Network+ Guide to Networks 7th edition West Solutions Manual

SKU: 9781305090941-SOLUTIONS

Network+ Guide to Networks, Seventh Edition

Chapter 2, Solutions

[C HD] Applying Concepts: Configure Address Translation Using NAT

At the end of this chapter, you'll create your own NAT translation table entry using this example as a template. To help you better understand where the IP address in a translation table entry comes from, answer the following questions about the information in Figures 2-16 and 2-17:

1. What is the router's outside interface IP address?

Answer: 69.32.208.100

2. What is the router's inside interface IP address?

Answer: 192.168.50.1

3. What is the Web site's public IP address?

Answer: 69.32.208.74

4. What is the private IP address of the active Web server?

Answer: 192.168.10.7

[A HD] Review Questions

1. Which part of a MAC address is unique to each manufacturer?

   A. The network identifier

   B. The OUI

   C. The device identifier

   D. The physical address

Answer: B. The OUI

2. What decimal number corresponds to the binary number 11111111?

A. 255

B. 256

C. 127

D. 11111111

Answer: A. 255

3. What type of device does a computer turn to first when attempting to make contact with a host on another network?

A. Default gateway

B. DNS server

C. Root server

D. DHCP server

Answer: A. Default gateway

4. Which statement actually describes SMTP?

A. SMTP is a connectionless protocol that uses UDP

B. SMTP is a connection-based protocol that uses UDP

C. SMTP is a connectionless protocol that uses TCP

D. SMTP is a connection-based protocol that uses TCP

Answer: D. SMTP is a connection-based protocol that uses TCP

5. When your computer first joins an IPv6 network, what is the prefix of the IP address the computer first configures for itself?

A. FE80::/10

B. FF00::/8

C. 2001::/64

D. 2001::/3

Answer: A. FE80::/10

6. You have just brought online a new secondary DNS server and notice your monitoring software reports a significant increase in network traffic. Which two hosts on your network are likely to be causing the increased traffic and why?

   A. The caching and primary DNS servers, because the caching server is requesting zone transfers from the primary server

   B. The secondary and primary DNS servers, because the secondary server is requesting zone transfers from the primary server

   C. The root and primary DNS servers, because the primary server is requesting zone transfers from the root server.

   D. The Web server and primary DNS server, because the Web server is requesting zone transfers from the primary DNS server.

Answer: B. The secondary and primary DNS servers, because the secondary server is requesting zone transfers from the primary server.

7. Suppose you send data to the 11111111 11111111 11111111 11111111 IP address on an IPv4 network. To which device(s) are you transmitting?

   A. All devices on the Internet

B. All devices on your local network

C. The one device with this given IP address

D. Because no device can have this given IP address, no devices receive the transmission

Answer: B. All devices on your local network

8. If you are connected to a network that uses DHCP, and you need to terminate your Windows workstation's DHCP lease, which command would you use?

A. `ipconfig /release`

B. `ipconfig /renew`

C. `ifconfig /release`

D. `ifconfig /new`

Answer: A. `ipconfig /release`

9. What computers are the highest authorities in the Domain Name System hierarchy?

A. Authoritative name servers

B. Root servers

C. Top-level domain servers

D. Primary DNS server

Answer: B. Root servers

10. What version of SMB can be used across Windows, UNIX, and other operating systems?

A. SIP (Session Initiation Protocol)

B. RDP (Remote Desktop Protocol)

C. CIFS (Common Internet File System)

D. MGCP (Media Gateway Control Protocol)

Answer: C. CIFS (Common Internet File System)

11. Suppose you want to change the default port for RDP as a security precaution. What port does RDP use by default, and from what range of numbers should you select a private port number?

Answer: 3389; 49152 through 65535

12. Which type of DNS record identifies a mail server?

Answer: MX

13. How many bits does an IPv6 address contain?

Answer: 128

14. On what port is an IPv6 client listening for DHCP messages?

Answer: 546

15. The second 64 bits of an autoconfigured IPv6 address may either be random or generated from the computer's MAC address, which contains 48 bits. What standard defines the conversion of the MAC address to the IPv6 64-bit device ID?

