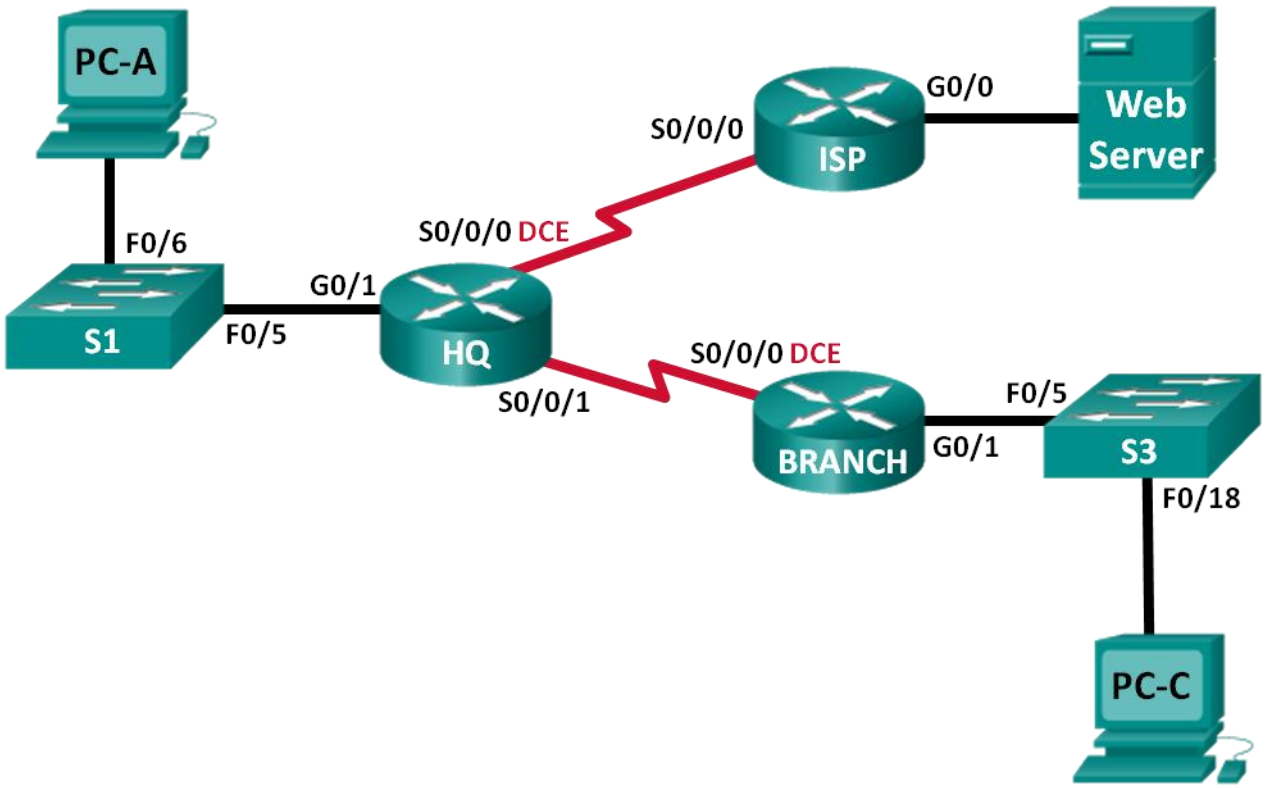
Lab – Troubleshooting IPv4 and IPv6 Static Routes (Solution)

Topology



Addressing Table

Device	Interface	IP Address	Default Gateway
HQ	G0/1	192.168.0.1/25 2001:DB8:ACAD::1/64 FE80::1 link-local	N/A
	S0/0/0 (DCE)	10.1.1.2/30 2001:DB8:ACAD:20::2/64	N/A
	S0/0/1	192.168.0.253/30 2001:DB8:ACAD:2::1/30	N/A
ISP	G0/0	172.16.3.1/24 2001:DB8:ACAD:30::1/64 FE80::1 link-local	N/A
	S0/0/0	10.1.1.1/30 2001:DB8:ACAD:20::1/64	N/A
BRANCH	G0/1	192.168.1.1/24 2001:DB8:ACAD:1::1/64 FE80::1 link-local	N/A
	S0/0/0 (DCE)	192.168.0.254/30 2001:DB8:ACAD:2::2/64	N/A
S1	VLAN 1	N/A	N/A
S3	VLAN 1	N/A	N/A
PC-A	NIC	192.168.0.3/25 2001:DB8:ACAD::3/64	192.168.0.1 FE80::1
Web Server	NIC	172.16.3.3/24 2001:DB8:ACAD:30::3/64	172.16.3.1 FE80::1
PC-C	NIC	192.168.1.3/24 2001:DB8:ACAD:1::3/64	192.168.1.1 FE80::1

Objectives

Part 1: Build the Network and Configure Basic Device Settings

Part 2: Troubleshoot Static Routes in an IPv4 Network

Part 3: Troubleshoot Static Routes in an IPv6 Network

Background / Scenario

As a network administrator, you must be able to configure routing of traffic using static routes. Understanding how to configure and troubleshoot static routing is a requirement. Static routes are commonly used for stub networks and default routes. Your company's ISP has hired you to troubleshoot connectivity issues on the network. You will have access to the HQ, BRANCH, and the ISP routers.

