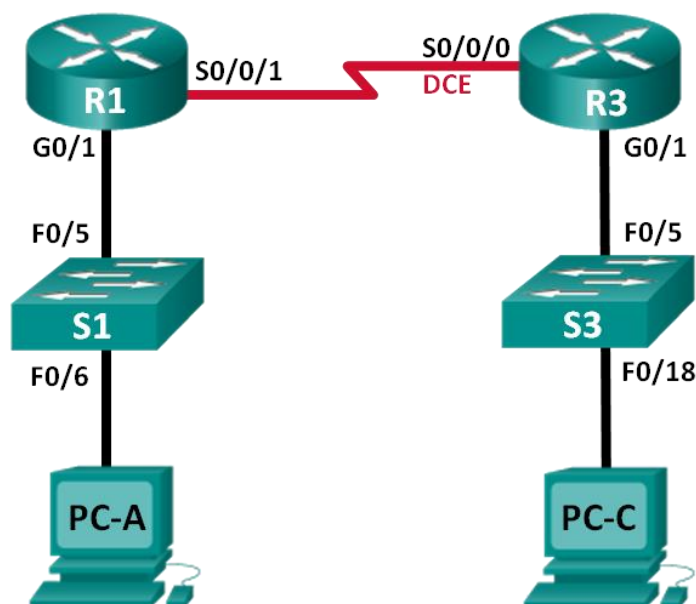# Lab – Configuring IPv6 Static and Default Routes

Topology

Addressing Table

Device	Interface	IPv6 Address / Prefix Length	Default Gateway
R1	G0/1	2001:DB8:ACAD:A::1/64 FE80::1	N/A
	S0/0/1	FC00::1/64	N/A
R3	G0/1	2001:DB8:ACAD:B::1/64 FE80::1	N/A
	S0/0/0	FC00::2/64	N/A
PC-A	NIC	2001:DB8:ACAD:A::2/64	FE80::1
PC-C	NIC	2001:DB8:ACAD:B::2/64	FE80::1

Objectives

Part 1: Build the Network and Configure Basic Device Settings

- Enable IPv6 unicast routing and configure IPv6 addressing on the Routers and PCs.
- Use **show** commands to verify IPv6 settings.

Part 2: Configure IPv6 Static and Default Routes

- Configure a directly attached IPv6 static route.
- Configure a recursive IPv6 static route.
- Configure a default IPv6 static route.

Background / Scenario

In this lab, you will configure the entire network to communicate using only IPv6 addressing, including configuring the routers and PCs. You will also configure IPv6 static and default routes on the routers to enable communication to remote networks that are not directly connected.

Note: The routers used with CCNA hands-on labs are Cisco 1941 Integrated Services Routers (ISRs) with Cisco IOS Release 15.2(4)M3 (universalk9 image). The switches used are Cisco Catalyst 2960s with Cisco IOS Release 15.0(2) (lanbasek9 image). Other routers, switches, and Cisco IOS versions can be used. Depending on the model and Cisco IOS version, the commands available and output produced might vary from what is shown in the labs. Refer to the Router Interface Summary Table at the end of this lab for the correct interface identifiers.

Note: Make sure that the routers and switches have been erased and have no startup configurations. If you are unsure, contact your instructor.

Required Resources

- 2 Routers (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
- 2 Switches (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
- 2 PCs (Windows 7, Vista, or XP with terminal emulation program, such as Tera Term)
- Console cables to configure the Cisco IOS devices via the console ports
- Ethernet and serial cables as shown in the topology

Part 1: Build the Network and Configure Basic Device Settings

In Part 1, you will cable and configure the network to communicate using IPv6 addressing.

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

Step 2: Initialize and reload the routers and switches.

Step 3: Enable IPv6 unicast routing and configure IPv6 addressing on the routers.

a. Using Tera Term, console into the router labeled R1 in the topology diagram and assign the router the name R1.

b. Within global configuration mode, enable IPv6 routing on R1.

```
R1(config)# ipv6 unicast-routing
```

c. Configure the network interfaces on R1 with IPv6 addresses. Notice that IPv6 is enabled on each interface. The G0/1 interface has a globally routable unicast address and EUI-64 is used to create the interface identifier portion of the address. The S0/0/1 interface has a privately routable, unique-local address, which is recommended for point-to-point serial connections.

```
R1(config)# interface g0/1
R1(config-if)# ipv6 address 2001:DB8:ACAD:A::1/64
R1(config-if)# no shutdown
R1(config-if)# interface serial 0/0/1
R1(config-if)# ipv6 address FC00::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
```

d. Assign a device name to router R3.

e. Within global configuration mode, enable IPv6 routing on R3.

```
R3(config)# ipv6 unicast-routing
```

f. Configure the network interfaces on R3 with IPv6 addresses. Notice that IPv6 is enabled on each interface. The G0/1 interface has a globally routable unicast address and EUI-64 is used to create the interface identifier portion of the address. The S0/0/0 interface has a privately routable, unique-local address, which is recommended for point-to-point serial connections. The clock rate is set because it is the DCE end of the serial cable.

```
R3(config)# interface gigabit 0/1
R3(config-if)# ipv6 address 2001:DB8:ACAD:B::1/64
R3(config-if)# no shutdown
R3(config-if)# interface serial 0/0/0
R3(config-if)# ipv6 address FC00::2/64
R3(config-if)# clock rate 128000
R3(config-if)# no shutdown
R3(config-if)# exit
```

Use the **show ipv6 interface brief** command on both routers to verify the IPv6 settings.

Part 2: Configure IPv6 Static and Default Routes

In Part 2, you will configure IPv6 static and default routes three different ways. You will confirm that the routes have been added to the routing tables, and you will verify successful connectivity between PC-A and PC-C.

