

## Lab 11.6.2: Challenge OSPF Configuration Lab

Device	Interface	IP Address	Subnet Mask	Default Gateway
HQ	Fa0/0			N/A
	S0/0/0			N/A
	S0/0/1			N/A
	Lo1			N/A
Branch1	Fa0/0			N/A
	S0/0/0			N/A
	S0/0/1			N/A
Branch2	Fa0/0			N/A
	S0/0/0			N/A
	S0/0/1			N/A
PC1	NIC			
PC2	NIC			
PC3	NIC			

### Learning Objectives

Upon completion of this lab, you will be able to:

- Create an efficient VLSM design given requirements
- Assign appropriate addresses to interfaces and document
- Cable a network according to the Topology Diagram
- Erase the startup configuration and reload a router to the default state
- Configure routers including OSPF
- Configure and propagate a static default route
- Verify OSPF operation
- Test and verify full connectivity
- Reflect upon and document the network implementation

### Scenario

In this lab activity, you will be given a network address that must be subnetted using VLSM to complete the addressing of the network shown in the Topology Diagram. A combination OSPF routing and static routing will be required so that hosts on networks that are not directly connected will be able to communicate with each other. OSPF area ID of 0 and process ID of 1 will be used in all OSPF configurations.

### Task 1: Subnet the Address Space.

#### Step 1: Examine the network requirements.

The addressing for the Network has the following requirements.

- The 172.20.0.0/16 network must be subnetted to provide addresses for the LANs and serial links.
  - The HQ LAN will require 8000 addresses
  - The Branch1 LAN will require 4000 addresses
  - The Branch 2 LAN will require 2000 addresses
  - The links between the routers will require two addresses for each link
- The loopback address representing the link between the HQ router and the ISP will use the 10.10.10.0/30 network.

## **Step 2: Consider the following questions when creating your network design.**

How many subnets need to be created from the 172.20.0.0/16 network? \_\_\_\_\_

How many total IP addresses are required from the 172.16.0.0/16 network? \_\_\_\_\_

What subnet mask will be used for the HQ LAN subnet? \_\_\_\_\_

What is the maximum number of host addresses that could be used on this subnet? \_\_\_\_\_

What subnet mask will be used for the Branch1 LAN subnet? \_\_\_\_\_

What is the maximum number of host addresses that could be used on this subnet? \_\_\_\_\_

What subnet mask will be used for the Branch2 LAN subnet? \_\_\_\_\_

What is the maximum number of host addresses that could be used on this subnet? \_\_\_\_\_

What subnet mask will be used for the links between the three routers? \_\_\_\_\_

What is the maximum number of host addresses that could be used on each of these subnets? \_\_\_\_\_

## **Step 3: Assign subnetwork addresses to the Topology Diagram.**

1. Assign subnet 0 of the 172.20.0.0/16 network to the HQ LAN subnet. What is the network address of this subnet? \_\_\_\_\_
2. Assign subnet 1 of the 172.20.0.0/16 network to the Branch1 LAN subnet. What is the network address of this subnet? \_\_\_\_\_
3. Assign subnet 2 of the 172.20.0.0/16 network to the Branch2 LAN subnet. What is the network address of this subnet? \_\_\_\_\_
4. Assign subnet 3 of the 172.20.0.0/16 network to the link between the HQ and Branch1 routers. What is the network address of this subnet? \_\_\_\_\_
5. Assign subnet 4 of the 172.20.0.0/16 network to the link between the HQ and Branch2 routers. What is the network address of this subnet? \_\_\_\_\_
6. Assign subnet 5 of the 172.20.0.0/16 network to the link between the Branch1 and Branch2 routers. What is the network address of this subnet? \_\_\_\_\_

## **Task 2: Determine Interface Addresses.**

Assign appropriate addresses to the device interfaces.

1. Assign the first valid host address in the 10.10.10.0/30 network to the Loopback 1 interface on the HQ router.
2. Assign the first valid IP address of the HQ LAN network to the LAN interface of the HQ router.
3. Assign the last valid IP address of the HQ LAN network to PC2.
4. Assign the first valid IP address of the Branch1 LAN network to the LAN interface of the Branch1 router.
5. Assign the last valid IP address of the Branch1 LAN network to PC1.
6. Assign the first valid IP address of the Branch2 LAN network to the LAN interface of the Branch2 router.
7. Assign the last valid IP address of the Branch2 LAN network to PC3.
8. Assign the first valid IP address of the HQ to Branch1 link network to the Serial 0/0/0 interface of the HQ router.
9. Assign the last valid IP address of the HQ to Branch1 link network to the Serial0/0/0 interface of the Branch router.
10. Assign the first valid IP address of the HQ to Branch2 link network to the Serial 0/0/1 interface of the HQ router.
11. Assign the last valid IP address of the HQ to Branch2 link network to the Serial0/0/1 interface of the Branch2 router.
12. Assign the first valid IP address of the Branch1 to Branch2 link network to the Serial 0/0/1 interface of the Branch1 router.
13. Assign the last valid IP address of the Branch1 to Branch2 link network to the Serial0/0/0 interface of the Branch2 router.

Document the addresses to be used in the table provided under the Topology Diagram.

