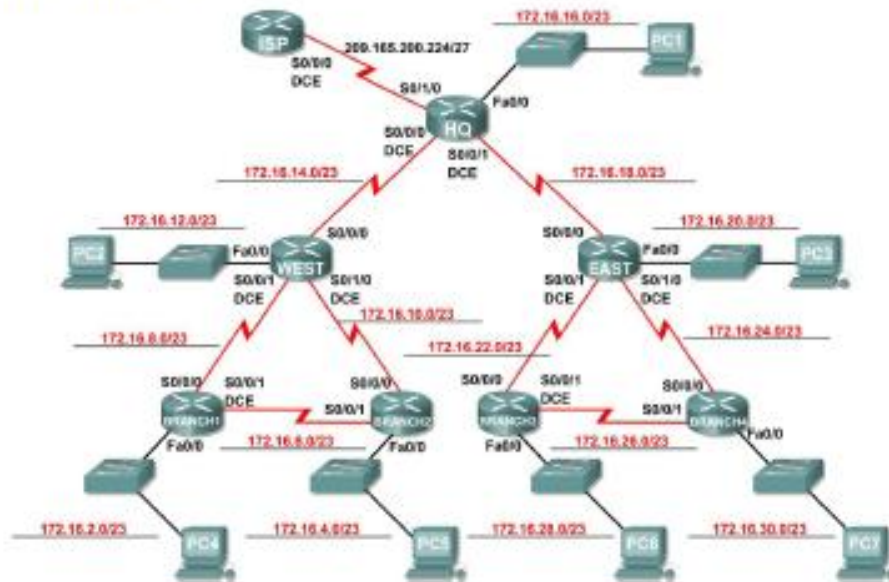


## Lab 3.5.3 Subnetting Scenario 2 - Answers

### Lab 3.5.3: Subnetting Scenario 2

#### Topology Diagram



## Lab 3.5.3 Subnetting Scenario 2 - Answers

Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
ISP	S0/0/0	209.165.200.227	255.255.255.224	N/A
HQ	Fa0/0	172.16.16.1	255.255.254.0	N/A
	S0/0/0	172.16.14.1	255.255.254.0	N/A
	S0/0/1	172.16.18.1	255.255.254.0	N/A
	S0/1/0	209.165.200.226	255.255.255.224	N/A
West	Fa0/0	172.16.12.1	255.255.254.0	N/A
	S0/0/0	172.16.15.254	255.255.254.0	N/A
	S0/0/1	172.16.8.1	255.255.254.0	N/A
	S0/1/0	172.16.10.1	255.255.254.0	N/A
East	Fa0/0	172.16.20.1	255.255.254.0	N/A
	S0/0/0	172.16.19.254	255.255.254.0	N/A
	S0/0/1	172.16.22.1	255.255.254.0	N/A
	S0/1/0	172.16.24.1	255.255.254.0	N/A
Branch 1	Fa0/0	172.16.2.1	255.255.254.0	N/A
	S0/0/0	172.16.9.254	255.255.254.0	N/A
	S0/0/1	172.16.6.1	255.255.254.0	N/A
Branch 2	Fa0/0	172.16.4.1	255.255.254.0	N/A
	S0/0/0	172.16.11.254	255.255.254.0	N/A
	S0/0/1	172.16.7.254	255.255.254.0	N/A
Branch 3	Fa0/0	172.16.28.1	255.255.254.0	N/A
	S0/0/0	172.16.23.254	255.255.254.0	N/A
	S0/0/1	172.16.26.1	255.255.254.0	N/A
Branch 4	Fa0/0	172.16.30.1	255.255.254.0	N/A
	S0/0/0	172.16.25.254	255.255.254.0	N/A
	S0/0/1	172.16.27.254	255.255.254.0	N/A
PC1	NIC	172.16.17.254	255.255.254.0	172.16.16.1
PC2	NIC	172.16.13.254	255.255.254.0	172.16.12.1
PC3	NIC	172.16.21.254	255.255.254.0	172.16.20.1
PC4	NIC	172.16.3.254	255.255.254.0	172.16.2.1
PC5	NIC	172.16.5.254	255.255.254.0	172.16.4.1
PC6	NIC	172.16.29.254	255.255.254.0	172.16.28.1
PC7	NIC	172.16.31.254	255.255.254.0	172.16.30.1

## Lab 3.5.3 Subnetting Scenario 2 - Answers

### Learning Objectives

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

- Determine the number of subnets needed.
- Determine the number of hosts needed.
- Design an appropriate addressing scheme.
- Assign addresses and subnet mask pairs to device interfaces and hosts.
- Examine the use of the available network address space.
- Determine how static routing could be applied to the network.