You will configure three types of IPv6 static routes:

- **Directly Connected IPv6 Static Route** – A directly connected static route is created when specifying the outgoing interface.
- **Recursive IPv6 Static Route** – A recursive static route is created when specifying the next-hop IP address. This method requires the router to execute a recursive lookup in the routing table in order to identify the outgoing interface.
- **Default IPv6 Static Route** – Similar to a quad zero IPv4 route, a default IPv6 static route is created by making the destination IPv6 prefix and prefix length all zeros, ::/0.

Step 1: Configure a directly connected IPv6 static route.

In a directly connected IPv6 static route, the route entry specifies the router outgoing interface. A directly connected static route is typically used with a point-to-point serial interface. To configure a directly attached IPv6 static route, use the following command format:

```
Router(config)# ipv6 route <ipv6-prefix/prefix-length> <outgoing-interface-
type> <outgoing-interface-number>
```

a. On router R1, configure an IPv6 static route to the 2001:DB8:ACAD:B::/64 network on R3, using the R1 outgoing S0/0/1 interface.

```
R1(config)# ipv6 route 2001:DB8:ACAD:B::/64 serial 0/0/1
R1(config)#
```

b. View the IPv6 routing table to verify the new static route entry.

What is the code letter and routing table entry for the newly added route in the routing table?

_____

c. Now that the static route has been configured on R1, is it now possible to ping the host PC-C from PC-A?

_____

These pings should fail. If the recursive static route is correctly configured, the ping arrives at PC-C. PC-C sends a ping reply back to PC-A. However, the ping reply is discarded at R3 because R3 does not have a return route to the 2001:DB8:ACAD:A::/64 network in the routing table. To successfully ping across the network, you must also create a static route on R3.

d. On router R3, configure an IPv6 static route to the 2001:DB8:ACAD:A::/64 network, using the R3 outgoing S0/0/0 interface.

```
R3(config)# ipv6 route 2001:DB8:ACAD:A::/64 serial 0/0/0
R3(config)#
```

e. Now that both routers have static routes, attempt an IPv6 **ping** from PC-A to the PC-C global unicast IPv6 address.

Was the ping successful? Why? _____

Step 2:   Configure a recursive IPv6 static route.

In a recursive IPv6 static route, the route entry has the next-hop router IPv6 address. To configure a recursive IPv6 static route, use the following command format:

```
Router(config)# ipv6 route <ipv6-prefix/prefix-length> <next-hop-ipv6-
address>
```

a. On router R1, delete the directly attached static route and add a recursive static route.

```
R1(config)# no ipv6 route 2001:DB8:ACAD:B::/64 serial 0/0/1
R1(config)# ipv6 route 2001:DB8:ACAD:B::/64 FC00::2
R1(config)# exit
```

b. On router R3, delete the directly attached static route and add a recursive static route.

```
R3(config)# no ipv6 route 2001:DB8:ACAD:A::/64 serial 0/0/0
R3(config)# ipv6 route 2001:DB8:ACAD:A::/64 FC00::1
R3(config)# exit
```

c. View the IPv6 routing table on R1 to verify the new static route entry.

What is the code letter and routing table entry for the newly added route in the routing table?

_____

d. Verify connectivity by issuing a **ping** command from PC-A to PC-C.

Was the ping successful? _____

Note: It may be necessary to disable the PC firewall to ping between PCs.

Step 3:   Configure a default IPv6 static route.

In a default static route, the destination IPv6 prefix and prefix length are all zeros.

```
Router(config)# ipv6 route ::/0 <outgoing-interface-type> <outgoing-
interface-number> {and/or} <next-hop-ipv6-address>
```

a. On router R1, delete the recursive static route and add a default static route.

```
R1(config)# no ipv6 route 2001:DB8:ACAD:B::/64 FC00::2
R1(config)# ipv6 route ::/0 serial 0/0/1
R1(config)#
```

b. Delete the recursive static route and add a default static route on R3.

c. View the IPv6 routing table on R1 to verify the new static route entry.

What is the code letter and routing table entry for the newly added default route in the routing table?

_____

d. Verify connectivity by issuing a **ping** command from PC-A to PC-C.

Was the ping successful? _____

Note: It may be necessary to disable the PC firewall to ping between PCs.

Reflection

1. This lab focuses on configuring IPv6 static and default routes. Can you think of a situation where you would need to configure both IPv6 and IPv4 static and default routes on a router?

_____

_____

_____

_____

2. In practice, configuring an IPv6 static and default route is very similar to configuring an IPv4 static and default route. Aside from the obvious differences between the IPv6 and IPv4 addressing, what are some other differences when configuring and verifying an IPv6 static route as compared to an IPv4 static route?

_____

_____

_____

Router Interface Summary Table

Router Interface Summary				
Router Model	**Ethernet Interface #1**	**Ethernet Interface #2**	**Serial Interface #1**	**Serial Interface #2**
1800	Fast Ethernet 0/0 (F0/0)	Fast Ethernet 0/1 (F0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
1900	Gigabit Ethernet 0/0 (G0/0)	Gigabit Ethernet 0/1 (G0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2801	Fast Ethernet 0/0 (F0/0)	Fast Ethernet 0/1 (F0/1)	Serial 0/1/0 (S0/1/0)	Serial 0/1/1 (S0/1/1)
2811	Fast Ethernet 0/0 (F0/0)	Fast Ethernet 0/1 (F0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2900	Gigabit Ethernet 0/0 (G0/0)	Gigabit Ethernet 0/1 (G0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
Note: To find out how the router is configured, look at the interfaces to identify the type of router and how many interfaces the router has. There is no way to effectively list all the combinations of configurations for each router class. This table includes identifiers for the possible combinations of Ethernet and Serial interfaces in the device. The table does not include any other type of interface, even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface.				