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Lab 6.2.4 Configuring BGP with Default Routing
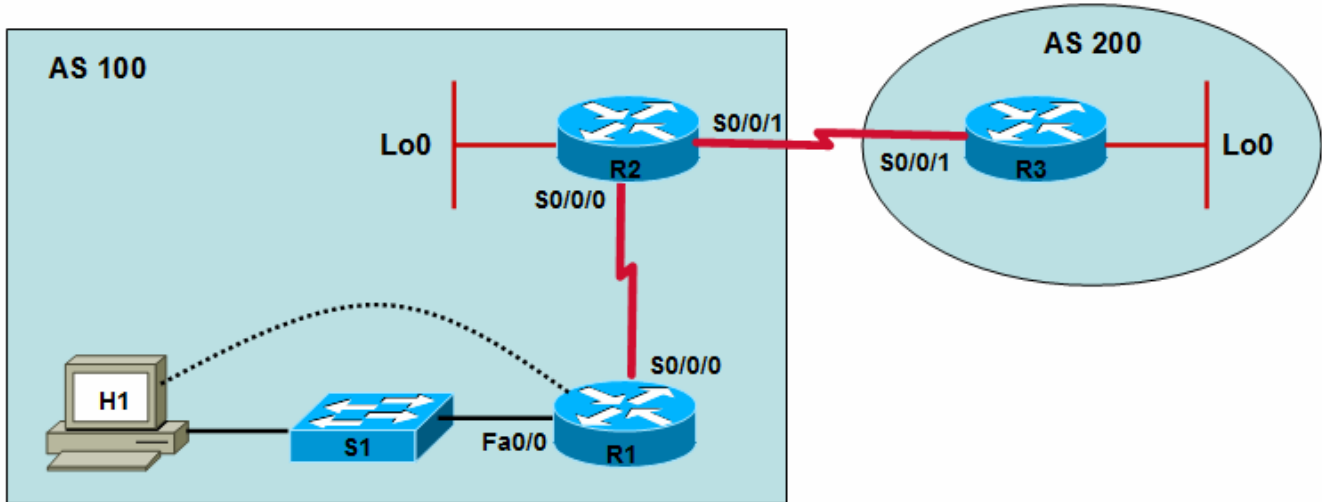
Device	Host Name	Interface	IP Address	Subnet Mask
R1	CR	Serial 0/0/0 (DTE)	10.10.10.1	255.255.255.0
		Fast Ethernet 0/0	192.168.1.1	255.255.255.0
R2	ISP1	Serial 0/0/0 (DCE)	10.10.10.2	255.255.255.0
		Serial 0/0/1 (DCE)	172.16.1.1	255.255.255.0
		Loopback 0	192.168.100.1	255.255.255.0
R3	ISP2	Serial 0/0/1 (DTE)	172.16.1.2	255.255.255.0
		Loopback 0	192.168.200.1	255.255.255.0

Objectives

- Configure the customer router with an internal network that will be advertised by ISP1 via Border Gateway Protocol (BGP).
- Configure BGP to exchange routing information between ISP1 in AS 100 and ISP2 in AS 200.

Background / Preparation

A small company needs access to the Internet. They have arranged for services to be provided by their local ISP (ISP1). ISP1 connects to the Internet through ISP2, using an external routing protocol. BGP4 is the most popular routing protocol between ISPs on the Internet. In this lab, the customer router connects to the ISP using a default route, and ISP1 connects to ISP2 via BGP4.

Set up a network similar to the one in the diagram above. You can use any router or combination of routers that meets the interface requirements in the diagram, such as 800, 1600, 1700, 1800, 2500, or 2600 routers. 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. Depending on the model of router, the output may vary from the output shown in this lab.

Note: Some Cisco router IOS images do not support BGP. You must have an IOS image that supports BGP and enough Flash memory and RAM available to load the image. The Discovery lab configuration document lists the Cisco 1841 router with 32 Mbytes flash, 128 Mbytes of DRAM and Basic IP IOS as a requirement for this course. An 1841 router with these specifications was used to perform this lab. If you are unsure if your router can be used for this lab, contact you instructor.

Required Resources

The following resources are required:

- Customer router (1841 or other)
- Switch (optional if crossover cable is used between PC and customer router)
- 2 ISP routers (1841 or other routers that support BGP)
- Windows XP computer with terminal emulation program installed
- Two straight-through Category 5 Ethernet cables (H1 to switch and switch to R1)
- Two null serial cables
- Console cable to configure routers
- Access to host H1 command prompt
- Access to host H1 network TCP/IP configuration

On host H1, start a HyperTerminal session to each router.

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. Check with your instructor if you are unsure of how to do this.

