the OSI model. An Ethernet MAC address is a 48-bit address expressed using 12 hexadecimal digits, or 6 bytes. An Ethernet MAC address consists of a 6 hexadecimal vendor OUI code followed by a 6 hexadecimal vendor assigned value. When a device is forwarding a message to an Ethernet network, the Ethernet header includes the source and destination MAC addresses. In Ethernet, different MAC addresses are used

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for Layer 2 unicast, broadcast, and multicast communications.

The MAC Address Table

A Layer 2 Ethernet switch makes its forwarding decisions based solely on the Layer 2 Ethernet MAC addresses. The switch dynamically builds the MAC address table by examining the source MAC address of the frames received on a port. The switch forwards frames by searching for a match between the destination MAC address in the frame and an entry in the MAC address table. As a switch receives frames from different devices, it is able to populate its MAC address table by examining the source MAC address of every frame. When the MAC address table of the switch contains the destination MAC address, it is able to filter the frame and forward out a single port.

Switch Speeds and Forwarding Methods

Switches use one of the following forwarding methods for switching data between network ports: store-and-forward switching or cut-through switching. Two variants of cut-through switching are fast-forward and fragment-free. Two methods of memory buffering are port-based memory and shared memory. There are two types of duplex settings used for communications on an Ethernet network: full-duplex and half-duplex. Autonegotiation is an optional function found on most Ethernet switches and NICs. It enables two devices to automatically negotiate the best speed and duplex capabilities. Full-duplex is chosen if both devices have the capability along with their highest common bandwidth. Most switch devices now support the automatic medium-dependent interface crossover (auto-MDIX) feature. When enabled, the switch automatically detects the type of cable attached to the port and configures the interfaces accordingly.

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1. Which two characteristics describe Ethernet technology? (Choose two.)

✔ Topic 7.1.0 - The 802.3 Ethernet standard specifies that a network implement the CSMA/CD access control method. Each node on the network has a unique MAC address for communication purposes.

- ☐ It is supported by IEEE 802.5 standards.
- ☒ It uses unique MAC addresses to ensure that data is sent to the appropriate destination.
- ☐ It typically uses an average of 16 Mbps for data transfer rates.
- ☒ It is supported by IEEE 802.3 standards.
- ☐ It uses a ring topology.

2. What statement describes a characteristic of MAC addresses?

✔ Topic 7.2.0 - Any vendor selling Ethernet devices must register with the IEEE to ensure the vendor is assigned a unique 24-bit code, which becomes the first 24 bits of the MAC address. The last 24 bits of the MAC address are generated per hardware device. This helps to ensure globally unique addresses for each Ethernet device.

- ☐ They have a 32-bit binary value.
- ☐ They must be globally unique.
- ☐ They are added as part of a Layer 3 PDU.
- ☐ They are only routable within the private network.

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3. What is the special value assigned to the first 24 bits of a multicast MAC address transporting an IPv4 packet?

✔ Topic 7.2.0 - Just as with multicast IP addresses, there is a special assigned value for multicast MAC addresses. The first 24 bits are set in hex to: 01-00-5E. The remaining 6 hex digits are derived from the lower 23 bits of the IP multicast.

- ☐ FF-FF-FF
- ☐ 01-5E-00
- ☐ FF-00-5E
- ☐ 01-00-5E

4. What will a host on an Ethernet network do if it receives a frame with a unicast destination MAC address that does not match its own MAC address?

✔ Topic 7.3.0 - In an Ethernet network, each NIC in the network checks every arriving frame to see if the destination MAC address in the frame matches its own MAC address. If there is no match, the device discards the frame. If there is a match, the NIC passes the frame up to the next OSI layer.

- ☐ It will remove the frame from the media.
- ☐ It will discard the frame.
- ☐ It will forward the frame to the next host.
- ☐ It will strip off the data-link frame to check the destination IP address.

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5. Which network device makes forwarding decisions based on the destination MAC address that is contained in the frame?

✔ Topic 7.3.0 - Switches are the central connection point for a LAN and they maintain a MAC address table. The MAC address table has a port number associated with a MAC address for each particular device. The switch inspects a frame to look at the destination MAC address. The switch then looks in its MAC address table and if that MAC address is found, the switch forwards the data to the port that is associated with that particular MAC address.