In this lab, you will begin by loading configuration scripts on each of the routers. These scripts contain errors that will prevent end-to-end communication across the network. You will need to troubleshoot each router to determine the configuration errors, and then use the appropriate commands to correct the configurations. When you have corrected all of the configuration errors, the hosts on the network should be able to communicate with each other.

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

- 3 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)
- 3 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 set up the network topology and configure the routers and switches with some basic settings, such as passwords and IP addresses. Preset configurations are also provided for you for the initial router configurations. You will also configure the IP settings for the PCs in the topology.

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

Attach the devices as shown in the topology diagram and cable, as necessary.

Step 2: Initialize and reload the routers and switches.

Step 3: Configure basic settings for each router.

a. Disable DNS lookup.

b. Configure device name as shown in the topology.

c. Assign **class** as the privileged EXEC mode password.

d. Assign **cisco** as the console and vty passwords.

e. Configure **logging synchronous** to prevent console messages from interrupting command entry.

Step 4: Configure hosts and Web Server.

a. Configure IP addresses for IPv4 and IPv6.

b. Configure IPv4 default gateway.

Step 5: Load router configurations.

Router HQ

```
hostname HQ
ipv6 unicast-routing
interface GigabitEthernet0/1
 ipv6 address 2001:DB8:ACAD::1/64
 ip address 192.168.0.1 255.255.255.128
 ipv6 address FE80::1 link-local
!no shutdown
interface Serial0/0/0
 ipv6 address 2001:DB8:ACAD:20::2/64
 ip address 10.1.1.2 255.255.255.252
 clock rate 800000
 no shutdown
interface Serial0/0/1
 ipv6 address 2001:DB8:ACAD:2::3/64
!ipv6 address 2001:DB8:ACAD:2::1/64
 ip address 192.168.0.253 255.255.255.252
 no shutdown
ip route 172.16.3.0 255.255.255.0 10.1.1.1
ip route 192.168.1.0 255.255.255.0 192.16.0.254
!ip route 192.168.1.0 255.255.255.0 192.168.0.254
ipv6 route 2001:DB8:ACAD:1::/64 2001:DB8:ACAD:2::2
ipv6 route 2001:DB8:ACAD:30::/64 2001:DB8:ACAD::20:1
!ipv6 route 2001:DB8:ACAD:30::/64 2001:DB8:ACAD:20::1
```

Router ISP

```
hostname ISP
ipv6 unicast-routing
interface GigabitEthernet0/0
 ipv6 address 2001:DB8:ACAD:30::1/64
 ip address 172.16.3.11 255.255.255.0
!ip address 172.16.3.1 255.255.255.0
 ipv6 address FE80::1 link-local
 no shutdown
interface Serial0/0/0
 ipv6 address 2001:DB8::ACAD:20:1/64
!ipv6 address 2001:DB8:ACAD:20::1/64
 ip address 10.1.1.1 255.255.255.252
 no shutdown
ip route 192.168.1.0 255.255.255.0 10.1.1.2
!ip route 192.168.0.0 255.255.254.0 10.1.1.2
ipv6 route 2001:DB8:ACAD::/62 2001:DB8:ACAD:20::2
```

Router BRANCH

```
hostname BRANCH
ipv6 unicast-routing
interface GigabitEthernet0/1
```

```
 ipv6 address 2001:DB8:ACAD:1::1/64
 ip address 192.168.1.1 255.255.255.0
 ipv6 address FE80::1 link-local
 no shutdown
interface Serial0/0/0
 ipv6 address 2001:DB8:ACAD:2::2/64
 clock rate 128000
 ip address 192.168.0.249 255.255.255.252
!ip address 192.168.0.254 255.255.255.252
 clock rate 128000
 no shutdown
ip route 0.0.0.0 0.0.0.0 10.1.1.2
!ip route 0.0.0.0 0.0.0.0 192.168.0.253
!ipv6 unicast-routing
ipv6 route ::/0 2001:DB8:ACAD::1
!ipv6 route ::/0 2001:DB8:ACAD:2::1
```