Answer: EUI-64

16. You issue a transmission from your workstation to the following socket on your LAN: 10.1.1.145:110. Assuming your network uses standard port designations, what Application layer protocol are you using?

Answer: POP3

17. What protocol does a network gateway use to keep track of which internal client is talking to which external Web server?

Answer: PAT (Port Address Translation)

18. You are the network manager for a computer training center that allows clients to bring their own laptops to class for learning and taking notes. Clients need access to the Internet, so you have configured your network's DHCP server to issue IP addresses automatically. What DHCP option should you modify to make sure you are not wasting addresses that were used by clients who have left for the day?

Answer: The lease duration for client computers

19. What is the range of IP addresses that might be assigned by APIPA?

Answer: Range 169.254.0.1 through 169.254.255.254

20. While troubleshooting a network connection problem for a coworker, you discover the computer is querying a nonexistent DNS server. What command-line utility can you use to assign the correct DNS server IP address?

Answer: `nslookup` (in interactive mode)

21. FTP sometimes uses a random port for data transfer, but an FTP server always, unless programmed otherwise, listens to the same port for session requests from clients. What port is the FTP server listening on?

Answer: 21

22. While troubleshooting a network connection problem for a coworker, you discover that the computer has a static IP address and is giving a duplicate IP address error. What command-line utility can you use to find out what other device may already be using that IP address?

Answer: `ping` or `nslookup`

23. What is the IPv4 loopback address? What is the IPv6 loopback address?

Answer: 127.0.0.1

Answer: ::1/128

24. You have just set up a new wireless network in your house, and you want to determine whether your Linux laptop has connected to it and obtained a valid IP address. What command will give you the information you need?

Answer: `ifconfig -a`

25. You have decided to use SNAT and PAT on your small office network. At minimum, how many IP addresses must you obtain from your ISP for all five clients in your office to be able to access servers on the Internet?

Answer: 1

26. If you know that your colleague's TCP/IP host name is JSMITH, and you need to find out his IP address, what command should you type at your shell prompt or command prompt?

Answer: `nslookup jsmith` or `ping jsmith`

27. When determining whether a local network has any NetBIOS traffic, do you use the nslookup utility in interactive mode or a packet analyzer such as Wireshark?

Answer: A packet analyzer such as Wireshark

28. List three signaling protocols discussed in the chapter that are used for communicating multimedia data.

Answer: SIP, H.323, and MGCP

29. What version of the `ping` command do you use in Windows with IPv6 addresses? What version do you use on a Linux system?

Answer: ping -6

Answer: ping6

30. When running a scan on your computer, you find that a session has been established with a host at the address 208.85.40.44:80. Which protocol is in use for this session? What command-line utility might you use to find out who the host is?

Answer: Port 80 indicates this is an HTTP session.

Answer: nslookup can identify the domain name of the host at that IP address.

[B HD] Project 2-1: Create a NAT Translation Table Entry

[B HD] Your corporation hosts a Web site at the static public IP address 92.110.30.123. A router directs this traffic to a Web server at the private IP address 192.168.11.100. However, the Web server needs a hardware upgrade and will be down for two days. Your network administrator has asked you to configure the router so that requests to the IP address 92.110.30.123 are redirected to the backup server for the Web site, which has the private IP address 192.168.11.110. The router's inside Ethernet interface uses IP address 192.168.11.254 and its outside interface uses the IP address 92.110.30.65. Answer the following questions about the new static route you'll be creating:

1. What is the router's outside interface IP address?

Answer: 92.110.30.65

2. What is the router's inside interface IP address?

Answer: 192.168.11.254

3. What is the Web site's public IP address?

Answer: 92.110.30.123

4. What is the private IP address of the backup Web server?

Answer: 192.168.11.110

[B HD] Use the example given earlier in the chapter as a template to create the NAT translation table entries for the address translation. For the subnet masks, use the default subnet mask for a Class C IP address license. Include appropriate comment lines in your table.