- ☐ repeater
- ☐ switch
- ☐ hub
- ☐ router

6. Which network device has the primary function to send data to a specific destination based on the information found in the MAC address table?

✔ Topic 7.3.0 - If a MAC address is found in the MAC address table, then data is sent to the associated switch port. If the MAC address is not found in the MAC address table, the data is sent to all switch ports that have devices attached to the same network.

- ☐ switch
- ☐ router
- ☐ modem
- ☐ hub

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8 Network Layer v

7. Which function or operation is performed by the LLC sublayer?

✓ Topic 7.1.0 - The Ethernet LLC sublayer has the responsibility to handle communication between the upper layers and the lower layers of the protocol stack. The LLC is implemented in software and communicates with the upper layers of the application to transition the packet to the lower layers for delivery.

- ☐ It performs data encapsulation.
- ☐ It adds a header and trailer to a packet to form an OSI Layer 2 PDU.
- ☐ It communicates with upper protocol layers.



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8. What happens to runt frames received by a Cisco Ethernet switch?

✓ Topic 7.1.0 - In an attempt to conserve bandwidth and not forward useless frames, Ethernet devices drop frames that are considered to be runt (less than 64 bytes) or jumbo (greater than 1500 bytes) frames.

- ☐ The frame is dropped.
- ☐ The frame is returned to the originating network device.
- ☐ The frame is broadcast to all other devices on the same network.
- ☐ The frame is sent to the default gateway.

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9. What addressing information is recorded by a switch to build its MAC address table?

☒ Topic 7.3.0 - A switch builds a MAC address table by inspecting incoming Layer 2 frames and recording the source MAC address found in the frame header. The discovered and recorded MAC address is then associated with the port used to receive the frame.

- ☐ the destination Layer 3 address of incoming packets
- ☐ the source Layer 3 address of outgoing packets
- ☐ the source Layer 2 address of incoming frames
- ☐ the destination Layer 2 address of outgoing frames

10. What is auto-MDIX?

☒ Topic 7.4.0 - Auto-MDIX is a feature that is enabled on the latest Cisco switches and that allows the switch to detect and use whatever type of cable is attached to a specific port.

- ☐ an Ethernet connector type
- ☐ a feature that detects Ethernet cable type
- ☐ a type of Cisco switch
- ☐ a feature to automatically determine speed and duplex

11. What type of address is 01-00-5E-0A-00-02?

☒ Topic 7.2.0 - The multicast MAC address is a special value that begins with 01-00-5E in hexadecimal. It allows a source device to send a packet to a group of devices.

- ☐ an address that reaches one specific host
- ☐ an address that reaches every host inside a local subnet

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- ☐ an address that reaches a specific group of hosts
- ☐ an address that reaches every host in the network

12. Which statement is true about MAC addresses?

☒ **Topic 7.2.0 - A MAC address is composed of 6 bytes. The first 3 bytes are used for vendor identification and the last 3 bytes must be assigned a unique value within the same OUI. MAC addresses are implemented in hardware. A NIC needs a MAC address to communicate over the LAN. The IEEE regulates the MAC addresses.**

- ☐ MAC addresses are implemented by software.
- ☐ The first three bytes are used by the vendor assigned OUI.
- ☐ The ISO is responsible for MAC addresses regulations.
- ☐ A NIC only needs a MAC address if connected to a WAN.

13. What are the two sizes (minimum and expected maximum) of an Ethernet frame? (Choose two.)

☒ **Topic 7.1.0 - The minimum Ethernet frame is 64 bytes. The maximum expected Ethernet frame is 1518 bytes. A network technician must know the minimum and expected maximum frame size in order to recognize runt and jumbo frames.**

- ☐ 128 bytes
- ☐ 56 bytes
- ☒ 64 bytes
- ☐ 1024 bytes
- ☒ 1518 bytes

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14. Which two functions or operations are performed by the MAC sublayer? (Choose two.)

✓ Topic 7.1.0 - The MAC sublayer is the lower of the two data link sublayers and is closest to the physical layer. The two primary functions of the MAC sublayer are to encapsulate the data from the upper layer protocols and to control access to the media.

- ☐ It performs the function of NIC driver software.
- ☒ It adds a header and trailer to form an OSI Layer 2 PDU.
- ☒ It is responsible for Media Access Control.
- ☐ It adds control information to network protocol layer data.
- ☐ It handles communication between upper and lower layers.

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