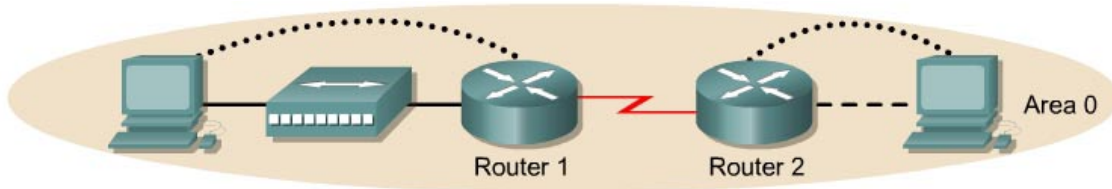


### Lab 2.3.3 Modifying OSPF Cost Metric



| Router Designation | Router Name | Enable Secret Password | Enable, VTY, and Console Passwords | Routing Protocol | Network Statements         |
|--------------------|-------------|------------------------|------------------------------------|------------------|----------------------------|
| Router 1           | Cairo       | class                  | cisco                              | OSPF             | 192.168.1.0                |
| Router 2           | Moscow      | class                  | cisco                              | OSPF             | 192.168.1.0<br>192.168.0.0 |

| Router Designation | IP Host Table Entry | FastEthernet 0 Address/Subnet Mask | Interface Type Serial 0 | Serial 0 Address/Subnet Mask | Interface Type Serial 1 | Serial 1 Address/Subnet Mask |
|--------------------|---------------------|------------------------------------|-------------------------|------------------------------|-------------------------|------------------------------|
| Router 1           | Moscow              | 192.168.1.129/26                   | DCE                     | 192.168.1.1/30               | NA                      | No address                   |
| Router 2           | Cairo               | 192.168.0.1/24                     | DTE                     | 192.168.1.2/30               | NA                      | No address                   |

Note: The IP Host Table Entry column contents indicate the name(s) of the other router(s) in the IP host table.



#### Objective

- Setup an IP addressing scheme for Open Shortest Path First (OSPF) area.
- Configure and verify OSPF routing.
- Modify OSPF cost metric on an interface.

#### Background/Preparation

Cable a network similar to the one shown in the diagram. Any router that meets the interface requirements displayed on the above diagram may be used. For example, router series 800, 1600, 1700, 2500, and 2600 or any such combination can be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce slightly different output. Perform the following steps on each router unless specifically instructed otherwise.

Start a HyperTerminal session.

**Note:** Go to the erase and reload instructions at the end of this lab. Perform those steps on all routers in this lab assignment before continuing.

#### Step 1 Configure the routers

On the routers, enter the global configuration mode and configure the hostname, console, virtual terminal, and enable passwords. Next configure the interfaces and IP hostnames according to the

chart. Do not configure the routing protocol until specifically told to. If there are any problems configuring the router basics, refer to the lab "Review of Basic Router Configuration with RIP".

## Step 2 Save the configuration information from the privileged EXEC command mode

```
Cairo#copy running-config startup-config  
Destination filename [startup-config]?[Enter]
```

```
Moscow#copy running-config startup-config  
Destination filename [startup-config]?[Enter]
```

Why save the running configuration to the startup configuration?

---

## Step 3 Configure the hosts with the proper IP address, subnet mask and default gateway

- Each workstation should be able to ping the attached router. Troubleshoot as necessary. Remember to assign a specific IP address and default gateway to the workstation. If running Windows 9x/ME, check by using **Start > Run > winipcfg**. If running Windows NT/2000/XP, check by using the **ipconfig** command in a Command Prompt window.
- At this point the workstations will not be able to communicate with each other. The following steps will demonstrate the process required to get communication working using OSPF as the routing protocol.

## Step 4 View the routers configuration and interface information

- At the privileged EXEC mode type:

```
Cairo#show running-config
```

- Using the **show ip interface brief** command, check the status of each interface.
- What is the state of the interfaces on each router?

Cairo:

FastEthernet 0: \_\_\_\_\_

Serial 0: \_\_\_\_\_

Moscow:

FastEthernet 0: \_\_\_\_\_

Serial 0: \_\_\_\_\_

- On a router, ping the serial interface of the other router.
- Was the ping successful? \_\_\_\_\_
- If the ping was not successful, troubleshoot the router configuration, until the ping is successful.

## Step 5. Configure OSPF routing on router Cairo

- Configure OSPF routing on each router. Use OSPF process number 1 and ensure all networks are in area 0.

```
Cairo(config)#router ospf 1  
Cairo(config-router)#network 192.168.1.128 0.0.0.63 area 0
```

```
Cairo(config-router)#network 192.168.1.0 0.0.0.3 area 0
Cairo(config-router)#end
```

- b. Examine the running configuration file.
- c. Did the IOS version automatically add any lines under router OSPF 1? \_\_\_\_\_
- d. What did it add? \_\_\_\_\_
- e. If there were no changes to the running configuration, type the following commands:

```
Cairo(config)#router ospf 1
Cairo(config-router)#log-adjacency-changes
Cairo(config-router)#end
```

- f. Show the routing table for the Cairo router.  
Cairo#**show ip route**
- g. Are there any entries in the routing table? \_\_\_\_\_
- h. Why? \_\_\_\_\_

## Step 6 Configure OSPF routing on router Moscow

- a. Configure OSPF routing on each router. Use OSPF process number 1 and ensure all networks are in area 0.

```
Moscow(config)#router ospf 1
Moscow(config-router)#network 192.168.0 .0 0.0.0.255 area 0
Moscow(config-router)#network 192.168.1.0 0.0.0.3 area 0
Moscow(config-router)#end
```

