UNIT-IV

1. Describe the Distance vector routing protocol with examples.

ANSWER:

Distance Vector Routing Algorithm or (Bellman-Ford) or (Ford-Fullkerson)

Distance Vector is a Subset of the forwarding table of a counter.

It contains two columns — destination and its distance from the router.
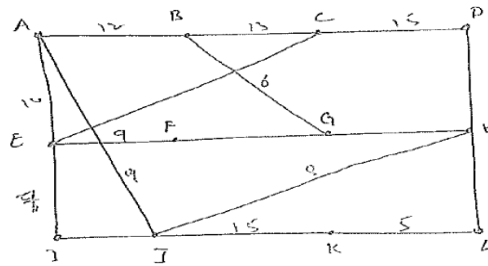
All the destinations known to the router are listed in the distance vector.

Here 'distance' is a routing metric that can have different types of meanings but its is usually the hop count.

Distance Vector routing algorithm aims to determine minimum-hop paths to various destinations.

→ Example

Network diagram with nodes A, B, C, D, E, F, G, H, I, J, K, L and edge delays.

Vectors received from J's four neighbors:

To	A	I	H	K
A	0	24	20	21
B	12	36	31	28
C	25	18	19	36
D	40	27	8	24
E	14	7	30	22
F	23	20	19	40
G	18	31	6	31
H	17	20	0	19
I	21	0	14	22
J	9	11	7	10
K	24	22	22	0
L	29	33	9	9

JA delay is 8, JI delay is 10, JH delay is 12, JK delay is 6

New estimated delay from J — New routing table for J:

	Line
A	8 — A
B	20 — A
C	28 — I
D	20 — H
E	17 — I
F	30 — I
G	18 — H
H	12 — H
I	10 — I
J	0 — —
K	6 — K
L	15 — K

You are Router J. Notice that you have four neighbors: A, I, H and K. Your delay to A is 8, your delay to I is 10, your delay to H is 12 and your delay to K is 6. You receive the distance vectors shown below on the right (the first column is the received distance vector from Router A, the second is from Router I, the third from Router H and the last column is the received distance vector from Router K.

Your goal: Write down your new estimates of distances to all nodes, and annotate your distance vector showing the next router on the best path to each destination.

2. Discuss the principles of reliable flooding and its advantages and applications.
ANSWER:

Principles
The main objective of the network layer is to allow endsystems, connected to different networks, to exchange information through intermediate systems called *router*. The unit of information in the network layer is called a *packet*.
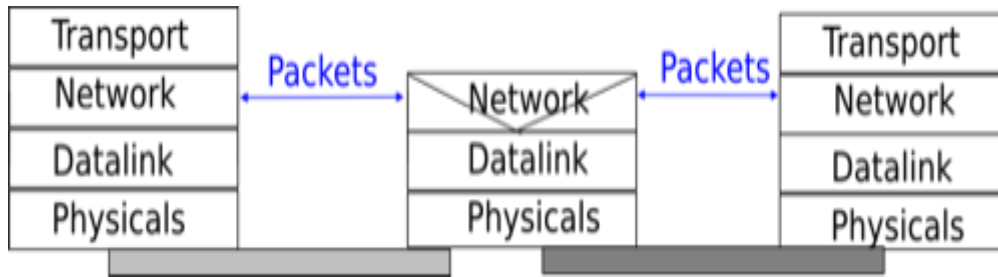
The network layer in the reference model

Before explaining the network layer in detail, it is useful to begin by analysing the service provided by the *datalink* layer. There are many variants of the datalink layer. Some provide a connection-oriented service while others provide a connectionless service. In this section, we focus on connectionless datalink layer services as they are the most widely used. Using a connection-oriented datalink layer causes some problems that are beyond the scope of this chapter. See **RFC 3819** for a discussion on this topic.
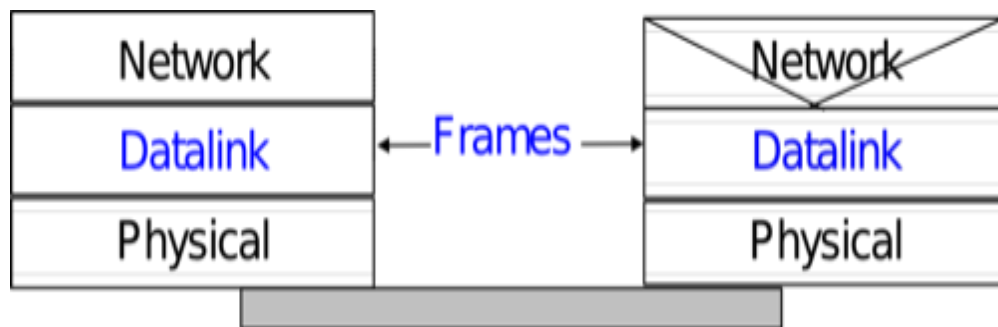
3. Consider the network shown below, where the numbers on the edges indicate the cost of using that edge. For example, the cost of using the link from Router A to Router B is 1, whereas the cost of using the link from Router A to Router D is 4.

