Packet Tracer - Multiarea OSPF Exploration - Physical Mode (Part 1)
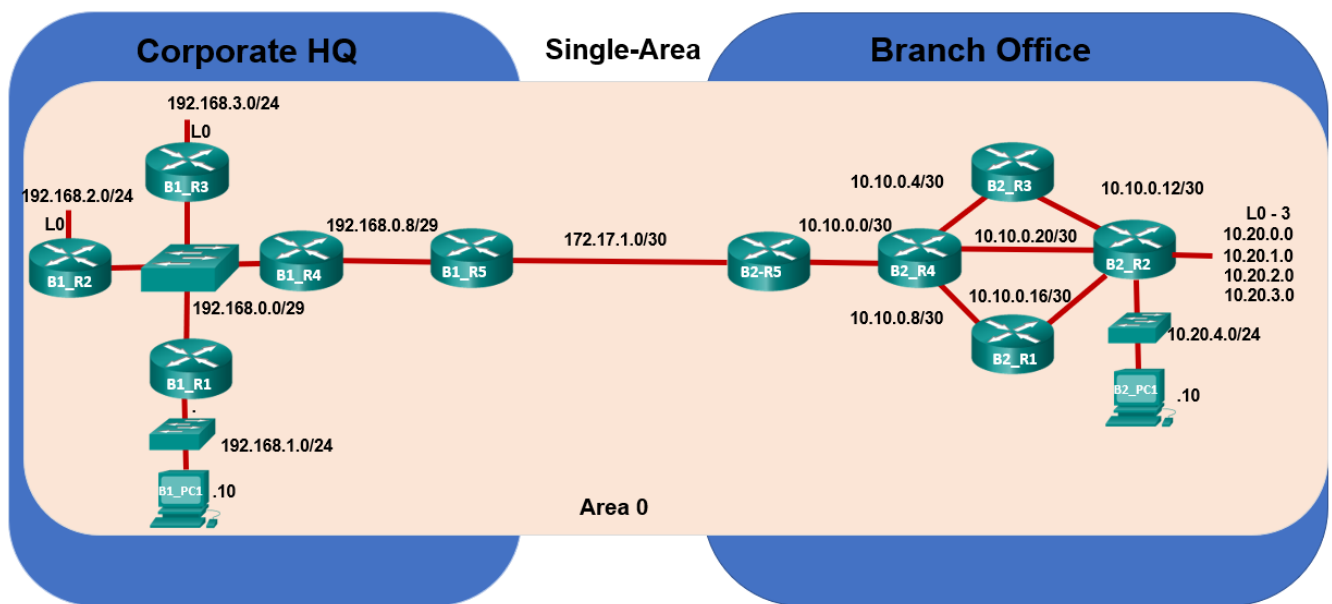
Objectives

Part 1: Evaluate Network Operation of Single-Area OSPF

Part 2: Evaluate Network Operation of Multiarea OSPF

Part 3: Configure a New Area and Attach to Area 0 Through the Internet

Topology

Background / Scenario

Part 1: The Beginning

Casual Recording Company (CRC), based in Sao Paulo, Brazil, provides self-serve, mini-recording studios around the city so that anyone can rent a timeslot and record their songs by themselves. CRC began with a single-area OSPF network located in one building. This idea was very popular and consequently the business has grown, causing the company to expand into a branch office in a second building at the far end of the city. They continued to use single-area OSPF. You will evaluate the impact of the expanded network.

Part 2: Business is Booming

The IT department in CRC decided to migrate to a multiarea OSPF network. You will evaluate the impact and benefits derived from the change to determine if it was a good decision or not.

Part 3: CRC Expansion Continues

CRC has continued to grow and will open a new branch office in Montevideo, Uruguay. You will configure the Area Border Router for the new area and physically connect the branch office network to the corporate headquarters network through the internet.

Instructions

Part 1: Evaluate Single-Area OSPF Network Operation

In this part, CRC has expanded to a second location in Sao Paulo and currently uses single-area OSPF routing.