- b. Examine the running configuration file.
- c. Did the IOS version automatically add any lines under router OSPF 1? \_\_\_\_\_
- d. If there were no changes to the running configuration, type the following commands:

```
Moscow(config)#router ospf 1
Moscow(config-router)#log-adjacency-changes
Moscow(config-router)#end
```

## Step 7 Show the routing table entries

- a. Show the routing table entries for the Cairo router.

```
Cairo#show ip route
```

- b. Are there any OSPF entries in the routing table now? \_\_\_\_\_
- c. What is the metric value of the OSPF route? \_\_\_\_\_
- d. What is the VIA address in the OSPF route? \_\_\_\_\_
- e. Are routes to all networks shown in the routing table? \_\_\_\_\_
- f. What does the O mean in the first column of the routing table? \_\_\_\_\_

### Step 8 Test network connectivity

- a. Ping the Cairo host from the Moscow host. Was it successful? \_\_\_\_\_
- b. If not troubleshoot as necessary.

### Step 9 Look at the OSPF cost on the Cairo router interfaces

| Link Bandwidth     | Default OSPF Cost |
|--------------------|-------------------|
| 56 Kbps            | 1785              |
| T1                 | 65                |
| 10-Mbps            | 10                |
| 16-Mbps Token-ring | 6                 |
| FDDI/Fast Ethernet | 1                 |

- a. Show the properties of the Cairo router serial and FastEthernet interfaces using the `show interfaces` command.
- b. What is the default bandwidth of the interfaces?
- c. Serial Interface: \_\_\_\_\_
- d. FastEthernet Interface: \_\_\_\_\_
- e. Calculate the OSPF cost.
- f. Serial Interface: \_\_\_\_\_
- g. FastEthernet Interface: \_\_\_\_\_

### Step 10 Record the OSPF cost of the serial and FastEthernet interfaces

- a. Using the `show ip ospf interface` command, record the OSPF cost of the serial and Fast Ethernet interfaces.
- b. OSPF cost of Serial Interface: \_\_\_\_\_
- c. OSPF cost of Ethernet Interface: \_\_\_\_\_
- d. Do these agree with the calculations? \_\_\_\_\_
- e. The clock rate set for the interface should have been 64000. This is what has been used as a default to this point and specified in the lab, "Review of Basic Configuration including RIP". To calculate the cost of this actual bandwidth divide  $10^8$  by 64000.

### Step 11 Manually set the cost on the serial interface

On the Serial interface of the Cairo router, set the OSPF cost to 1562 by typing `IP ospf cost 1562` at the serial interface configuration mode prompt.

### Step 12. Verify cost

- a. Note that it is essential that all connected links agree about the cost for consistent calculation of the shortest path first algorithm (SPF) in an area.
- b. Verify that the interface OSPF cost was successfully modified.

- c. Reverse the effect of this command by entering in interface configuration mode the command `no ip ospf cost`.
- d. Verify that the default cost for the interface has returned.
- e. Enter the command `bandwidth 2000` at the serial 0 interface configuration mode.
- f. Record the new OSPF cost of the Serial interface. \_\_\_\_\_
- g. Can the OSPF cost of an Ethernet interface be modified in this way? \_\_\_\_\_
- h. The speed can be set on an Ethernet interface. Will this affect the OSPF cost of that interface?  
\_\_\_\_\_  
\_\_\_\_\_
- i. Verify or explain the above answer.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- j. Reset the bandwidth on the serial interface using the `no bandwidth 2000` at the serial 0 interface configuration mode.

Once completion previous steps are completed, log off by typing `exit`, and turn the router off. Then remove and store the cables and adapters.

## Erasing and reloading the router

Enter into the privileged EXEC mode by typing **enable**.

If prompted for a password, enter **class**. If that does not work, ask the instructor for assistance.

```
Router>enable
```

At the privileged EXEC mode, enter the command **erase startup-config**.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue?  
[confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged EXEC mode, enter the command **reload**.

```
Router(config)#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Press RETURN to get started!
```

Press **Enter**.

Now the router is ready for the assigned lab to be performed.

| <b>Router Interface Summary</b>   |                          |                          |                     |                     |
|---|--------------------------|--------------------------|---------------------|---------------------|
| Router Model  | Ethernet Interface #1    | Ethernet Interface #2    | Serial Interface #1 | Serial Interface #2 |
| 800 (806)   | Ethernet 0 (E0)          | Ethernet 1 (E1)          |                     |                     |
| 1600  | Ethernet 0 (E0)          | Ethernet 1 (E1)          | Serial 0 (S0)       | Serial 1 (S1)       |
| 1700  | FastEthernet 0 (FA0)     | FastEthernet 1 (FA1)     | Serial 0 (S0)       | Serial 1 (S1)       |
| 2500  | Ethernet 0 (E0)          | Ethernet 1 (E1)          | Serial 0 (S0)       | Serial 1 (S1)       |
| 2600  | FastEthernet 0/0 (FA0/0) | FastEthernet 0/1 (FA0/1) | Serial 0/0 (S0/0)   | Serial 0/1 (S0/1)   |
| <p>In order to find out exactly how the router is configured, look at the interfaces. This will identify what type and how many interfaces the router has. There is no way to effectively list all of the combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart 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 IOS command to represent the interface.</p> |                          |                          |                     |                     |