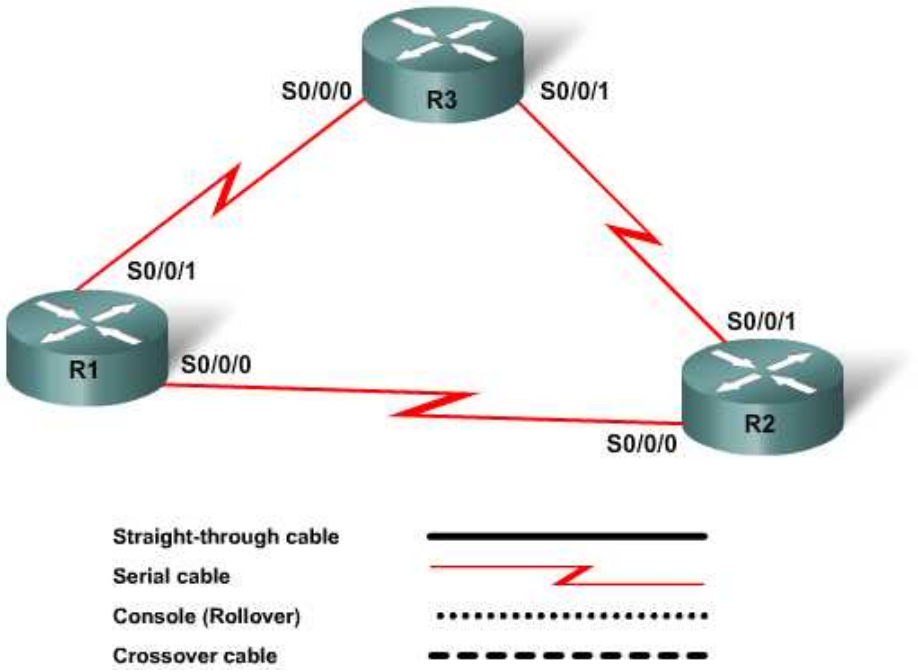
Lab 6.2.3 Configuring OSPF Parameters



Device	Interface	IP Address	Routing Protocol	Interface Type
R1	**S0/0/0**	192.168.1.1/30	OSPF area 0	DCE
	S0/0/1	192.168.2.1/30	OSPF area 0	DTE
R2	**S0/0/0**	192.168.1.2/30	OSPF area 0	DTE
	S0/0/1	10.0.0.1/30	OSPF area 0	DCE
R3	**S0/0/0**	192.168.2.2/30	OSPF area 0	DCE
	S0/0/1	10.0.0.2/30	OSPF area 0	DTE

Objectives

- Configure OSPF routing on all routers.
- Verify OSPF routing using **show** commands.
- Configure loopback OSPF cost parameters to influence route selection.

Background / Preparation

This lab focuses on the configuration of multiple OSPF routers attached to a muti-access Ethernet network to control the outcome of the DR/BDR election. The lab uses Cisco IOS commands.

Any router that meets the interface requirements displayed in the addressing table may be used. For example, router series 800, 1600, 1700, 1800, 2500, 2600, 2800, or any combination can be used.

The information in this lab applies to the 1841 router. Other routers may be used; however, the command syntax may vary. Depending on the router model, the interfaces may differ. For example, on some routers Serial 0 may be Serial 0/0, Serial 0/0/0 and Ethernet 0 may be FastEthernet 0/0. Any Cisco Catalyst switch may be utilized. The default configuration of the switch will perform properly for this exercise.

The following resources are required:

- Three Cisco routers with at least 2 serial interfaces (preferably the same model number and IOS version)
- One Windows-based PC with a terminal emulation program
- At least one RJ-45-to-DB-9 connector console cables to configure the routers
- Three serial crossover cables to connect the routers

NOTE: Make sure that the routers and the switches have been erased and have no startup configurations. Instructions for erasing both switch and router are provided in the Lab Manual, located on Academy Connection in the Tools section.

NOTE: SDM Enabled Routers – If the startup-config is erased in an SDM enabled router, SDM will no longer come up by default when the router is restarted. It will be necessary to build a basic router configuration using IOS commands. The steps provided in this lab use IOS commands and do not require the use of SDM. If you wish to use SDM, refer to the instructions in the Lab Manual, located on the Academy Connection in the Tools section or contact your instructor if necessary.

Step 1: Connect the equipment

Using a crossover serial cable, connect the serial interface of each router to the other routers, as shown in the topology diagram. Note the DTE vs. DCE end of the connection.