Part 2: Troubleshoot Static Routes in an IPv4 Network

IPv4 Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
HQ	G0/1	192.168.0.1	255.255.255.0	N/A
	S0/0/0 (DCE)	10.1.1.2	255.255.255.252	N/A
	S0/0/1	192.168.0.253	255.255.255.252	N/A
ISP	G0/0	172.16.3.1	255.255.255.0	N/A
	S0/0/0	10.1.1.1	255.255.255.252	N/A
BRANCH	G0/1	192.168.1.1	255.255.255.0	N/A
	S0/0/0 (DCE)	192.168.0.254	255.255.255.252	N/A
S1	VLAN 1	192.168.0.11	255.255.255.128	192.168.0.1
S3	VLAN 1	192.168.1.11	255.255.255.0	192.168.1.1
PC-A	NIC	192.168.0.3	255.255.255.128	192.168.0.1
Web Server	NIC	172.16.3.3	255.255.255.0	172.16.3.1
PC-C	NIC	192.168.1.3	255.255.255.0	192.168.1.1

Step 1: Troubleshoot the HQ router.

The HQ router is the link between the ISP router and the BRANCH router. The ISP router represents the outside network while the BRANCH router represents the corporate network. The HQ router is configured with static routes to ISP and BRANCH networks.

a. Display the status of the interfaces on HQ. Enter **show ip interface brief**. Record and resolve any issues as necessary.

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The interface g0/1 is status administratively down and protocol down. Issue the **no shutdown** command on interface g0/1 to resolve the issue.

```
HQ# show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
Embedded-Service-Engine0/0 unassigned      YES unset  administratively down down
GigabitEthernet0/0         unassigned      YES unset  administratively down down
GigabitEthernet0/1         192.168.0.1     YES manual administratively down down
Serial0/0/0                10.1.1.2        YES manual up                    up
Serial0/0/1                192.168.0.253   YES manual up                    up
```

b. Ping from HQ router to BRANCH router (192.168.0.254). Were the pings successful? _____ No

c. Ping from HQ router to ISP router (10.1.1.1). Were the pings successful? _____ Yes

d. Ping from PC-A to the default gateway. Were the pings successful? _____ Yes

e. Ping from PC-A to PC-C. Were the pings successful? _____ No

f. Ping from PC-A to Web Server. Were the pings successful? _____ No

g. Display the routing table on HQ. What non-directly connected routes are shown in the routing table?

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static route to 172.16.3.0/24 via 10.1.1.1.

no route to 192.168.1.0/24

```
HQ# show ip route
<Output omitted>

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        10.1.1.0/30 is directly connected, Serial0/0/0
L        10.1.1.2/32 is directly connected, Serial0/0/0
      172.16.0.0/24 is subnetted, 1 subnets
S        172.16.3.0 [1/0] via 10.1.1.1
      192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.0.252/30 is directly connected, Serial0/0/1
L        192.168.0.253/32 is directly connected, Serial0/0/1
```

h. Based on the results of the pings, routing table output, and static routes in the running configuration, what can you conclude about network connectivity?

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There is a static route to PC-C's network but it does not show in the route table, need to re-enter route with correct destination IP. There is a static route to the 172.16.3.0 network but the Web Server is not reachable.

```
HQ# show run | include ip route
```

```
ip route 172.16.3.0 255.255.255.0 10.1.1.1
ip route 192.168.1.0 255.255.255.0 192.16.0.254
```

i. What commands (if any) need to be entered to resolve routing issues? Record the command(s).

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```
HQ(config)# no ip route 192.168.1.0 255.255.255.0 192.16.0.254
HQ(config)# ip route 192.168.1.0 255.255.255.0 192.168.0.254
```

j. Repeat any of the steps from b to f to verify whether the problems have been resolved. Record your observations and possible next steps in troubleshooting connectivity.

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The routing problems have not been resolved. The HQ router still cannot ping the BRANCH router. This may indicate there is an issue on BRANCH router that is preventing PC-A from pinging PC-C successfully. The HQ router can reach ISP router, but PC-A cannot ping Web Server. There may be an issue on the ISP router.

```
HQ# show ip route
<Output omitted>

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        10.1.1.0/30 is directly connected, Serial0/0/0
L        10.1.1.2/32 is directly connected, Serial0/0/0
      172.16.0.0/24 is subnetted, 1 subnets
S        172.16.3.0 [1/0] via 10.1.1.1
      192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.0.252/30 is directly connected, Serial0/0/1
L        192.168.0.253/32 is directly connected, Serial0/0/1
S     192.168.1.0/24 [1/0] via 192.168.0.254
```

Step 2: Troubleshoot the ISP router.

For the ISP router, there should be a route to HQ and BRANCH routers. One static route is configured on ISP router to reach the 192.168.1.0/24, 192.168.0.0/25, and 192.168.0.252/30 networks.

a. Display the status of interfaces on ISP. Enter **show ip interface brief**. Record and resolve any issues as necessary.

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The IP address for G0/0 is incorrectly configured.