Answer:

```
interface serial 0/0
  ip address 92.110.30.65 255.255.255.0
  ip nat outside

!--- Defines the serial 0/0 interface as the router's NAT outside interface
!--- with an IP address of 92.110.30.65

interface ethernet 1/1
  ip address 192.168.11.254 255.255.255.0
  ip nat inside

!--- Defines the Ethernet 1/1 interface as the router's NAT inside interface
!--- with an IP address of 192.168.11.254


ip nat inside source static 192.168.11.110 92.110.30.123

!--- States that source information about the inside host will be translated
!--- so the host's private IP address (192.168.11.110) will appear as the
!--- public IP address (92.110.30.123). Both ingoing and outgoing traffic
!--- exchanged with the public IP address will be routed to the host at the
!--- private IP address.
```

Lab Manual for Network+ Guide to Networks, Seventh Edition

Chapter 2, Solutions

Lab 2.1

Review Questions

1. A host has been overloading your Web server with a flood of requests and you want to investigate whether this is some kind of network attack. You look up the IP address on *arin.net* to determine its owner, but ARIN's Web site tells you that LACNIC owns the IP address. What should you do?

   a. Complain to the owner of the *lacnic.net* Web site.

   b. Look up LACNIC in the Regional Internet Registry.

   c. Look up the owner of the IP address on the LACNIC Web site.

   d. Look up the owner of the IP address on the APNIC Web site.

2. What might happen if no organization were responsible for IP addressing on the Internet? (Choose all that apply.)

   a. Organizations might try to use the same ranges of IP addresses.

   b. Anyone could host their own Web server.

   c. Nothing would happen.

   d. The Internet would use another protocol besides IP.

3. You look up an IP address on *arin.net* and two organizations are listed. What does this mean?

   a. The two organizations share the IP address assignment.

   b. That IP address is currently involved in a network attack.

   c. The RIR made a mistake.

   d. One organization delegated the IP address to the second.

4. What is a Regional Internet Registry responsible for?

a. Maintaining Internet connectivity

b. Replacing IP with TCP

c. Assigning IP addresses

d. Signing up users with ISP accounts

5. In which of the following situations would it be useful to contact the owner of an IP address? (Choose all that apply.)

a. A host outside your network has been attempting to log on to your servers without your permission.

b. A host inside your network has been attempting to log on to your servers without your permission.

c. A host outside your network has been attempting to send large amounts of unsolicited commercial email or spam.

d. A host outside your network has been accessing your Web site once an hour.

Lab 2.2

Review Questions

1. Which of the following information is included in the results of the `ping` command? (Choose all that apply.)

a. The operating system used by the remote computer

b. The IP address or name of the remote computer

c. The number of packets that were lost

d. The time it took for the reply to be received

2. Which of the following commands can you use to print information about a computer's Network layer configuration?

a. `netstat`

b. `ipconfig`

c. `arp`

d. `ping`

3. How can you verify that two hosts are connected and communicating properly?

   a. From one host, run the `ping` command to the other host.

   b. From a third host, run the `ping` command to both hosts.

   c. Run the `arp` command on both hosts.

   d. Run the `ipconfig` command on both hosts.

4. What protocol does the `ping` command use?

   a. TCP/IP

   b. UDP

   c. ICMP

   d. ARP

5. A Dynamic Host Control Protocol (DHCP) server can be used to assign IP addresses automatically. Why might this be useful to a network administrator?
   Answer: So the network administrator doesn't have to manually configure large numbers of IP addresses on workstations.

6. On many networks, DHCP is used to assign workstations their IP addresses. However, DHCP is rarely used to assign addresses for servers. Why?

   a. DHCP is too expensive.

   b. DHCP is not scalable enough.

   c. Servers don't have the option to use DHCP.

   d. It would be more difficult for a client to find a server if its IP address changes.