Step 2: Perform basic configuration on the routers

a. Connect a PC to the console port of the routers to perform configurations using a terminal emulation program.

b. Configure Routers 1, 2, and 3 with a hostname, console, Telnet, and privileged passwords according to the table and topology diagram.

Step 3: Configure single area OSPF routing on the routers

Configure basic OSPF routing on the routers. All networks are in Area 0.

```
R1(config)#router ospf 1
R1(config-router)#network 192.168.1.0 0.0.0.3 area 0
R1(config-router)#network 192.168.2.0 0.0.0.3 area 0
R1(config-router)#end

R2(config)#router ospf 1
R2(config-router)#network 192.168.1.0 0.0.0.3 area 0
R2(config-router)#network 10.0.0.0 0.0.0.3 area 0
R2(config-router)#end
```

```
R3(config)#router ospf 1
R3(config-router)#network 192.168.2.0 0.0.0.3 area 0
R3(config-router)#network 10.0.0.0 0.0.0.3 area 0
R3(config-router)#end
```

Step 4: Verify current OSPF operation

Now that the serial interfaces and OSPF have been configured, OSPF should be operational between the routers.

a. Use the **show ip route** command on all the routers to verify operation. The outputs should be similar to what is shown below. All networks should be listed in the routing table of each router.

```
R1#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS
level-2
       ia - IS-IS inter area, * - candidate default, U - per-user
static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/30 is subnetted, 1 subnets
O       10.0.0.0 [110/128] via 192.168.2.2, 00:10:38, Serial0/0/1
                 [110/128] via 192.168.1.2, 00:10:38, Serial0/0/0
     192.168.1.0/30 is subnetted, 1 subnets
C       192.168.1.0 is directly connected, Serial0/0/0
     192.168.2.0/30 is subnetted, 1 subnets
C       192.168.2.0 is directly connected, Serial0/0/1
```

Do all routers show that they have paths to all other networks? _____

b. Use the **show interfaces serial 0/0/0** command to determine the bandwidth settings on the serial interfaces.

```
Serial0/0/0 is up, line protocol is up
  Hardware is GT96K Serial
  Internet address is 192.168.1.1/30
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  <*** output omitted ***>
```

What is the current bandwidth setting of the interface? _____

Do the interface bandwidth values match the clock rates set by the configuration_____

What path(s) would R1 take to get to the 10.0.0.0 network?

_____

Step 5: Configure serial interface bandwidth settings

The metric used by OSPF is cost. On Cisco routers, cost is derived from the bandwidth setting on the interfaces.

a. Configure the bandwidth on the serial 0/0 interface of R1.

```
R1(config)#interface serial 0/0/0
R1(config-if)#bandwidth 64
R1(config-if)#end
```

b. Use the **show interfaces serial 0/0/0** command on R1.

What is the bandwidth on S0/0 now? _____

c. Again use the **show ip route** command on R1.

Has the routing table changed? _____

Which path to the 10.0.0.0 network is now preferred?

_____

Why is that path preferred? _____

What is the cost shown to the 10.0.0.0 network? _____

How is this cost calculated? _____

_____

_____

Step 6: Use ospf cost to determine route selection

Another method that is used to determine the path chosen by OSPF is to dictate the cost of an interface.

a. Use the **show ip ospf interface** command to determine the current cost for both R1 serial interfaces.

```
R1#show ip ospf interface
Serial0/1 is up, line protocol is up
  Internet Address 192.168.2.1/30, Area 0
  Process ID 1, Router ID 192.168.2.1, Network Type POINT_TO_POINT,
Cost: 64
     <*** output omitted ***>

Serial0/0 is up, line protocol is up
  Internet Address 192.168.1.1/30, Area 0
  Process ID 1, Router ID 192.168.2.1, Network Type POINT_TO_POINT,
Cost: 1562
        <*** output omitted ***>
```

What is the cost for interface S0/0/0? _____

What is the cost for interface S0/0/1? _____

b. On R1, configure the cost of the S0/1 interface with the **ip ospf cost** command.

```
R1(config)#interface s0/0/1
R1(config)#ip ospf cost 2000
```

c. Use the **show ip route** command on R1.

Has the routing table changed? _____

Which path to the 10.0.0.0 network is now preferred by R1? _____

Why is that path preferred? _____

What is the cost shown to the 10.0.0.0 network now? _____

How is this cost calculated? _____

_____

_____

Step 7: Reflection

a. What determines the path chosen by OSPF?

_____

_____

b. What has a more direct effect on the OSPF cost of a link: the bandwidth setting or the `ip ospf cost` setting?

_____