Configuration Labs

Part 3: IPv6 Configuration and IP Address Management

Lab 2: IPv6 Router Configuration

Objective

The overall objective of this laboratory exercise is to gain experience configuring Internet Protocol version 6 (IPv6) on Cisco routers. Your objective is to configure the two routers with IPv6 so that they can communicate. The routers are missing all the configuration necessary to support IPv6. You must configure the routers for IPv6 forwarding. Next, you should configure the interfaces with the specified IPv6 addresses. In this lab, you will gain an introductory understanding of the following:

- The steps to statically configure an IPv6 address on the WAN interfaces.

- The steps to statically configure an IPv6 address on the LAN interfaces.

- Configuring the computer's network interface.
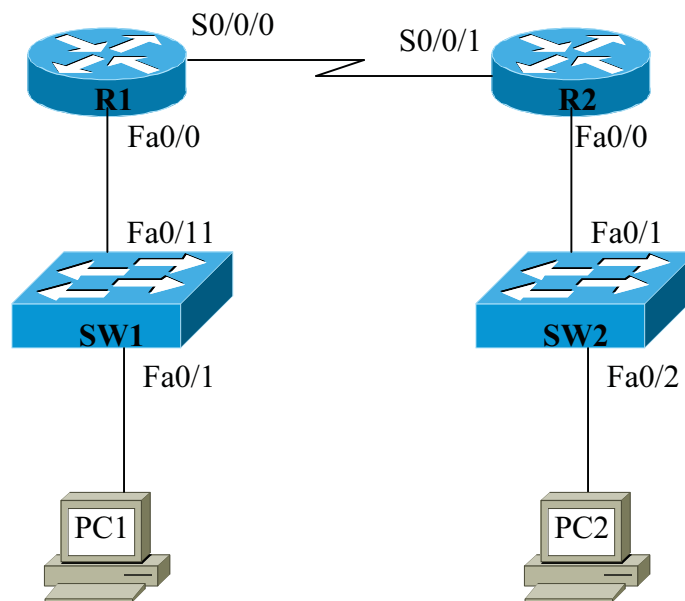
Topology

Figure 1   Network Topology for This Lab

Reference

The following simulator exercises provided with the CCNA 640-802 Network Simulator should be reviewed prior to starting this virtual laboratory exercise:

- IPv6 Configuration I
- IPv6 Configuration II
- IPv6 Address Configuration I–IX
- IPv6 Routing Configuration I, II, III

Key Concepts

The following concepts, terms, commands, and steps should have been mastered in this exercise

- List the steps required to enable IPv6 routing.
- For the steps needed to enable the forwarding of IPv6 unicast datagrams, use the **ipv6 unicast-routing** command in global configuration mode.
- List the command used to enable IPv6 routing.
- The steps to add IPv6 addressing to a WAN interface.
- List the command used to observe the IPv6 address added to the interface.
- How IPv6 addresses can be abbreviated by dropping leading zeros and substituting :: for successive fields of zeros.
- Examine IPv6 routes on a router using the **show ipv6 route** command.
- Verify IPv6 connectivity between the two routers using the **ping ipv6** command to ping from one interface to the IPv6 address of another interface.
- The purpose of the **eui-64** option when configuring an IPv6 interface.
- The steps for assigning host names to IPv6 addresses.

Reference Table

Table 1 provides the IP addresses and masks for all necessary interfaces used to complete this lab.

Table 1   IP Addresses, Subnet Masks, and VLAN Assignments for Lab 2

Computer/Interface – R1	IPv6 Address
FA0/0	2001:C16C:0000:0002:0000:0000:0000:0000/64
S0/0/0	2001:C16C:0000:0001:0000:0000:0000:0001/64

Computer/Interface – R2	IPv6 Address
FA0/0	2001:C16C:0000:0003:0000:0000:0000:0000/64
S0/0/1	2001:C16C:0000:0001:0000:0000:0000:0002/64

Detailed Lab Steps

Task 1

In this lab, you will configure the two routers, R1 and R2, with IPv6 so that they can communicate. The routers are missing all the configuration necessary to support IPv6. To establish IPv6 on Cisco routers, there are two basic steps. First, you must configure the routers for IPv6 forwarding. Next, you should configure the interfaces with specified IPv6 addresses. This lab tests your ability to configure support for IPv6 and verify the configuration. The IPv6 addresses are provided in Table 1. You will not use the PCs in this lab.