Lab 2.3

Review Questions

1. What is the class of network that you configured in this activity?

   a. Class A

b. Class B

c. Class C

d. Class D

2. What is the purpose of a subnet mask?

a. To indicate which protocols a particular network uses

b. To further subdivide a network

c. To mask, or prevent access to the whole network

d. To limit the protocols used in a particular network

3. A network has a subnet mask of 255.255.255.0. How many usable IP addresses are available for network hosts?

a. 65,535

b. 65,534

c. 256

d. 254

4. Assuming that it has the default subnet mask, why can't you assign the IP address 192.168.54.255 to a host?

a. This address is reserved for multicast.

b. This address is reserved for experimental uses.

c. This address describes the network.

d. This address is the broadcast address.

5. Which of the following commands can you use in Windows to display information about the subnet mask configured for a particular NIC?

a. `ipconfig`

b. `ping`

c. `cmd`

d. `netstat`

Lab 2.4

Review Questions

1. What was the IP address the Windows computer obtained in Step 23?

A: Answers will vary, but should be between 192.168.54.10 and 192.168.54.200.

2. When does the DHCP lease you obtained in this lab expire?

A: The DHCP lease will expire ten days after the student completes the lab.

3. Which of the following are valid methods of assigning IP addresses to workstations, servers, and network devices? (Choose all that apply.)

a. Manual configuration

b. DHCP

c. BOOTP

d. POST

4. You would like to assign a WINS server to each workstation. Can you accomplish this via DHCP?

A: Yes.

5. Your colleague placed a second DHCP server on the network by mistake. What might happen as a result? (Choose all that apply.)

a. The second DHCP server might lease duplicate addresses to some hosts.

b. The second DHCP server might give out incorrect settings to its clients.

c. DHCP might stop working on the first DHCP server.

d. You might need to configure IP addresses on some hosts manually.

6. Which of the following information could not be given out by a DHCP server?

a. WINS server address

b. DNS server address

c. Default gateway

d. Additional network protocols to be used

7. All of the following configuration information can be supplied by a DHCP server. Which of the following cannot be supplied by APIPA? (Choose all that apply.)

   a. IP address

   b. Subnet mask

   c. DNS servers

   d. Default gateway

Lab 2.5

Review Questions

1. What is the purpose of a name server?

   a. To maintain the MAC address database for an entire zone

   b. To supply clients with IP address resolution for requested hosts

   c. To track and record all TCP/IP host name information for a network

   d. To track and record all NetBIOS naming information for a network

2. What is the term for the group of devices that a name server manages?

   a. Hierarchy

   b. Tree

   c. Zone

   d. Directory

3. Which of the following are examples of top-level domains? (Choose all that apply.)

   a. .net

   b. .com

   c. .uk

   d. .aut

4. When a DNS server retrieves the host name associated with an IP address, what type of lookup is it accomplishing?

a. Forward

b. Adjacent

c. Backward

d. Reverse

5. What is one advantage of using DNS instead of hosts files?

a. DNS does not require manual updating of files on multiple networked nodes.

b. DNS is more compatible with Linux systems.

c. DNS will map both NetBIOS and TCP/IP host names to IP addresses, whereas hosts files will map only TCP/IP host names to IP addresses.

d. Using DNS is more secure than using hosts files.

Lab 2.6

Review Questions

1. Which of the following commands would you type at the `ftp>` prompt to copy a file named *textfile.doc* from your C:\ directory to an FTP server?

a. `copy "textfile.doc"`

b. `put C:\textfile.doc`

c. `get C:\textfile.doc`

d. `move C:\textfile.doc`

2. On what Transport layer protocol does FTP rely?

a. TCP

b. UDP

c. ICMP

d. NTP

3. What is the term for an FTP site that allows any user to access its directories?

a. Anonymous

b. Restricted

c. Private

d. Unlimited

4. What command allows you to list the contents of a directory on an FTP server?

a. `list`

b. `lf`

c. `ls`

d. `la`

5. What would you type at the `ftp>` prompt to view a list of available FTP commands? (Choose all that apply.)

a. `list`

b. `?`

c. `help`

d. `commands`

6. What two file types can you specify when transferring files via FTP?

a. ASCII and binary

b. Alphabetical and numeric

c. Program and data

d. Dynamic and static

Lab 2.7

Review Questions

1. What symbol is used to separate the computer name from the port number in a URL (assuming that IP version 4 is in use)?

a. ;

b. :

c. #

d. .

