Name_____ Date _____

Module 6 - NAT
Reading Organizer
Student Version

Note: The Reading Organizer has weighted scoring. Any question with the word **explain** or **define** 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 NAT characteristics
- Describe the benefits and drawbacks of NAT
- Configure static NAT using the CLI
- Configure dynamic NAT using the CLI
- Configure PAT using the CLI
- Configure port forwarding using the CLI
- Configure NAT-PT (v6 to v4)
- Use show commands to verify NAT operation

6.1.1 IPv4 Private Address Space

1. NAT has many uses, but its primary use is to conserve public IPv4 addresses. Explain how NAT does this.

2. What is the RFC for Private IP Addresses? (Memorize this)

3. What are the Private IPv4 Address ranges? (Memorize this)

    a. Class A: _____

    b. Class B: _____

    c. Class C: _____

4. The router that does the translations from private to public IP, and public to private IP is called the _____.

6.1.2 What is NAT?

5. The primary purpose of NAT is to:

6. What has to be configured on a NAT router?

7. How many NAT routers are normally installed in a typical network?

8. Where logically/physically in the network are NAT routers typically installed?

9. What is a stub network?

6.1.3 How NAT Works

10. Watch the animation and understand how translation takes place. **SA** – Source Address, **DA** – Destination Address. Why do you think the Outside Local and Outside Global addresses are the same?

6.1.4 NAT Terminology

11. The language of NAT includes four names for the four types of addresses. List and explain each. (Know these terms)

    a.

    b.

    c.

    d.

12. Explain the following terms:
    a. Inside address –

    b. Outside address –

    NAT also uses the concept of local or global with respect to addresses:

    c. Local address –

    d. Global address –

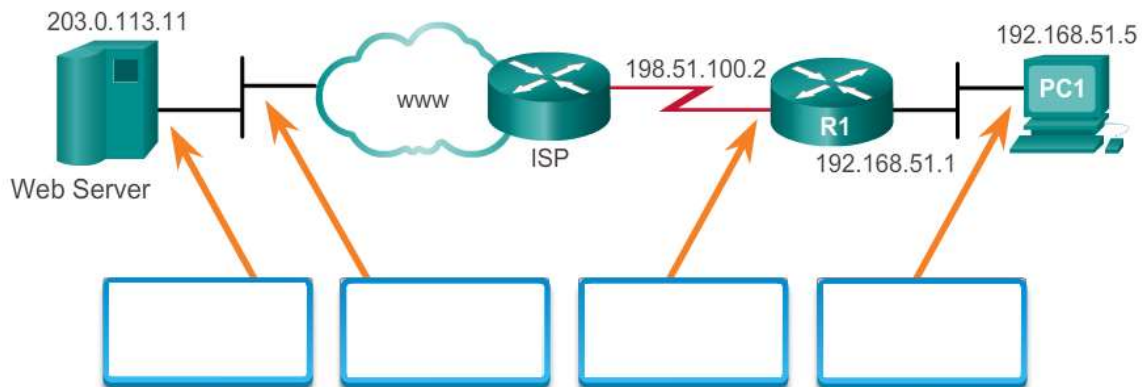13. The terms above are combined. Define the following combined terms:

    a. Inside local address –

    b. Inside global address –

    c. Outside global address –

    d. Outside local address –

14. From the prospective of someone sitting at the PC in the diagram, correctly identify the type of addresses below.

6.2 Types of NAT
6.2.1   Static NAT

15. What type of mapping does static NAT use?

16. Which type of NAT translation is particularly useful for web servers or devices that must have a consistent address that is accessible from the Internet, such as a company web server.

6.2.2 Dynamic NAT
17. Which type of NAT translation uses a pool of public addresses and assigns them on a first-come, first-served basis.

6.2.3 Port Address Translation (PAT)
18. How does Port Address Translation (PAT), also known as NAT overloading work?

19. With PAT, multiple addresses can be mapped to one or to a few addresses. Explain how

20. How does the PAT process add a degree of security to each session?

6.2.4 Next Available Port
21. What happens if there is a conflict of source port numbers?

6.2.5 NAT and Pat Comparison

22. Fill in the table to provide a summary of the differences between NAT and PAT:

NAT	PAT

6.2.6 Packets without a Layer 4 Segment

23. How does NAT treat ICMP traffic differently? (since ICMP doesn't use port numbers)

6.3 NAT Advantages and Disadvantages
6.3.1 Advantages of NAT

24. What are the benefits provided by NAT?

a.

b.

c.

d.