(a) Draw the routing table for Router A.
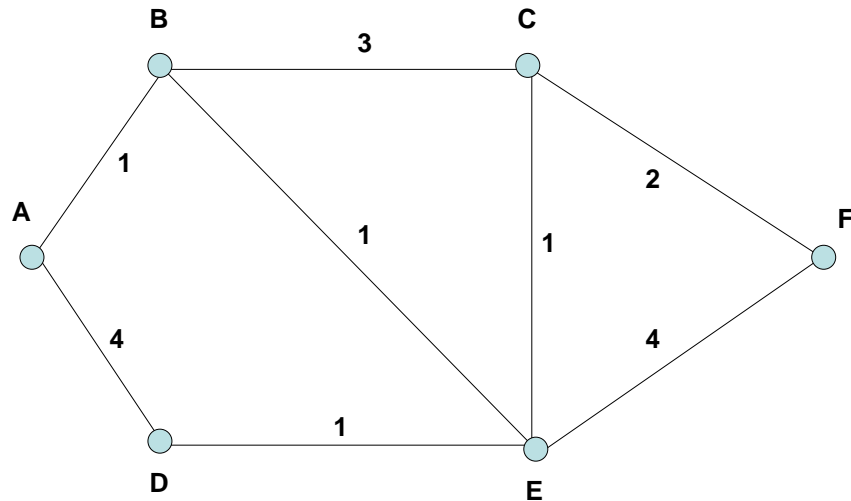
Solution:

Destination	Next Hop
B	
	C
	D
	E
F	

4. State the major difference between Distance Vector Routing and Link State Routing. Discuss how these routing techniques work.
ANSWER:

There are two major types of routing protocols: Distance Vector and Link State.
Distance Vector:
Distance Vector Protocol broadcasts its complete routing table periodically.
Examples of Distance Vector Protocols are RIP, BGP [Border Gateway Protocol], IGRP, EIGRP [Enhanced IGRP].

A distance-vector routing protocol is one of the two major classes of routing protocols used in packet-switched networks for computer communications, the other major class being the link state protocol. A distance vector routing protocol uses the **Bellman-Ford algorithm** to calculate paths.

A distance vector routing protocol requires that a router informs its neighbors of topology changes periodically and, in some cases, when a change is detected in the topology of a network.

The three key features for this routing is
1. Sharing knowledge about the entire Network:
   Each router sends all of its collected knowledge about the network to its neighbors.

2. Sharing only with neighbors:
   Each router sends its collected knowledge about the network to its neighbor routers which directly connected. It sends whatever it has knowledge about the network through all of its ports.
3. Sharing at regular intervals:
   Each router periodically shares its knowledge about the entire network with its neighbors.

Sharing Information:
A router can share its knowledge about network to its neighbors.
 The knowledge may be collected by itself or otherwise shared from other routers.

Routing Table:
Distance vector routing information may be, **Network ID, cost and NextHop**. These three essentials need to form a Distance vector's routing table.

Link State:
    A Link-state routing is a concept used in routing of packet-switched networks in computer communications. Link-state routing works by having the routers tell every router on the network about its closest neighbors. The entire routing table is not distributed from any router, only the part of the table containing its neighbors.

    The basic concept of link-state routing is that every node constructs a map of the connectivity of the network, in the form of graph. Using that map of connectivity graph, each node independently calculates the best next hop from it for every possible destination in the network. The   collection   of   best   next   hops   forms   the Routing   Table for   the   node. Contrast with Distance Vector:

Distance vector, which work by having each node share its routing table with its neighbors. But, in link state protocol, the only information passed between the nodes is information used to construct the connectivity maps.

Note:* Optimized link state routing protocol is its extended version which is used with wireless mesh networks.

Three Key features for this routing are:
 • Sharing knowledge about the neighborhood:
   Instead of sending its entire routing table, a router sends information about its neighborhood only.
 • Share to all Routers:
   Each router sends its information to every other router on the network using process   named flooding.

- Share the information when change:

Every router sends information about its neighbors if any change occurs.

Distributing the information for the map:

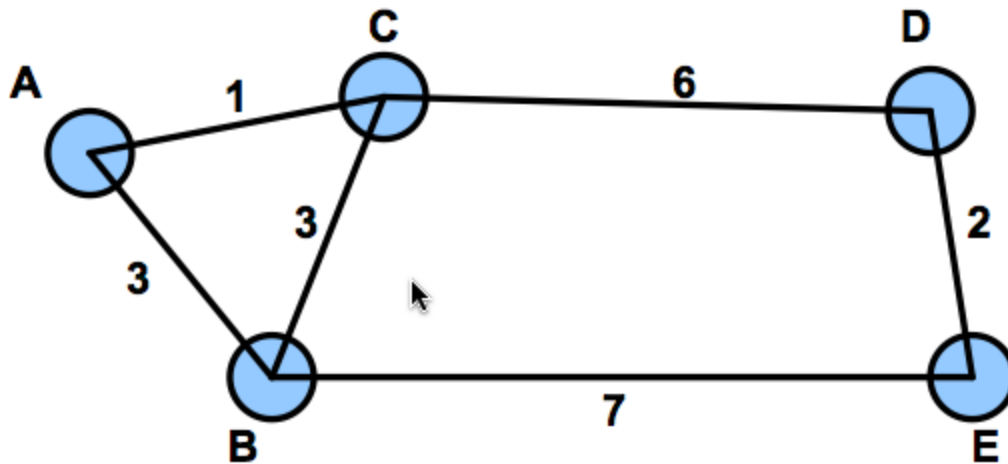   Next, each node periodically makes up a short message, the link-state advertisement, which:
- Identifies the node which is producing it.
- Identifies all the other nodes to which it is directly connected.
- Includes a sequence number, which increases every time the source node makes up a new version of the message.

This message is then flooded throughout the network.

Calculating the shortest path:

   Each node independently runs an algorithm called Dijkstra's algorithm used to identify every other node in the network.

5 . For the following network an empty routing tree generated by Dijkstra's algorithm for node A (to every other node) is shown below. Fill in the missing nodes and indicate the order that each node was added and its associated cost. For reference, node C's completed routing tree is shown as well.

ANSWER: