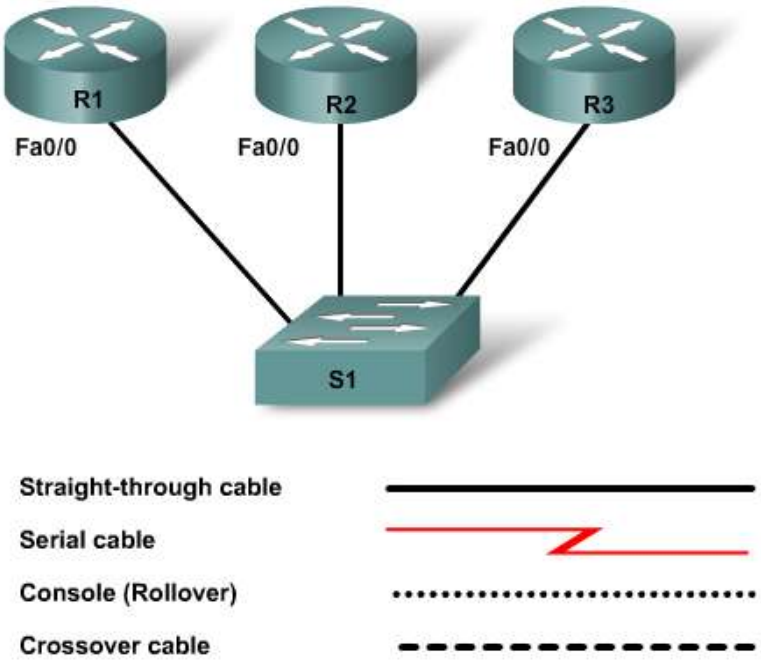
Lab 6.2.3 Controlling a DR/BDR Election



Device	Fast Ethernet 0/0 IP Address	Loopback0 IP Address	Network Statements
R1	192.168.1.1/24	10.0.3.1/32	192.168.1.0
R2	192.168.1.2/24	10.0.2.1/32	192.168.1.0
R3	192.168.1.3/24	10.0.1.1/32	192.168.1.0

Objectives

- Configure OSPF routing on all routers.
- Verify OSPF routing using **show** commands.
- Configure loopback addresses to dictate DR/BDR election.
- Verify DR/BDR election.

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 on the above diagram 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 1841 routers. Other routers may be used; however, 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:

- One Cisco 2960 switch or other comparable switch
- Three Cisco routers with at least 1 FastEthernet interface (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 cable to configure the routers
- Three straight-through Ethernet cables to connect the routers to the switch

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

Connect each of the router Fa0/0 interfaces to any port on the switch using a straight-through cable.

Step 2: Perform basic configuration on the routers

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

b. Configure Routers 1, 2, and 3 with a hostname, and console, Telnet, and privileged passwords according to the table 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 0.0.0.255 area 0

R2(config)#router ospf 1
R2(config-router)#network 192.168.1.0 0.0.0.255 area 0

R3(config)#router ospf 1
R3(config-router)#network 192.168.1.0 0.0.0.255 area 0
```

Step 4: Verify current OSPF operation

a. Now that the Ethernet interfaces and OSPF have been configured, OSPF should be operational between the routers. Because this is a multi-access network, a DR/BDR election should have occurred.

b. Use the **show ip ospf neighbor** command on all the routers to verify operation. The output should be similar to what is shown below.

```
R1#show ip ospf neighbor

Neighbor ID   Pri   State      Dead Time   Address       Interface
192.168.1.2    1    FULL/BDR   00:00:38    192.168.1.2   FastEthernet0/0
192.168.1.3    1    FULL/DR    00:00:35    192.168.1.3   FastEthernet0/0
```

Do all routers show that they have established a neighbor relationship with the other routers?

_____

c. Use the **show ip ospf neighbor detail** command on R1 to determine which routers are the DR and BDR.

Which router is the DR? _____

Which router is the BDR? _____

What factor determined which router was the DR and which was the BDR in this scenario?

_____

Step 5: Configure router loopback interfaces

a. Configuring loopback interfaces for OSPF operation serves two purposes:

1) Because loopback interfaces are logical interfaces and never go down, it ensures that the router ID will never change.

2) Configuring loopback interfaces allows control over the DR/BDR election.

b. Configure the loopback interfaces as shown in the addressing table on the first page.

