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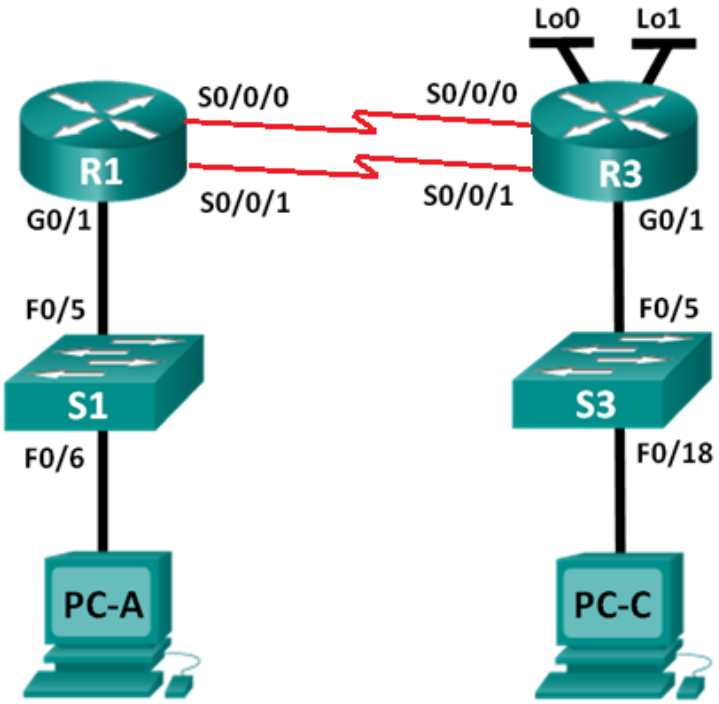
Lab 8.1 - Configure IPv4 and IPv6 Static and Default Routes

Topology



Addressing Table

Device	Interface	IPv4 Address	IPv4 Default Gateway	IPv6 Address	IPv6 Default Gateway
R1	G0/1	192.168.0.1/24	N/A	2001:db8:acad:0::1/64	N/A
	S0/0/0	10.1.1.1/30	N/A	2001:db8:cafe:1::1/64	N/A
	S0/0/1	10.2.2.1/30	N/A	2001:db8:cafe:2:1/64	N/A
R3	G0/1	192.168.1.1/24	N/A	2001:db8:acad:1::1/64	N/A
	S0/0/0	10.1.1.2/30	N/A	2001:db8:cafe:1::2/64	N/A

	S0/0/1	10.2.2.2/30	N/A	2001:db8:cafe:2::2/64	N/A
	Lo0	209.165.200.225/27	N/A	2001:baad:baad:1::5/64	N/A
	Lo1	198.133.219.1/24	N/A	2001:feed:feed:1::1/64	N/A
PC-A	NIC	192.168.0.10/24	192.168.0.1	2001:db8:acad:0::A/64	2001:db8:acad:0::1/64
PC-C	NIC	192.168.1.10/24	192.168.1.1	2001:db8:acad:1::A/64	2001:db8:acad:1::1/64

Objectives

Part 1: Build the Network and Configure Basic Device IP and IPv6 Settings

Part 2: Configure and verify static and default routing for IPv4

Part 3: Configure and verify static and default routing for IPv6

Background / Scenario

Static and Default routing are the simplest forms of network routing and configured manually. They are fixed, meaning that they do not change dynamically to meet changing network conditions. They are either valid and made available to the routing table or invalid and not made available to the routing table. Static routes have an administrative distance of one by default. However, static and default routes can be configured with an administrator-defined administrative distance. This capability allows the administrator to put the static or default route in reserve, and only make it available to the routing table when routes with lower administrative distances (usually generated by dynamic routing protocols) are no longer valid.

Instructions

Part 1: Build the Network and Configure Basic Device Settings

In Part 1, you will set up the network topology and configure basic settings on the PC hosts and switches.

Step 1: Cable the network as shown in the topology.

Attach the devices as shown in the topology diagram, and cable as necessary. To use routers with serial interfaces in Packet Tracer, select the Cisco 1941 model from the router options and attach the HWIC-2T expansion module under the Physical tab of the router. The router must be turned off using its power switch before attaching the module and turned on again afterwards.

Step 2: Configure IP settings for each router.

a. Assign a device name to the router.

b. Enable IPv6 Unicast Routing on both routers.

c. Configure the IPv4 and IPv6 address for all the interfaces according to the Addressing Table.

d. Issue the command to verify IPv4 assignments to the interfaces.

e. Issue the command to verify IPv6 assignments to the interfaces.

Step 3: Configure IP settings for each PC.

Configure the IPv4 and IPv6 address and gateway settings for all the PCs according to the Addressing Table.

Step 4: Verify connectivity of the LANs.

a. Test connectivity by pinging from each PC to the default gateway that has been configured for that host.

