Good job!
You have successfully identified the correct answers.

You answered 13 out of 13 questions correctly.

Show Menu

Module Practice and Quiz

8.6.1

What did I learn in this module?

Network Layer Characteristics

The network layer (OSI Layer 3) provides services to allow end devices to exchange data across networks. IPv4 and IPv6 are the principle network layer communication protocols. The network layer also includes the routing protocol OSPF and messaging protocols such as ICMP. Network layer protocols perform four basic operations: addressing end devices, encapsulation, routing, and de-encapsulation. IPv4 and IPv6 specify the packet structure and processing used to carry the data from one host to another host. IP encapsulates the transport layer segment by adding an IP header, which is used to deliver the packet to the destination host. The IP header is examined by Layer 3 devices (i.e., routers) as it travels across a network to its destination. The characteristics of IP are that it is connectionless, best effort, and media independent. IP is connectionless, meaning that no dedicated end-to-end connection is created by IP before data is sent. The IP protocol does not guarantee that all packets that are delivered are, in fact, received. This is the definition of the unreliable, or best effort characteristic. IP operates independently of the media that carry the data at lower layers of the protocol stack.

IPv4 Packet

An IPv4 packet header consists of fields containing information about the packet. These fields contain binary numbers which are examined by the Layer 3 process. The

binary values of each field identify various settings of the
ket header
L, protocol,
sses.

Good job!
You have successfully identified the correct answers.

You answered 13 out of 13 questions correctly.

IPv6 is designed to overcome the limitations of IPv4 including: IPv4 address depletion, lack of end-to-end connectivity, and increased network complexity. IPv6 increases the available address space, improves packet handling, and eliminates the need for NAT. The fields in the IPv6 packet header include: version, traffic class, flow label, payload length, next header, hop limit, and the source and destination IPv6 addresses.

How a Host Routes

A host can send a packet to itself, another local host, and a remote host. In IPv4, the source device uses its own subnet mask along with its own IPv4 address and the destination IPv4 address to determine whether the destination host is on the same network. In IPv6, the local router advertises the local network address (prefix) to all devices on the network, to make this determination. The default gateway is the network device (i.e., router) that can route traffic to other networks. On a network, a default gateway is usually a router that has a local IP address in the same address range as other hosts on the local network, can accept data into the local network and forward data out of the local network, and route traffic to other networks. A host routing table will typically include a default gateway. In IPv4, the host receives the IPv4 address of the default gateway either dynamically via DHCP or it is configured manually. In IPv6, the router advertises the default gateway address, or the host can be configured manually. On a Windows host, the **route print** or **netstat -r** command can be used to display the host routing table.

Introduction to Routing

When a host sends a packet to another host, it consults its routing table to determine where to send the packet. If the destination host is on a remote network, the packet is forwarded to the default gateway which is usually the local router. What happens when a packet arrives on a router interface? The router examines the packet's destination IP address and searches its routing table to

Good job!
You have successfully identified the correct answers.

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determine where to forward the packet. The routing table ses (prefixes) tries are r will forward g route entry. pes of route te networks, and a default route. Routers learn about remote networks manually, or dynamically using a dynamic routing protocol. Static routes are route entries that are manually configured. Static routes include the remote network address and the IP address of the next hop router. OSPF and EIGRP are two dynamic routing protocols. The **show ip route** privileged EXEC mode command is used to view the IPv4 routing table on a Cisco IOS router. At the beginning of an IPv4 routing table is a code that is used to identify the type of route or how the route was learned. Common route sources (codes) include:

L - Directly connected local interface IP address

C - Directly connected network

S - Static route was manually configured by an administrator

O - Open Shortest Path First (OSPF)

D - Enhanced Interior Gateway Routing Protocol (EIGRP)

8.6.2

Module Quiz - Network Layer

Show Menu

Good job!
You have successfully identified the correct answers.
You answered 13 out of 13 questions correctly.

1. Which command can be used on a Windows host

host,
-r
ay the host
routing table. The **show ip route** command is used on a router to display its routing table. The **netstat –s** command is used to display per-protocol statistics. The **tracert** command is used to display the path that a packet travels to its destination.

- **netstat –s**
- **tracert**
- **netstat –r**
- **show ip route**

2. What information is added during encapsulation at OSI Layer 3?

Topic 8.1.0 - IP is a Layer 3 protocol. Layer 3 devices can open the Layer 3 header to inspect the Layer 3 header which contains IP-related information including the source and destination IP addresses.

- source and destination application protocol
- source and destination port number
- source and destination IP address
- source and destination MAC

Good job!
You have successfully identified the correct answers.

You answered 13 out of 13 questions correctly.

3. How does the network layer use the MTU value?

yer
e MTU for
The
ion
to determine how large the packet can be when it is forwarded. When packets are received on one medium and forwarded on a medium with a smaller MTU, the network layer device can fragment the packet to accommodate the smaller size.