2. What is the default port number for the Telnet service?

a. 20

b. 21

c. 22

d. 23

3. What is the default port number for the HTTP service?

a. 40

b. 44

c. 60

d. 80

4. What range of port numbers comprises the well-known port numbers?

a. 0 to 64

b. 0 to 128

c. 0 to 1023

d. 0 to 8880

5. What is a socket?

a. A virtual connector that associates a URL with its IP address

b. A method of identifying the IP addresses belonging to clients as they connect to servers

c. A logical address assigned to a specific process running on a computer

d. A discrete unit of data

6. Which of the following addresses could represent the SMTP service using its default port on a mail server?

   a. 188.65.79.80:25

   b. 188.65.79.80...24

   c. 188.65.79.80$24

   d. 188.65.79.80;25

Chapter 2

How Computers Find Each Other on Networks

At a Glance

Instructor's Manual Table of Contents

- Overview
- Objectives
- Teaching Tips
- Quick Quizzes
- Class Discussion Topics
- Additional Projects
- Additional Resources
- Key Terms

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Lecture Notes

Overview

In Chapter 1, students learned that the OSI model can be used describe just about every aspect of networking. In this chapter, students learn the several methods used to address and find software, computers, and other devices on a network. They will take a top-down approach to the OSI model as they explore these topics, starting at the Application layer and working their way down to the Data Link layer. At the end of this chapter, they will learn how to troubleshoot addressing problems by using an OSI top-down or bottom-up approach to solving the problem.

Chapter Objectives

After reading this chapter and completing the exercises, the student will be able to:

- Describe how computers and other devices are addressed on a network
- Explain how host names and domain names work
- Identify how ports and sockets work at the OSI Transport layer
- Demonstrate how IP addresses are assigned and formatted at the OSI Network layer
- Use command-line tools to troubleshoot problems with network addresses

Teaching Tips

Overview of Addressing on Networks

1. Give students a quick overview of the four addressing methods, starting at the top of the OSI model.
    - Application layer FQDNs, computer names, and host names
    - Transport layer port numbers
    - Network layer IP address
    - Data Link layer MAC address

MAC Addresses

1. Describe where a student may find a NIC's MAC address.

2. Use Figure 2-1 to illustrate a NIC's MAC address.

3. Describe the two components of a MAC address:
    a. Block ID
    b. Device ID

4. Note the use of hexadecimal notation to represent the MAC address.

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5. Explain how a student can determine which company manufactured a NIC by looking up its block ID if you know a computer's MAC address.

6. Walk students through the "Applying Concepts: Explore Addresses on Your Computer" section to demonstrate how addressing happens at each layer of the OSI model.

How Host Names and Domain Names Work

1. Note that TCP/IP addressing involves numbers. Explain how this is great for computers; however, most people can remember words better than numbers.

2. Remind students that a FQDN is a host name and a domain name together and the last part of an FQDN is called the top-level domain (TLD).

3. Define and explain a domain name.

4. Explain how domain names are registered.

5. Use Table 2-1 to illustrate some well-known top-level domains.

6. Explain that in 2011, ICANN loosened its restrictions on top-level domains names.

Legacy Networking: Host Files

1. Describe how ARPAnet used HOSTS.TXT.

2. Explain why ARPAnet's arrangement became outdated.

3. Use Figure 2-5 to illustrate an example of a host file.

DNS (Domain Name System)

1. Introduce and describe DNS (Domain Name System or Domain Name Service).

2. Define and describe a namespace.

3. Define and describe name servers.

4. Define and describe resolvers.

5. Use Figure 2-6 to discuss how name servers are organized.

6. Use Figure 2-7 as an example to illustrate domain name resolution.

7. Discuss a few ways the DNS process can get more complex.

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8. Define and describe the two types of DNS requests:
   - Recursive queries
   - Iterative queries

9. Introduce students to the concept of a distributed database model.

10. Define and describe a DNS zone.

11. Explain the process of a zone transfer

12. Introduce students to the most popular DNS server software, which is called BIND.

13. Explain the concept of a split DNS design and discuss when a network administrator should implement this design.

14. Use Figure 2-8 to demonstrate DNS services handled by two different servers so that the internal network remains protected.

