Static Routing Lab Guide with Floating Static Route

This guide provides a comprehensive walkthrough for configuring a network topology using static routing, including a floating static route for redundancy. The lab is designed around a diamond topology with four routers and two end-user PCs.

1. Topology Summary

- **Routers:** 4 Cisco 2901 series routers interconnected in a diamond topology.
- **End Devices:** PC-PT (Left) and PC-PT (Right) connected to separate LAN networks.
- **Routing Method:** We will exclusively use static routes. A floating static route will be configured on **ROUTER-A** to demonstrate path redundancy.
- **Goal:** Enable full end-to-end communication between all devices, verifying both the primary and backup paths of the floating static route.

2. Router Naming Convention

To make configuration and verification easier, we will assign the following names to the routers, configured in a clockwise direction starting from the left:

- **ROUTER-A** (The router on the far left, connected to PC-PT Left)
- **ROUTER-B** (The router at the top of the diamond)
- **ROUTER-C** (The router on the far right, connected to PC-PT Right)
- **ROUTER-D** (The router at the bottom of the diamond)

3. IP Addressing Table

This table outlines the IP addresses and subnet masks for all devices and interfaces in the topology.

Device	Interface	IP Address	Subnet Mask	Network
PC-PT (Left)	Fa0	172.16.3.10	255.255.255.0	172.16.3.0/24

PC-PT (Right)	Fa0	192.168.2.10	255.255.255.0	192.168.2.0/24
ROUTER-A	GigabitEthernet 0/0	172.16.3.1	255.255.255.0	172.16.3.0/24
	Serial0/1/0	172.16.2.1	255.255.255.0	172.16.2.0/24
	Serial0/1/1	172.16.1.1	255.255.255.0	172.16.1.0/24
ROUTER-B	Serial0/1/0	172.16.2.2	255.255.255.0	172.16.2.0/24
	Serial0/1/1	192.168.1.1	255.255.255.0	192.168.1.0/24
ROUTER-C	GigabitEthernet 0/0	192.168.2.1	255.255.255.0	192.168.2.0/24
	Serial0/1/0	192.168.1.2	255.255.255.0	192.168.1.0/24
	Serial0/1/1	192.168.3.2	255.255.255.0	192.168.3.0/24
ROUTER-D	Serial0/1/0	172.16.1.2	255.255.255.0	172.16.1.0/24
	Serial0/1/1	192.168.3.1	255.255.255.0	192.168.3.0/24

4. PC Configuration

Configure the IP addresses and default gateways on your PC end devices.

```
PC-PT (Left)
IP Address: 172.16.3.10
Subnet Mask: 255.255.255.0
Default Gateway: 172.16.3.1

PC-PT (Right)
```

```
IP Address: 192.168.2.10
Subnet Mask: 255.255.255.0
Default Gateway: 192.168.2.1
```

5. Router Configuration

This section provides the basic interface and general configurations for each router. Remember to enter `enable` and `configure terminal` mode before entering these commands.

5.1. ROUTER-A

```
no ip domain-lookup
hostname ROUTER-A
service password-encryption
enable secret class
banner motd #Authorized Access Only#

interface GigabitEthernet0/1
 ip address 172.16.3.1 255.255.255.0
 no shutdown
exit
interface Serial0/1/0
 ip address 172.16.2.1 255.255.255.0
 clock rate 64000
 no shutdown
exit
interface Serial0/1/1
 ip address 172.16.1.1 255.255.255.0
 clock rate 64000
 no shutdown
exit
```

Follow the same configuration steps for ROUTER-B, ROUTER-C and ROUTER-D

6. Static Routing Configuration

This section provides the `ip route` commands for each router. Use these commands in `configure terminal` mode after the interface configurations are complete. Remember to use `do write` after all routing commands.

6.1. On ROUTER-A

```
! Primary route: Via ROUTER-B (next-hop 172.16.2.2). Default
Administrative Distance (AD) is 1.
ip route 192.168.2.0 255.255.255.0 172.16.2.2
! Backup route: ViaROUTER-D (next-hop 172.16.1.2).
! AD 5 makes this a "floating" static route. It will only be used if
the primary route (AD 1) fails.
ip route 192.168.2.0 255.255.255.0 172.16.1.2 5
!
! Standard Static Routes to other network segments not directly
connected to ROUTER-A:
ip route 192.168.1.0 255.255.255.0 172.16.2.2
ip route 192.168.3.0 255.255.255.0 172.16.1.2
do write
```

6.2. On ROUTER-B

```
! Static Routes to reach all other networks not directly connected:
ip route 172.16.3.0 255.255.255.0 172.16.2.1
ip route 172.16.1.0 255.255.255.0 192.168.1.2
ip route 192.168.2.0 255.255.255.0 192.168.1.2
ip route 192.168.3.0 255.255.255.0 192.168.1.2
do write
```

```
Update route on the ROUTER-C and ROUTER-D as configured above.
```

7. Verification Commands

After configuring all devices, perform these checks to verify connectivity and routing.

7.1. Basic Interface and Routing Table Checks (On each Router)

- **Check Interface Status:**

```
show ip interface brief
Show ip route
Ping <>
Traceroute <destination>
```

7.2. End-to-End Connectivity Test (From PCs)

- **Ping from PC-PT (Left) to PC-PT (Right):**
  - Open the Command Prompt on PC-PT (Left).

```
ping 192.168.2.10
```

  - **Expected Output:** You should receive successful replies.
- **Ping from PC-PT (Right) to PC-PT (Left):**
  - Open the Command Prompt on PC-PT (Right).

```
ping 172.16.3.10
```

  - **Expected Output:** You should receive successful replies.

7.3. Path Verification (From Routers)

- **Trace Route from ROUTER-A to PC-PT (Right):**
  - From ROUTER-A's CLI:

```
traceroute 192.168.2.10
```

- o **Expected Output:** The trace should show the path going via `172.16.2.2` (ROUTER-B) as the primary route.

7.4. Test Floating Static Route Failover

1. **Introduce a failure:**
   a. Go to **ROUTER-B** and shut down its `Serial0/1/0` interface (the link between ROUTER-B and ROUTER-A):

```
configure terminal
interface Serial0/1/0
shutdown
end
```

   b. This will simulate a failure of the primary path from ROUTER-A to ROUTER-C.
2. **Observe Routing Table Change (On ROUTER-A):**
   a. Go back to **ROUTER-A** and run `show ip route`.
   b. **Expected Output:** The route for `192.168.2.0/24` should now show as active with a next-hop of `172.16.1.2` (R4-Bottom), indicating that the floating static route has taken over.
3. **Verify Connectivity via Backup Path (From PC-PT Left or ROUTER-A):**
   a. From PC-PT (Left) or ROUTER-A's CLI:

```
ping 192.168.2.10
traceroute 192.168.2.10
```

   b. **Expected Output:** Connectivity should still exist, but the `traceroute` will now show the path going via `172.16.1.2` (R4-Bottom), confirming the failover.
4. **Restore Primary Path:**
   a. Go back to **ROUTER-B** and bring its `Serial0/1/0` interface back up:

```
configure terminal
interface Serial0/1/0
no shutdown
end
```

      b. After a short delay, the primary route via ROUTER-B should become active again on ROUTER-A.

End of Lab Guide