```
ISP(config)# interface GigabitEthernet0/0
ISP(config-if)# ip address 172.16.3.1 255.255.255.0
ISP# show ip interface brief
```

```
Interface                  IP-Address      OK? Method Status                Protocol
Embedded-Service-Engine0/0 unassigned      YES unset  administratively down down
GigabitEthernet0/0         172.16.3.11     YES manual up                    up
GigabitEthernet0/1         unassigned      YES unset  administratively down down
Serial0/0/0                10.1.1.1        YES manual up                    up
Serial0/0/1                unassigned      YES unset  administratively down down
```

b. Ping from the ISP router to the HQ router (10.1.1.2). Were the pings successful? _____ Yes

c. Ping from Web Server to the default gateway. Were the pings successful? _____ Yes

d. Ping from Web Server to PC-A. Were the pings successful? _____ No

e. Ping from Web Server to PC-C. Were the pings successful? _____ No

f. Display the routing table on ISP. What non-directly connected routes are shown in the routing table?

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Static route to 192.168.1.0/24 via 10.1.1.2

No route to 192.168.0.252/30

```
ISP# show ip route
<Output omitted>

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        10.1.1.0/30 is directly connected, Serial0/0/0
L        10.1.1.1/32 is directly connected, Serial0/0/0
      172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.16.3.0/24 is directly connected, GigabitEthernet0/0
L        172.16.3.1/32 is directly connected, GigabitEthernet0/0
S     192.168.1.0/24 [1/0] via 10.1.1.2
```

g. Based on the results of the pings, routing table output, and static routes in the running configuration, what can you conclude about network connectivity?

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A summary route to 192.168.0.0/23 is needed to reach both 192.168.1.0/24 and 192.168.0.252/30 network.

h. What commands (if any) need to be entered to resolve routing issues? Record the command(s).

(Hint: ISP only requires one summarized route to the company's networks 192.168.1.0/24, 192.168.0.0/25, and 192.168.0.252/32.)

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```
ISP(config)# no ip route 192.168.1.0 255.255.255.0 10.1.1.2
ISP(config)# ip route 192.168.0.0 255.255.254.0 10.1.1.2
```

i. Repeat any of the steps from b to e to verify whether the problems have been resolved. Record your observations and possible next steps in troubleshooting connectivity.

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After the correction, Web Server can reach PC-A. However, Web Server still cannot ping PC-C. There are still more unresolved issues in the network.

```
ISP# show ip route
<Output omitted>

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        10.1.1.0/30 is directly connected, Serial0/0/0
L        10.1.1.1/32 is directly connected, Serial0/0/0
      172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.16.3.0/24 is directly connected, GigabitEthernet0/0
L        172.16.3.1/32 is directly connected, GigabitEthernet0/0
S     192.168.0.0/23 [1/0] via 10.1.1.2
```

Step 3: Troubleshoot the BRANCH router.

For the BRANCH router, a default route is set to reach the rest of the network and ISP.

a. Display the status of the interfaces on BRANCH. Enter **show ip interface brief**. Record and resolve any issues, as necessary.

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The IP address for S0/0/1 is incorrectly configured.

```
BRANCH(config)# interface s0/0/0
BRANCH(config-if)# ip address 192.168.0.254 255.255.255.252

BRANCH# show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
Embedded-Service-Engine0/0 unassigned      YES unset  administratively down down
GigabitEthernet0/0         unassigned      YES unset  administratively down down
GigabitEthernet0/1         192.168.1.1     YES manual up                    up
Serial0/0/0                192.168.0.249   YES manual up                    up
Serial0/0/1                unassigned      YES unset  administratively down down
```

b. Ping from the BRANCH router to the HQ router (192.168.0.253). Were the pings successful? _____ Yes

c. Ping from PC-C to the default gateway. Were the pings successful? _____ Yes

d. Ping from PC-C to PC-A. Were the pings successful? _____ No

e. Ping from PC-C to Web Server. Were the pings successful? _____ No

f. Display the routing table on BRANCH. What non-directly connected routes are shown in the routing table?

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None.

```
BRANCH# show ip route
<Output omitted>

Gateway of last resort is not set

      192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.0.252/30 is directly connected, Serial0/0/0
L        192.168.0.254/32 is directly connected, Serial0/0/0
      192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.1.0/24 is directly connected, GigabitEthernet0/1
L        192.168.1.1/32 is directly connected, GigabitEthernet0/1
```

g. Based on the results of the pings, routing table output, and static routes in the running configuration, what can you conclude about network connectivity?

