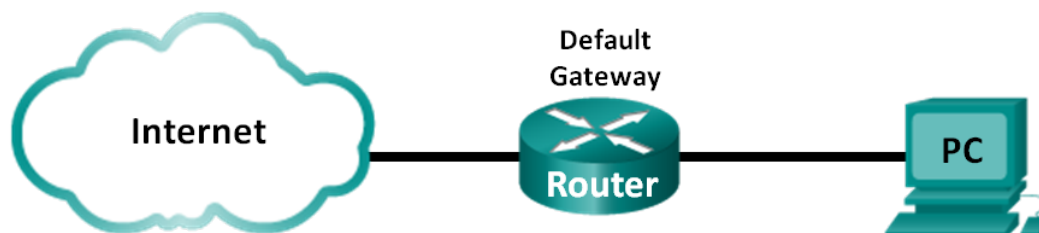# Lab - Viewing Host Routing Tables

Topology

Background / Scenario

To access a resource on a network, your host will determine the route to the destination host using its routing table. The host routing table is similar to that of a router, but is specific to the local host and much less complex. For a packet to reach a local destination, the local host routing table is required. To reach a remote destination, both the local host routing table and the router routing table are required. The **netstat –r** and **route print** commands provide insight into how your local host routes packets to the destination.

In this lab, you will display and examine the information in the host routing table of your PC using the **netstat –r** and **route print** commands. You will determine how packets will be routed by your PC depending on the destination address.

Part 1: Access the Host Routing Table

Step 1: Record your PC information.

On your PC, open a command prompt window and type the **ipconfig /all** command to display the following information and record it:

IPv4 Address	
MAC Address	
Default Gateway	

Step 2: Display the routing tables.

In a command prompt window type the **netstat –r** (or **route print**) command to display the host routing table.

```
C:\Users\user1>netstat -r
===========================================================================
Interface List
 13...90 4c e5 be 15 63 ......Atheros AR9285 802.11b/g/n WiFi Adapter
  1...........................Software Loopback Interface 1
 25...00 00 00 00 00 00 00 e0 Microsoft ISATAP Adapter
 12...00 00 00 00 00 00 00 e0 Microsoft 6to4 Adapter
 26...00 00 00 00 00 00 00 e0 Microsoft ISATAP Adapter #2
 14...00 00 00 00 00 00 00 e0 Teredo Tunneling Pseudo-Interface
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0      192.168.1.1    192.168.1.11     25
        127.0.0.0        255.0.0.0         On-link         127.0.0.1    306
        127.0.0.1  255.255.255.255         On-link         127.0.0.1    306
  127.255.255.255  255.255.255.255         On-link         127.0.0.1    306
      192.168.1.0    255.255.255.0         On-link      192.168.1.11    281
     192.168.1.11  255.255.255.255         On-link      192.168.1.11    281
    192.168.1.255  255.255.255.255         On-link      192.168.1.11    281
        224.0.0.0        240.0.0.0         On-link         127.0.0.1    306
        224.0.0.0        240.0.0.0         On-link      192.168.1.11    281
  255.255.255.255  255.255.255.255         On-link         127.0.0.1    306
  255.255.255.255  255.255.255.255         On-link      192.168.1.11    281
===========================================================================
Persistent Routes:
  None

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
 14     58 ::/0                     On-link
  1    306 ::1/128                  On-link
 14     58 2001::/32                On-link
 14    306 2001:0:9d38:6ab8:1863:3bca:3f57:fef4/128
                                    On-link
 14    306 fe80::/64                On-link
 14    306 fe80::1863:3bca:3f57:fef4/128
                                    On-link
  1    306 ff00::/8                 On-link
 14    306 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```

What are the three sections displayed in the output?

_____

Step 3:   Examine the Interface List.

The first section, Interface List, displays the Media Access Control (MAC) addresses and assigned interface number of every network-capable interface on the host.

The first column is the interface number. The second column is the list of MAC addresses associated with the network-capable interfaces on the hosts. These interfaces can include Ethernet, Wi-Fi and Bluetooth adapters. The third column shows the manufacturer and a description of the interface.

In this example, the first line displays the wireless interface that is connected to the local network.

Note: If you have a PC with an Ethernet interface and a Wireless adapter enabled, both interfaces would be listed in the Interface List.

What is the MAC address of the interface connected to your local network? How does the MAC address compare to the recorded MAC address in Step 1?

_____

_____

The second line is loopback interface. The loopback interface is automatically assigned an IP address of 127.0.0.1 when the Transmission Control Protocol/Internet Protocol (TCP/IP) is running on a host.

The last four lines represent transition technology that allows communication in a mixed environment and includes IPv4 and IPv6.

Part 2: Examine IPv4 Host Routing Table Entries

In Part 2, you will examine the IPv4 host routing table. This table is in the second section as a result of the **netstat –r** output. It lists all the known IPv4 routes, including direct connections, local network, and local default routes.