### Scenario

In this lab, you have been given the network address 172.16.0.0/16 to subnet and provide the IP addressing for the network shown in the Topology Diagram. The network has the following addressing requirements:

- The Branch 1 LAN will require 100 host IP addresses.
  - The Branch 2 LAN will require 100 host IP addresses.
  - The Branch 3 LAN will require 100 host IP addresses.
  - The Branch 4 LAN will require 100 host IP addresses.
  - The West LAN will require 400 hosts.
  - The East LAN will require 400 hosts.
  - The HQ LAN will require 500 host IP addresses.
  - The links between each of the routers will require an IP address for each end of the link.
- (Note: Remember that the interfaces of network devices are also host IP addresses and are included in the above addressing requirements.)

The IP addresses for the link from the HQ router to the ISP have already been assigned. The Serial 0/1/0 address of the HQ router is 209.165.200.226/27. The IP address of the Serial 0/0/0 of the ISP router is 209.165.200.227/27.

#### Task 1: Examine the Network Requirements.

Examine the network requirements and answer the questions below. Keep in mind that IP addresses will be needed for each of the LAN interfaces.

How many subnets are needed? 15

What is the maximum number of IP addresses that are needed for a single subnet? 500

How many IP addresses are needed for each of the branch LANs? 100

How many IP addresses are needed for all of the connections between routers? 16

What is the total number of IP addresses that are needed? 1716

#### Task 2: Design an IP Addressing Scheme.

**Step 1:** Subnet the 172.16.0.0 network based on the maximum number of hosts required by the largest subnet.

What will the subnet mask be for the subnetworks? 255.255.254.0 or /23

How many usable host IP addresses are there per subnet? 510

### Lab 3.5.3 Subnetting Scenario 2 - Answers

Fill in the following chart with the subnet information.

Subnet Number	Subnet IP	First Usable Host IP	Last Usable Host IP	Broadcast Address
0	172.16.0.0	172.16.0.1	172.16.1.254	172.16.1.255
1	172.16.2.0	172.16.2.1	172.16.3.254	172.16.3.255
2	172.16.4.0	172.16.4.1	172.16.5.254	172.16.5.255
3	172.16.6.0	172.16.6.1	172.16.7.254	172.16.7.255
4	172.16.8.0	172.16.8.1	172.16.9.254	172.16.9.255
5	172.16.10.0	172.16.10.1	172.16.11.254	172.16.11.255
6	172.16.12.0	172.16.12.1	172.16.13.254	172.16.13.255
7	172.16.14.0	172.16.14.1	172.16.15.254	172.16.15.255
8	172.16.16.0	172.16.16.1	172.16.17.254	172.16.17.255
9	172.16.18.0	172.16.18.1	172.16.19.254	172.16.19.255
10	172.16.20.0	172.16.20.1	172.16.21.254	172.16.21.255
11	172.16.22.0	172.16.22.1	172.16.23.254	172.16.23.255
12	172.16.24.0	172.16.24.1	172.16.25.254	172.16.25.255
13	172.16.26.0	172.16.26.1	172.16.27.254	172.16.27.255
14	172.16.28.0	172.16.28.1	172.16.29.254	172.16.29.255
15	172.16.30.0	172.16.30.1	172.16.31.254	172.16.31.255

Step 2: Assign the subnets to the network shown in the Topology Diagram.

When assigning the subnets, keep in mind that routing will need to occur to allow information to be sent throughout the network. The subnets will be assigned to the networks to allow for route summarization on each of the routers.

Note: The lowest subnet (subnet 0) will not be assigned in this lab. You should start assigning with the second lowest subnet (subnet 1).