Step 1: Explore OSPF in the Corporate Headquarters.

a. Click the city icon for **Sao Paulo**. Notice that there are two buildings connected by a fiber link.

b. Click **Corporate HQ**, and then click the **rack icon** that represents the **Sao Paulo HQ Wiring Closet**.

c. Click **B1_R4**, and then select the **CLI** tab.

d. The terminal should show that G0/0/0 and G0/0/1 are up and that four adjacencies have been established, as shown below. If not, wait for the OSPF loading process to complete.

```
<output omitted>
Press RETURN to get started!


%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to
up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to
up
23:00:45: %OSPF-5-ADJCHG: Process 1, Nbr 172.17.1.1 on GigabitEthernet0/0/1 from
LOADING to FULL, Loading Done
23:00:45: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.2.1 on GigabitEthernet0/0/0 from
LOADING to FULL, Loading Done
23:00:45: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.1.1 on GigabitEthernet0/0/0 from
LOADING to FULL, Loading Done
23:00:45: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.3.1 on GigabitEthernet0/0/0 from
LOADING to FULL, Loading Done


B1_R4>
```

e. Execute the **show ip route** command. Notice the size of the routing table and the routes learned via OSPF from the routers in the Sao Paulo Branch Office.

f. On B1_R4, execute the **show ip ospf** command.

Record the number of times that the SPF algorithm has been executed.

How many areas are displayed on router B1_R4?

g. Keep the console window for B1_R4 open. Click **B1_R2**, and then select the **CLI** tab. Execute the same two commands.

For the **show ip route** command, compare the output of B1_R2 to the output of B1_R4. Notice that the B1_R2 routing table, with the exception of local and connected routes, has learned the same routes via OSPF as B1_R4.

Record the number of times that the SPF algorithm has been executed.

Step 2: Explore OSPF in the Branch Office.

a. Keep the console windows open for both routers **B1_R2** and **B1_R4**.

b. On the blue tool bar at the top, click the **Back level** button twice to return to the **Sao Paulo** city view. You can also use the shortcut keys **Alt+Left** arrow key.

c. Click **Branch Office**, and then the **rack icon** that represents the **Sao Paulo Branch Office Wiring Closet**.

d. Click **B2_R3**, and then select the **CLI** tab.

e. The terminal should show that G1/0 and G2/0 are up and that two adjacencies have been established, as shown below.

```
<output omitted>
Press RETURN to get started!


%LINK-5-CHANGED: Interface GigabitEthernet1/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0, changed state to
up
%LINK-5-CHANGED: Interface GigabitEthernet2/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet2/0, changed state to
up
23:00:40: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on GigabitEthernet2/0 from LOADING to
FULL, Loading Done
23:00:45: %OSPF-5-ADJCHG: Process 1, Nbr 4.4.4.4 on GigabitEthernet1/0 from LOADING to
FULL, Loading Done


B2_R3>
```

f. Execute the **show ip route** command. Compare the output of B2_R3 to the output of B1_R4 or B1_R2. Notice that other than a few connected or local routes, the same networks are displayed.

g. On B2_R3, execute the **show ip ospf** command.

Record the number of times that the SPF algorithm has been executed.

How many areas are displayed on router B2_R3?

h. Keep the console window open. Click **B2_R1**, and then select the **CLI** tab. The output should be similar to the output of B2_R3.

i. On B2_R1, click **Physical** tab and power the device off to simulate a power outage. Networks 10.10.0.8/30 and 10.10.0.16/36 will no longer be advertised.

j. Issue the **show ip route** and the **show ip ospf** commands on one router in the Branch office and one router in the Head Office.

Are the two networks missing from both of the routing tables and have the SPF algorithm executions increased?

Note: Every router, in both buildings, has been forced to do extra SPF algorithm executions. Because all of the routers are in the same area, every change to the topology will cause OSPF to execute the SPF algorithm on each router. This is not a problem for small networks, but for large networks, excessive SPF

calculations can impact network performance. The solution is to divide the OSPF topology into multiple areas. Changes in topology in one area will not cause SPF recalculations in other areas.

You have completed **Part 1: Evaluate Network Operation of Single-Area OSPF**.

To continue to **Part 2: Evaluate Multiarea OSPF Network Operation**, close this Packet Tracer file. Return to the online course and open the **Multiarea OSPF Exploration - Physical Mode (Part2)** Packet Tracer file**.**