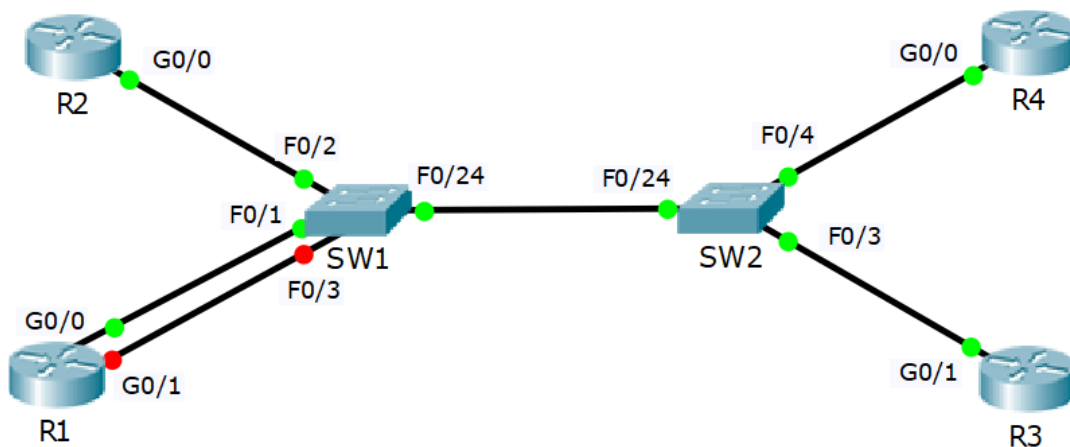# 11 Cisco Device Functions – Lab Exercise

This lab explores the MAC address table on Cisco IOS switches and routing table on Cisco IOS routers.

This lab is a guided walkthrough of Cisco device functions. You will explore the commands used here in much more detail as you go through the rest of the course.

Lab Topology

Load the Startup Configurations

Open the '11 Cisco Device Functions.pkt' file in Packet Tracer to load the lab.

This preconfigures each router with an IP address in the 10.10.10.0/24 network.

Verify the Switch MAC Address Tables

1) Log into routers R1 to R4 and verify which interface is configured on the 10.10.10.0/24 network.

The 'show ip interface brief' command in Privileged Exec (Enable) mode shows which IP addresses are configured on which interfaces, and the status of the interfaces.

On all routers:
```
R1>enable

R1#show ip interface brief
Interface IP-Address OK? Method Status Protocol
GigabitEthernet0/0 10.10.10.1 YES manual up up
GigabitEthernet0/1 unassigned YES unset administratively down down
GigabitEthernet0/2 unassigned YES unset administratively down down
Vlan1 unassigned YES unset administratively down down

R2#show ip interface brief
Interface IP-Address OK? Method Status Protocol
GigabitEthernet0/0 10.10.10.2 YES manual up up
GigabitEthernet0/1 unassigned YES unset administratively down down
GigabitEthernet0/2 unassigned YES unset administratively down down
Vlan1 unassigned YES unset administratively down down

R3#show ip interface brief
Interface IP-Address OK? Method Status Protocol
GigabitEthernet0/0 unassigned YES unset administratively down down
GigabitEthernet0/1 10.10.10.3 YES manual up up
GigabitEthernet0/2 unassigned YES unset administratively down down
Vlan1 unassigned YES unset administratively down down

R4#show ip interface brief
Interface IP-Address OK? Method Status Protocol
GigabitEthernet0/0 10.10.10.4 YES manual up up
GigabitEthernet0/1 unassigned YES unset administratively down down
GigabitEthernet0/2 unassigned YES unset administratively down down
Vlan1 unassigned YES unset administratively down down
```

For the 10.10.10.0/24 network, R1, R2 and R4 are using GigabitEthernet0/0, R3 is using GigabitEthernet0/1.

2) Note down the MAC addresses of these interfaces.

```
R1#show interface gig0/0
GigabitEthernet0/0 is up, line protocol is up (connected)
Hardware is CN Gigabit Ethernet, address is 0090.2b82.ab01
(bia 0090.2b82.ab01)
```

```
R2#show interface gig0/0
GigabitEthernet0/0 is up, line protocol is up (connected)
Hardware is CN Gigabit Ethernet, address is 0060.2fb3.9152
(bia 0060.2fb3.9152)

R3#show interface gig0/1
GigabitEthernet0/1 is up, line protocol is up (connected)
Hardware is CN Gigabit Ethernet, address is 0001.9626.8970
(bia 0001.9626.8970)

R4#show interface gig0/0
GigabitEthernet0/0 is up, line protocol is up (connected)
Hardware is CN Gigabit Ethernet, address is 00d0.9701.02a9
(bia 00d0.9701.02a9)
```

Note: the MAC addresses in your lab may be different.

3) Verify connectivity between the routers by pinging R2, R3 and R4 from R1.

'Ping' sends test packets to the destination and waits for a response. Success indicates the test packet reached the destination and the response to that packet reached this router, verifying connectivity in both directions. It is not a concern if the first packet fails while the connection is set up, as shown in the output below.

```
R1#ping 10.10.10.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/3 ms

R1#ping 10.10.10.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.3, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms

R1#ping 10.10.10.4

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.4, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms
```

4) Ping R3 and R4 from R2.

```
R2#ping 10.10.10.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.3, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms

R2#ping 10.10.10.4

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.4, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms
```

5) View the dynamically learned MAC addresses on SW1 and verify that the router's MAC addresses are reachable via the expected ports. Ignore any other MAC addresses in the table.

```
SW1#enable
SW1#show mac address-table dynamic
Mac Address Table
-------------------------------------------

Vlan Mac Address Type Ports
---- ----------- -------- -----

1 0001.9626.8970 DYNAMIC Fa0/24
1 000c.cf84.8418 DYNAMIC Fa0/24
1 0060.2fb3.9152 DYNAMIC Fa0/2
1 0090.2b82.ab01 DYNAMIC Fa0/1
1 00d0.9701.02a9 DYNAMIC Fa0/24
```

6) Repeat on SW2.

```
SW2#enable
SW2#show mac address-table dynamic
Mac Address Table
-------------------------------------------

Vlan Mac Address Type Ports
---- ----------- -------- -----

1 0001.9626.8970 DYNAMIC Fa0/3
1 000b.be53.6418 DYNAMIC Fa0/24
1 0060.2fb3.9152 DYNAMIC Fa0/24
1 0090.2b82.ab01 DYNAMIC Fa0/24
1 00d0.9701.02a9 DYNAMIC Fa0/4
```

7) Clear the dynamic MAC Address Table on SW1.

```
SW1#clear mac address-table dynamic
```

8) Show the dynamic MAC Address Table on SW1. Do you see any MAC addresses? Why or why not?

```
SW1#show mac address-table dynamic
Mac Address Table
-------------------------------------------

Vlan Mac Address Type Ports
---- ----------- -------- -----

1 0001.9626.8970 DYNAMIC Fa0/24
1 000c.cf84.8418 DYNAMIC Fa0/24
1 0060.2fb3.9152 DYNAMIC Fa0/2
1 0090.2b82.ab01 DYNAMIC Fa0/1
1 00d0.9701.02a9 DYNAMIC Fa0/24
```

Devices in a real world network tend to be chatty and send traffic frequently, this causes the MAC address table to update (you may see less entries in Packet Tracer).

The switch will periodically flush old entries.

Examine a Routing Table

9) View the routing table on R1. What routes are present and why?

```
R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.10.10.0/24 is directly connected, GigabitEthernet0/0
L 10.10.10.1/32 is directly connected, GigabitEthernet0/0
```

The router has a connected route for the 10.10.10.0/24 network and a local route for 10.10.10.1/32. These routes were automatically created when the IP address 10.10.10.1/24 was enabled on interface GigabitEthernet0/0

10) Configure IP address 10.10.20.1/24 on interface GigabitEthernet0/1

Enter Global Configuration then Interface Configuration mode to configure the interface.

```
R1#configure terminal
R1(config)#interface GigabitEthernet 0/1
R1(config-if)#ip address 10.10.20.1 255.255.255.0
```

11) Verify the status of interfaces GigabitEthernet0/0 and GigabitEthernet0/1.

A router interface status is 'administratively down' by default. For a router interface to be used it must be brought online.
Tip: Remember this for troubleshooting in later lab exercises.

'Show' commands are entered in Privileged Exec (Enable) mode.

```
R1(config-if)#end

R1#show ip interface brief
Interface              IP-Address      OK? Method Status                 Protocol
GigabitEthernet0/0     10.10.10.1      YES manual up                     up
GigabitEthernet0/1     10.10.20.1      YES manual administratively down  down
GigabitEthernet0/2     unassigned      YES unset  administratively down  down
Vlan1                  unassigned      YES unset  administratively down  down
```

G0/0 was already brought online by an administrator but G0/1 is still shutdown.

12) Bring interface GigabitEthernet0/1 online.

To negate a command enter the 'no' form of the command. Router interfaces are administratively 'shutdown' by default, so enter the 'no shutdown' command to bring them online. This is typically done immediately after configuring an IP address on an interface. Best practice is to leave interfaces shutdown until they are brought into use.

```
R1#configure terminal
R1(config)#interface GigabitEthernet 0/1
R1(config-if)#no shutdown
```

(Switch interfaces are already online by default. There is no need to enter the 'no shutdown' command on switches unless an administrator has previously explicitly entered the 'shutdown' command on an interface.)

13) Verify the status of interfaces GigabitEthernet0/0 and GigabitEthernet0/1 now.

```
R1(config-if)#end

R1#show ip interface brief
Interface              IP-Address     OK? Method Status                 Protocol
GigabitEthernet0/0     10.10.10.1     YES manual up                     up
GigabitEthernet0/1     10.10.20.1     YES manual up                     up
GigabitEthernet0/2     unassigned     YES unset  administratively down down
Vlan1                  unassigned     YES unset  administratively down down
```

14) What routes are in the routing table now?

```
R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C 10.10.10.0/24 is directly connected, GigabitEthernet0/0
L 10.10.10.1/32 is directly connected, GigabitEthernet0/0
C 10.10.20.0/24 is directly connected, GigabitEthernet0/1
L 10.10.20.1/32 is directly connected, GigabitEthernet0/1
```

The router has routes for both interfaces and can route traffic between hosts on the 10.10.10.0/24 and 10.10.20.0/24 networks.

15) Configure a static route to 10.10.30.0/24 with a next hop address of 10.10.10.2

```
R1#configure terminal
R1(config)#ip route 10.10.30.0 255.255.255.0 10.10.10.2
```

16) What routes are in the routing table now?

'Show' commands can be entered outside Privileged Exec (Enable) mode by typing 'do' before the command.

```
R1(config)#do show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks
C 10.10.10.0/24 is directly connected, GigabitEthernet0/0
L 10.10.10.1/32 is directly connected, GigabitEthernet0/0
C 10.10.20.0/24 is directly connected, GigabitEthernet0/1
L 10.10.20.1/32 is directly connected, GigabitEthernet0/1
S 10.10.30.0/24 [1/0] via 10.10.10.2
```

The router has routes to its locally connected networks, and also to 10.10.30.0/24 which is available via 10.10.10.2