Department of Computer Science and Engineering
Islamic University of Technology (IUT)
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Laboratory Report

CSE 4412: Data Communication and Networking Lab

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Title: Configuration of OSPF in a network topology.

Objective:

1. Understand Link State Routing Protocol
2. Understand OSPF
3. Understand the difference between DV and LS routing

Devices/ software Used:

1. Cisco Packet tracer

Theory:

Link State (LS) Routing

A routing algorithm to determine the shortest path for traveling data packets in a computer network. It uses current state, availability, and bandwidth to calculate the shortest path.

Link-State Database (LSDB)

LSDB is a data structure maintained by each node to store information about the state of the network and connectivity between nodes.

Link State Packet

Link state packet is a type of message used in link state routing protocols to communicate information about a node's state and state of its connected links to other nodes in network. LSPs are typically sent out periodically or whenever there is a change in the state of a link or network resource. Each LSP contains a sequence number that allows routers to determine which LSP is the most recent, and to detect and discard duplicate or outdated LSPs.

Open Shortest Path First (OSPF)

This is a routing protocol that utilizes link state information to share routing details within a network. It determines the shortest route between routers through a cost metric and hierarchical system with routers grouped into regions. Each router keeps its own link state database (LSDB) and picks the path with the lowest cost as the most optimal route.

Metric:

Bandwidth of a link

Areas:

In OSPF, routers are organized into a hierarchy where each area has its own set of routers. Routers within the same area exchange Link State Advertisements (LSAs) with one another to maintain a full picture of the network's topology. This enables each router to have a comprehensive view of the area's connectivity and routing information.

Link State Advertisement (LSA):

Each node of a link state routing algorithm creates a Link advertisement that describes the state of the links and shares it with all other nodes in the network.

OSPF Implementation:

Performance:

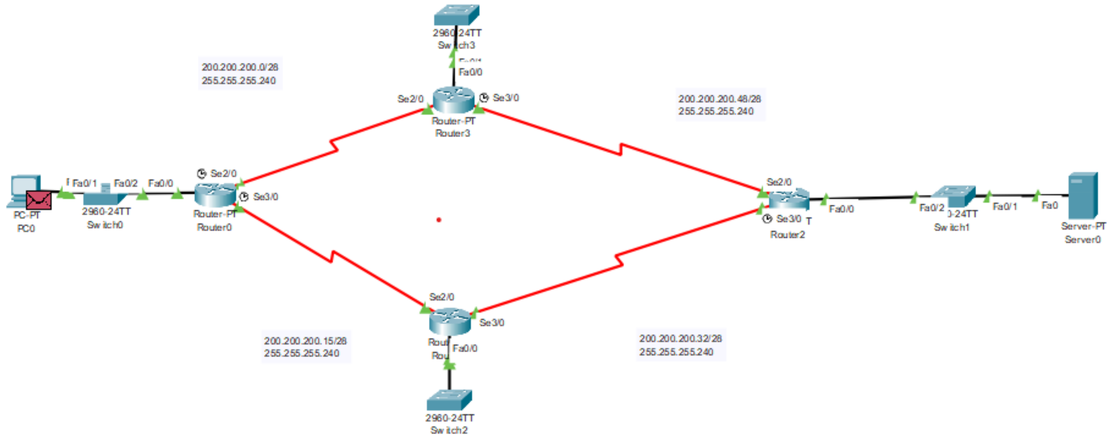
Update Message:

In this network, routers quickly notify their neighbors of any changes by sending updates. These updates are then shared throughout the network by the designated router (DR), which forwards the updates to all other routers on the same network segment. Routers will only accept updates from the DR or backup designated router (BDR) and will ignore updates from any other router.

Convergence of Forwarding Tables:

The term "routing table convergence" describes the duration required for all routers in a network to update their routing tables to reflect changes in the network topology. In the event of a network alteration, like the failure of a link or the addition of a new network, routers must update their routing tables to reflect the modified network status.