### **Task 3: Prepare the Network.**

#### **Step 1: Cable a network that is similar to the one in the Topology Diagram.**

You can use any current router in your lab as long as it has the required interfaces as shown in the topology.

#### **Step 2: Clear any existing configurations on the routers.**

### **Task 4: Perform Basic Router Configurations.**

Perform basic configuration of the BRANCH, HQ, and ISP routers according to the following guidelines:

1. Configure the router hostname.
2. Disable DNS lookup.
3. Configure an EXEC mode password.
4. Configure a message-of-the-day banner.
5. Configure a password for console connections.
6. Configure a password for VTY connections.
7. Synchronize unsolicited messages and debug output with solicited output and prompts for the console and virtual terminal lines.
8. Configure an EXEC timeout of 15 minutes.

### **Task 5: Configure and Activate Serial and Ethernet Addresses.**

#### **Step 1: Configure the interfaces on the HQ, Branch1, and Branch2 routers with the IP addresses from the table provided under the Topology Diagram.**

When you have finished, be sure to save the running configuration to the NVRAM of the router.

#### **Step 2: Configure the Ethernet interfaces of PC1, PC2, and PC3 with the IP addresses from the table provided under the Topology Diagram. Configure serial DCE interfaces with clock rates of 64000.**

#### **Step 3: Configure the correct bandwidth for the serial interfaces on the Branch 1 router.**

What commands are required to accomplish this?

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#### **Step 4: Configure the correct bandwidth for the serial interfaces on the Branch 2 router.**

What commands are required to accomplish this?

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#### **Step 5: Configure the correct bandwidth for the serial interfaces on the HQ router.**

What commands are required to accomplish this?

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### **Task 6: Verify Connectivity to Next Hop Device.**

You should NOT have connectivity between end devices yet. However, you can test connectivity between two routers and between an end device and its default gateway.

#### **Step 1: Verify that the HQ, Branch1, and Branch2 routers can ping each of the neighboring routers across the WAN links.**

#### **Step 2: Verify that PC1, PC2, and PC3 can ping their respective default gateway.**

## **Task 7: Configure OSPF Routing on the Branch1 Router.**

**Step 1: Consider the networks that need to be included in the OSPF updates that are sent out by the Branch1 router.**

What directly connected networks are present in the Branch1 routing table?

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What commands are required to enable OSPF and include the connected networks in the routing updates?

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Are there any router interfaces that do not need to have OSPF updates sent out?

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What command is used to disable OSPF updates on these interfaces?

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## **Task 8: Configure OSPF and Static Routing on the HQ Router.**

**Step 1: Consider the type of static routing that is needed on HQ.**

A static default route will need to be configured to send all packets with destination addresses that are not in the routing table to the loopback address representing the link between the HQ router and the ISP. What command is needed to accomplish this?

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What directly connected networks are present in the HQ routing table?

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Will the networks of the HQ LAN and the links between the Branch 1 and Branch2 routers need to have the subnet mask information included in the network statements? \_\_\_\_\_

What commands are required to enable OSPF and include the appropriate networks in the routing updates?

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Are there any router interfaces that do not need to have OSPF updates sent out? \_\_\_\_\_

What command is used to disable OSPF updates on these interfaces?

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The HQ router needs to send the default route information to the Branch1 and Branch2 routers in the OSPF updates. What command is used to configure this?

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## **Task 9: Configure OSPF Routing on the Branch2 Router.**

**Step 1: Consider the networks that need to be included in the OSPF updates that are sent out by the Branch2 router.**

What directly connected networks are present in the Branch2 routing table?

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What commands are required to enable OSPF and include the connected networks in the routing updates?

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Are there any router interfaces that do not need to have OSPF updates sent out? \_\_\_\_\_

What command is used to disable OSPF updates on these interfaces?

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## Task 10: Verify the Configurations

Answer the following questions to verify that the network is operating as expected.

From PC1, is it possible to ping PC2? \_\_\_\_\_  
From PC1, is it possible to ping the PC3? \_\_\_\_\_

The answer to the above questions should be ‘yes’. If any of the above pings failed, check your physical connections and configurations. Refer to your basic troubleshooting techniques used in the Chapter 1 labs.

What OSPF routes are present in the routing table of the Branch1 router?

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What is the gateway of last resort in the routing table of the Branch1 router?

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What OSPF routes are present in the routing table of the HQ router?

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What is the gateway of last resort in the routing table of the HQ router?

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What OSPF routes are present in the routing table of the Branch2 router?

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What is the gateway of last resort in the routing table of the Branch2 router?

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## Task 11: Reflection

On PC1, use the tracert command to examine the route that is used between PC1 and PC3.  
What are the hops in the route to PC3?

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Is this the least number of hops that can be used to reach PC3? \_\_\_\_\_

If the answer is no, why is a path with more than the minimum amount of hops used?

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At the end of this activity your completion rate should be 100%. If the completion rate is not 100%, use the **Check Results** button and troubleshoot as necessary.

**Note:** There is a bug in Packet Tracer v5.1 that ignores the wildcard mask for both scoring this activity and routing via OSPF. On actual routers, using an incorrect wildcard mask when configuring OSPF creates routing problems.

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