Lab ID: 9.9K914A110.SAI2.1

Stand-Alone Lab: Configuring IPv6 Routing

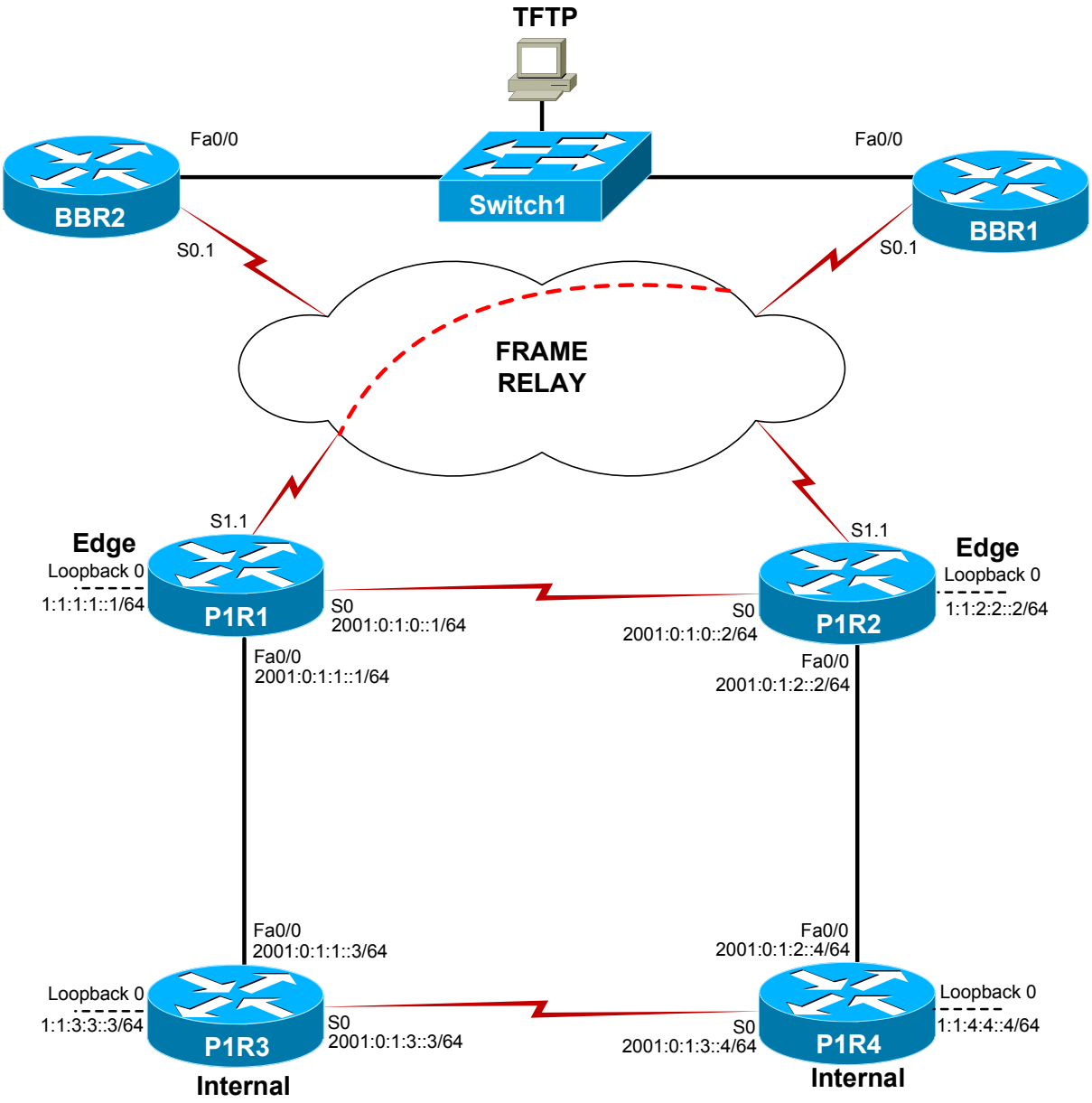
Objective

Configure Internet Protocol version 6 (IPv6) addresses, and configure P1R1, P1R2, P1R3, and P1R4 for IPv6 routing. Connectivity to the backbone is not required.