Diagram of the experiment:



Configuration of Routers:

Commands for configuring OSPF

Router 0:

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#router ospf 10

Router(config-router)#network 192.168.10.0 0.0.0.255 area 0

Router(config-router)#network 200.200.200.0 0.0.0.15 area 0

Router(config-router)#network 200.200.200.15 0.0.0.15 area 0

Router 1:

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#router ospf 10

Router(config-router)#network 192.168.5.0 0.0.0.255 area 0

Router(config-router)#network 200.200.200.15 0.0.0.15 area 0

Router(config-router)#network 200.200.200.32 0.0.0.15 area 0

Router 2:

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#router ospf 10
Router(config-router)#network 193.168.5.0 0.0.0.255 area 0
Router(config-router)#network 200.200.200.0 0.0.0.15 area 0
Router(config-router)#network 200.200.200.48 0.0.0.15 area 0

Observation:

The screenshots of routing table of each router is shown below:

Router 0:

```
O    192.168.5.0/24 [110/65] via 200.200.200.18, 00:25:17, Serial3/0
C    192.168.10.0/24 is directly connected, FastEthernet0/0
O    193.168.5.0/24 [110/65] via 200.200.200.2, 00:25:17, Serial2/0
O    193.168.10.0/24 [110/129] via 200.200.200.2, 00:25:17, Serial2/0
                     [110/129] via 200.200.200.18, 00:25:17, Serial3/0
     200.200.200.0/28 is subnetted, 4 subnets
C       200.200.200.0 is directly connected, Serial2/0
C       200.200.200.16 is directly connected, Serial3/0
O       200.200.200.32 [110/128] via 200.200.200.18, 00:25:17, Serial3/0
O       200.200.200.48 [110/128] via 200.200.200.2, 00:25:17, Serial2/0
```

Router 1:

```
C    192.168.5.0/24 is directly connected, FastEthernet0/0
O    192.168.10.0/24 [110/65] via 200.200.200.17, 00:26:17, Serial2/0
O    193.168.5.0/24 [110/129] via 200.200.200.17, 00:26:17, Serial2/0
                    [110/129] via 200.200.200.34, 00:26:17, Serial3/0
O    193.168.10.0/24 [110/65] via 200.200.200.34, 00:26:27, Serial3/0
     200.200.200.0/28 is subnetted, 4 subnets
O       200.200.200.0 [110/128] via 200.200.200.17, 00:26:17, Serial2/0
C       200.200.200.16 is directly connected, Serial2/0
C       200.200.200.32 is directly connected, Serial3/0
O       200.200.200.48 [110/128] via 200.200.200.34, 00:26:27, Serial3/0
```

Router 2:

```
O    192.168.5.0/24 [110/65] via 200.200.200.33, 00:27:13, Serial3/0
O    192.168.10.0/24 [110/129] via 200.200.200.33, 00:27:03, Serial3/0
                     [110/129] via 200.200.200.50, 00:27:03, Serial2/0
O    193.168.5.0/24 [110/65] via 200.200.200.50, 00:27:13, Serial2/0
C    193.168.10.0/24 is directly connected, FastEthernet0/0
     200.200.200.0/28 is subnetted, 4 subnets
O       200.200.200.0 [110/128] via 200.200.200.50, 00:27:13, Serial2/0
O       200.200.200.16 [110/128] via 200.200.200.33, 00:27:13, Serial3/0
C       200.200.200.32 is directly connected, Serial3/0
C       200.200.200.48 is directly connected, Serial2/0
```

Router 3:

```
O    192.168.5.0/24 [110/129] via 200.200.200.49, 00:27:38, Serial3/0
                    [110/129] via 200.200.200.1, 00:27:38, Serial2/0
O    192.168.10.0/24 [110/65] via 200.200.200.1, 00:27:48, Serial2/0
C    193.168.5.0/24 is directly connected, FastEthernet0/0
O    193.168.10.0/24 [110/65] via 200.200.200.49, 00:27:38, Serial3/0
     200.200.200.0/28 is subnetted, 4 subnets
C       200.200.200.0 is directly connected, Serial2/0
O       200.200.200.16 [110/128] via 200.200.200.1, 00:27:48, Serial2/0
O       200.200.200.32 [110/128] via 200.200.200.49, 00:27:38, Serial3/0
C       200.200.200.48 is directly connected, Serial3/0
```

Challenges:

OSPF configuration commands are complex and small errors in configuration can lead to problems. We need to make sure we write the right codes.