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No static routes are displayed in the routing table. The default route was configured incorrectly.

```
BRANCH# show run | include ip route
ip route 0.0.0.0 0.0.0.0 10.1.1.2
```

h. What commands (if any) need to be entered to resolve routing issues? Record the command(s).

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```
BRANCH(config)# no ip route 0.0.0.0 0.0.0.0 10.1.1.2
BRANCH(config)# ip route 0.0.0.0 0.0.0.0 192.168.0.253
```

i. Repeat any of the steps from b to e to verify whether the problems have been resolved. Record your observations and possible next steps in troubleshooting connectivity.

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```
BRANCH# show ip route
<Output omitted>

Gateway of last resort is 192.168.0.253 to network 0.0.0.0

S*    0.0.0.0/0 [1/0] via 192.168.0.253
      192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.0.252/30 is directly connected, Serial0/0/0
L        192.168.0.254/32 is directly connected, Serial0/0/0
      192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
```

```
C        192.168.1.0/24 is directly connected, GigabitEthernet0/1
L        192.168.1.1/32 is directly connected, GigabitEthernet0/1
```

Part 3: Troubleshoot Static Routes in an IPv6 Network

Device	Interface	IPv6 Address	Prefix Length	Default Gateway
HQ	G0/1	2001:DB8:ACAD::1	64	N/A
	S0/0/0 (DCE)	2001:DB8:ACAD::20:2	64	N/A
	S0/0/1	2001:DB8:ACAD:2::1	64	N/A
ISP	G0/0	2001:DB8:ACAD:30::1	64	N/A
	S0/0/0	2001:DB8:ACAD:20::1	64	N/A
BRANCH	G0/1	2001:DB8:ACAD:1::1	64	N/A
	S0/0/0 (DCE)	2001:DB8:ACAD:2::2	64	N/A
PC-A	NIC	2001:DB8:ACAD::3	64	FE80::1
Web Server	NIC	2001:DB8:ACAD:30::3	64	FE80::1
PC-C	NIC	2001:DB8:ACAD:1::3	64	FE80::1

Step 1: Troubleshoot the HQ router.

The HQ router is the link between the ISP router and the BRANCH router. The ISP router represents the outside network while the BRANCH router represents the corporate network. The HQ router is configured with static routes to both the ISP and the BRANCH networks.

a. Display the status of the interfaces on HQ. Enter **show ipv6 interface brief**. Record and resolve any issues, as necessary.

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The IPv6 address for S0/0/1 is incorrectly configured.

```
HQ(config)# interface s0/0/1
HQ(config-if)# no ipv6 address 2001:DB8:ACAD:2::3/64
HQ(config-if)# ipv6 address 2001:DB8:ACAD:2::1/64
HQ# show ipv6 interface brief
Em0/0                  [administratively down/down]
    unassigned
GigabitEthernet0/0     [administratively down/down]
    unassigned
GigabitEthernet0/1     [up/up]
    FE80::1
    2001:DB8:ACAD::1
Serial0/0/0            [up/up]
    FE80::D68C:B5FF:FECE:A0C0
    2001:DB8:ACAD:20::2
Serial0/0/1            [up/up]
    FE80::D68C:B5FF:FECE:A0C0
```

```
    2001:DB8:ACAD:2::3ping
```

b. Ping from the HQ router to the BRANCH router (2001:DB8:ACAD:2::2). Were the pings successful? _____ Yes

c. Ping from the HQ router to the ISP router (2001:DB8:ACAD:20::1). Were the pings successful? _____ No

d. Ping from PC-A to the default gateway. Were the pings successful? _____ Yes

e. Ping from PC-A to Web Server. Were the pings successful? _____ No

f. Ping from PC-A to PC-C. Were the pings successful? _____ No

g. Display the routing table by issuing a **show ipv6 route** command. What non-directly connected routes are shown in the routing table?