- Assign subnet 1 to the Branch 1 LAN subnet: 172.16.2.0 /23
- Assign subnet 2 to the Branch 2 LAN subnet: 172.16.4.0 /23
- Assign subnet 3 to the link between the Branch 1 and Branch 2 routers: 172.16.6.0 /23
- Assign subnet 4 to the link between the Branch 1 and West routers: 172.16.8.0 /23
- Assign subnet 5 to the link between the Branch 2 and West routers: 172.16.10.0 /23
- Assign subnet 6 to the West LAN subnet: 172.16.12.0 /23
- Assign subnet 7 to the link between the West and HQ routers: 172.16.14.0 /23
- Assign subnet 8 to the HQ LAN subnet: 172.16.16.0 /23
- Assign subnet 9 to the link between the HQ and East routers: 172.16.18.0 /23
- Assign subnet 10 to the East LAN subnet: 172.16.20.0 /23
- Assign subnet 11 to the link between the Branch 3 and East routers: 172.16.22.0 /23
- Assign subnet 12 to the link between the Branch 4 and East routers: 172.16.24.0 /23

## Lab 3.5.3 Subnetting Scenario 2 - Answers

13. Assign subnet 13 to the link between the Branch 3 and Branch 4 routers:

172.16.26.0 /23

14. Assign subnet 14 to the Branch 3 subnet: 172.16.28.0 /23

15. Assign subnet 15 to the Branch 4 subnet: 172.16.30.0 /23

### Task 3: Assign IP Addresses to the Network Devices.

Assign the appropriate addresses to the device interfaces. Document the addresses to be used in the Addressing Table provided under the Topology Diagram.

#### Step 1: Assign addresses to the HQ router.

1. Assign the first valid host address in the HQ LAN subnet to the LAN interface.
2. Assign the first valid host address in the link from HQ to West subnet to the S0/0/0 interface.
3. Assign the first valid host address in the link from HQ to East subnet to the S0/0/1 interface.

#### Step 2: Assign addresses to the West router.

1. Assign the first valid host address in the West LAN subnet to the LAN interface.
2. Assign the last valid host address in the link from HQ to West subnet to the S0/0/0 interface.
3. Assign the first valid host address in the link from West to Branch 1 subnet to the S0/0/1 interface.
4. Assign the first valid host address in the link from West to Branch 2 subnet to the S0/1/0 interface.

#### Step 3: Assign addresses to the East router.

1. Assign the first valid host address in the East LAN subnet to the LAN interface.
2. Assign the last valid host address in the link from HQ to East subnet to the S0/0/0 interface.
3. Assign the first valid host address in the link from East to Branch 3 subnet to the S0/0/1 interface.
4. Assign the first valid host address in the link from East to Branch 4 subnet to the S0/1/0 interface.

#### Step 4: Assign addresses to the Branch 1 router.

1. Assign the first valid host address in the Branch 1 LAN subnet to the LAN interface.
2. Assign the last valid host address in the link from West to Branch 1 subnet to the S0/0/0 interface.
3. Assign the first valid host address in the link from Branch 1 to Branch 2 subnet to the S0/0/1 interface.

#### Step 5: Assign addresses to the Branch 2 router.

1. Assign the first valid host address in the Branch 2 LAN subnet to the LAN interface.
2. Assign the last valid host address in the link from West to Branch 2 subnet to the S0/0/0 interface.
3. Assign the last valid host address in the link from Branch 1 to Branch 2 subnet to the S0/0/1 interface.

#### Step 6: Assign addresses to the Branch 3 router.

1. Assign the first valid host address in the Branch 3 LAN subnet to the LAN interface.
2. Assign the last valid host address in the link from East to Branch 3 subnet to the S0/0/0 interface.

## Lab 3.5.3 Subnetting Scenario 2 - Answers

3. Assign the first valid host address in the link from Branch 3 to Branch 4 subnet to the S0/0/1 interface.

### Step 7 Assign addresses to the Branch 4 router.

1. Assign the first valid host address in the Branch 4 LAN subnet to the LAN interface.
2. Assign the last valid host address in the link from East to Branch 4 subnet to the S0/0/0 interface.
3. Assign the last valid host address in the link from Branch 3 to Branch 4 subnet to the S0/0/1 interface.

