Module Practice and Quiz

9.4.1

What did I learn in this module?

MAC and IP

Layer 2 physical addresses (i.e., Ethernet MAC addresses) are used to deliver the data link frame with the encapsulated IP packet from one NIC to another NIC on the same network. If the destination IP address is on the same network, the destination MAC address will be that of the destination device. When the destination IP address (IPv4 or IPv6) is on a remote network, the destination MAC address will be the address of the host default gateway (i.e., the router interface). Along each link in a path, an IP packet is encapsulated in a frame. The frame is specific to the data link technology associated that is associated with that link, such as Ethernet. If the next-hop device is the final destination, the destination MAC address will be that of the device Ethernet NIC. How are the IP addresses of the IP packets in a data flow associated with the MAC addresses on each link along the path to the destination? For IPv4 packets, this is done through a process called ARP. For IPv6 packets, the process is ICMPv6 ND.

ARP

Every IP device on an Ethernet network has a unique Ethernet MAC address. When a device sends an Ethernet Layer 2 frame, it contains these two addresses: destination MAC address and source MAC address. A device uses ARP to determine the destination MAC address of a local device when it knows its IPv4 address.

ARP provides two basic functions: resolving IPv4 addresses to MAC addresses and maintaining a table of IPv4 to MAC address mappings. The ARP request is encapsulated in an Ethernet frame using this header information: source and destination MAC addresses and type. Only one device on the LAN will have an IPv4 address that matches the target IPv4 address in the ARP request. All other devices will not reply. The ARP reply contains the same header fields as the request. Only the device that originally sent the ARP request will receive the unicast ARP reply. After the ARP reply is received, the device will add the IPv4 address and the corresponding MAC address to its ARP table. When the destination IPv4 address is not on the same network as the source IPv4 address, the source device needs to send the frame to its default gateway. This is the interface of the local router. For each device, an ARP cache timer removes ARP entries that have not been used for a specified period of time. Commands may also be used to manually remove some or all of the entries in the ARP table. As a broadcast frame, an ARP request is received and processed by every device on the local network, which could cause the network to slow down. A threat actor can use ARP spoofing to perform an ARP poisoning attack.

Neighbor Discovery

IPv6 does not use ARP, it uses the ND protocol to resolve MAC addresses. ND provides address resolution, router discovery, and redirection services for IPv6 using ICMPv6. ICMPv6 ND uses five ICMPv6 messages to perform these services: neighbor solicitation, neighbor advertisement, router solicitation, router advertisement, and redirect. Much like ARP for IPv4, IPv6 devices use IPv6 ND to resolve the MAC address of a device to a known IPv6 address.

9.4.2

Module Quiz - Address Resolution

1. Which router component holds the routing table, ARP cache, and running configuration file?

ROM

NVRAM

RAM

Show Menu

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table?

- routes to reach destination networks
- IPv4 address to MAC address mappings
- domain name to IPv4 address mappings
- switch ports associated with destination MAC addresses

3. A PC is configured to obtain an IPv4 address automatically from network 192.168.1.0/24. The network administrator issues the **arp –a** command and notices an entry of 192.168.1.255 ff-ff-ff-ff-ff-ff. Which statement describes this entry?

- This entry maps to the default gateway.
- This is a static map entry.
- This entry refers to the PC itself.
- This is a dynamic map entry.

4. A cybersecurity analyst believes an attacker is spoofing the MAC address of the default gateway to perform a man-in-the-middle attack. Which command should the analyst use to view the MAC address a host is using to reach the default gateway?

- **ipconfig /all**
- **netstat -r**
- **route print**
- **arp -a**

5. What will a Layer 2 switch do when the destination MAC address of a received frame is not in the MAC table?

- It forwards the frame out of all ports except for the port at which the frame was received.
- It broadcasts the frame out of all ports on the switch.
- It initiates an ARP request.
- It notifies the sending host that the frame cannot be delivered.

6. Which two ICMPv6 messages are used during the Ethernet MAC address resolution process? (Choose two.)

- [x] router solicitation
- [ ] neighbor solicitation
- [ ] router advertisement
- [ ] echo request
- [x] neighbor advertisement

7. How does the ARP process use an IPv4 address?

- to determine the MAC address of the remote destination host
- to determine the MAC address of a device on the same network
- to determine the network number based on the number of bits in the IPv4 address
- to determine the amount of time a packet takes when traveling from source to destination

8. What is one function of the ARP protocol?

- maintaining a table of domain names with their resolved IP addresses
- mapping a domain name to its IP address
- obtaining an IPv4 address automatically
- resolving an IPv4 address to a MAC address

9. Which action is taken by a Layer 2 switch when it receives a Layer 2 broadcast frame?

It sends the frame to all ports.

It sends the frame to all ports except the port on which it received the frame.

It drops the frame.

It sends the frame to all ports that are registered to forward broadcasts.

10. What addresses are mapped by ARP?

destination MAC address to the source IPv4 address

destination IPv4 address to the source MAC address

IPv4 address to a destination MAC address

destination IPv4 address to the destination host name

11. When an IPv4 packet is sent to a host on a remote network, what information is provided by ARP?

the IPv4 address of the destination host

the IPv4 address of the default gateway

the MAC address of the router interface closest to the sending host

the MAC address of the switch port that connects to the sending host

12. The ARP table in a switch maps which two types of address together?

Layer 3 address to a Layer 2 address

Layer 3 address to a Layer 4 address

Layer 4 address to a Layer 2 address

Layer 2 address to a Layer 4 address

13. What is the purpose of ARP in an IPv4 network?

to build the MAC address table in a switch from the information that is gathered

to obtain a specific MAC address when an IP

address is known

- to forward data onward based on the destination IP address
- to forward data onward based on the destination MAC address.

14. Which destination address is used in an ARP request frame?

- FFFF.FFFF.FFFF
- 01-00-5E-00-AA-23
- 0.0.0.0
- 127.0.0.1
- 255.255.255.255

Check

Show Me

Reset

9.3 IPv6 Neighbor Disc...

10.0 Introduction