Lab ID: 9.9K614A111.SAI1.1

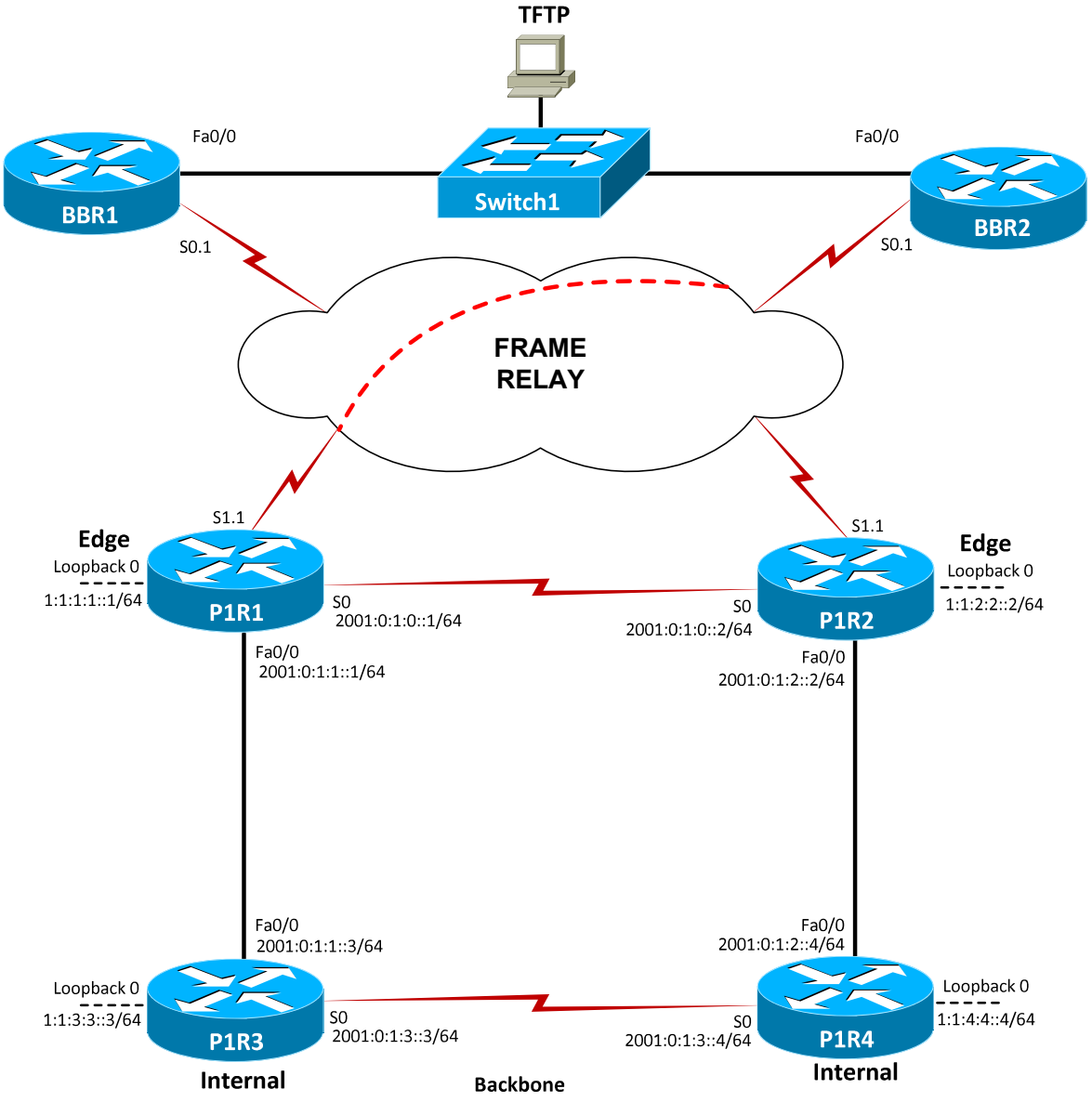
Stand-Alone Lab: Configuring Static and OSPFv3 Routing

Objective

In this lab, you will configure an IPv6 static default route for the Internal routers. You will also configure the Edge routers for Internet Protocol version 6 (IPv6) Open Shortest Path First (OSPF) routing. The Edge routers will be in OSPF version 3 (OSPFv3) Area 0. Connectivity to the backbone is not required.