Step 1.   Enter the privileged mode on Router R1 and enter the command to enable IPv6 routing. List the steps required to enable IPv6 routing.

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

Step 2.   Enter privileged mode on Router R2 and enter the command to enable IPv6 routing. List the steps required to enable IPv6 routing.

```
R2(config)# ipv6 unicast-routing
```

Step 3.   In the next step, you now need to add IPv6 addresses to the WAN interfaces. Add the IPv6 address 2001:C16C:0000:0001:0000:0000:0000:0001/64 to the serial 0/0/0 interface of R1. What command is required to add this address? Add the address and enable the interface.

```
R1(config)# interface serial 0/0/0
R1(config-if)# ipv6 address 2001:C16C:0000:0001:0000:0000:0000:0001/64
R1(config-if)# clock rate 1536000
R1(config-if)# no shutdown
%LINK-3-UPDOWN: Interface Serial0/0/0, changed state to down
R1(config-if)#
```

Step 4.   Next add the IPv6 address to the serial interface of R2. You are to use the abbreviated version of IPv6 address 2001:C16C:0000:0001:0000:0000:0000:0002/64, add the address to the serial 0/0/1 interface of R2, and enable the interface. List the command sequence used.

```
R2(config)# int s0/0/1
R2(config-if)# ipv6 address 2001:C16C:0:1::2/64
R2(config-if)# no shutdown
%LINK-3-UPDOWN: Interface Serial0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to
  up
R2(config-if)#
```

Step 5.   Use the command on R1 to observe the address added to the serial 0/0/0 interface. What command is used? What addresses are shown?

```
R1# sh ipv6 interface
Serial0/0/0 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::213:19FF:FE7B:1101/64
  No Virtual link-local address(es):
  Global unicast address(es):
    2001:C16C:0:1::1, subnet is 2001:C16C:0:1::/64
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::0001:FF00:0001
```

```
    MTU is 1500 bytes
    ICMP error messages limited to one every 100 milliseconds
    ICMP redirects are enabled
    ICMP unreachables are sent
    ND DAD is enabled, number of DAD attempts: 1
    ND reachable time is 30000 milliseconds
    Hosts use stateless autoconfig for addresses.
```

Step 6.   Issue the **show running-config** command on R1 and examine the command you added to add the IPv6 address to the serial 0/0/0 interface. What address is shown in the command? What has changed from the original entry?

ipv6 address 2001:C16C:0:1::1/64.

IPv6 addresses can be abbreviated by dropping leading zeros and substituting :: for successive fields of zeros. Cisco IOS will always reduce IPv6 addresses to the shortest format possible.

Step 7.   Next, use the **show ipv6 interface brief** command to verify that the serial interface is operational. What indicates that the serial 0/0/0 interface is operational?

```
R1# SH ipv6 interface brief
FastEthernet0/0    [administratively down/down]
      unassigned
FastEthernet0/1    [administratively down/down]
      unassigned
Serial0/0/0        [up/up]
      FE80::0213:19FF:FE7B:1101
      2001:C16C:0:1::1
Serial0/0/1        [administratively down/down]
      unassigned
```

Step 8.   Examine the IPv6 routes on R2 with the **show ipv6 route** command. What networks are added?