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Static route to 2001:DB8:ACAD:1::/64 via 2001:DB8:ACAD:2::2

Static route to 2001:DB8:ACAD:30::/64 via 2001:DB8:ACAD::20:1

```
HQ# show ipv6 route
IPv6 Routing Table - default - 9 entries
<Output omitted>
C   2001:DB8:ACAD::/64 [0/0]
     via GigabitEthernet0/1, directly connected
L   2001:DB8:ACAD::1/128 [0/0]
     via GigabitEthernet0/1, receive
S   2001:DB8:ACAD:1::/64 [1/0]
     via 2001:DB8:ACAD:2::2
C   2001:DB8:ACAD:2::/64 [0/0]
     via Serial0/0/1, directly connected
L   2001:DB8:ACAD:2::1/128 [0/0]
     via Serial0/0/1, receive
C   2001:DB8:ACAD:20::/64 [0/0]
     via Serial0/0/0, directly connected
L   2001:DB8:ACAD:20::2/128 [0/0]
     via Serial0/0/0, receive
S   2001:DB8:ACAD:30::/64 [1/0]
     via 2001:DB8:ACAD::20:1
L   FF00::/8 [0/0]
      via Null0, receive
```

h. Based on the results of the pings, routing table output, and static routes in the running configuration, what can you conclude about network connectivity?

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Static route to 2001:DB8:ACAD:30::/64 has an incorrectly configured next hop address.

i. What commands (if any) need to be entered to resolve routing issues? Record the command(s).

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```
HQ(config)# no ipv6 route 2001:DB8:ACAD:30::/64 2001:DB8:ACAD::20:1
HQ(config)# ipv6 route 2001:DB8:ACAD:30::/64 2001:DB8:ACAD:20::1
```

j. Repeat any of the steps from b to f to verify whether the problems have been resolved. Record your observations and possible next steps in troubleshooting connectivity.

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The routing problems have not been resolved. The HQ router still cannot ping ISP router. The ISP router probably has IP address issue. PC-A still cannot ping PC-C and Web Server.

```
HQ# show ipv6 route
IPv6 Routing Table - default - 9 entries
<Output omitted>
C   2001:DB8:ACAD::/64 [0/0]
     via GigabitEthernet0/1, directly connected
L   2001:DB8:ACAD::1/128 [0/0]
     via GigabitEthernet0/1, receive
S   2001:DB8:ACAD:1::/64 [1/0]
     via 2001:DB8:ACAD:2::2
C   2001:DB8:ACAD:2::/64 [0/0]
     via Serial0/0/1, directly connected
L   2001:DB8:ACAD:2::1/128 [0/0]
     via Serial0/0/1, receive
C   2001:DB8:ACAD:20::/64 [0/0]
     via Serial0/0/0, directly connected
L   2001:DB8:ACAD:20::2/128 [0/0]
     via Serial0/0/0, receive
S   2001:DB8:ACAD:30::/64 [1/0]
     via 2001:DB8:ACAD:20::1
L   FF00::/8 [0/0]
     via Null0, receive
```

Step 2: Troubleshoot the ISP router.

On the ISP router, one static route is configured to reach all the networks on HQ and BRANCH routers.

a. Display the status of the interfaces on ISP. Enter **show ipv6 interface brief**. Record and resolve any issues, as necessary.

_____

_____

The IPv6 address for S0/0/0 is incorrectly configured.

```
ISP(config)# interface s0/0/0
ISP(config-if)# no ipv6 address 2001:DB8::ACAD:20:1/64
ISP(config-if)# ipv6 address 2001:DB8:ACAD:20::1/64
```

```
ISP# show ipv6 interface brief
Em0/0                  [administratively down/down]
    unassigned
GigabitEthernet0/0     [up/up]
    FE80::1
    2001:DB8:ACAD:30::1
GigabitEthernet0/1     [administratively down/down]
    unassigned
Serial0/0/0            [up/up]
    FE80::FE99:47FF:FE71:78A0
    2001:DB8::ACAD:20:1
Serial0/0/1            [administratively down/down]
    unassigned
```

b. Ping from the ISP router to the HQ router (2001:DB8:ACAD:20::2). Were the pings successful? _____ Yes

c. Ping from Web Server to the default gateway. Were the pings successful? _____ Yes

d. Ping from Web Server to PC-A. Were the pings successful? _____ Yes

e. Ping from Web Server to PC-C. Were the pings successful? _____ No

f. Display the routing table. What non-directly connected routes are shown in the routing table?

_____

_____

Static route to 2001:DB8:ACAD::/62 via 2001:DB8:ACAD:20::2

