Experiment 6

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1. **Aim**: Configure network using Routing Protocols using Packet tracer or NS2.

2. **Objectives:**

   Routing protocols are used to automatically populate routing tables. Study about different features such as fast convergence speed and loop-free protocols. Observe quantifiable metrics such as packet delivery ratio, end-to-end delay, packet loss, routing overhead. To create a simulation environment that can be used for future studies.

3. **Apparatus used:** Cisco Packet tracer

4. **Theory:**
   Introduction to Routing Protocols:-

   1. RIP (routing information protocol): RIP is an open standard routing protocol. It is a distance vectored routing protocols. It is a class-full routing protocol where updates are exchanged through broadcast. The routing table is exchanged every 30 seconds among the routers in the inter-network. The RIP protocol uses hop count as the metric to find the shortest path but the maximum allowable hop count is 15 by default. The RIP protocols is used only for a small network and is ineffective for a large network.

   RIP Timers: To manage the routing performance, RIP uses four different kinds of timers:
   1. Update timer: It is the time interval after which a router sends it's a copy of the routing table as update to the neighbor routers. The update timer is 30 sec by default.
   2. Invalid timer: It is the time interval after which a router understands that the path to a network is invalid or becomes invalid. The invalid timer is 180 sec by default.
   3. Hold-down timer: It specifies the amount of time for which the information about the poorer routes are ignored. The hold-down timer is 180sec by default.
   4. Flush timer: It is the time before the invalid route is purged from the routing table. The flush timer is 240 sec by default.

   Dis-advantages of RIP: uses more bandwidth as updates are exchanged every 30 seconds where each update contains the complete routing table of the router. It does not uses bandwidth as the metric for calculation of the shortest path. RIP has a very slow convergence.

• RIP implementation can lead to routing loops in the network. • RIP is only applicable to small network and is inefficient for larger networks.

2. OSPF (open shortest path first): It is an open standard routing protocol. It is the successor of RIP routing protocol. It is a classless routing protocol. It works with link state advertisement and uses Dijkstra algorithm to find the shortest path. Here updates are exchanged through multicast. The metric used by OSPF is the cost which is based on the bandwidth of the link.

Features: Includes division into areas and autonomous systems. It minimizes the traffic by reducing update. It is scalable. It supports Variable Length Subnet Mask and Classless Inter-Domain Routing. Has maximum hop count of 255. It can be configured on different vendor routers. Faster convergence. Hello packets are sent every 10sec. Hierarchical design with multiple areas.

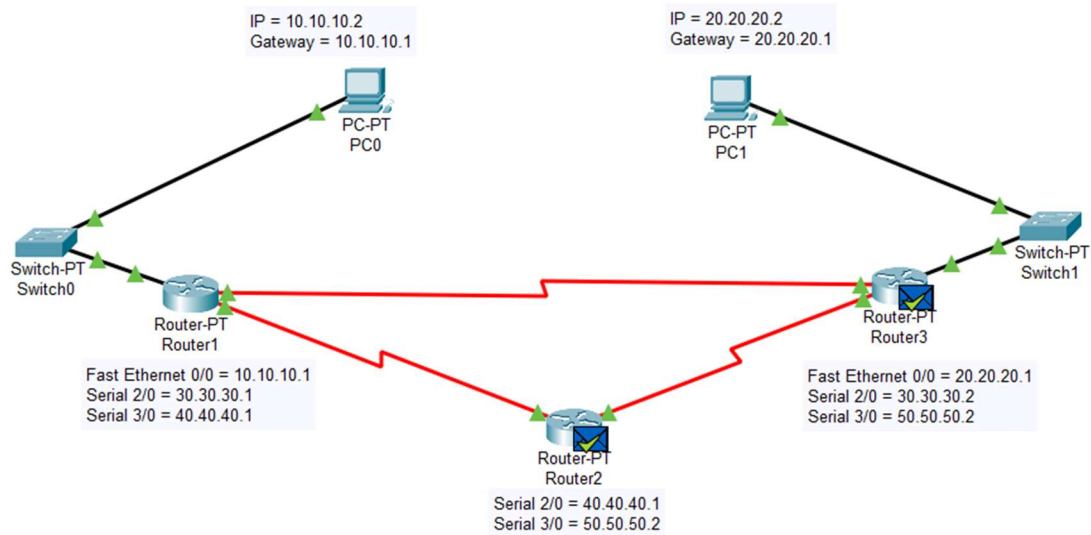**OSPF Tables**: The OSPF routing protocol has three tables:
1. Neighbor table: It has the details about the nodes in the topology that are directly connected to the router i.e. the adjacent nodes.
2. Database table: It has the details of the topology of the network i.e. how each node is connected to other nodes.
3. Routing table: It has the best path to reach each network in the internetwork on the basis of the protocol implemented in the router.

Dis-advantages of OSPF: It consumes more memory. It consumes a lot of processing power.

5. **Implementation:**
   1. Launch cisco packet tracer on your system.
   2. Create network topology with router, switch and PCs using cables.
   3. Configure PCs with IP Addresses and Gateway.
   4. Configure OSPF on routers by accessing their FastEthernet and Serial Comm ports.
   5. Drag and drop packet to assign the communication between networks.
   6. Switch to simulation mode and observe how data frames are transmitted through the hub.

6. Output:

IP = 10.10.10.2
Gateway = 10.10.10.1

IP = 20.20.20.2
Gateway = 20.20.20.1

PC-PT
PC0

PC-PT
PC1

Switch-PT
Switch0

Switch-PT
Switch1

Router-PT
Router1

Router-PT
Router3

Fast Ethernet 0/0 = 10.10.10.1
Serial 2/0 = 30.30.30.1
Serial 3/0 = 40.40.40.1

Fast Ethernet 0/0 = 20.20.20.1
Serial 2/0 = 30.30.30.2
Serial 3/0 = 50.50.50.2

Router-PT
Router2

Serial 2/0 = 40.40.40.1
Serial 3/0 = 50.50.50.2

7. Learning Outcome:

- Simulating packets to confirm the connection is established or not.
- Configuring protocols using the Config menu
- Learnt usage of the Serial-Clock cable.
- Observed Hello packets in OSPF
- Observed advantages of OSPF over RIP.
- Observed working of Serial Port.