- The MTU is passed to the network layer by the data link layer.
- To increase speed of delivery, the network layer ignores the MTU.
- The network layer depends on the data link layer to set the MTU, and adjusts the speed of transmission to accommodate it.
- The network layer depends on the higher level layers to determine the MTU.

4. Which characteristic describes an IPv6 enhancement over IPv4?

Topic 8.3.0 - IPv6 addresses are based on 128-bit hierarchical addressing, and the IPv6 header has been simplified with fewer fields, improving packet handling. IPv6 natively supports authentication and privacy capabilities as opposed to IPv4 that needs additional features to support those. The IPv6 address space is many times bigger than IPv4 address space.

- The IPv6 address space is four times bigger than the IPv4 address space.
- Both IPv4 and IPv6 support authentication, but only IPv6 supports privacy capabilities.
- The IPv6 header is simpler than the IPv4 header is, which improves packet handling.
- IPv6 addresses are based on 128-bit flat addressing as opposed to IPv4 which is based

on 32-bit hierarchical addressing.

Good job!
You have successfully identified the correct answers.

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Show Menu

...bit address space, providing 4,294,967,296 unique addresses, but only 3.7 billion are assignable, a limit due to address reservation for multicasting and testing. IPv4 does not provide native support for IPsec. IPv6 has a simplified header with fewer fields than IPv4 has.

- An IPv4 header has fewer fields than an IPv6 header has.
- IPv4 has a 32-bit address space.
- IPv4 natively supports IPsec.
- All IPv4 addresses are assignable to hosts.

6. When a router receives a packet, what information must be examined in order for the packet to be forwarded to a remote destination?

Topic 8.4.0 - When a router receives a

- destination MAC address
- destination IP address
- source MAC address
- source IP address

Good job!
You have successfully identified the correct answers.

You answered 13 out of 13 questions correctly.

7. A computer has to send a packet to a destination …cket be sent?

…n host is …ost, there …. A default gateway is needed if a packet needs to be sent outside the LAN.

- The packet will be sent only to the default gateway.
- The packet will first be sent to the default gateway, and then from the default gateway it will be sent directly to the destination host.
- The packet will be sent directly to the destination host.
- The packet will be sent to the default gateway first, and then, depending on the response from the gateway, it may be sent to the destination host.

8. Which IPv4 address can a host use to ping the loopback interface?

Topic 8.4.0 - A host can ping the loopback interface by sending a packet to a special IPv4 address within the network 127.0.0.0/8.

- 127.0.0.0
- 126.0.0.0
- 126.0.0.1
- 127.0.0.1

Good job!
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You answered 13 out of 13 questions correctly.

9. When a connectionless protocol is in use at a lower data ry?

onless yer of the OSI model, upper-level protocols may need to work together on the sending and receiving hosts to account for and retransmit lost data. In some cases, this is not necessary, because for some applications a certain amount of data loss is tolerable.

- Upper-layer connection-oriented protocols keep track of the data received and can request retransmission from the upper-level protocols on the sending host.
- Connectionless acknowledgements are used to request retransmission.
- The best-effort delivery process guarantees that all packets that are sent are received.
- Network layer IP protocols manage the communication sessions if connection-oriented transport services are not available.

10. What was the reason for the creation and implementation of IPv6?

Topic 8.3.0 - IPv4 addressing space is exhausted by the rapid growth of the Internet and the devices connected to the Internet. IPv6 expands the IP addressing space by increasing the address length from the 32 bits to 128 bits, which should provide sufficient addresses for future Internet growth needs for many years to come.

- to relieve IPv4 address depletion
- to provide more address space in the Internet Names Registry
- to allow NAT support for private addressing
- to make reading a 32-bit address easier

Good job!
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You answered 13 out of 13 questions correctly.

11. Which information is used by routers to forward a

IP receiving by routers to forward the packet to its destination.

- source data-link address
- destination data-link address
- source IP address
- destination IP address

12. Which field in an IPv4 packet header will typically stay the same during its transmission?

Topic 8.1.0 - The value in the Destination Address field in an IPv4 header will stay the same during its transmission. The other options might change during its transmission.

- Destination Address
- Time-to-Live
- Packet Length
- Flag

13. Which field in an IPv6 packet is used by the router to determine if a packet has expired and should be dropped?

Topic 8.3.0 - ICMPv6, like IPv4, sends a Time Exceeded message if the router cannot forward an IPv6 packet because the packet has expired. However, the IPv6 packet does not have a TTL field. Instead, it uses the Hop Limit field to determine if the packet has expired.

- Address Unreachable
- TTL
- No Route to Destination

Hop Limit

Good job!
You have successfully identified the correct answers.

You answered 13 out of 13 questions correctly.

Reset

8.5 Introduction to Rout...

9.0 Introduction

Show Menu