```
ISP# show ipv6 route
IPv6 Routing Table - default - 6 entries
<Output omitted>
S   2001:DB8:ACAD::/62 [1/0]
     via 2001:DB8:ACAD:20::2
C   2001:DB8:ACAD:20::/64 [0/0]
     via Serial0/0/0, directly connected
L   2001:DB8:ACAD:20::1/128 [0/0]
     via Serial0/0/0, receive
C   2001:DB8:ACAD:30::/64 [0/0]
     via GigabitEthernet0/0, directly connected
L   2001:DB8:ACAD:30::1/128 [0/0]
     via GigabitEthernet0/0, receive
L   FF00::/8 [0/0]
     via Null0, receive
```

g. Based on the results of the pings, routing table output, and static routes in the running configuration, what can you conclude about network connectivity?

_____

_____

_____

No issues with the static route

h. What commands (if any) need to be entered to resolve routing issues? Record the command(s).

_____

_____

None

i. Repeat any of the steps from b to e to verify whether the problems have been resolved. Record your observations and possible next steps in troubleshooting connectivity.

_____

_____

_____

Not all routing issues have been resolved. Web Server still cannot ping PC-C.

Step 3: Troubleshoot the BRANCH router.

For the BRANCH routers, there is a default route to the HQ router. This default route allows the BRANCH network to the ISP router and Web Server.

a. Display the status of the interfaces on BRANCH. Enter **show ipv6 interface brief**. Record and resolve any issues, as necessary.

_____

_____

All interfaces were configured correctly according to the Addressing Table.

```
BRANCH# show ipv6 interface brief
Em0/0                  [administratively down/down]
    unassigned
GigabitEthernet0/0     [administratively down/down]
    unassigned
GigabitEthernet0/1     [up/up]
    FE80::1
    2001:DB8:ACAD:1::1
Serial0/0/0            [up/up]
    FE80::FE99:47FF:FE71:7A20
    2001:DB8:ACAD:2::2
Serial0/0/1            [administratively down/down]
    unassigned
```

b. Ping from the BRANCH router to the HQ router (2001:DB8:ACAD:2::1). Were the pings successful? _____ Yes

c. Ping from the BRANCH router to the ISP router (2001:DB8:ACAD:20::1). Were the pings successful? _____ No

d. Ping from PC-C to the default gateway. Were the pings successful? _____ Yes

e. Ping from PC-C to PC-A. Were the pings successful? _____ No

f. Ping from PC-C to Web Server. Were the pings successful? _____ No

g. Display the routing table. What non-directly connected routes are shown in the routing table?

_____

_____

None

```
BRANCH# show ipv6 route
IPv6 Routing Table - default - 5 entries
<Output omitted>
C   2001:DB8:ACAD:1::/64 [0/0]
     via GigabitEthernet0/1, directly connected
L   2001:DB8:ACAD:1::1/128 [0/0]
     via GigabitEthernet0/1, receive
C   2001:DB8:ACAD:2::/64 [0/0]
     via Serial0/0/0, directly connected
L   2001:DB8:ACAD:2::2/128 [0/0]
     via Serial0/0/0, receive
L   FF00::/8 [0/0]
     via Null0, receive
```

h. Based on the results of the pings, routing table output, and static routes in the running configuration, what can you conclude about network connectivity?

_____

_____

_____

No default route is displayed in the table. The next-hop address was incorrectly configured.

i. What commands (if any) need to be entered to resolve routing issues? Record the command(s).

_____

_____

```
BRANCH(config)# no ipv6 route ::/0 2001:DB8:ACAD::1
BRANCH(config)# ipv6 route ::/0 2001:DB8:ACAD:2::1
```

j. Repeat any of the steps from b to f to verify whether the problems have been resolved. Record your observations and possible next steps in troubleshooting connectivity.

_____

_____

_____

```
BRANCH# show ipv6 route
IPv6 Routing Table - default - 6 entries
<Output omitted>
S   ::/0 [1/0]
     via 2001:DB8:ACAD:2::1
C   2001:DB8:ACAD:1::/64 [0/0]
     via GigabitEthernet0/1, directly connected
L   2001:DB8:ACAD:1::1/128 [0/0]
     via GigabitEthernet0/1, receive
C   2001:DB8:ACAD:2::/64 [0/0]
     via Serial0/0/0, directly connected
L   2001:DB8:ACAD:2::2/128 [0/0]
     via Serial0/0/0, receive
L   FF00::/8 [0/0]
     via Null0, receive
```

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.

Device Configs

Router HQ (Corrected)

```
HQ# show run
Building configuration...

Current configuration : 1652 bytes
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname HQ
!
boot-start-marker
boot-end-marker
!
!
enable secret 4 06YFDUHH61wAE/kLkDq9BGho1QM5EnRtoyr8cHAUg.2
!
no aaa new-model
memory-size iomem 15
!
!
```

```
!
!
!
!
!
ip cef
ipv6 unicast-routing
ipv6 cef
multilink bundle-name authenticated
!
!
!
!
!
!
!
!
!
!
interface Embedded-Service-Engine0/0
 no ip address
 shutdown
!
interface GigabitEthernet0/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 ip address 192.168.0.1 255.255.255.128
 duplex auto
 speed auto
 ipv6 address FE80::1 link-local
 ipv6 address 2001:DB8:ACAD::1/64
!
interface Serial0/0/0
 ip address 10.1.1.2 255.255.255.252
 ipv6 address 2001:DB8:ACAD:20::2/64
 clock rate 2000000
!
interface Serial0/0/1
 ip address 192.168.0.253 255.255.255.252
 ipv6 address 2001:DB8:ACAD:2::1/64
!
ip forward-protocol nd
!
no ip http server
no ip http secure-server
```