	IPv4	IPv6
From PC-A, is it possible to ping its default gateway?	YES	YES
From PC-C, is it possible to ping is default gateway?	YES	YES

b. Test connectivity by pinging between the directly connected routers.

	IPv4	IPv6
From R1, is it possible to ping the S0/0/0 interface of R3?	YES	YES
From R1, is it possible to ping the S0/0/1 interface of R3?	YES	YES

If the answer is **no** to any of these questions, troubleshoot the configurations and correct the error.

c. Test connectivity between devices that are not directly connected.

	IPv4	IPv6
From PC-A, is it possible to ping PC-C?	NO	NO
From PC-A, is it possible to ping Lo0 of R3?	NO	NO
From PC-A, is it possible to ping Lo1 of R3?	NO	NO

Were these pings successful? Why or why not?

No because there was no route provided

Step 5: Gather IPv4 information.

a. Check the status of the interfaces on R1 with the **show ip interface brief** command.

How many interfaces are activated on R1?	3

b. Check the status of the interfaces on R3.

How many interfaces are activated on R3?	5

c. View the routing table information for R1 using the **show ip route** command.

What **IPv4** networks are present in the Addressing Table of this lab, but not in the routing table for R1?

Both loopback networks of R3 and 192.168.1.0/24

d. View the routing table information for R3

What **IPv4** networks are present in the Addressing Table of this lab, but not in the routing table for R3?

192.168.0.0/24

Step 6: Gather IPv6 information.

a. Check the status of the interfaces on R1 with the **show ipv6 interface brief** command.

How many interfaces are activated on R1?	3

b. Check the status of the interfaces on R3.

How many interfaces are activated on R3?	5

c. View the routing table information for R1 using the **show ipv6 route** command.

What **IPv6** networks are present in the Addressing Table of this lab, but not in the routing table for R1?

2001:feed:feed:1::1/64
2001:db8:acad:1::/64
2001:baad:baad:1::5/64

d. View the routing table information for R3

What **IPv6** networks are present in the Addressing Table of this lab, but not in the routing table for R3?

2001:db8:acad:0::1/64

Why are there IPv4 and IPv6 networks missing from the routing tables?

Only the directly connected networks are shown in the routing tables in this instance.

Part 2: Configure and verify static and default routing for IPv4 on R1 and R3

In Part 2, you will employ multiple ways to implement static and default routes, you will confirm that the routes have been added to the routing tables of R1 and R3, and you will verify connectivity based on the introduced routes.

Step 1: Configure a recursive static route.

With a recursive static route, the next-hop IP address is specified. Because only the next-hop IP is specified, the router must perform multiple lookups in the routing table before forwarding packets. To configure IPv4 recursive static routes, use the following syntax:

```
Router(config)# ip route network-address subnet-mask next-hop
```

a. On the R1 router, configure a static route to the 192.168.1.0 network using the IP address of the Serial 0/0/0 interface of R3 as the next-hop address. Write the command you used in the space provided.

ip route 192.168.1.0 255.255.255.0 10.1.1.2

b. View the routing table to verify the new static route entry.

Is the new route present in the routing table?	YES
What is the administrative distance assigned to the new route?	1

c. From host PC-A, try to ping host PC-C.

Is it successful? Why or why not?

No,

Step 2: Configure a directly connected static route.

With a directly connected static route, the *exit-interface* parameter is specified, which allows the router to resolve a forwarding decision in one lookup. A directly connected static route is typically used with a point-to-point serial interface. To configure directly connected static routes with an exit interface specified, use the following syntax:

```
Router(config)# ip route network-address subnet-mask exit-intf
```

a. On the R3 router, configure a static route to the 192.168.0.0 network using S0/0/0 as the exit interface. Write the command you used in the space provided.

ip route 192.168.0.0 255.255.255.0 s0/0/0

b. View the routing table to verify the new static route entry.

Is the new route present in the routing table?	YES

c. From host PC-A, try to ping host PC-C.

Is it successful? Why or why not?

Yes, this is because R3 already has a path back to R1.

Step 3: Configure and Verify an IPv4 Default Route

A default route identifies the gateway to which the router sends all IP packets for which it does not have a learned or static route. A default static route is a static route with 0.0.0.0 as the destination IP address and subnet mask. This is commonly referred to as a “quad zero” route.

In a default route, either the next-hop IP address or exit interface can be specified. To configure a default static route, use the following syntax:

```
Router(config)# ip route 0.0.0.0 0.0.0.0 {next-hop or exit-intf}
```

a. Configure the R1 router with a default route using the exit interface of S0/0/0.

Write the command you used in the space provided.

ip route 0.0.0.0 0.0.0.0 s0/0/0

b. View the routing table to verify the new static route entry.