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 ospf *process-id* **area** *area-id*	configures an interface to run OSPFv3
ipv6 route *network/length next-hop*	configures a static route for IPv6
ipv6 router ospf *process-id*	configures global options for OSPFv3
ping ipv6 *ipv6-address*	sends an Internet Control Message Protocol (ICMP) echo request to the specified IPv6 address
router-id *ipv4 address*	defines the router ID for the OSPFv3 process; is required only if the router is IPv6 only
show ipv6 route	displays the IPv6 route table
show ipv6 ospf interface	displays OSPFv3 interface information
show ipv6 ospf neighbor	displays a list of all OSPFv3 neighbors

Lab Tasks

1. On each Internal router, configure an IPv6 static default route. The next hop should be the FastEthernet interface on the corresponding Edge router.

2. Verify that each Internal router can ping the IPv6 address on the loopback interface of the corresponding Edge router.

3. On each Edge router, configure the IPv4 address of the Loopback 0 interface as the OSPFv3 router ID; use process ID **1**.

4. On each Edge router, enable OSPFv3 on all IPv6 interfaces; use process ID **1** and Area 0.

5. On each Edge router, verify the OSPFv3 interface configuration.

6. On each Edge Router, verify that P1R1 and P1R2 have formed an adjacency.

7. On P1R1, display the IPv6 routing table.

8. Verify that each Internal router is able to ping the loopback interfaces of both Edge routers.

Lab Solutions

1. You should issue the following commands on P1R3 and P1R4, which are the Internal routers, to configure an IPv6 default route with the next hop as the FastEthernet interface on the corresponding Edge router:

```
P1R3>enable
P1R3#configure terminal
P1R3(config)#ipv6 route ::/0 2001:0:1:1::1

P1R4>enable
P1R4#configure terminal
P1R4(config)#ipv6 route ::/0 2001:0:1:2::2
```

2. You should issue the following commands to verify that each Internal router can ping the IPv6 address on the loopback interface of the corresponding Edge router:

```
P1R3(config)#end
P1R3#ping ipv6 1:1:1:1::1

P1R4(config)#end
P1R4#ping ipv6 1:1:2:2::2
```

3. You should issue the following commands on P1R1 and P1R2, which are Edge routers, to configure the IPv4 address of their Loopback 0 interfaces as the OSPFv3 router ID:

```
P1R1>enable
P1R1#configure terminal
P1R1(config)#ipv6 router ospf 1
P1R1(config-rtr)#router-id 1.1.1.1

P1R2>enable
P1R2#configure terminal
P1R2(config)#ipv6 router ospf 1
P1R2(config-rtr)#router-id 1.1.2.2
```

4. You should issue the following commands on each Edge router to enable OSPFv3 on all IPv6 interfaces:

```
P1R1(config-rtr)#interface serial 0
P1R1(config-if)#ipv6 ospf 1 area 0
P1R1(config-if)#interface fastethernet 0/0
P1R1(config-if)#ipv6 ospf 1 area 0
P1R1(config-if)#interface loopback 0
P1R1(config-if)#ipv6 ospf 1 area 0

P1R2(config-rtr)#interface serial 0
P1R2(config-if)#ipv6 ospf 1 area 0
P1R2(config-if)#interface fastethernet 0/0
P1R2(config-if)#ipv6 ospf 1 area 0
P1R2(config-if)#interface loopback 0
P1R2(config-if)#ipv6 ospf 1 area 0
```

5. You should issue the **show ipv6 ospf interface** command to verify the OSPFv3 interface configuration on the Edge routers, as shown in the following sample output from P1R1:

```
P1R1(config-if)#end
P1R1#show ipv6 ospf interface
FastEthernet0/0 is up, line protocol is up
  Link Local Address FF80:20C:81FF:FE73:8769, Interface ID 3
  Area 0, Process 1, Instance ID 0, Router ID 1.1.1.1
  Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 2001:0:1:1::1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:00
  Supports Link-local Signaling (LLS)
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 0, maximum is 0
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Loopback0 is up, line protocol is up
  Link Local Address FF80:20C:81FF:FE73:8769, Interface ID 5
  Area 0, Process 1, Instance ID 0, Router ID 1.1.1.1
  Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
Serial0 is up, line protocol is up
  Link Local Address FF80:20C:81FF:FE73:8769, Interface ID 1
  Area 0, Process 1, Instance ID 0, Router ID 1.1.1.1
  Network Type POINT_TO_POINT, Cost: 64
  Transmit Delay is 1 sec, State POINT_TO_POINT
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:00
  Supports Link-local Signaling (LLS)
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 0, maximum is 0
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 1.1.2.2
  Suppress hello for 0 neighbor(s)
```