```
!
ip route 172.16.3.0 255.255.255.0 10.1.1.1
ip route 192.168.1.0 255.255.255.0 192.168.0.254
!
ipv6 route 2001:DB8:ACAD:1::/64 2001:DB8:ACAD:2::2
ipv6 route 2001:DB8:ACAD:30::/64 2001:DB8:ACAD:20::1
!
!
!
control-plane
!
!
!
line con 0
 password cisco
 logging synchronous
line aux 0
line 2
 no activation-character
 no exec
 transport preferred none
 transport input all
 transport output pad telnet rlogin lapb-ta mop udptn v120 ssh
 stopbits 1
line vty 0 4
 password cisco
 login
 transport input all
!
scheduler allocate 20000 1000
!
end
```

Router ISP (Corrected)

```
ISP# show run
Building configuration...

Current configuration : 1493 bytes
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname ISP
!
boot-start-marker
boot-end-marker
!
```

```
!
enable secret 4 06YFDUHH61wAE/kLkDq9BGho1QM5EnRtoyr8cHAUg.2
!
no aaa new-model
memory-size iomem 15
!
!
!
!
!
!
!
ip cef
ipv6 unicast-routing
ipv6 cef
multilink bundle-name authenticated
!
!
!
!
!
!
!
!
!
!
interface Embedded-Service-Engine0/0
 no ip address
 shutdown
!
interface GigabitEthernet0/0
ip address 172.16.3.1 255.255.255.0
 duplex auto
 speed auto
 ipv6 address Fe80::1 link-local
 ipv6 address 2001:DB8:ACAD:30::1/64
!
interface GigabitEthernet0/1
no ip address
 shutdown
 duplex auto
 speed auto
!
interface Serial0/0/0
 ip address 10.1.1.1 255.255.255.252
 ipv6 address 2001:DB8:ACAD:20::1/64
!
interface Serial0/0/1
 no ip address
```

```
 shutdown
 clock rate 2000000
!
ip forward-protocol nd
!
no ip http server
no ip http secure-server
!
ip route 192.168.0.0 255.255.254.0 10.1.1.2
!
ipv6 route 2001:DB8:ACAD::/62 2001:DB8:ACAD:20::2
!
!
!
control-plane
!
!
!
line con 0
 password cisco
 logging synchronous
 login
line aux 0
line 2
 no activation-character
 no exec
 transport preferred none
 transport input all
 transport output pad telnet rlogin lapb-ta mop udptn v120 ssh
 stopbits 1
line vty 0 4
 password cisco
 login
 transport input all
!
scheduler allocate 20000 1000
!
end
```

Router BRANCH (Corrected)

```
BRANCH# show run
Building configuration...

Current configuration : 1522 bytes
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
```

```
!
hostname BRANCH
!
boot-start-marker
boot-end-marker
!
!
enable secret 4 06YFDUHH61wAE/kLkDq9BGho1QM5EnRtoyr8cHAUg.2
!
no aaa new-model
memory-size iomem 10
!
!
!
!
!
!
!
ip cef
ipv6 unicast-routing
ipv6 cef
multilink bundle-name authenticated
!
!
!
!
!
!
!
!
!
interface Embedded-Service-Engine0/0
 no ip address
 shutdown
!
interface GigabitEthernet0/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 ip address 192.168.1.1 255.255.255.0
 duplex auto
 speed auto
ipv6 address FE80::1 link-local
 ipv6 address 2001:DB8:ACAD:1::1/64
!
interface Serial0/0/0
```

```
 ip address 192.168.0.254 255.255.255.252
 ipv6 address 2001:DB8:ACAD:2::2/64
 clock rate 128000
!
interface Serial0/0/1
 no ip address
 shutdown
!
ip forward-protocol nd
!
no ip http server
no ip http secure-server
!
ip route 0.0.0.0 0.0.0.0 192.168.0.253
!
ipv6 route ::/0 2001:DB8:ACAD:2::1
!
!
!
control-plane
!
!
!
line con 0
 password cisco
 logging synchronous
login
line aux 0
line 2
 no activation-character
 no exec
 transport preferred none
 transport input all
 transport output pad telnet rlogin lapb-ta mop udptn v120 ssh
 stopbits 1
line vty 0 4
 password cisco
 login
 transport input all
!
scheduler allocate 20000 1000
!
end
```