How is this new route different from the routes previously configured when listed in the routing table?

The new static entry is the default entry for the non-matching route.

c. Verify connectivity by performing the following ping tests.

From host PC-A, is it possible to ping the 209.165.200.225?	YES

From host PC-A, is it possible to ping the 198.133.219.1?	YES

Step 4: Configure and Verify a Floating Static Default Route

A floating route is used as a backup route that will automatically be installed in the routing table when the primary route fails by assigning it a higher administrative distance than the preferred route.

A router will always choose the lowest AD to a destination network. By assigning a higher AD to a route, it remains 'floating' until such time that the primary route becomes unavailable and it now becomes the route with the lowest AD

In a floating route, either the next-hop IP address or exit interface can be specified and the administrative distance is manually assigned. To configure a default static route, use the following syntax:

```
Router(config)# ip route 0.0.0.0 0.0.0.0 {ip-address or exit-intf}{admin-dist}
```

a. Configure a floating static default route on R1 with an AD of 80 via R3's S0/0/1 address.

Write the command you used in the space provided.

ip route 0.0.0.0 0.0.0.0 10.2.2.2 80

b. View the R1 routing table to verify the new static route entry.

Is the new route present in the routing table? Why or why not?

no, since the configure floating static default route has a higher AD, it is not displayed in the routing table. Once it became the lowest, it will be visible. No, this is because the configuring of the floating static default

c. On R1, issue the command **traceroute 209.165.200.225**.

Note: The final hop 209.165.200.225 will not be listed in the trace output because it is also an IP address of the R3

What is the next hop in the path to the destination?	10.1.1.2

d. Issue the **shutdown** command on R1 S0/0/0.

e. Demonstrate that the floating static route is working.

1) Issue the **show ip route static** command on R1. You should see two static routes. A default static route with an AD of 80 and a static route to the 10.2.0.0/24 network with an AD of 1.

2) Issue the **traceroute 209.165.200.193** command on R1.

What is the next hop in the path to the destination?	10.2.2.2

f. Issue the **no shutdown** command on R1 S0/0/0.

Part 3: Configure and verify static and default routing for IPv6 on R1 and R3

In Part 3, you will configure static and default routing on R1 and R3 to enable full connectivity between the routers using IPv6. Once again, the static routing being used here is not meant to represent best practice, but

to assess your ability to complete the required configurations. Configuring IPv6 static routes is similar to doing so for IPv4 routes.

Step 1: On R3, configure a directly connected IPv6 static route to R1's LAN

To configure a directly connected IPv6 static route, use the following command format:

```
Router(config)# ipv6 route ipv6-prefix/prefix-length exit-intf
```

Write the command you used in the space provided.

ipv6 route 2001:db8:acad:0::/64 2001:db8:cafe:1::1

Step 2: On R1, configure a recursive IPv6 static route to R3's LAN

To configure a recursive IPv6 static route, use the following command format:

```
Router(config)# ipv6 route ipv6-prefix/prefix-length next_hop
```

Write the command you used in the space provided.

ipv6 route 2001:db8:acad:1::/64 2001:db8:cafe:1::2

Step 3: On R1, configure a static IPv6 default route via R3's S0/0/1 address.

To configure an IPv6 default route, use the following command format:

```
Router(config)# ipv6 route ::/0 {ip-address or exit-intf}{
```

Write the command you used in the space provided.

ipv6 route ::/0 s0/0/1

Step 4: Verify that the routes are operational.

a. Use the **show ipv6 route** command to ensure that R1's routing table shows the static and default routes.

b. On PC-A, perform a traceroute to PC-C from the command line using the command

```
C:> tracert 2001:db8:acad:1::A
```

Is PC-C reachable?	YES

What are the hops listed in the traceroute results?

2001::db8:acad::1 2001::db8:acad:1::2 2001::db8:acad:1::a

c. On PC-A, perform a traceroute to **2001:feed:feed:1::1/64**

Is the destination reachable?	YES

What are the hops listed in the traceroute results?

2001:db8:acad::1

2001:feed;feed:1::1

Reflection

1. A directly connected static route is usable only when the exit interface of a route is a serial point-to-point connection? Why is this so?

   A directly connected static route is only usable when the exit interface of a route is serial p2p because the router assumes that the destination is directly attached to the output interface and the packet destination is used as the next hop address.

2. Why is it important to configure a default route on a router?

   Being able to configure a default route on a router is important because it allows all the routers in the topology to forward all incoming packets whose addresses aren't available in the routing table.

   Using default routing on a router will allow a default routing path to be held and will allow an efficient and utilized network which in turn will provide a better topology and will allow cases such that if there is no possible routing or any other route that matches, it defaults to a specific path which will not let the packets be dropped in any instance. Doing this will allow an overall efficient network topology that will allow it to be self-sufficient and better.