IPv6 routing will be run within Pod 1. IPv4 and Enhanced Interior Gateway Routing Protocol (EIGRP) routing are configured on the routers when you load the lab by using the Lab Navigator.

Lab Topology

The topology diagram below represents the NetMap in the Simulator.



Command Summary

Command	Description
configure terminal	enters global configuration mode from privileged EXEC mode
enable	enters privileged EXEC mode
end	ends and exits configuration mode
exit	exits one level in the menu structure
interface *type number*	changes from global configuration mode to interface configuration mode
ipv6 address *address/prefix-length*	configures an IPv6 address for an interface
ipv6 cef	enables Cisco Express Forwarding (CEF) for IPv6
ipv6 unicast-routing	enables IPv6 routing
ping ipv6 *ipv6-address*	sends an Internet Control Message Protocol (ICMP) echo request to the specified IPv6 address
show ipv6 interface	displays IPv6 interface information
show ipv6 interface brief	displays a brief summary of each IPv6 interface's configuration and status
show ipv6 route	displays the IPv6 routing table
show running-config	displays the active configuration file

The IP addresses and subnet masks used in this lab are shown in the table below:

IP Addresses

Device	Interface	IPv6 Address and Subnet Mask
P1R1	Serial 0	2001:0:1:0::1/64
	FastEthernet 0/0	2001:0:1:1::1/64
	Loopback 0	1:1:1:1::1/64
P1R2	Serial 0	2001:0:1:0::2/64
	FastEthernet 0/0	2001:0:1:2::2/64
	Loopback 0	1:1:2:2::2/64
P1R3	Serial 0	2001:0:1:3::3/64
	FastEthernet 0/0	2001:0:1:1::3/64
	Loopback 0	1:1:3:3::3/64
P1R4	Serial 0	2001:0:1:3::4/64
	FastEthernet 0/0	2001:0:1:2::4/64
	Loopback 0	1:1:4:4::4/64

Lab Tasks

1. Enable IPv6 routing on the P1R1, P1R2, P1R3, and P1R4.

2. Configure the routers to run CEF for IPv6.

3. Configure the appropriate IPv6 addresses on the interfaces; refer to the IP Addresses table.

4. Verify the IPv6 configuration on the routers.

5. Verify that each router is able to ping its locally configured IPv6 addresses.

6. Verify that each edge router can ping the IPv6 address of the internal router to which it is connected via its FastEthernet interface.

Lab Solutions

1. You should issue the **ipv6 unicast-routing** command on P1R1, P1R2, P1R3, and P1R4 to enable IPv6 routing:

```
P1R1(config)#ipv6 unicast-routing

P1R2(config)#ipv6 unicast-routing

P1R3(config)#ipv6 unicast-routing

P1R4(config)#ipv6 unicast-routing
```

2. You should issue the **ipv6 cef** command on all four routers to configure the routers to run CEF for IPv6:

```
P1R1(config)#ipv6 cef

P1R2(config)#ipv6 cef

P1R3(config)#ipv6 cef

P1R4(config)#ipv6 cef
```