Step 1: Configure the basic information on each router.

a. Build and configure the network according to the topology diagram, but do not configure a routing protocol. If necessary, see Lab 5.3.5, "Configuring Basic Router Settings with the Cisco IOS CLI," for instructions on setting the host name, passwords, and interface addresses.

b. Configure the host H1 IP address and subnet mask on the customer network to be compatible with the CR router Fast Ethernet interface with a default gateway of 192.168.1.1.

c. Ping between the directly connected routers to test connectivity. Is the CR router able to reach the ISP2 router? _____ Is the customer host able to reach ISP1? _____

d. Configure a loopback interface with an IP address for the ISP1 and ISP2 routers, as shown in the topology diagram. A loopback interface is a virtual interface that simulates a real network for testing purposes.

```
ISP1>enable
ISP1#configure terminal
ISP1(config)#interface loopback0
ISP1(config-if)#ip address 192.168.100.1 255.255.255.0

ISP2>enable
ISP2#configure terminal
ISP2(config)#interface loopback0
ISP2(config-if)#ip address 192.168.200.1 255.255.255.0
```

Step 2: Configure the default and static routes.

a. On the CR router, configure the default route so that users have access to ISP1.

```
CR(config)#ip route 0.0.0.0 0.0.0.0 10.10.10.2
```

b. On the ISP1 router, configure a static route back to the customer network.

```
ISP1(config)#ip route 192.168.1.0 255.255.255.0 10.10.10.1
```

c. Test connectivity by pinging from the host to ISP1 at 10.10.10.2.

Note: If pings are not successful, troubleshoot the router and host configurations and connections.

Step 3: Configure BGP on both ISP routers.

a. Configure BGP on the ISP1 router.

```
ISP1(config)#router bgp 100
ISP1(config-router)#neighbor 172.16.1.2 remote-as 200
ISP1(config-router)#network 192.168.1.0
ISP1(config-router)#network 192.168.100.0
ISP1(config-router)#end
ISP1#copy running-config startup-config
```

Note: It is good practice to save the configuration frequently, especially after completing major configuration steps.

b. Configure BGP on the ISP2 router.

```
ISP2(config)#router bgp 200
ISP2(config-router)#neighbor 172.16.1.1 remote-as 100
ISP2(config-router)#network 192.168.200.0
ISP2(config-router)#end
ISP2#copy running-config startup-config
```

Step 4: View the routing tables.

The BGP configuration is complete. Check the routing table for each router.

Note: Output may vary slightly depending on the model of router used.

a. `ISP2#show ip route`

```
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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

     172.16.0.0/24 is subnetted, 1 subnets
C       172.16.1.0 is directly connected, Serial0/0/1
C    192.168.200.0/24 is directly connected, Loopback0
B    192.168.1.0/24 [20/0] via 172.16.1.1, 00:40:38
B    192.168.100.0/24 [20/0] via 172.16.1.1, 00:40:38
```

1) Is network 192.168.1.0 in the routing table of ISP2? _____

2) What letter is at the left of the entry for 192.168.1.0? _____

3) What does the letter mean? _____

_____

4) Is network 192.168.100.0 in the routing table? _____

5) Which router advertised network 192.168.1.0? _____

b. `ISP1#show ip route`

```
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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

     172.16.0.0/24 is subnetted, 1 subnets
C       172.16.1.0 is directly connected, Serial0/0/1
B    192.168.200.0/24 [20/0] via 172.16.1.2, 00:33:45
     10.0.0.0/24 is subnetted, 1 subnets
C       10.10.10.0 is directly connected, Serial0/0/0
S    192.168.1.0/24 [1/0] via 10.10.10.1
C    192.168.100.0/24 is directly connected, Loopback0
```

1) What networks did ISP1 learn from ISP2? _____

2) How did ISP1 learn about network 192.168.1.0? _____

_____

3) Will ISP1 advertise any networks to the customer router? _____

c. `CR#show ip route`

```
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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 10.10.10.2 to network 0.0.0.0

     10.0.0.0/24 is subnetted, 1 subnets
C       10.10.10.0 is directly connected, Serial0/0/0
C    192.168.1.0/24 is directly connected, FastEthernet0/0
S*   0.0.0.0/0 [1/0] via 10.10.10.2
```

1) Why are networks 192.168.100.0 and 192.168.200.0 not in the CR routing table?

_____

Step 5: Verify connectivity.

a. Ping from host H1 on the CR Ethernet network to the loopback interface on ISP2.

b. Ping from the ISP2 router to host H1 on the Ethernet network of CR.

Note: If pings are not successful, troubleshoot the router and host configurations and connections.

Step 6: View BGP information on the ISP routers.

    a. On the ISP1 router, view the BGP routing.

```
ISP1#show ip bgp
BGP table version is 4, local router ID is 192.168.100.1
Status codes: s suppressed, d damped, h history, * valid, > best, i -
internal
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 192.168.1.0      10.10.10.1               0          32768 i
*> 192.168.100.0    0.0.0.0                  0          32768 i
*> 192.168.200.0    172.16.1.2               0              0 200 i
```

    b. On the ISP2 router, view the BGP routing.

```
ISP2#show ip bgp
BGP table version is 4, local router ID is 192.168.200.1
Status codes: s suppressed, d damped, h history, * valid, > best, i -
internal
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 192.168.1.0      172.16.1.1               0              0 100 i
*> 192.168.100.0    172.16.1.1               0              0 100 i
*> 192.168.200.0    0.0.0.0                  0          32768 i
```

Step 7: Reflection

Why does ISP1 not advertise any networks to the customer router?

_____

_____

Router Interface Summary Table

Router Interface Summary				
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	Fast Ethernet 0 (FA0)	Fast Ethernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
1800	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
2600	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)

Note: To find out exactly how the router is configured, look at the interfaces. The interface identifies the type of router and how many interfaces the router has. There is no way to effectively list all 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 information in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface.