Name _____ Date _____

Module 11 – IPv4 Addressing
Introduction to Networks – Semester 1
Student Version

Module 11 Sections:

11.0 Introduction
11.1 IPv4 Address Structure
11.2 IPv4 Unicast, Broadcast, and Multicast
11.3 Types of IPv4 Addresses
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Required Materials:

Reading Organizer

Packet Tracer Activities: 11.5.5 - Subnet an IPv4 Network
                             11.7.5 - Subnetting Scenario
                             11.9.3 - VLSM Design and Implementation Practice
                             11.10.1 - Design and Implement a VLSM Addressing Scheme

Labs: 11.6.6 - Calculate IPv4 Subnets
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Module's 11 – 13 Exam

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Name_____ Date _____

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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:

- Describe the structure of an IPv4 address including the network portion, the host portion, and the subnet mask.
- Compare the characteristics and uses of the unicast, broadcast and multicast IPv4 addresses.
- Explain public, private, and reserved IPv4 addresses.
- Explain how subnetting segments a network to enable better communication.
- Calculate IPv4 subnets for a /24 prefix.
- Calculate IPv4 subnets for a /16 and /8 prefix.
- Given a set of requirements for subnetting, implement an IPv4 addressing scheme.
- Explain how to create a flexible addressing scheme using variable length subnet masking (VLSM).
- Implement a VLSM addressing scheme.

11.1 IPv4 Address Structure

1. An IPv4 address is a _____ hierarchical address that is made up of a <u>network</u> portion and a _____portion.

2. Assigning an IPv4 address to a host requires two things. List and describe both.

    a. _____ -

    b. _____ -

3. What is required for an IPv4 address to reach remote networks.

4. A DNS server IPv4 addresses are required to translate _____ to IPv4 addresses.

5. To identify the _____ and _____portions of an IPv4 address, the subnet mask is compared to the IPv4 address bit for bit, from left to right

6. Describe an alternative method of identifying a subnet mask.

7. Write in the prefix length for the following subnet masks.

Prefix Length	32-bit Address	Subnet Mask
/_____	11111111.00000000.00000000.00000000	255.0.0.0
/_____	11111111.11111111.00000000.00000000	255.255.0.0
/_____	11111111.11111111.11111111.00000000	255.255.255.0
/_____	11111111.11111111.11111111.11000000	255.255.255.192
/_____	11111111.11111111.11111111.11110000	255.255.255.240
/_____	11111111.11111111.11111111.11111100	255.255.255.252

8. To identify the network address of an IPv4 host, the IPv4 address is logically _____ , bit by bit, with the subnet mask.

9. The _____ operation between an IPv4 host address and subnet mask results in the IPv4 network address for this host.

10. List the three types of IP addresses within each network.

a.

b.

c.

11. What are the three criteria that are required for a device to have a network address that represents a specific network.

a.

b.

c.

12. A host determines its network address by performing an AND operation between it's a
_____ and its _____.

13. Host addresses are addresses that can be assigned to a device such as:

    a.

    b.

    c.

    d.

    e.

    f.

14. Why do host addresses have any combination of bits in the host portion except for all 0 bits or all 1 bits.

    a. <u>All 0 bits</u> –

    b. <u>All 1 bits</u> –

15. All devices within the same network, must have the same _____ and the same _____.

16. Explain what a broadcast address is.

11.2 IPv4 Unicast, Broadcast, and Multicast

17. Explain what a unicast address is and does.

18. Explain how a broadcast transmission operates.

19. Broadcast packets use resources on the network and make every receiving host on the network process the packet. Explain why should broadcast traffic should be limited?

20. Explain how a directed broadcast operates.

21. Because of security concerns, directed broadcasts are _____ by default.

22. Explain how multicast transmissions reduces traffic?

23. What is the Pv4 reserved the addresses multicast range?

11.3 Types of IPv4 Addresses

24. Explain what Public IPv4 addresses are.

25. Explain what private addresses are used for.

26. Private IPv4 addresses are not unique and can be used _____ within any network.

27. Write in the three private address blocks and ranges.

Network Address and Prefix	RFC 1918 Private Address Range
10.0.0.0/8	_____
172.16.0.0/12	_____
192.168.0.0/16	_____

28. Private addresses are not globally routable.

29. Packets with a private address must be filtered (discarded) or translated to a public address before forwarding the packet to an ISP.

30. Network Address Translation or NAT is used to translate between private IPv4 and public IPv4 addresses before routing them to the internet.

31. Is NAT considered an effective security measure?

    No

32. There are certain addresses, such as the _____ address and _____ address, that cannot be assigned to hosts.

33. What is the IP address range assigned to Loopback addresses?

34. What are loop back addresses used for?

35. What is the IP address range for Link-local addresses?

36. What are Link-local addresses more commonly known as?

37. How are Link-local addresses used by a Windows?

38. List and describe the three specific classes of unicast addresses.

    a. _____-

    b. _____-

    c. _____-

39. What are the numeric ranges of the three address ranges.

    a.

    b.

    c.

40. There is also a Class D multicast block consisting of _____.

41. Class E, the experimental address block consists of _____ .

42. How many hosts are available in each address class?

      a. Class A –

      b. Class B –

      c. Class C –

43. Public IPv4 addresses are addresses which are globally routed over the_____.

44. Public IPv4 addresses must be _____.

45. _____ or _____ are responsible for allocating IP addresses to ISPs who provide IPv4 address blocks to organizations and smaller ISPs.

11.4 Network Segmentation

46. What type of email is addressed to every person at your work or school?

47. Describe how Address Resolution Protocol (ARP) locates other devices MAC addresses.

48. A host typically acquires its IPv4 address configuration using the _____ _____which sends broadcasts on the local network to locate a DHCP server.

49. Switches propagate _____out all interfaces except the interface on which it was received.

50. What device does not propagate broadcasts?

51. What is a large broadcast domain?

52. What is the problem with a large broadcast domain?

53. What process can be used to reduce the size of a network to create smaller broadcast domains?

54. Subnetting reduces _____ network traffic and _____ network performance.

55. Subnetting enables an administrator to implement _____ policies such as which subnets are allowed or not allowed to communicate together.

56. Subnetting reduces the number of devices affected by abnormal _____ traffic due to misconfigurations, hardware/software problems, or malicious intent.

57. List three ways network administrators can group devices and services into subnets.

   a. _____

   b. _____

   c. _____

11.5 Subnet an IPv4 Network

58. IPv4 subnets are created by using one or more of the _____ bits as network bits.

59. When subnetting the more <u>host</u> bits that are borrowed, the more _____ can be defined.

60. What happens when to the host address when more bits are borrowed to increase the number of subnets?

61. Which networks are most easily subnetted at the octet boundary?

   a.

   b.

   c.

62. If an enterprise subnetnetted a 10.0.0.0/8 address at the octet boundary of /16 how many subnets and how many hosts per subnet would be created?

Subnets: _____

Hosts: _____

11.6 Subnet a /16 and a /8 Prefix

63. When borrowing bits from a /16 address, start borrowing bits in the third octet, going from _____to _____.

64. To satisfy the requirement of 100 subnets for an enterprise using a 172.16.0.0 address, how many bits would have to be borrowed from the host portion of the address?

65. What is the prefix number for a 100 subnets from the 172.16.0.0 address?

66. How many bit would have to be borrowed to create a 1000 subnets from the 10.0.0.0 address?

67. What is the prefix number for a 1000 subnets from the 10.0.0.0 address?

68. How many hosts are created in each subnet when you have 1000 subnets in a 10.0.0.0 address?

11.7 Subnet To Meet Requirements

69. Define the following terms.

a. Intranet –

b. DMZ –

70. The intranet uses _____ IPv4 addressing space.

71. Devices in the DMZ require _____ IPv4 addresses.

72. The depletion of public IPv4 address space became an issue beginning in the mid-1990s. Since 2011, IANA and four out of five _____ have run out of IPv4 address space.

73. What are two considerations when planning subnets to minimize the number of unused host IPv4 addresses and maximize the number of available subnets?

    a.

    b.

74. The addressing scheme should allow for growth in both the number of _____ addresses per subnet and the total number of _____.

11.8 Variable Length Subnet Masking

75. What does the acronym VLSM stand for?

76. VLSM was developed to avoid _____ addresses by enabling us to subnet a subnet.

77. With VLSM, the _____ will vary depending on how many bits have been borrowed for a particular subnet, thus the "variable" part of the VLSM.

78. Why is a /30 the smallest subnet you can create?

79. When using VLSM, always begin by satisfying the host requirements of the _____ subnet.
80. Using the VLSM subnets, the LAN and inter-router networks can be addressed without unnecessary _____.

11.9 Structured Design

81. Before you start subnetting, you should develop an IPv4 addressing scheme for your entire network. What do you need to know before you start?

    a.

    b.

    c.

    d.

82. Where address conservation is required, the plan should determine how many _____ are needed and how many _____ per subnet.

83. Within a network, there are different types of devices that require addresses. List and describe each.

    a. _____ -

    b. _____ -

    c. _____ -

    d. _____ -

    e. _____ -