LAB #10

Routing Protocols

To Configuring OSPF (Open Shortest Path First).

Theory:

Open Shortest Path First:

Open Shortest Path First (OSPF) is a link-state routing protocol that was developed for IP networks and is based on the Shortest Path First (SPF) algorithm. OSPF is an Interior Gateway Protocol (IGP). In an OSPF network, routers or systems within the same area maintain an identical linkstate database that describes the topology of the area. Each router or system in the area generates its link-state database from the link-state advertisements (LSAs) that it receives from all the other routers or systems in the same area and the LSAs that itself generates. An LSA is a packet that contains information about neighbors and path costs. Based on the link-state database, each router or system calculates a shortest-path spanning tree, with itself as the root, using the SPF algorithm. OSPF has the following key advantages: Compared with distance-vector routing protocols such as the Routing Information Protocol (RIP), OSPF is more suitable for serving large, heterogeneous internetworks. OSPF can recalculate the routes in a short amount of time when the network topology changes. With OSPF, you can divide an Autonomous System (AS) into areas and keep area topologies separate to decrease the OSPF routing traffic and the size of the link-state database of each area. OSPF provides equal-cost multipath routing. You can add duplicate routes to the TCP stack using different next hops.

SPF Routing Algorithm:

The SPF algorithm accumulates costs along each path from source to destination. The accumulated costs is then used by the router to build a topology table.
OSPF features include:
• Fast convergence
• Supports VLSM
• Efficient use of bandwidth - Routing changes trigger routing updates (no periodic updates)
• Supports large network size
• Routing based on best path selection
• Grouping of members into Area
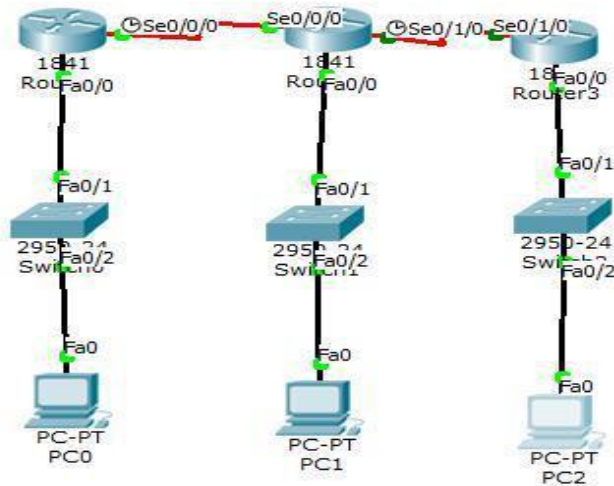
Procedure:

Step1:

The topology consists of 3 Cisco routers which are connected with each other and also with 3switches and switches are connected with 3PCs

Step 2:

A WIC-1T card is placed in the slots in each router. Switch off the router and place the card in the slots and turn it on again. One end of thecable is DTE and the other is automatically DCE.

Step 3:

We have total 5 networks , now assign ip to each network, assign first three ip in pc using default gateways: 192.168.1.1, 192.168.2.1, 192.168.3.1and remaining two on the serial interface of router.

Step 4:

Now configure fast Ethernet and serial interface of router by using CLI. Configuration of R0 are as follow:

```
Router#conf t
Router#conf terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip add
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#no shutdown
Router(config-if)#exit

Router(config)#int s 0/0/0
Router(config-if)#ip add
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#clock r
Router(config-if)#clock rate 64000
Router(config-if)#no shut down
Router(config-if)#exit
Router(config)#
```

Step 5:

Enabling OSPF :

By using following Syntax:

- Router Eigrp Process id

- Network ip address , wild card mask , area 0

Enable a EIGRP routing process, which places you in router configuration mode. And associate the networks with a EIGRP routing process. Then enter the command show ip route on Ro, R1 and R2 to verify that the new route is now in the routing table.

Exercises:

Q1. What is OSPF what is the use of OSPF?

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Q2. How do we configure OSPF?

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Q3 On which basis OSPF decides the best path (routing metric)?

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Q.4 What is the benefits of dividing entire network into area?

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Q.5 Which algorithm OSPF use for finding best path?

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Q.6 In which routing protocol did **OSPF** lie ?

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Q.7 What is the router id in OSPF?

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Q.8 On a single router, if we have connected two different networks with different process id's configured, will they communicate or not. If yes, what needs to be done, to communicate with each other?

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Q.9 What is backbone area and what do we mean by link state in OSPF?

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Q.10. What are the two categories of dynamic routing?

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Q.11. what are the metric in OSPF, RIP, EIGRP?

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