

Name _____ Date _____

Module 7 - Ethernet Switching

Introduction to Networks – Semester 1

Student Version

Module 7 Sections:

- 7.0 Introduction
- 7.1 Ethernet Frame
- 7.2 Ethernet MAC Address
- 7.3 The MAC Address Table
- 7.4 Switch Speeds and Forwarding Methods
- 7.5 Module Practice and Quiz

Required Materials:

Reading Organizer

Packet Tracer Activities: None

Labs: 7.1.6 - Use Wireshark to Examine Ethernet Frames
7.2.7 - View Network Device MAC Addresses
7.3.7 View the Switch MAC Address Table

Module's 4 - 7 Exam

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Note: The Reading Organizer has weighted scoring. Any question with the word **explain, define, or describe** in it is expected to have a longer answer and is worth two points each.

After completion of this chapter, you should be able to:

- Explain how the Ethernet sublayers are related to the frame fields.
- Describe the Ethernet MAC address.
- Explain how a switch builds its MAC address table and forwards frames.
- Describe switch forwarding methods and port settings available on Layer 2 switch ports.

7.1 Ethernet Frame

1. Ethernet is one of two LAN technologies used today. What is the other?

2. List the wire types or media Ethernet uses to communicate over.

a.

b.

c.

3. What OSI layers does Ethernet operate in?

a.

b.

4. List and describe the two data link sublayers.

a. _____ –

b. _____ –

5. List what the IEEE 802.3 data encapsulation includes.

a.

b.

c.

6. Explain what carrier sense multiple access/collision detection (CSMA/CD) does.

7. Does full-duplex communications with Ethernet switches require access control through CSMA/CD?

8. The minimum Ethernet frame size is _____ and the maximum is _____.

9. What is any frame less than 64 bytes in length is called?

10. What is a frames with more than 1500 bytes of data called?

11. Match the Ethernet frame field name to its description.

- | | |
|--|----------------------------------|
| a. Preamble and Start Frame Delimiter Fields | b. Destination MAC Address Field |
| c. Source MAC Address Field | d. Type /Length |
| e. Data Field | f. Frame Check Sequence Field |

_____ The Frame Check Sequence (FCS) field (4 bytes) is used to detect errors in a frame. It uses a cyclic redundancy check (CRC). The sending device includes the results of a CRC in the FCS field of the frame. The receiving device receives the frame and generates a CRC to look for errors. If the calculations match, no error occurred. Calculations that do not match are an indication that the data has changed; therefore, the frame is dropped. A change in the data could be the result of a disruption of the electrical signals that represent the bits.

_____ This 6-byte field is the identifier for the intended recipient. As you will recall, this address is used by Layer 2 to assist devices in determining if a frame is addressed to them. The address in the frame is compared to the MAC address in the device. If there is a match, the device accepts the frame. Can be a unicast, multicast or broadcast address.

_____ This field (46 - 1500 bytes) contains the encapsulated data from a higher layer, which is a generic Layer 3 PDU, or more commonly, an IPv4 packet. All frames must be at least 64 bytes long. If a small packet is encapsulated, additional bits called a pad are used to increase the size of the frame to this minimum size.

_____ The Preamble (7 bytes) and Start Frame Delimiter (SFD), also called the Start of Frame (1 byte), fields are used for synchronization between the sending and receiving devices. These first eight bytes of the frame are used to get the attention of the receiving nodes. Essentially, the first few bytes tell the receivers to get ready to receive a new frame.

_____ This 6-byte field identifies the originating NIC or interface of the frame.

_____ This 2-byte field identifies the upper layer protocol encapsulated in the Ethernet frame. Common values are, in hexadecimal, 0x800 for IPv4, 0x86DD for IPv6 and 0x806 for ARP. Note: You may also see this field referred to as EtherType, Type, or Length.

7.2 Ethernet MAC Address

12. In networking, IPv4 addresses are represented using the _____ base ten number system and the _____ base 2 number system.

13. IPv6 addresses and Ethernet addresses are represented using the _____ base sixteen number system.

14. When using _____, leading zeroes are always displayed to complete the 8-bit representation.

15. Hexadecimal numbers are often represented by the value preceded by _____ to distinguish between decimal and hexadecimal values in documentation.
16. Hexadecimal may also be represented by a _____, or the hex number followed by an H.
17. MAC addressing provides a method for device identification at the _____ layer of the OSI model.
18. Explain what a organizationally unique identifier (OUI) is.
19. When a vendor assigns a MAC address to a device or Ethernet interface, what must the vendor include?
- a.
 - b.
20. What is another name for a MAC address?
21. List and explain what an Ethernet header includes when a device is forwarding a message to an Ethernet network?
- a. _____ –
 - b. _____ –
22. Different MAC addresses are used for Layer 2 unicast, broadcast, and multicast communications. Describe a unicast MAC address.
23. Explain what Address Resolution Protocol does.

24. The process that a source host uses to determine the destination MAC address associated with an IPv6 address is called what?

25. The source MAC address must always be a _____.

26. Describe the features of an Ethernet broadcast.

a.

b.

c.

27. Describe the features of an Ethernet multicast.

a.

b.

c.

d.

