REVIEW LESSON

MTA Course: 98-366 Networking Fundamentals
Lesson name: Understanding Protocols and Services 3.3_A
Topic: Understand IPv6
(50-minute class period)
File name: NetFund_RL_3.3_A

Lesson Objective

3.3_A: Understand IPv6. *This objective may include but is not limited to:* subnetting; Ipconfig; why use IPv6; addressing; ipv4toipv6 tunneling protocols to ensure backwards compatibility; dual IP stack; subnetmask; gateway; ports; packets; reserved address ranges for local use (including local loopback IP).

Preparation Details

Prerequisite student experiences and knowledge

This MTA Certification Exam Review lesson is written for students who have learned about networking fundamentals. Students who do not have the prerequisite knowledge and experiences cited in the objective will find additional learning opportunities using resources such as those listed in the Microsoft® resources and Web links at the end of this review lesson.

Instructor preparation activities

- Make copies of Student Activity NetFund_SA_3.3_A

Resources, software, and additional files needed for this lesson

- NetFund_PPT_3.3_A
- NetFund_SA_3.3_A
- NetFund_SA_3.3_A_Key

Teaching Guide

Essential Vocabulary

6to4—an Internet transition mechanism for migrating from IPv4 to IP, a system that allows IPv6 packets to be transmitted over an IPv4 network without the need to configure explicit tunnels.

address—an identifier that can be used as the source or destination of IPv6 packets that is assigned at the IPv6 layer to an interface or set of interfaces.

addressing—specifies how to calculate the effective memory address of an operand by using information held in constants contained within a machine instruction.

dual IP stack—involves running IPv4 and IPv6 at the same time where end nodes and routers/switches run both protocols.

gateway—a computer program that links between two computer programs allowing them to share information and bypass certain protocols on a host computer.

IPv6—an Internet protocol that has a large address space and supports 2^128 (about 3.4 × 1038) addresses, provides flexibility in allocating addresses and routing traffic, simplifies aspects of address assignment and network renumbering, and the subnet size has been standardized 64 bits.

IPv4 to IPv6 tunneling—the use of special addresses assigned to IPv6-capable devices, called "dual stack" devices that speak both IPv4 and IPv6.

Intra-Site Automatic Tunnel Addressing Protocol (ISATAP)—an IPv6 transition mechanism meant to transmit IPv6 packets between dual-stack nodes on top of an IPv4 network.

Teredo—a tunneling protocol designed to grant IPv6 connectivity to nodes that are located behind IPv6-unaware NAT devices defines a way of encapsulating IPv6 packets within IPv4 UDP datagrams that can be routed through NAT devices and on the IPv4 internet.

Lesson Sequence

Activating prior knowledge/lesson staging (Anticipatory Set: 10 minutes)

1. Student prompt (see PowerPoint® slide 3): On a sheet of paper, explain why IPv4 is typically insufficient and why IPv6 is more useful.
2. Have students form groups of three to discuss their answers.
3. Give students a few minutes to respond, allowing them to work until they have finished.

4. As time permits, call on a few students to report to the group with their responses.

Lesson activity (30 minutes)

- Teacher Instruction
- Use the included PowerPoint presentation to review IPv6; addressing; dual IP stack; gateway, and IPv4 to IPv6 tunneling protocols to ensure backwards compatibility.

Assessment/lesson reflection (10 minutes)

1. Students complete NetFund_SA_3.3_A
2. If time permits, have students compare answers and review notes to determine the correct answer if there are differences.

Microsoft resources and Web links

- **Cisco: IPv6**
  http://www.cisco.com/en/US/docs/internetworking/technology/handbook/IPv6.html
- **Cisco: Gateway**
  http://www.cisco.com/en/US/docs/ios/ipv6/configuration/guide/ip6-fhrp.html#wp1054963
- **CompNetworking: Network Gateway**
  http://compnetworking.about.com/od/networkdesign/g/network-gateway.htm
- **Computer Hope: Binary and Hexidecimal**
  http://www.computerhope.com/binhex.htm
- **IETF: Addresses**
  http://www.ietf.org/rfc/rfc4291.txt
- **IETF: IPv6**
  http://www.ietf.org/html.charters/ipngwg-charter.html
- **Microsoft: Bit-level IPv6**
  http://technet.microsoft.com/en-us/library/bb726995.aspx#EDAA
- **Microsoft: Dual Stack Architecture**
  http://msdn.microsoft.com/en-us/library/aa922872.aspx
- **Microsoft: Gateway**
  http://technet.microsoft.com/en-us/network/bb530961.aspx

- **Microsoft: IPv6 Address Structure**
  http://msdn.microsoft.com/en-us/library/ms682140(VS.85).aspx
- **Network World: Dual IP Stack**
  http://www.networkworld.com/news/tech/2007/090507-tech-uodate.html
- **Playground Sun: IPv6**
  http://playground.Sun.COM:80/pub/ipng/html
- **Wikipedia: Addressing**
  http://en.wikipedia.org/wiki/Addressing_mode
- **Wikipedia: Anycast**
  http://en.wikipedia.org/wiki/Anycast
- **Wikipedia: IPv6**
  http://en.wikipedia.org/wiki/IPv6
- **Wikipedia: ISATAP**
  http://en.wikipedia.org/wiki/ISATAP
- **Wikipedia: 6to4**
  http://en.wikipedia.org/wiki/6to4
- **Wikipedia: Teredo**
  http://en.wikipedia.org/wiki/Teredo_tunneling