You should see these routes:

Connected: 2001:C16C:0:1::/64, S0/0/1

Local: 2001:C16C:0:1::2/128, S0/0/1

```
R1# sh ipv6 route
IPv6 Routing Table - 4 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
L   2001:C16C:0:1::1/128 [0/0]
     via ::, Serial0/0/0
C   2001:C16C:0:1::/64 [0/0]
     via ::, Serial0/0/0
L   FE80::/10 [0/0]
     via ::, Null0
L   FF00::/8 [0/0]
     via ::, Null0
```

Step 9. Verify IPv6 connectivity between the two routers. To do this, use the **ping ipv6** command to ping from R2 to the IPv6 address of R1's serial interface. Was the ping successful? List the command used to verify IPv6 connectivity.

```
R2# ping ipv6 2001:C16C:0:1::1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:C16C:0:1::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/4 ms
```

Step 10. In the next step, you are to assign the host name R1-WAN to R1's s0/0/0 IP address using the **ipv6 host R1-LAN 2001:C16C:0:1::1/64** command.

Assign the host name R2-WAN to R2's s0/0/0 IP address using the **ipv6 host R2-LAN 2001:C16C:0:1::2/64** command.

Now test the **ping** command using the newly assigned host names for R1 and R2. List the commands used and the result.

```
R2(config)# ipv6 host R1-WAN 2001:C16C:0:1::1

R2# ping R1-LAN
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:C16C:0:1::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/4 ms
R2#
```

Step 11. Next, you are to configure the IPv6 addresses on the LAN interfaces. For this configuration, you will use the EUI-64 format. For R1's Fast Ethernet 0/0 interface, use the IPv6 subnetwork address 2001:C16C:0000:0002:0000:0000:0000:0000/64. What is the abbreviated format for this network?

2001:C16C:0:2::/64

Step 12. List the command that is used to configure the IPv6 address on the Fast Ethernet 0/0 interface of R1. You are to use the abbreviated address format and the **eui-64** option to specify the ID of the interface. Add the IPv6 addresses to R1's Fa0/0 interface using the **eui-64** option and enable the interface. List the commands required to do this.

```
R1(config)# int fa0/0
R1(config-if)# ipv6 address 2001:C16C:0000:0002::/64 eui-64
R1(config-if)# no shutdown
%LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state
  to up
```

Step 13. Next, add the IPv6 address to the R2 Fa0/0 interface. You are to use a subnet address of 2001:C16C:0:3::/64 and the **eui-64** option. Also, enable the interface. List the command sequence required to do this.

```
R2(config)# int fa0/0
R2(config-if)# ipv6 address 2001:C16C:0:3::/64 eui-64
R2(config-if)# no shutdown
%LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state
  to up
```

Step 14. Use the **show ipv6 interface brief** command to verify that R2's Fa0/0 interface is properly configured. What indicates that the interface is properly configured?

```
R2# sh ipv6 interface brief
FastEthernet0/0     [up/up]
   FE80::0213:19FF:FE7B:2201
   2001:C16C:0:3
FastEthernet0/1     [administratively down/down]
   unassigned
Serial0/0/0         [administratively down/down]
   unassigned
Serial0/0/1         [up/up]
   FE80::0213:19FF:FE7B:2201
   2001:C16C:0:1::1
```

Step 15. On Router R2, enter the **show ipv6 interface brief** command to confirm that the correct address has been added. Verify that you have proper routes for your network.

```
R2# sh ipv6 route
IPv6 Routing Table - 6 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
L   2001:C16C:0:3:213:19FF:FE7B:2201/128 [0/0]
     via ::, FastEthernet0/0
C   2001:C16C:0:3::/64 [0/0]
     via ::, FastEthernet0/0
L   2001:C16C:0:1::2/128 [0/0]
     via ::, Serial0/0/1
C   2001:C16C:0:1::/64 [0/0]
     via ::, Serial0/0/1
L   FE80::/10 [0/0]
     via ::, Null0
L   FF00::/8 [0/0]
     via ::, Null0

R2#
```

Task 2: Configuration List

The following is a partial list of the items displayed when you issue the **show running-configuration [sh run]** command on a switch. Your task is to define each item and its purpose. You might need to go to the Cisco website (http://www.cisco.com) and look up what each of these commands means.

