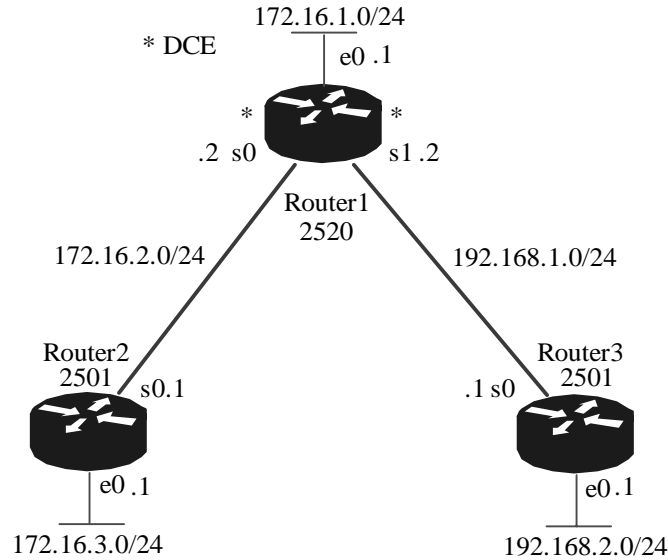


3 Router Static Route Lab



Objective

In this lab, you will configure static routes between all three routers. This will allow your routers to route packets so that all routers and all hosts will be able to reach (ping) each other. Once your configuration is complete, you will use basic techniques to test your network's connectivity.

Scenario

Three separate classful networks need routing between them and their subnets.

Questions:

- What are the different classful networks?
 1. _____
 2. _____
 3. _____
 4. _____
 5. _____
- Are there any subnets? If so, what are they?
 1. _____
 2. _____
 3. _____
 4. _____
 5. _____

Setup

- Configure the cabling as shown in the network diagram
- If the routers have a startup-config, erase it and perform a reload of the routers.
- **Important! Configure the routers to include hostnames and the proper interface commands including IP addresses, subnet masks, etc. Each router should be able to ping the interface of the adjacent (neighboring) router and the host on its LAN (Ethernet) interface. Test and troubleshoot as necessary. Use the context sensitive help, previous labs, your books and /or handouts and if your still having problems ask your partner or ask the instructor for assistance.**

Step 1 – Configuring Static Routes

On each router configure a separate and specific static route for each network or subnet. You do not need to configure static routes for the router's directly connected network(s) because like a host, by configuring the IP address and subnet mask on an interface tells the router that it belongs to that network/subnet.

Router1

- Router1(config)# **ip route 172.16.3.0 255.255.255.0 172.16.2.1**
- Router1(config)# **ip route 192.168.2.0 255.255.255.0 192.168.1.1**

Router2

- Router2(config)# **ip route 172.16.1.0 255.255.255.0 172.16.2.2**
- Router2(config)# **ip route 192.168.1.0 255.255.255.0 172.16.2.2**
- Router2(config)# **ip route 192.168.2.0 255.255.255.0 172.16.2.2**

Router3

- Router3(config)# **ip route 172.16.1.0 255.255.255.0 192.168.1.2**
- Router3(config)# **ip route 172.16.2.0 255.255.255.0 192.168.1.2**
- Router3(config)# **ip route 172.16.3.0 255.255.255.0 192.168.1.2**

Verify and Validate:

- All hosts and all routers should be able to ping every interface in the network.
- Do a “show running-config” and notice the static routes that you entered.
- Router# show ip route
 - What routes to networks do you see?
 - Which routes are static and which routes are directly connected?
 - What is the administrative distance for a static route?
 - What is the administrative distance for a directly connected network?

Questions:

- How does the next-hop-ip-address help with the routing process?
-

- Does it give the entire route, i.e., subnet mask?

- What is it actually doing regarding the routing of the packet?

- How does a packet get from Host 2 to Host 3?

- Instead of a next-hop-ip-address, what else could you have used?

- What would you need to do if you added new networks or deleted/modified existing networks?

- Is there any way to summarize several static routes to multiple subnets into a single static route?