```
R1(config)#interface loopback 0
R1(config-if)#ip address 10.0.3.1 255.255.255.255
R1(config-if)#end

R2(config)#interface loopback 0
R2(config-if)#ip address 10.0.2.1 255.255.255.255
R2(config-if)#end

R3(config)#interface loopback 0
R3(config-if)#ip address 10.0.1.1 255.255.255.255
R3(config-if)#end
```

c. Use the **show ip ospf neighbor detail** command on R1 to view the DR/BDR status.

Have the DR and BDR routers changed? _____

d. Once elected, the DR and the BDR do not change unless the interfaces all cycle or the OSPF processes are reset. Use the **clear ip ospf 1 process** command on all routers to reset the OSPF processes.

NOTE: If the **clear ip osfp 1 process** command does not result in the loopback addresses determining the router ID and DR/BDR status, use the **reload** command from the privileged EXEC prompt on each router. Be sure to save the configuration on each router before issuing the **reload** command.

e. After the processes have been reset, use the **show ip ospf neighbor detail** command to recheck the DR/BDR status.

```
R1#show ip ospf neighbor detail
 Neighbor 10.0.1.1, interface address 192.168.1.3
    In the area 0 via interface FastEthernet0/0
    Neighbor priority is 1, State is FULL, 6 state changes
    DR is 192.168.1.1 BDR is 192.168.1.2
    Options is 0x52
    LLS Options is 0x1 (LR)
    Dead timer due in 00:00:34
    Neighbor is up for 00:11:55
    Index 2/2, retransmission queue length 0, number of retransmission 0
    First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum is 0 msec

 Neighbor 10.0.2.1, interface address 192.168.1.2
    In the area 0 via interface FastEthernet0/0
    Neighbor priority is 1, State is FULL, 6 state changes
    DR is 192.168.1.1 BDR is 192.168.1.2
    Options is 0x52
    LLS Options is 0x1 (LR)
    Dead timer due in 00:00:31
    Neighbor is up for 00:11:57
    Index 1/1, retransmission queue length 0, number of retransmission 0
    First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum is 0 msec
```

Which router is now the DR? _____

Which router is now the BDR? _____

What factor determined which router was elected as the DR?

_____

Step 6: Use router interface priority to determine DR election

a. Another method that is used to determine the DR/BDR election is router interface priority. Use the **show ip ospf interface** command to determine the default priority settings on the routers.

```
R1#show ip ospf interface
FastEthernet0/0 is up, line protocol is up
  Internet Address 192.168.1.1/24, Area 0
  Process ID 1, Router ID 10.0.3.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 10.0.3.1, Interface address 192.168.1.1
  Backup Designated router (ID) 10.0.2.1, Interface address 192.168.1.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:03
  Supports Link-local Signaling (LLS)
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 2
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 10.0.1.1
```

```
    Adjacent with neighbor 10.0.2.1  (Backup Designated Router)
  Suppress hello for 0 neighbor(s)
```

What is the default interface priority for the Fa0/0 interfaces? _____

b. Configure interface priorities on R1 and R2 to determine the DR/BDR election results.

```
R1(config)#interface fa0/0
R1(config-if)#ip ospf priority 25
R1(config-if)#end

R2(config)#interface fa0/0
R2(config-if)#ip ospf priority 50
R2(config-if)#end
```

c. Use the **show ip ospf neighbor** command to determine the DR and BDR.

Have the DR and the BDR changed? _____

d. Use the **clear ip ospf 1 process** command on all of the routers to reset the OSPF processes.

e. Again use the **show ip ospf neighbor** command to determine which router is the DR and which is the BDR.

Which router is now the DR? _____

Which router is now the BDR? _____

f. Use the **show ip ospf interface** command again on R1 and R2 to confirm the priority settings and DR/BRD status on the routers.

```
R1#show ip ospf interface
FastEthernet0/0 is up, line protocol is up
  Internet Address 192.168.1.1/24, Area 0
  Process ID 1, Router ID 10.0.3.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State BDR, Priority 25
  Designated Router (ID) 10.0.2.1, Interface address 192.168.1.2
  Backup Designated router (ID) 10.0.3.1, Interface address 192.168.1.1
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:00
  Supports Link-local Signaling (LLS)
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 0, maximum is 2
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 10.0.1.1
    Adjacent with neighbor 10.0.2.1  (Designated Router)
  Suppress hello for 0 neighbor(s)

R2#show ip ospf interface
FastEthernet0/0 is up, line protocol is up
  Internet Address 192.168.1.2/24, Area 0
  Process ID 1, Router ID 10.0.2.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 50
  Designated Router (ID) 10.0.2.1, Interface address 192.168.1.2
  Backup Designated router (ID) 10.0.3.1, Interface address 192.168.1.1
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:00
  Supports Link-local Signaling (LLS)
```

```
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 2
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 2, Adjacent neighbor count is 2
  Adjacent with neighbor 10.0.1.1
  Adjacent with neighbor 10.0.3.1  (Backup Designated Router)
Suppress hello for 0 neighbor(s)
```

Did the interface priority override the router ID in determining the DR/BDR? _____

Step 7: Reflection

List the criteria used from highest to lowest for determining the DR on an OSPF network.

_____

_____

_____