# OPEN SHORTEST PATH ROUTING ALGORITHM

**Experiment No : 11 DATE:29-04-2024**

**Aim**: Construct a network with at least 6 routers connected with a suitable topologies where each network connected with 5 PC’s . Implement Open Shortest Path Routing Algorithm (OSPF) which is also known as Link State Routing .

Theory:

OSPF, which stands for Open Shortest Path First, is a routing protocol used in computer networks, particularly in large enterprise networks and the internet. It's categorized as a link-state routing protocol, often referred to as the SPF (Shortest Path First) algorithm.

Working of OSPF:

1. **Neighbor Discovery**: OSPF routers discover their neighbors on directly attached links using Hello packets. These packets are sent periodically to establish and maintain neighbor relationships.
2. **Link-State Advertisement (LSA)**: Each router in the OSPF network creates a database of the network topology, including information about its directly connected neighbors and the state of those links. This information is stored in Link-State Advertisements (LSAs). Each router floods its LSAs to all other routers in the network.
3. **Database Synchronization**: When routers receive LSAs from their neighbors, they update their own link-state databases and flood the LSAs to other routers, ensuring that every router in the OSPF domain has the same understanding of the network topology.
4. **Dijkstra's Shortest Path Algorithm**: After building a complete picture of the network topology, each router independently runs Dijkstra's algorithm to calculate the shortest path to every destination network within the OSPF domain. The shortest path is determined based on the cumulative cost metric associated with each link. The cost metric can be based on various factors such as bandwidth, delay, or administrative preference.
5. **Routing Table Calculation**: Once the shortest paths to all destinations are calculated, each router constructs its routing table based on this information. The routing table contains entries for all reachable destinations and the next-hop router to reach each destination.
6. **Link-State Updates**: OSPF routers continue to exchange LSAs periodically to update the network topology information. If there's a change in the network, such as a link failure or a new link coming online, routers quickly update their link-state databases and rerun the SPF algorithm to recalculate the shortest paths.

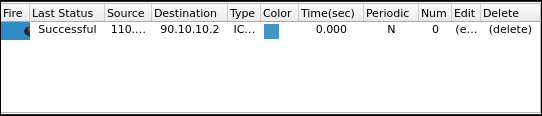
# Procedure:

Design your network topology in Packet Tracer. Place routers and connect them using appropriate connections (Ethernet, Serial, etc.). Ensure that IP addresses are assigned to router interfaces and that routers can reach each other.

1. **Access Router CLI**: Double-click on a router to access its command-line interface (CLI).
2. **Enter Global Configuration Mode**: Type enable to enter privileged EXEC mode, then type configure terminal or simply conf t to enter global configuration mode.
3. **Enable OSPF**: Type router ospf <process-id> to enter OSPF configuration mode. Replace <process-id> with any numeric value you choose.
4. **Configure OSPF Router ID**: Type router-id <router-id> to set the OSPF router ID. This ID uniquely identifies the router in the OSPF domain. The router ID can be an IPv4 address or a 32-bit number in dotted decimal notation.
5. **Enable OSPF on Interfaces**: Type network <network-address> <wildcard-mask> area <area-id> to enable OSPF on interfaces. Replace <network-address> with the network address of the interface, <wildcard-mask> with the wildcard mask, and <area-id> with the OSPF area ID. Repeat this command for each interface participating in OSPF.
6. **Exit Configuration Mode**: After configuring OSPF on all necessary interfaces, type end or exit to exit OSPF configuration mode.
7. **Save Configuration**: Type write memory or copy running-config startup-config to save the configuration changes to the router's startup configuration.
8. **Verify OSPF Configuration**: Type show ip ospf and show ip ospf interface to verify OSPF configuration and see OSPF interface information.
9. **Repeat for Other Routers**: Repeat the above steps for other routers in the network, ensuring consistency in OSPF configuration parameters such as process ID, router ID, and network statements.
10. **Testing**: Test connectivity between routers and ensure that OSPF is properly distributing routing information.

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**Conclusion:**

OSPF (Open Shortest Path First) routing algorithm was studied and implemented in Cisco Packet Tracer.