6.3.2 Disadvantages of NAT

25. What are the disadvantages of using NAT?

    a.

    b.

    c.

    d.

    e.

6.4 Static NAT
6.4.1 Static NAT Scenario

26. What is static NAT?

6.4.2 Configure Static NAT

27. <u>Explain in detail</u> the two basic tasks when configuring static NAT translations.

    a.

    b.

6.4.3 Analyzing Static NAT

28. (Think!) Why would you want to use a private address during a static NAT process? Why not use an inside local public address?

6.4.4 Verifying Static NAT

29. A useful command to verify NAT operation is the **`show ip nat translations`** command. Explain what this command shows?

30. Which command displays information about the total number of active translations, NAT configuration parameters, the number of addresses in the pool, and the number of addresses that have been allocated?

31. Explain why the **`clear ip nat statistics`** command needs to be run before testing?

6.4.5 PT – Configuring Static NAT

6.5 Dynamic NAT
6.5.1 Dynamic NAT Scenario

32. Dynamic NAT, like static NAT, requires the configuration of the inside and outside interfaces participating in NAT. Explain how is static NAT different from dynamic NAT?

33. What is the most common use of NAT?

34. What happens if all the addresses in a NAT pool have been used and another device try's to access the outside network?

6.5.2 Configuring Dynamic NAT

    35. Explain the five steps and the commands used to configure dynamic NAT.

        Step 1.

        Step 2.

        Step 3.

        Step 4.

        Step 5.

6.5.3 Analyzing Dynamic NAT – Inside to Outside

    36. Using the illustration and accompanying text, explain how the router is able to correctly send the request packets to the outside network.

6.5.4 Analyzing Dynamic NAT – Outside to Inside

    37. Using the illustration and accompanying text, explain how the router is able to correctly return the reply packets back to their original local network.

6.5.5 Verifying Dynamic NAT

38. Explain what happens when you use the *clear ip nat translation* global configuration command to clear all translations from the table.

6.5.6 PT – Configuring Dynamic NAT

6.6 PAT
9.2.3.1 Configuring PAT: Address Pool

39. Explain what PAT (also called NAT overload) does.

40. What is the number of internal addresses that can actually be assigned a single public IP address?

41. There are two ways to configure PAT, depending on how the ISP allocates public IPv4 addresses. Explain both.

    a.

    b.

6.6.2 Configuring PAT: Single Address

    42. Explain the four steps to follow to configure PAT with a single IPv4 address (analyze the syntax).

        Step 1.

        Step 2.

        Step 3.

        Step 4.

6.6.2 Configuring PAT to Use an Address Pool

    43. Explain the four steps to follow to configure PAT with a single IPv4 address (analyze the syntax).

        Step 1.

        Step 2.

        Step 3.

        Step 4.

        Step 5.

6.6.4 Analyzing PAT – PC to Server
44. Before the NAT table is populated with actual values, what needs to take place?

6.6.5 Analyzing PAT – Server to PC
45. Before the NAT table is populated with actual values, what needs to take place?

6.6.6 Verify PAT
46. What command is used to display the values of the NAT table?

47. What IOS command is needed if you wish to see how many NAT translations have taken place?

6.6.7 PT – Configure PAT

9.2.4.1 Port Forwarding
48. Explain in detail what port forwarding or tunneling is.

6.7 NAT64
6.7.1 NAT for IPv6?
49. Explain one of the unintentional benefits of NAT for IPv4?

6.7.2 NAT 64

    50. What is the primary purpose of using NAT in an IPv6 network?

    51. Explain what dual-stack is.

6.8 Module Practice and Quiz

6.8.1 PT – Configure NAT for IPv4

6.8.2 Lab – Configure NAT for IPv4

6.8.3 What did I learn in this module?

6.8.4 Module Quiz – NAT for IPv4