15. Explain how resource records come in many different types, depending on their function.

16. Describe the fields in a resource record.

17. Discuss the "Applying Concepts: Configure a DNS Server" with your students.

DDNS (Dynamic DNS)

1. Define and describe DDNS (Dynamic DNS).

2. Note that DDNS does not take the place of DNS.

Teaching Tip	Students may find more information on DNS at http://technet.microsoft.com/en-us/network/bb629410.aspx

How Ports and Sockets Work

1. Define and explain a port number.

2. Define and explain a socket.

3. Define the range for port numbers.

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4. Explain the three types of port numbers:
   a. Well known
   b. Registered ports
   c. Dynamic and/or Private Ports

5. Use Figure 2-10 to illustrate a virtual connection for the Telnet service.

6. Use Table 2-3 to illustrate commonly used TCP/IP port numbers.

Teaching Tip	Students may find more information on network ports used by key Microsoft Server products at: https://msdn.microsoft.com/en-us/library/cc875824.aspx

Quick Quiz 1

1. True or False: Every host on a network is assigned a unique character-based name called the fully qualified domain name.
   Answer: True

2. The first 24 bits in a MAC address are known as which of the following?
   a. device ID
   b. OUI
   c. extension ID
   d. host ID
   Answer: B

3. The _____ is the gateway device that nodes on the network turn to first for access to the outside world.
   Answer: default gateway

4. The last part of an FQDN is called the _____.
   a. host name
   b. domain name
   c. top-level domain
   d. resolver
   Answer: C

5. When a secondary DNS server needs to update its database, it makes a request to the primary server. This process is known as which of the following?
   a. zone transfer
   b. zone caching
   c. distributed database
   d. BIND
   Answer: A

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How IP Addresses Are Formatted and Assigned

1. Remind students of the two types of IP addresses: IPv4 addresses and IPv6 addresses.

How IPv4 Addresses Are Formatted and Assigned

1. Review the makeup of an IPv4 address.
2. Mention the two types of information an IP address may contain.
3. Describe the three types of network classes used for LANs in traditional IP addressing.
4. Use Table 2-4 to illustrate characteristics of the three commonly used classes of TCP/IP-based networks.
5. Mention the existence of Class D and Class E addresses and note that they are rarely used.
6. Use Table 2-5 to discuss reserved IP addresses.
7. Explain the use of the number 255 in broadcast transmissions.
8. Discuss dynamic IP address assignment.
9. Walk students through the "Applying Concepts: Configure a DHCP Server" section of the text.
10. Define the term public network and provide examples.
11. Define the term private network and provide examples.
12. Define the term NAT (Network Address Translation).
13. Describe reasons for using address translation.
14. Define and describe PAT (Port Address Translation).
15. Use Figure 2-15 to illustrate an example of PAT usage.
16. Explain how the gateway might instead operate on a network host.
17. Define and describe SNAT (Static Network Address Translation).
18. Define and describe DNAT (Dynamic Network Address Translation).
19. Discuss the "Applying Concepts: Configure Address Translation Using NAT" section with your students.

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How IPv6 Addresses Are Formatted and Assigned

1. Review the increased length of IPv6 addresses.
2. Explain the hexadecimal notation used for IPv6 addresses.
3. Remind students of the proper way to use IPv6 shorthand notation for addresses.
4. Discuss the terms used in the IPv6 standard that students will need to be familiar with.
5. Describe the three types of IP addresses supported by IPv6. Use Figure 2-18 in your discussion:
   - unicast
   - multicast
   - anycast
6. Use Figure 2-19 to discuss two types of unicast addresses: global and link local addresses.
7. Use Table 2-6 to discuss currently used address prefixes for IPv65 addresses.
8. Demonstrate using the `ipconfig` command to view addresses assigned to all network connections.
9. Describe the steps involved in IPv6 autoconfiguration.
10. Define and describe the term dual stacked. List three tunneling protocols developed for IPv6 packets to travel over or through and IPv4 network.