Outputs

Router2#**show ip route**

(Output omitted)

Gateway of last resort is not set

```

    172.16.0.0/24 is subnetted, 3 subnets
S       172.16.1.0 [1/0] via 172.16.2.2
C       172.16.2.0 is directly connected, Serial0
C       172.16.3.0 is directly connected, Ethernet0
S     192.168.1.0/24 [1/0] via 172.16.2.2
S     192.168.2.0/24 [1/0] via 172.16.2.2

```

Router1#**show ip route**

(output omitted)

Gateway of last resort is not set

```

    172.16.0.0/24 is subnetted, 3 subnets

```

```

C      172.16.1.0 is directly connected, Ethernet0
C      172.16.2.0 is directly connected, Serial0
S      172.16.3.0 [1/0] via 172.16.2.1
C      192.168.1.0/24 is directly connected, Serial1
S      192.168.2.0/24 [1/0] via 192.168.1.1

```

Router3#**show ip route**

(Output omitted)

Gateway of last resort is not set

```

      172.16.0.0/24 is subnetted, 3 subnets
S      172.16.1.0 [1/0] via 192.168.1.2
S      172.16.2.0 [1/0] via 192.168.1.2
S      172.16.3.0 [1/0] via 192.168.1.2
C      192.168.1.0/24 is directly connected, Serial0
C      192.168.2.0/24 is directly connected, Ethernet0

```

Step 2 – Configuring Summary Static Routes

The configuration of the routers in Step 1 works just great and is a valid way to configure routing on these networks. Earlier, we noticed that the network 172.16.0.0 is divided into several subnets. The Router3 router does not really need separate static routes for each subnet, since all of the 172.16.0.0 subnets can be reached via the same next-hop-ip-address, i.e. Router1. Let's reconfigure the static routes on Router3 so that it only uses a single static route to reach all of the 172.16.0.0 subnets.

Router1

- No changes

Router2

- No changes

Router3

- First, remove the current static routes:
 - Router3(config)# **no ip route 172.16.1.0 255.255.255.0 192.168.1.2**
 - Router3(config)# **no ip route 172.16.2.0 255.255.255.0 192.168.1.2**
 - Router3(config)# **no ip route 172.16.3.0 255.255.255.0 192.168.1.2**
- Now, add the new summary static route:
 - Router3(config)# **ip route 172.16.0.0 255.255.0.0 192.168.1.2**

Verify and Validate:

- All hosts and all routers should be able to ping every interface in the network.
- Do a “**show running-config**” and notice the static routes that you entered.
- Router3# show ip route
 - What routes to networks do you now see?

Questions:

- What made this new summary static route work for all subnets?

- Why is a single summary static route an advantage regarding the size of the routing table?

- Why is a single summary static route an advantage regarding future changes to the 172.16.0.0 network?

Outputs

```
Router3#show ip route
(Output omitted)
```

```
Gateway of last resort is not set
```

```
S    172.16.0.0/16 [1/0] via 192.168.1.2
C    192.168.1.0/24 is directly connected, Serial0
C    192.168.2.0/24 is directly connected, Ethernet0
```

Step 3 – Configuring Default Static Routes

Both Step 1 and Step 2 are acceptable ways to configure routing for these networks. We notice that the 172.16.3.0/24 and the 192.168.2.0/24 networks are “stub networks,” meaning that there is only one way out (both via Router1).

Router1

- No changes

Router2

- First, remove the current static routes:
 - Router2(config)# **no ip route 172.16.1.0 255.255.255.0 172.16.2.2**
 - Router2(config)# **no ip route 192.168.1.0 255.255.255.0 172.16.2.2**
 - Router2(config)# **no ip route 192.168.2.0 255.255.255.0 172.16.2.2**
- Now, add the new default static route:
 - Router2(config)# **ip route 0.0.0.0 0.0.0.0 172.16.2.2**

Router3

- First, remove the current static routes:
- Router3(config)# **no ip route 172.16.0.0 255.255.0.0 192.168.1.2**

- Now, add the new default static route:
- Router3(config)# **ip route 0.0.0.0 0.0.0.0 192.168.1.2**

Verify and Validate:

- All hosts and all routers should be able to ping every interface in the network.
- Do a “show running-config” and notice the static routes that you entered.
- Router2# show ip route
 - What routes to networks do you now see?
- Router3# show ip route
 - What routes to networks do you now see?

Questions:

- Do you think static routes are still used even with dynamic routing (RIP, OSPF, etc.)?
_____ . Hint: Think about the administrative distance.

- Do you think default static routes are still used even with dynamic routing (RIP, OSPF, etc.)?
_____ .

- What is the disadvantage of doing this? How would a default static route be properly used in a real world network? (How would a company’s network use a default route when connecting to the Internet?)

Outputs

Router3#**show ip route**
(Output omitted)

Gateway of last resort is 192.168.1.2 to network 0.0.0.0

```
C   192.168.1.0/24 is directly connected, Serial0
C   192.168.2.0/24 is directly connected, Ethernet0
S*  0.0.0.0/0 [1/0] via 192.168.1.2
```

Save your current configuration to NVRAM.

End of Lab