# Assignment No : 2

AIM: Simulation of WAN network (min 3 networks) using Cisco Packet Tracer tool (Dynamic Routing)

THEORY:

A) RIP -

The Routing Information Protocol (RIP) is one of the oldest distance-vector routing protocols which employ the hop count as a routing metric.

Distance Vector Routing -

Distance Vector Routing is a dynamic routing algorithm. In this algorithm, each router maintains a routing table indexed by, and containing one entry for each router in the network. This entry has two parts: the preferred outgoing line to use for that destination and an estimate of the best known distance to that destination. The distance might be measured as the no. of hops or propagation delay. These tables are updated by exchanging them with the neighbors of the router periodically. Eventually, each router knows the best link to get to a destination.

Count to Infinity Problem -

The main drawback of distance vector routing algorithm is 'Count to Infinity' problem. It occurs due to the routing loops that are created in a network when an interface or device goes down. The core of the count-to-infinity problem is that if A tells B that it has a path somewhere, there is no way for B to know if B

itself is a part of the path.
Therefore, even though a distance vector routing algorithm does converge, it may do so slowly. Particularly, it reacts to good news faster than it reacts to bad news.

RIP Protocol-
Routing Information Protocol (RIP) is a dynamic routing protocol which uses hop count as a routing metric to find the best path between the source and destination network. It is a distance vector routing protocol which has AD value 120 and works on the application layer of OSI model. RIP uses port no. 520.

In RIPv1, routers broadcast updates with their routing table every 30 seconds. In the early deployments, routing tables were small enough that the traffic was not significant. As the networks grew in size, however, it became evident there could be a massive traffic burst every 30 seconds, even if the routers had been initialized at random times.

RIP prevents routing loops by implementing a limit on the no. of hops allowed from source to destination. The maximum hop count allowed for RIP is 15 and hop count of 16 is considered as network unreachable. RIP implement the split horizon, route poisoning and holddown mechanisms to prevent incorrect information from being propagated.

Router Configuration Commands for RIP -

```
#enable
#config t
#router rip
#network 10.0.0.0
#network 172.16.0.0
```

The above configuration is applicable to router 1.
The command router rip enters router configuration mode, and enables RIP on the router. The command network 'ip-address' specifies the list of networks on which RIP is to be applied, using the address of the network of each directly connected network

```
#enable
#config t
#router rip
#network 192.168.30.0
#network 172.16.0.0
```

The above configuration is applicable to router 2

B) OSPF -

Link state Routing -
In Link state Routing, each router must follow the following steps -

1) Discover its neighbors and learn their network addresses. This goal is accomplished by sending

a HELLO packet on each point-to-point line. The router on the other end is expected to send back a reply giving its name.

2) Set the distance or cost metric to each of its neighbors. The cost to reach neighbors can be set automatically, or configured by the network operator.

3) Construct a packet telling all it has just learned. The packet starts with the identity of the sender, followed by a sequence no., and age and a list of neighbors including the cost to reach them.

4) Send this packet to and receive packets from all other routers. Flooding is used to distribute packets and sequence nos. are used to keep track of packets that have already been received.

5) Compute the shortest path to every other router. Once the router has accumulated a full set of link state packets, it can construct the entire network graph. Then, Dijkstra's algorithm can be used to compute shortest paths.

OSPF -

The OSPF (Open Shortest Path First) is an interior Gateway protocol (IGP) for the Internet, used to

distribute IP routing information throughout a single Autonomous System (AS) in an IP network.
The OSPF protocol is a link-state routing protocol, which means that routers exchange topology information with their nearest neighbors. The topology information is flooded throughout the AS, so that each router within the AS has a complete picture of the topology of the AS. This is then used to calculate best end-to-end paths using Dijkstra's algorithm. Because each router knows the entire topology of the network, the chance of occurence of a routing loop is minimal.
Each OSPF router stores routing & topology information in three tables -
Neighbor table - stores information about OSPF neighbors
Topology table - stores the topology structure of a network
Routing table - stores the best routes

Router configuration commands for OSPF -
For Router 1 -
#enable
#config t
#router ospf 10
#network 10.0.0.0 255.0.0.0 area 0
#network 172.16.0.0 255.255.0.0 area 0

For Router 2 -
#enable
#config t
#router ospf 10

#network 192.168.30.0 255.255.255.0 area 0
#network 172.16.0.0 255.255.0.0 area 0

The command #router ospf 'process_id' will enable OSPF routing in router. Process_id is an integer between 1 to 65536 and is locally significant The command #network 'ip_address1' 'ip address2' area 'area_no' enables OSPF with area = area_no on matching interface

Output -
Output for RIP:
Router>sh ip route
Gateway of last resort is not set
C 10.0.0.0/8 is directly connected, Fast Ethernet 0/0
C 172.16.0.0/16 is directly connected, Serial 0/1/0
R 192.168.30.0/24 [120/1] via 172.16.0.2, 00:00:02, Serial 0/1/0

Output for OSPF:
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WAN Topology for RIP and OSPF :-