Teaching Tip	Students may find more information on IPv6 concepts at http://technet.microsoft.com/en-us/library/cc785929.aspx

Tools for Troubleshooting IP Address Problems

1. Explain that Event Viewer is one of the first places to start looking for clues when something goes wrong with a computer.

ping

1. Define and explain ping (Packet Internet Groper).
2. Explain how ping uses ICMP services.
3. Note that an IP address or a host name may be pinged.

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4. Use Figure 2-23 to illustrate examples of a successful ping test.

5. Use Table 2-7 to describe the different Ping command options, switches, and the syntax of the command.

6. Discuss the two variations of ping using ICMPv6. Use Figures 2-24 and 2-25 in your discussion.

Teaching Tip	Students may find more information about the ping utility at http://ipaddressguide.com/ping

ipconfig

1. Define and explain the ipconfig utility.
   a. Review the command switches.
   b. Note that this command operates with Windows-based systems.

2. Use Table 2-8 to discuss some of the options that can be used with the `ipconfig` command.

Teaching Tip	Students may find more information on the syntax and options for using the ipconfig diagnostic utility for network connections at http://support.microsoft.com/kb/117662

ifconfig

1. Define and explain the ifconfig utility.
   a. Review the command switches using Table 2-9.
   b. Note that ifconfig is the UNIX and Linux version of ipconfig.

2. Use Figure 2-26 to illustrate detailed information available through ifconfig.

Teaching Tip	Students may find more information on the syntax and options for the `ifconfig` command at http://en.wikipedia.org/wiki/Ifconfig

nslookup

1. Define and explain the nslookup utility.
   a. Note that this utility is useful in troubleshooting DNS resolution problems.
   b. Use Figure 2-27 to illustrate the result of running a simple `nslookup` command.

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2. Explain the two modes that are available in the nslookup utility: interactive and noninteractive.

3. Use Figure 2-29 to demonstrate the interactive mode of the nslookup utility.

Quick Quiz 2

1. Which of the following is a technique designed to conserve the number of public IP addresses needed by a network?
   a. public addressing
   b. NAT
   c. multicasting
   d. broadcasting
   Answer: B

2. IPv6 addresses are composed of ____ bits.
   a. 32
   b. 64
   c. 128
   d. 256
   Answer: C

3. Which of the following terms best describes a method used by IPv6 to transport IPV6 packets through or over an IPv4 network?
   a. local link
   b. neighboring
   c. anycasting
   d. tunneling
   Answer: D

4. Which IPv6 address type represents a single interface on a device?
   a. Unicast
   b. Multicast
   c. Anycast
   d. Singlecast
   Answer: A

5. True or False: The ipconfig utility is the TCP/IP configuration and management utility used on UNIX and Linux systems.
   Answer: False

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Class Discussion Topics

1. As a class, compare and contrast IPv4 and IPv6.

2. Ask students if IPv6 has been implemented at their workplace. Discuss whether they feel IPv6 will completely replace IPv4 or do they feel IPv4 will remain in use for years to come.

Additional Projects

1. Have each student research DHCPv6 and how it is used to serve up global IPv6 addresses to hosts that require static IP addresses. Students should write a report on their findings.

2. The future of the Internet will lie with IPv6. Have the students research the components of the protocol and compare the various TCP/IPv6 layers with the OSI model. The report should also include a section discussing additional functions or components that would be beneficial in IPv6.

Additional Resources

1. IBM TCP/IP RedBook
   http://www.redbooks.ibm.com/abstracts/gg243376.html

2. TCP/IP Fundamentals for Microsoft Windows: Overview
   http://technet.microsoft.com/en-us/library/bb726983.aspx

3. IPv6
   http://www.ipv6.org

4. Microsoft IPv6
   http://technet.microsoft.com/en-us/network/bb530961.aspx

5. Internet Protocol Version 6 Basics
   http://www.linux.org/threads/internet-protocol-version-6-ipv6-basics.4885/

Key Terms

For definitions of key terms, see the Glossary near the end of the book.

