

# Computer Network and Internet Protocol Experiment 7

**Aim:** - To implement shortest path algorithm using Open Shortest Path First (OSPF) in Cisco Packet Tracer.

**Objective:** - To show that the path chosen to send data from one network to the other is always chosen as the shortest path between the sender and the receiver.

**Theory:** - *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 link-state 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 neighbours 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: -

- It is more suitable for serving large, heterogeneous internetworks and 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.

**Procedure:** -

- 1) Select and Connect 2 PC's, 2 Switches (2950-24) and 3 Routers according to the topology shown.
- 2) Assign IPs to each PC and Router as the following: -
  - a. PC0 – 10.10.10.2 & Default Gateway – 10.10.10.1
  - b. PC1 – 20.20.20.2 & Default Gateway – 20.20.20.1
  - c. Router0 – Turn on FastEthernet 0/0 (IP) – 10.10.10.1 with Serial 2/0 (IP) – 30.30.30.1 and Serial 3/0 (IP) – 40.40.40.1 with clock rate 64000 in both Serials.
  - d. Router1 – Turn on FastEthernet 0/0 (IP) – 20.20.20.1 with Serial 2/0 (IP) – 30.30.30.3 and Serial 3/0 (IP) – 50.50.50.2 with clock rate 64000.
  - e. Router2 – Turn on Serial 2/0 (IP) – 50.50.50.1 and Serial 3/0 (IP) – 40.40.40.2.
- 3) Now open the CLI command tabs one by one for each router and enter the below commands: -
  - a. Router0 -
    - i. Exit
    - ii. Router ospf 1
    - iii. Network 10.0.0.0 0.255.255.255 area 0
    - iv. Network 30.0.0.0 0.255.255.255 area 0
    - v. Network 40.0.0.0 0.255.255.255 area 0

- vi. Exit
- vii. Exit
- b. Router1 -
  - i. Exit
  - ii. Router ospf 1
  - iii. Network 30.0.0.0 0.255.255.255 area 0
  - iv. Network 20.0.0.0 0.255.255.255 area 0
  - v. Network 50.0.0.0 0.255.255.255 area 0
  - vi. Exit
- c. Router2 -
  - i. Exit
  - ii. Router ospf 1
  - iii. Network 40.0.0.0 0.255.255.255 area 0
  - iv. Network 50.0.0.0 0.255.255.255 area 0
  - v. Exit
  - vi. Exit
- 4) After configuring the CLI commands of all routers the setup is ready.
- 5) First send a simple message from PC0 to PC1 with the same topology connected.  
Observe output in both real-time and simulation modes.
- 6) Now disconnect the path from Router 0 to Router 1 making the only path/network connecting the systems being from Router 0 to Router 2 to Router 1.
- 7) Send a simple message in this topology and observe the outputs.
- 8) Reconnect the path from Router 0 to Router 1 again sending a message from PC0 to PC1.

**Conclusion:** - Analysing the path taken by the message to reach the destination in the 3 cases, shows us that the shortest path (Router 0 to Router 1) is always preferred over the longer part (through Router 2) in the OSPF routing. The network chose to send the message through Router 0 and Router 1 when they were connected as the path was shorter in that case. On breaking the connection between the two routers the network chose a longer path from Router 2 but reconnecting the Routers 0 and 1 again the same path was taken as in case 1 showing that it was the actual shortest path between the 2 PCs.

**Result:** - I learnt to implement OSPF routing algorithm using Cisco Packet Tracer and realized how OSPF algorithm always selects the shortest path between the source and the destination.