3. You should issue the following commands to configure the appropriate IPv6 addresses:

```
P1R1(config)#interface serial 0
P1R1(config-if)#ipv6 address 2001:0:1:0::1/64
P1R1(config-if)#interface fastethernet 0/0
P1R1(config-if)#ipv6 address 2001:0:1:1::1/64
P1R1(config-if)#interface loopback 0
P1R1(config-if)#ipv6 address 1:1:1:1::1/64

P1R2(config)#interface serial 0
P1R2(config-if)#ipv6 address 2001:0:1:0::2/64
P1R2(config-if)#interface fastethernet 0/0
P1R2(config-if)#ipv6 address 2001:0:1:2::2/64
P1R2(config-if)#interface loopback 0
P1R2(config-if)#ipv6 address 1:1:2:2::2/64

P1R3(config)#interface serial 0
P1R3(config-if)#ipv6 address 2001:0:1:3::3/64
P1R3(config-if)#interface fastethernet 0/0
P1R3(config-if)#ipv6 address 2001:0:1:1::3/64
P1R3(config-if)#interface loopback 0
P1R3(config-if)#ipv6 address 1:1:3:3::3/64

P1R4(config)#interface serial 0
P1R4(config-if)#ipv6 address 2001:0:1:3::4/64
P1R4(config-if)#interface fastethernet 0/0
P1R4(config-if)#ipv6 address 2001:0:1:2::4/64
P1R4(config-if)#interface loopback 0
P1R4(config-if)#ipv6 address 1:1:4:4::4/64
```

4. You should issue the **show ipv6 interface** command to verify the IPv6 configuration on the routers, as shown in the following sample output from P1R1:

```
P1R1#show ipv6 interface
Serial0 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::020C:39FF:FE62:6232
  Global unicast address(es):
    2001:0:1::1, subnet is 2001:0:1::/64
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:FF00:1
    FF02::1: FF62:6232
  MTU is 1500 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are enabled
    ND DAD is enabled, number of DAD attempts: 1
  ND reachable time is 30000 milliseconds
  Hosts use stateless autoconfig for addresses.
FastEthernet0/0 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::020C:39FF:FE62:6232
  Global unicast address(es):
    2001:0:1:1::1, subnet is 2001:0:1:1::/64
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:FF00:1
    FF02::1: FF62:6232
  MTU is 1500 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are enabled
  ND DAD is enabled, number of DAD attempts: 1
  ND reachable time is 30000 milliseconds
  Hosts use stateless autoconfig for addresses.
Loopback0 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::020C:39FF:FE62:6232
  Global unicast address(es):
    1:1:1:1::1, subnet is 1:1:1:1::/64
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:FF00:1
    FF02::1: FF62:6232
  MTU is 1500 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are enabled
   ND DAD is enabled, number of DAD attempts: 1
  ND reachable time is 30000 milliseconds
  Hosts use stateless autoconfig for addresses.
```

5. You should issue the following commands to verify that each router is able to ping its locally configured IPv6 addresses:

```
P1R1#ping ipv6 2001:0:1:1::1
P1R1#ping ipv6 2001:0:1:0::1
P1R1#ping ipv6 1:1:1:1::1

P1R2#ping ipv6 2001:0:1:0::2
P1R2#ping ipv6 2001:0:1:2::2
P1R2#ping ipv6 1:1:2:2::2

P1R3#ping ipv6 2001:0:1:1::3
P1R3#ping ipv6 2001:0:1:3::3
P1R3#ping ipv6 1:1:3:3::3

P1R4#ping ipv6 2001:0:1:3::4
P1R4#ping ipv6 2001:0:1:2::4
P1R4#ping ipv6 1:1:4:4::4
```

6. You should issue the following commands to verify that each edge router can ping the IPv6 address of the internal router to which it is connected via its FastEthernet interface:

```
P1R1#ping ipv6 2001:0:1:1::3

P1R2#ping ipv6 2001:0:1:2::4
```

Sample Configuration Scripts

P1R1 (Edge Router)

```
P1R1#show running-config
Building configuration...
Current configuration : 980 bytes
!
Version 12.3
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname P1R1
!
ip subnet-zero
!
ip cef
no ip domain-lookup
!
ipv6 unicast-routing
ipv6 cef
!
interface Loopback0
 ip address 1.1.1.1 255.255.255.255
 ipv6 address 1:1:1:1::1/64
 no ip directed broadcast
!
interface Serial0
 ip address 10.1.0.1 255.255.255.0
 no ip directed-broadcast
 clock rate 64000
 ipv6 address 2001:0:1::1/64
!
```