6. You should issue the **show ipv6 ospf neighbor** command to verify that P1R1 and P1R2 have formed an adjacency. Sample output is shown below:

```
P1R1#show ipv6 ospf neighbor
Neighbor ID     Pri   State           Dead Time   Interface ID    Interface
1.1.2.2         0     FULL/  -        00:00:35    1               Serial0

P1R2(config-if)#end
P1R2#show ipv6 ospf neighbor
Neighbor ID     Pri   State           Dead Time   Interface ID    Interface
1.1.1.1         0     FULL/  -        00:00:32    1               Serial0
```

7. You should issue the **show ipv6 route** command to display the IPv6 routing table for P1R1. Sample output is shown below:

```
P1R1#show ipv6 route
IPv6 Routing Table
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
C   1:1:1:1::/64 [0/0]
     via Loopback0, directly connected
L   1:1:1:1::1/128 [0/0]
     via Loopback0, receive
C   2001:0:1:1::/64 [0/0]
     via FastEthernet0/0, directly connected
L   2001:0:1:1::1/128 [0/0]
     via FastEthernet0/0, receive
C   2001:0:1::/64 [0/0]
     via Serial0, directly connected
L   2001:0:1::1/128 [0/0]
     via Serial0, receive
O   1:1:2:2::/64 [110/65]
     via FE80::20C:21FF:FE10:5542, Serial0
O   2001:0:1:2::/64 [110/65]
     via FE80::20C:21FF:FE10:5542, Serial0
L   FF00::/8 [0/0]
     via Null0, receive
```

8. You should issue the following commands to verify that each Internal router is able to ping the loopback interfaces of both Edge routers:

```
P1R3#ping ipv6 1:1:1:1::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1:1:1:1::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

P1R3#ping ipv6 1:1:2:2::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1:1:2:2::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/29/32 ms

P1R4#ping ipv6 1:1:1:1::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1:1:1:1::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

P1R4#ping ipv6 1:1:2:2::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1:1:2:2::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/29/32 ms
```

Sample Configuration Scripts

P1R1 (Edge Router)

```
P1R1#show running-config
Building configuration...
Current configuration : 1120 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
 ipv6 ospf 1 area 0
 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
 ip ospf 2 area 0
 ipv6 ospf 1 area 0
!
interface Serial1
 no ip address
 no ip directed-broadcast
!
```

P1R1 (continued)

```
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
 ip ospf 2 area 0
 ipv6 ospf 1 area 0
!
interface FastEthernet0/1
 no ip address
 no ip directed-broadcast
!
router ospf 2
 log-adjacency-changes
!
ipv6 router ospf 1
 router-id 1.1.1.1
 log-adjacency-changes
!
ip classless
no ip http server
!
line con 0
line aux 0
line vty 0 4
!
no scheduler allocate
end
```

P1R2 (Edge Router)	P1R2 (continued)
P1R2#show running-config Building configuration... Current configuration : 1101 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 ipv6 ospf 1 area 0 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 ip ospf 2 area 0 ipv6 ospf 1 area 0 ! 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 ip ospf 2 area 0 ipv6 ospf 1 area 0 ! interface FastEthernet0/1 no ip address no ip directed-broadcast ! router ospf 2 log-adjacency-changes ! ipv6 router ospf 1 router-id 1.1.2.2 log-adjacency-changes ! ip classless no ip http server ! line con 0 line aux 0 line vty 0 4 ! no scheduler allocate end

P1R3 (Internal Router)	P1R4 (Internal Router)
P1R3#show running-config Building configuration... Current configuration : 937 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 ! ip classless no ip http server ! ipv6 route ::/0 2001:0:1:1::1 ! line con 0 line aux 0 line vty 0 4 ! no scheduler allocate end	P1R4#show running-config Building configuration... Current configuration : 918 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 ! ip classless no ip http server ! ipv6 route ::/0 2001:0:1:2::2 ! line con 0 line aux 0 line vty 0 4 ! no scheduler allocate end