```
IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0      192.168.1.1    192.168.1.11     25
        127.0.0.0        255.0.0.0         On-link         127.0.0.1    306
        127.0.0.1  255.255.255.255         On-link         127.0.0.1    306
  127.255.255.255  255.255.255.255         On-link         127.0.0.1    306
      192.168.1.0    255.255.255.0         On-link      192.168.1.11    281
     192.168.1.11  255.255.255.255         On-link      192.168.1.11    281
    192.168.1.255  255.255.255.255         On-link      192.168.1.11    281
        224.0.0.0        240.0.0.0         On-link         127.0.0.1    306
        224.0.0.0        240.0.0.0         On-link      192.168.1.11    281
  255.255.255.255  255.255.255.255         On-link         127.0.0.1    306
  255.255.255.255  255.255.255.255         On-link      192.168.1.11    281
===========================================================================
Persistent Routes:
  None
```

The output is divided in five columns: Network Destination, Netmask, Gateway, Interface, and Metric.

- The Network Destination column lists the reachable network. The Network Destination is used with Netmask to match the destination IP address.

- The Netmask lists the subnet mask that the host uses to determine the network and host portions of the IP address.

- The Gateway column lists the address that the host uses to send the packets to a remote network destination. If a destination is directly connected, the gateway is listed as On-link in the output.

- The Interface column lists the IP address that is configured on the local network adaptor. This is used to forward a packet on the network.

- The Metric column lists the cost of using a route. It is used to calculate the best route to a destination. A preferred route has a lower metric number than other routes listed.

The output displays five different types of active routes:

- The local default route 0.0.0.0 is used when the packet does not match other specified addresses in the routing table. The packet will be sent to the gateway from the PC for further processing. In this example, the packet will be sent to 192.168.1.1 from 192.168.1.11.

- The loopback addresses, 127.0.0.0 – 127.255.255.255, are related to direct connection and provide services to the local host.

- The addresses for the subnet, 192.168.1.0 – 192.168.1.255, are all related to the host and the local network. If the final destination of the packet is in the local network, the packet will exit 192.168.1.11 interface.

  - The local route address 192.168.1.0 represents all devices on the 192.168.1.0/24 network.

  - The address of the local host is 192.168.1.11.

  - The network broadcast address 192.168.1.255 is used to send messages to all the hosts on the local network.

- The special multicast class D addresses 224.0.0.0 are reserved for use through either the loopback interface (127.0.0.1) or the host (192.168.1.11).

- The local broadcast address 255.255.255.255 can be used through either the loopback interface (127.0.0.1) or host (192.168.1.11).

Based on the contents of the IPv4 routing table, if the PC wanted to send a packet to 192.168.1.15, what would it do and where would it send the packet?

_____

_____

_____

_____

_____

If the PC wanted to send a packet to a remote host located at 172.16.20.23, what would it do and where would it send the packet?

_____

_____

_____

_____

_____

_____

_____

_____

Part 3: Examine IPv6 Host Routing Table Entries

In Part 3, you will examine the IPv6 routing table. This table is in the third section displayed in the **netstat –r** output. It lists all the known IPv6 routes including direct connections, local network and local default routes.

```
IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
 14     58 ::/0                     On-link
  1    306 ::1/128                  On-link
 14     58 2001::/32                On-link
 14    306 2001:0:9d38:6ab8:1863:3bca:3f57:fef4/128
                                    On-link
 14    306 fe80::/64                On-link
 14    306 fe80::1863:3bca:3f57:fef4/128
                                    On-link
  1    306 ff00::/8                 On-link
 14    306 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```

The output of the IPv6 Route Table differs in column headings and format because the IPv6 addresses are 128 bits versus only 32 bits for IPv4 addresses. The IPv6 Route Table section displays four columns:

- The If column lists the interface numbers of the IPv6-enabled network interfaces from the Interface List section of the **netstat –r** command.

- The Metric column lists the cost of each route to a destination. The lower cost is the preferred route, and the metric is used to select between multiple routes with the same prefix.

- The Network Destination column lists the address prefix for the route.

- The Gateway lists the next-hop IPv6 address to reach the destination. On-link is listed as the next-hop address if it is directly connected to the host.

In this example, the figure displays the IPv6 Route Table section generated by the **netstat –r** command to reveal the following network destinations:

- ::/0: This is the IPv6 equivalent of the local default route. The Gateway column provides the link-local address of the default router.

- ::1/128: This is equivalent to the IPv4 loopback address and provides services to the local host.

- 2001::/32: This is the global unicast network prefix.

- 2001:0:9d38:6ab8:1863:3bca:3f57:fef4/128: This is the global unicast IPv6 address of the local computer.

- fe80::/64: This is the local link network route address and represents all computers on the local-link IPv6 network.

- fe80::1863:3bca:3f57:fef4/128: This is the link-local IPv6 address of the local computer.

- ff00::/8: These are special reserved multicast class D addresses equivalent to the IPv4 224.x.x.x addresses.