P1R1 (Edge Router) (*continued*)

```
interface Serial1
 no ip address
 no ip directed-broadcast
!
interface FastEthernet0/0
 ip address 10.1.1.1 255.255.255.0
 no ip directed-broadcast
 ipv6 address 2001:0:1:1::1/64
!
interface FastEthernet0/1
 no ip address
 no ip directed-broadcast
!
router eigrp 100
 network 10.0.0.0
 network 172.31.0.0
 auto-summary
!
ip classless
no ip http server
!
line con 0
line aux 0
line vty 0 4
!
no scheduler allocate
end
```

P1R2 (Edge Router)	P1R2 (Edge Router) (*continued*)
P1R2#show running-config Building configuration... Current configuration : 940 bytes ! Version 12.3 service timestamps debug uptime service timestamps log uptime no service password-encryption ! hostname P1R2 ! ip subnet-zero ! ip cef no ip domain-lookup ! ipv6 unicast-routing ipv6 cef ! interface Loopback0 ip address 1.1.2.2 255.255.255.255 ipv6 address 1:1:2:2::2/64 no ip directed broadcast ! interface Serial0 ip address 10.1.0.2 255.255.255.0 no ip directed-broadcast ipv6 address 2001:0:1::2/64 !	interface Serial1 no ip address no ip directed-broadcast ! interface FastEthernet0/0 ip address 10.1.2.2 255.255.255.0 no ip directed-broadcast ipv6 address 2001:0:1:2::2/64 ! interface FastEthernet0/1 no ip address no ip directed-broadcast ! router eigrp 100 network 10.0.0.0 auto-summary ! ip classless no ip http server ! line con 0 line aux 0 line vty 0 4 ! no scheduler allocate end

P1R3 (Internal Router)	P1R3 (Internal Router) (*continued*)
P1R3#show running-config Building configuration... Current configuration : 961 bytes ! Version 12.3 service timestamps debug uptime service timestamps log uptime no service password-encryption ! hostname P1R3 ! ip subnet-zero ! ip cef no ip domain-lookup ! ipv6 unicast-routing ipv6 cef ! interface Loopback0 ip address 1.1.3.3 255.255.255.255 ipv6 address 1:1:3:3::3/64 no ip directed broadcast ! interface Serial0 ip address 10.1.3.3 255.255.255.0 no ip directed-broadcast clock rate 64000 ipv6 address 2001:0:1:3::3/64 !	interface Serial1 no ip address no ip directed-broadcast ! interface FastEthernet0/0 ip address 10.1.1.3 255.255.255.0 no ip directed-broadcast ipv6 address 2001:0:1:1::3/64 ! interface FastEthernet0/1 no ip address no ip directed-broadcast ! router eigrp 100 network 10.0.0.0 auto-summary ! ip classless no ip http server ! line con 0 line aux 0 line vty 0 4 ! no scheduler allocate end

P1R4 (Internal Router)	P1R4 (Edge Router) (*continued*)
P1R4#show running-config Building configuration... Current configuration : 942 bytes ! Version 12.3 service timestamps debug uptime service timestamps log uptime no service password-encryption ! hostname P1R4 ! ip subnet-zero ! ip cef no ip domain-lookup ! ipv6 unicast-routing ipv6 cef ! interface Loopback0 ip address 1.1.4.4 255.255.255.255 ipv6 address 1:1:4:4::4/64 no ip directed broadcast ! interface Serial0 ip address 10.1.3.4 255.255.255.0 no ip directed-broadcast ipv6 address 2001:0:1:3::4/64 !	interface Serial1 no ip address no ip directed-broadcast ! interface FastEthernet0/0 ip address 10.1.2.4 255.255.255.0 no ip directed-broadcast ipv6 address 2001:0:1:2::4/64 ! interface FastEthernet0/1 no ip address no ip directed-broadcast ! router eigrp 100 network 10.0.0.0 auto-summary ! ip classless no ip http server ! line con 0 line aux 0 line vty 0 4 ! no scheduler allocate end