1. **ipv6 unicast-routing**

   To enable the forwarding of IPv6 unicast datagrams, use the **ipv6 unicast-routing** command in global configuration mode.

2. **no ipv6 unicast-routing**

   Disables the forwarding of IPv6 unicast datagrams.

3. **ipv6 address 2001:C16C:0:2:213:19FF:FE7B:1101/64 eui-64**

   This command is used to define an IPv6 address to an interface using the MAC address of 0013.197b.1101. The FFFE is placed in the middle of the MAC address. This places the address in EUI-64 form. The "universal/local" bit (bit 7 from the left) is changed from a zero to a one. This gives us the modified EUI-64 interface ID.

4. **no ip domain lookup**

   This disables the IP Domain Name System (DNS)–based host name–to–address translation.

5. **ipv6 address 2001:C16C:0:1::1/64**

   This command is used to define an IPv6 address to an interface using the abbreviated IPv6 address using the double colon.

6. **ipv6 host R1-LAN 30ef:1:2:aaaa::1**

   Assigns the host name R1-LAN to 30ef:1:2:aaaa::1.

7. **ipv6 rip ciscopress enable**

   Creates the RIPng process named ciscopress and enables RIPng on the interface.

8. **ipv6 router rip ciscopress**

   Creates the RIPng process named ciscopress if it has not already been created and moves to router configuration mode.

9. **ipv6 summary-address eigrp 1 2001:0DB8:0:1::/64**

   The **ipv6 summary-address eigrp** command is used to configure interface-level address summarization. EIGRP for IPv6 summary routes are given an administrative distance value of 5. The administrative distance metric is used to advertise a summary address without installing it in the routing table.

10. Router(config-if)# **ipv6 traffic-filter cisco in**

    This filters inbound IPv6 traffic as defined by the access list named cisco.

Router R1 – Show run

```
R1# sh run
Building configuration...
Current configuration : 800 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R1
!
boot-start-marker
boot-end-marker
!
!
no aaa new-model
!
resource policy
!
!
!
ip cef
```

```
!
!
no ip domain lookup
ipv6 unicast-routing
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
interface FastEthernet0/0
 no ip address
 ipv6 address 2001:C16C:0:2:213:19FF:FE7B:1101/64 eui-64
!
interface FastEthernet0/1
 no ip address
 shutdown
!
interface Serial0/0/0
 no ip address
 ipv6 address 2001:C16C:0:1::1/64
 clock rate 1536000
!
interface Serial0/0/1
 no ip address
 shutdown
!
log-adjacency-changes
!
!
!
ip http server
no ip http secure-server
!
!
!
!
!
!
!
!
control-plane
!
!
!
!
```

```
!
!
!
!
!
!
!
!
line con 0
  password  ciscopress
  login
line aux 0
line vty 0 4
 no login
!
scheduler allocate 20000 1000
!
end
R1#
```

Router R2 – Show run

```
R2# sh run
Building configuration...
Current configuration : 800 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R2
!
boot-start-marker
boot-end-marker
!
!
no aaa new-model
!
resource policy
!
!
!
ip cef
!
!
no ip domain lookup
ipv6 unicast-routing
!
!
!
!
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!
!
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!
!
```

```
!
!
!
!
!
!
!
interface FastEthernet0/0
 no ip address
 ipv6 address 2001:C16C:0:3/64
 ipv6 address 2001:C16C:0:3:213:19FF:FE7B:2201/64 eui-64
!
interface FastEthernet0/1
 no ip address
 shutdown
!
interface Serial0/0/0
 no ip address
 shutdown
!
interface Serial0/0/1
 no ip address
 ipv6 address 2001:C16C:0:1::1/64
!
log-adjacency-changes
!
!
!
ip http server
no ip http secure-server
!
!
!
!
!
!
!
!
control-plane
!
!
!
!
!
!
!
!
!
!
line con 0
  password  ciscopress
  login
line aux 0
line vty 0 4
 no login
!
scheduler allocate 20000 1000
!
end
R2#
```