### Step 8 Assign addresses to the host PCs

1. Assign the last valid host address in the HQ LAN subnet to PC1.
2. Assign the last valid host address in the West LAN subnet to PC2.
3. Assign the last valid host address in the East 1 LAN subnet to PC3.
4. Assign the last valid host address in the Branch 1 LAN subnet to PC4.
5. Assign the last valid host address in the Branch 2 LAN subnet to PC5.
6. Assign the last valid host address in the Branch 3 LAN subnet to PC6.
7. Assign the last valid host address in the Branch 4 LAN subnet to PC7.

### Task 4: Test the Network Design.

Apply your addressing scheme to the Packet Tracer file that has been supplied with this lab. Check to see that all devices on directly connected networks can ping each other.

### Task 5: Reflection

How many IP addresses in the 172.16.0.0 network are wasted in this design? 63820

What would the command be to add a default static route for your entire network design from the HQ router to the ISP router?

---

```
ip route 0.0.0.0 0.0.0.0 209.165.200.227
```

Can the West, Branch 1, and Branch 2 networks be summarized into one route on the HQ router? This summarized route should also include the serial links that connect the West, Branch 1, and Branch 2 routers. yes

What would be the command used to add this summary route to the routing table?

---

```
ip route 172.16.0.0 255.255.240.0 serial 0/0
```

Can the East, Branch 3, and Branch 4 networks be summarized into one route on the HQ router? This summarized route should also include the serial links that connect the East, Branch 3, and Branch 4 routers. yes

What would be the command used to add this summary route to the routing table?

---

```
ip route 172.16.16.0 255.255.240.0 serial 0/1
```



## Lab 3.5.3 Subnetting Scenario 2 - Answers

What would the command be to add a default static route on the West router to send traffic for all unknown destinations to the HQ router?

```
ip route 0.0.0.0 0.0.0.0 serial 0/0
```

What would the command be to add a default static route on the East router to send traffic for all unknown destinations to the HQ router?

```
ip route 0.0.0.0 0.0.0.0 serial 0/0
```

Can the Branch 1 and Branch 2 networks be summarized into one route on the West router? This summarized route should also include the serial link that connects the Branch 1 and Branch 2 routers.  
yes

What would be the command used to add this summary route to the routing table? Use the S0/0/1 interface of the West router as the exit interface.

```
ip route 172.16.0.0 255.255.248.0 serial 0/1
```

Can the Branch 3 and Branch 4 networks be summarized into one route on the East router? This summarized route should also include the serial link that connects the Branch 3 and Branch 4 routers.  
yes

What would be the command used to add this summary route to the routing table? Use the S0/0/1 interface of the East router as the exit interface.

```
ip route 172.16.24.0 255.255.248.0 serial 0/1
```

The Branch 1 router requires a static route for traffic destined for Branch 2. All other traffic should be sent to the West router using a default static route. What commands would be used to accomplish this?

```
ip route 172.16.4.0 255.255.254.0 serial 0/1
```

```
ip route 0.0.0.0 0.0.0.0 serial 0/0
```

The Branch 2 router requires a static route for traffic destined for Branch 1. All other traffic should be sent to the West router using a default static route. What commands would be used to accomplish this?

```
ip route 172.16.2.0 255.255.254.0 serial 0/1
```

```
ip route 0.0.0.0 0.0.0.0 serial 0/0
```

## Lab 3.5.3 Subnetting Scenario 2 - Answers

The Branch 3 router requires a static route for traffic destined for Branch 4. All other traffic should be sent to the East router using a default static route. What commands would be used to accomplish this?

```
ip route 172.16.30.0 255.255.254.0 serial 0/1
```

```
ip route 0.0.0.0 0.0.0.0 serial 0/0
```

The Branch 4 router requires a static route for traffic destined for Branch 3. All other traffic should be sent to the East router using a default static route. What commands would be used to accomplish this?

```
ip route 172.16.28.0 255.255.254.0 serial 0/1
```

```
ip route 0.0.0.0 0.0.0.0 serial 0/0
```