28. Multicast addresses represent a group of addresses. What are these groups sometimes called?

7.3 The MAC Address Table

29. A Layer 2 Ethernet switch uses Layer 2 _____ addresses to make forwarding decisions.

30. Switch's dynamically build _____ by examining the source MAC address of the frames received on a port.

31. By default, how long do most Ethernet switches keep an entry in the tMAC address table?

32. Explain the process a switch uses to forward a packet to it's destination address.

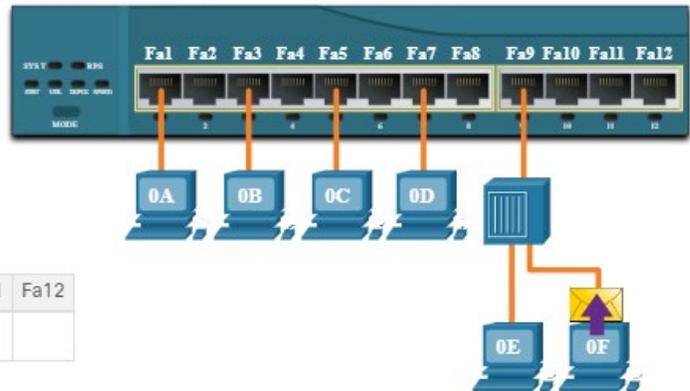
33.

Frame

Preamble	Destination MAC	Source MAC	Type / Length	Frame	End of Frame
	0A	0F			

MAC Table

Fa1	Fa2	Fa3	Fa4	Fa5	Fa6	Fa7	Fa8	Fa9	Fa10	Fa11	Fa12
0A		0B		0C							



Question 1 - Where will the switch forward the frame?

- Fa1
 Fa2
 Fa3
 Fa4
 Fa5
 Fa6
 Fa7
 Fa8
 Fa9
 Fa10
 Fa11
 Fa12

Question 2 - When the switch forwards the frame, which statement(s) are true?

- Switch adds the source MAC address which is currently not in the MAC address table.
 Frame is a broadcast frame and will be forwarded to all ports.
 Frame is a unicast frame and will be sent to specific port only.
 Frame is a unicast frame and will be flooded to all ports.
 Frame is a unicast frame but it will be dropped at the switch.

7.4 Switch Speeds and Forwarding Methods

34. List and describe the two forwarding methods switches use for switching data between network ports.

a. _____ –

b. _____ –

35. _____ switching is required for quality of service (QoS) analysis on converged networks where frame classification for traffic prioritization is necessary.

36. What is a big advantage of store-and-forward switching?

37. List and describe the two variants of cut-through switching.

a. _____ –

b. _____ –

38. List and describe two memory buffering methods switches can use.

a. _____ –

b. _____ –

39. List and describe the two types of duplex settings used for communications on an Ethernet network.

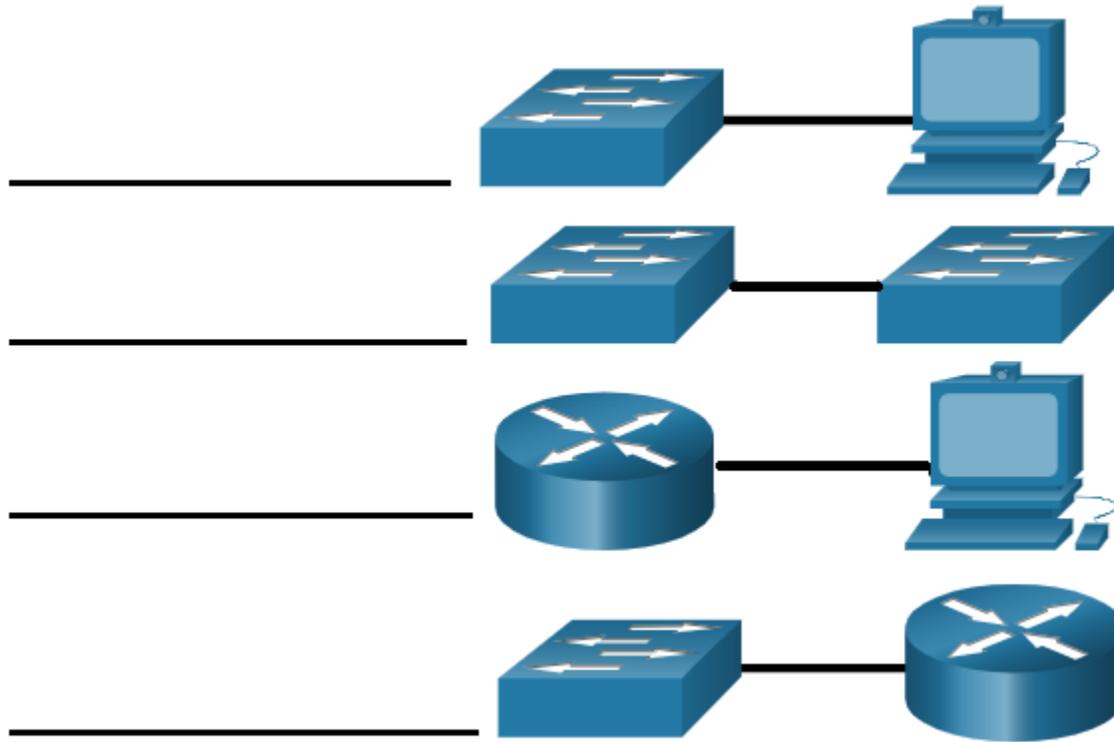
a. _____ –

b. _____ –

40. Most Cisco switches and Ethernet NICs default to autonegotiation for speed and duplex. Gigabit Ethernet ports only operate in _____.

41. Explain what happens when a duplex mismatch occurs.

42. What type of cable is required to connect the devices shown?



43. Most switch devices now support the automatic medium-dependent interface crossover (auto-MDIX) feature. Describe what auto-MDIX does when it's enabled?

44. The auto-MDIX feature is enabled by _____ on switches running Cisco IOS Release 12.2(18)SE or later.