Lab 12.9.2 - Configure IPv6 Addresses on Network Devices

This lab has been updated for use on NETLAB+.
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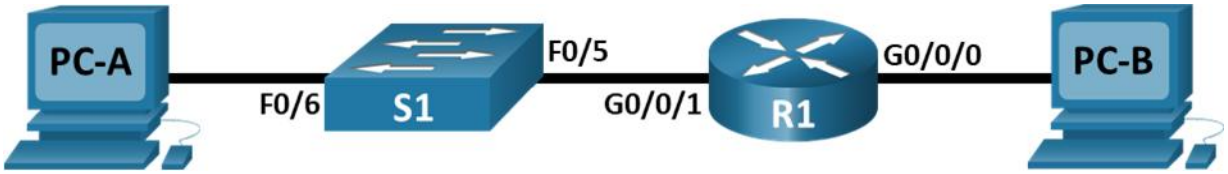
Topology



Addressing Table

Device	Interface	IPv6 Address	Prefix Length	Default Gateway
R1	G0/0/0	2001:db8:acad:a::1	64	N/A
	G0/0/1	2001:db8:acad:1::1	64	N/A
S1	VLAN 1	2001:db8:acad:1::b	64	N/A
PC-A	NIC	2001:db8:acad:1::3	64	fe80::1
PC-B	NIC	2001:db8:acad:a::3	64	fe80::1

Objectives

Part 1: Configure Basic Router and Switch Settings

Part 2: Configure IPv6 Addresses Manually

Part 3: Verify End-to-End Connectivity

Background / Scenario

In this lab, you will configure hosts and device interfaces with IPv6 addresses. You will issue **show** commands to view IPv6 unicast addresses. You will also verify end-to-end connectivity using **ping** and **traceroute** commands.

Note: The routers used with CCNA hands-on labs are Cisco 4221 with Cisco IOS XE Release 16.9.4 (universalk9 image). The switches used in the labs are Cisco Catalyst 2960s with Cisco IOS Release 15.2(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 the output produced might vary from what is shown in the labs. Refer to the Router Interface Summary Table at the end of the lab for the correct interface identifiers.

Note: The default 2960 Switch Database Manager (SDM) template does not support IPv6. It may be necessary to issue the command **sdm prefer dual-ipv4-and-ipv6 default** to enable IPv6 addressing before applying an IPv6 address to the VLAN 1 SVI.

Note: The **default bias** template used by the Switch Database Manager (SDM) does not provide IPv6 address capabilities. Verify that SDM is using either the **dual-ipv4-and-ipv6** template or the **lanbase-routing** template. The new template will be used after reboot.

```
S1# show sdm prefer
```

Follow these steps to assign the dual-ipv4-and-ipv6 template as the default SDM template:

```
S1# configure terminal
S1(config)# sdm prefer dual-ipv4-and-ipv6 default
S1(config)# end
S1# reload
```

Instructions

Part 1: Configure Basic Router and Switch Settings

Step 1: Configure the router.

Assign the hostname and configure basic device settings.

Step 2: Configure the switch.

Assign the hostname and configure basic device settings.

Part 2: Configure IPv6 Addresses Manually

Step 1: Assign the IPv6 addresses to Ethernet interfaces on R1.

a. Assign the IPv6 global unicast addresses, listed in the Addressing Table, to both Ethernet interfaces on R1.

b. Verify that the correct IPv6 unicast address is assigned to each interface.

Note: The link-local address (FE80::) displayed is based on EUI-64 addressing, which automatically uses the interface Media Access Control (MAC) address to create a 128-bit IPv6 link-local address.

c. To get the link-local address to match the global unicast address on the interface, manually enter the link-local addresses on each of the Ethernet interfaces on R1.

Note: Each router interface belongs to a separate network. Packets with a link-local address never leave the local network; therefore, you can use the same link-local address on both interfaces.

d. Use a command of your choice to verify that the link-local address has been changed to **FE80::1.**

Which two multicast groups have been assigned to interface G0/0/0?

Type your answers here.

FF02::1 and FF02::1:FF00:1

Step 2: Enable IPv6 routing on R1.

a. On a PC-B command prompt, enter the **ipconfig** command to examine IPv6 address information assigned to the PC interface.

Has an IPv6 unicast address been assigned to the network interface card (NIC) on PC-B?

Type your answers here.

No

b. Enable IPv6 routing on R1 using the **IPv6 unicast-routing** command.

c. Use a command to verify the new multicast group are assigned to interface G0/0/0. Notice that the all-router multicast group (FF02::2) now appears for interface G0/0/0.

Note: This will allow the PCs to obtain their IP address and default gateway information automatically using Stateless Address Autoconfiguration (SLAAC).

d. Now that R1 is part of the all-router multicast group FF02::2, re-issue the **ipconfig** command on PC-B and examine the IPv6 address information.

Why did PC-B receive the Global Routing Prefix and Subnet ID that you configured on R1?

All of R1's IPv6 interfaces are part of the FF02::2 all-router multicast group, so it can now send Router Advertisement (RA) messages to all hosts on the LAN.

Step 3: Assign IPv6 addresses to the management interface (SVI) on S1.

a. Assign the IPv6 address for S1. Also assign a link-local address for this interface.

b. Use a command of your choice to verify that the IPv6 addresses are properly assigned to the management interface.

Step 4: Assign static IPv6 addresses to the PCs.

a. Open the Ethernet Properties window on for each PC and assign IPv6 addressing.

b. Verify both PCs have the correct IPv6 address information. Each PC should have two Global IPv6 addresses: one static and one SLACC

Part 3: Verify End-to-End Connectivity

From PC-A, ping **FE80::1**. This is the link-local address assigned to G0/0/1 on R1.

Ping the S1 management interface from PC-A.

Use the **tracert** command on PC-A to verify that you have end-to-end connectivity to PC-B.

From PC-B, ping PC-A.

From PC-B, ping the link-local address for G0/0/0 on R1.

Note: If end-to-end connectivity is not established, troubleshoot your IPv6 address assignments to verify that you entered the addresses correctly on all devices.

Reflection Questions

1. Why can the same link-local address, FE80::1, be assigned to both Ethernet interfaces on R1?

If an address is link-local, it stays within the local network, so the same link-local address can be used on a different network.

2. What is the Subnet ID of the IPv6 unicast address 2001:db8:acad::aaaa:1234/64?

The subnet ID of 2001:acad::aaaa:1234/64 is 0000. Because of the IPv6 Omitting All 0 Segment rule, a double colon is used instead of all zeroes.

Router and Switch Interface Summary Table

Router / Switch 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)
2960	Fast Ethernet 0/1 (F0/1)	Fast Ethernet 0/2 (F0/2)	n/a	n/a
3560	Fast Ethernet 0/1 (F0/1)	Fast Ethernet 0/2 (F0/2)	n/a	n/a
3650	Gigabit Ethernet 1/0/1 (G1/0/1)	Gigabit Ethernet 1/0/2 (G1/0/2)	n/a	n/a
4221	Gigabit Ethernet 0/0/0 (G0/0/0)	Gigabit Ethernet 0/0/1 (G0/0/1)	Serial 0/1/0 (S0/1/0)	Serial 0/1/1 (S0/1/1)
4300	Gigabit Ethernet 0/0/0 (G0/0/0)	Gigabit Ethernet 0/0/1 (G0/0/1)	Serial 0/1/0 (S0/1/0)	Serial 0/1/1 (S0/1/1)

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.