Lab 11
Open Shortest Path First (OSPF)

Prof. Kredo

Due: Start of lab Friday, April 24

Name:	
Name:	

Introduction

In this lab you will accomplish several goals:

- Use the switch port monitoring diagnostic tool
- Deploy OSPF, a dynamic routing protocol
- Explore how OSPF neighbors interact

Work in pairs for this lab using the equipment at your desk. Distribute the work evenly to make sure both group members know the material, as you will be required to know the material for evaluation.

1 Preliminary

For this lab, a set of devices are setup at the fictional Desk Z. This desk is available at all times, in and outside of lab, for you to connect with and perform your lab experiments. The devices for Desk Z follow a topology similar to the Lab 11 Diagram with the IPs: 10.12.50.26, 100.26.26.1, 100.26.26.2, and 200.26.26.1.

Answering the questions for this lab may be simplified by looking up the contents and purposes of common OSPF packets (Hello, Database Description, Link State Request, Link State Update, and Link State Acknowledgment).

Clear your router and switch configurations by following the directions posted on the bulletin board.

Some useful commands for this lab, which aren't mentioned below, include: `show ip protocols`, `show ip route`, and `show ip ospf`.

2 OSPF Adjacency [60 Points]

Begin by removing the cable between the switch at the INT network, connecting PC2 directly to the INT network, selecting IP addresses for the router interfaces in your desk, and configuring your routers' interfaces from PC2. Do not configure OSPF yet. Fill in the Lab 11 Diagram with the values you select.

In this section you will capture the packets exchanged between two OSPF routers as they form an adjacency (as they discover each other and become neighbors). However, there are a couple of complications. You need to be very careful not to connect the routers before you begin capturing packets, otherwise you will miss important packets. Additionally, some of the packets exchanged between new routers are sent unicast, so you'll need to configure your switch to allow you to capture those packets.

First, ensure your routers are disconnected and leave them disconnected for now. Then, configure OSPF on both your routers from PC2. Configuring a router to use OSPF is very similar to that of RIP in the previous lab. One difference is in the `router ospf` command, where you must pick a Process ID. You may pick any value in the range provided; it does not affect this lab. The largest difference is the `network` command, where you must include extra arguments over those required for RIP. In OSPF, a `network` command looks like: `network <IP> <wildcard> area <area#>`. `<IP>` and `<wildcard>` select which router interfaces will be used. Any interfaces with an IP address that matches `<IP>` where `<wildcard>` has a zero bit will be included as a link in the OSPF area. For example, `network 122.55.0.0 0.0.255.255 area 0.1.2.3` would include the interface with IP address 122.55.33.123, but not the interface with IP address 122.54.22.80, in area 0.1.2.3. `<area#>` can be specified as a decimal number or in IP dotted decimal format. **Use area `0.0.0.0` for all routers and networks.** If you have questions on OSPF configuration, use the command help tool (`?`).

After both routers are configured (but unconnected), configure your switch to monitor a port where you will soon connect a router and have PC1 monitor all traffic on that port. This way, later in the lab, you can connect both routers to the switch and capture all packets exchanged between the routers. You learned earlier how to perform port monitoring.

Once all devices are configured, plug PC1 into the monitoring (destination) port and begin a packet capture. Finally, connect your routers to your switch so they can form an adjacency. Do not connect to the internal network yet. If you do not see all the packet types listed in the Lab Preliminary, then there is a configuration error and you need to: disconnect your routers, check your configurations, wait for a few minutes, and try again.

Answer the following questions about your packet trace. You can save your packet trace to a file and examine it later to answer the questions.

1. To which IP addresses do the routers send packets? Which is a special IP address?

2. What MAC address is used for this special IP address?

3. What are the names and purposes of the OSPF packet types? (HINT: You should see 5 different packet types.)

4. How many Link State LS types ("LS Type") do the router's exchange? What are the types and their purpose? (HINT: Look in DB Description packets.)

5. Which router is the designated router? Why was that router selected as the designated router? Research OSPF designated router election to see if your results make sense.

6. How do your routers select their Router ID?

7. On each link of the Lab 11 Diagram (except to INT), indicate which router is the designated router and the backup designated router.

After configuring and connecting your routers, wait a few moments for OSPF to stabilize. Connect PC2 and update its configuration and connect R1 to the INT network, as shown in Lab 11 Diagram. Ensure you have configured your devices correctly by pinging all the interface IP addresses of your devices and some addresses in Desk Z.

Once your devices are correctly configured, demo your setup to the lab instructor.

3 OSPF and Link Failure [40 Points]

OSPF must also adjust to network changes, which you'll explore now. Start a new packet trace on PC1. Make note of the packet capture time and disconnect R1 from the internal network. After OSPF stabilizes (stops sending routing updates), make note of the packet capture time and reconnect your router to the internal network. After OSPF stabilizes again, you can stop the packet trace. Use your packet trace to answer the following questions.

1. What messages do OSPF routers exchange to notify neighbors of link changes?

2. Approximately how long after you disconnect your network does the router detect the network has changed?

3. How do you know the router has detected the disconnection?

4. How long after you reconnect the router to the internal network does OSPF stabilize? How do you know it stabilized?

Lab 11 Diagram