- **4to6**
- **6to4**
- **A (Address) record**
- **AAAA (Address) record**

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- **address translation**
- **alias**
- **anycast address**
- **authoritative server**
- **Automatic Private IP Addressing**
- **(APIPA)**
- **base 2 number system**
- **base 8 number system**
- **binary number system**
- **BIND (Berkeley Internet Name Domain)**
- **bit**
- **block ID**
- **caching-only server**
- **canonical name**
- **CIFS (Common Internet File System)**
- **Class A**
- **Class B**
- **Class C**
- **CNAME (Canonical Name) record**
- **command-line interface (CLI)**
- **company-ID**
- **computer name**
- **DDNS (Dynamic DNS)**
- **default gateway**
- **device ID**
- **DHCP (Dynamic Host Configuration Protocol)**
- **DHCP6**
- **DHCPv6**
- **DHCP scope**
- **distributed database model**
- **DMZ (demilitarized zone)**
- **DNS (Domain Name System or**
- **Domain Name Service)**
- **DNS cache**
- **DNS server**
- **DNS zone**
- **domain name**
- **dual stacked**
- **dynamic IP address**
- **Dynamic Network Address**
- **Translation (DNAT)**
- **dynamic port**
- **elevated command prompt**
- **window**
- **EUI-64 (Extended Unique Identifier-64)**
- **extension identifier**
- **firewall**
- **fully qualified domain name (FQDN)**

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- **fully qualified host name**
- **gateway**
- **global address**
- **global unicast address**
- **H.323**
- **hex number**
- **hexadecimal number**
- **host name**
- **host table**
- **hosts file**
- **ICMPv6**
- **ifconfig**
- **interface**
- **interface ID**
- **Internet Corporation for Assigned Names and Numbers (ICANN)**
- **Internet Protocol version 4 (IPv4)**
- **Internet Protocol version 6 (IPv6)**
- **ipconfig**
- **ISATAP (Intra-Site Automatic Tunnel Addressing Protocol)**
- **iterative query**
- **link**
- **link local address**
- **link local unicast address**
- **local link**
- **loopback address**
- **loopback interface**
- **MGCP (Media Gateway Control Protocol)**
- **Miredo**
- **multicast address**
- **multicasting**
- **MX (Mail Exchanger) record**
- **name resolution**
- **name server**
- **namespace**
- **neighbor**
- **NetBIOS**
- **NetBT (NetBIOS over TCP/IP)**
- **Network Address Translation (NAT)**
- **nslookup (name space lookup)**
- **NTP (Network Time Protocol)**
- **octal number system**
- **octet**
- **open source**
- **OUI (Organizationally Unique Identifier)**
- **packet analyzer**
- **ping (Packet Internet Groper)**
- **ping -6**
- **ping6**

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- **Port Address Translation (PAT)**
- **private IP address**
- **private port**
- **protocol analyzer**
- **PTR (Pointer) record**
- **public IP address**
- **recursive query**
- **registered port**
- **reservation**
- **resolver**
- **resource record**
- **reverse DNS lookup**
- **root server**
- **Samba**
- **scope ID**
- **shell prompt**
- **signaling protocol**
- **SIP (Session Initiation Protocol)**
- **SMB (Server Message Block)**
- **SNMP (Simple Network Management Protocol)**
- **socket**
- **split DNS**
- **split-horizon DNS**
- **static IP address**
- **Static Network Address Translation (SNAT)**
- **subnet**
- **subnet ID**
- **subnet mask**
- **Teredo**
- **TFTP (Trivial File Transfer Protocol)**
- **Time to Live field**
- **top-level domain (TLD)**
- **tunneling**
- **unicast address**
- **vim text editor**
- **well-known port**
- **zone file**
- **zone ID**
- **zone transfer**

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