

## Dynamic Routing Protocols:

Routing protocols are the protocols used by routers to exchange routing information with other routers. This information is further used to build a routing table used by the router to find the best path to use and make appropriate forwarding decisions. A routing protocol also defines how routers communicate with each other, how they share information about the network, and how they update their routing tables.

There are mainly two types of routing protocol static and dynamic. In Static routing, the network administrator manually configures the route information. However, in Dynamic routing, the routers exchange routing information with each other and automatically update their routing tables.

## Routing Protocols:

Routing protocols are rules governing how routers communicate with each other. Routing protocols allow routers to find the best path for data packets to travel automatically by exchanging information about the network. Routing protocols help to select the most efficient path or route to each destination network. This route is then registered in the routing table. The primary goal of routing protocols is to ensure that all routers have accurate and up-to-date information about the network to make the best decisions about how to route traffic. Routing protocols also aim to reduce network traffic by determining the most efficient path between two points.

## Dynamic Routing Protocols:

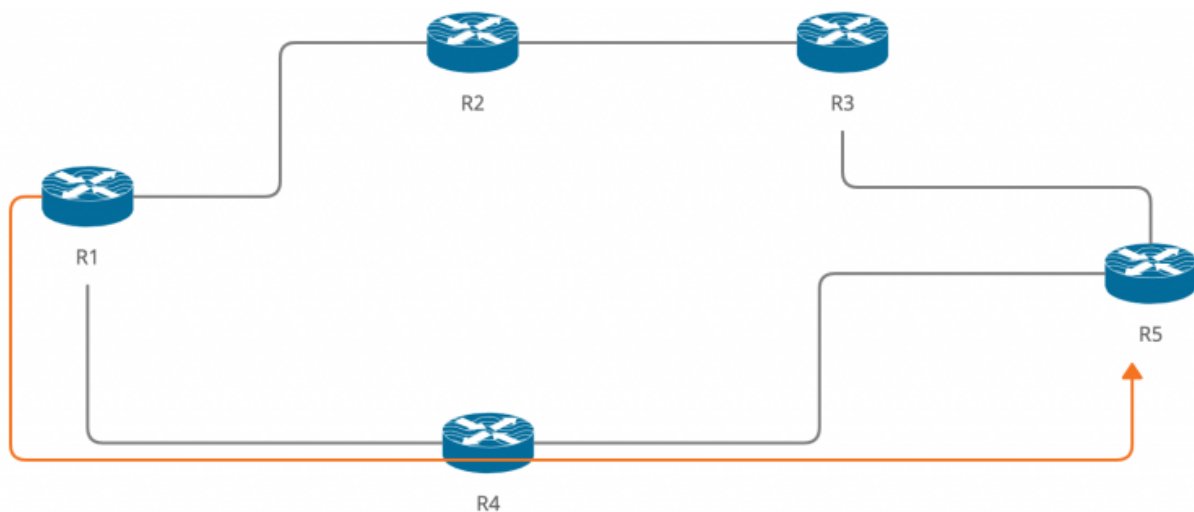
Dynamic routing uses routing protocols to discover network destinations and determine the best paths to reach them based on various metrics – such as bandwidth, hop count, etc. In addition, routing protocols help build dynamic Routing Tables that are automatically updated as network conditions change. The routing algorithms are the core part of routing protocol and are used to calculate the best route for an IP packet between two network nodes. There are three main routing algorithms Hop-by-Hop, Distance Vector, and Link State.

- o Dynamic routing protocols can dynamically respond to changes in the network.
- o Routing protocol is configured on each router & router learn about both each other.
- o Dynamic routing table is created, maintained and updates by the routing protocol.
- o Examples of routing protocols includes RIPv1, RIPv2, ISIS, EIGRP, and OSPF and BGP.
- o Dynamic routing protocols share routing updates with neighbors and find best path.
- o Dynamically choose a different route if a link goes down & updates are dynamically.
- o Also, Dynamic Protocols has the ability to load balance between multiple links.
- o Dynamic Routing protocols put additional load on the Router CPU and RAM.
- o The choice of the best route is on the hands of the Dynamic Routing Protocol.

## Distance Vector Routing Protocols:

Distance Vector Protocols use the Bellman-Ford algorithm and measure distance in hops to calculate the shortest path to a destination. The number of hops is equivalent to the number of routers the data passes through before it reaches its destination. The Routing Information Protocol (RIP) is the most common distance vector protocol.

- o Distance vector routing protocol uses distance (metric value) and direction (vector).
- o Distance Vector use distance and vector to find the best path to destination network.
- o In Distance Vector routing router receives routing update from neighboring router.
- o In distance vector neighboring routers receive updates from their neighboring routers.
- o In this way, distance vector routing protocol work until the destination network.
- o In Distance Vector routing, every router in the way of destination network called hop.
- o Each time a packet goes through a router, it adds one in hop count value or number.
- o Route with least hop count value chosen as best path & will be placed in routing table.
- o RIP version 1 and RIP version 2 is the example of distance vector routing protocol.
- o These protocol shares entire routing table to the directly connected neighbors.
- o Distance Vector Routing Protocols are slow and have a chances for loops.
- o Distance means (How far Away) and Vector means (Which Direction).

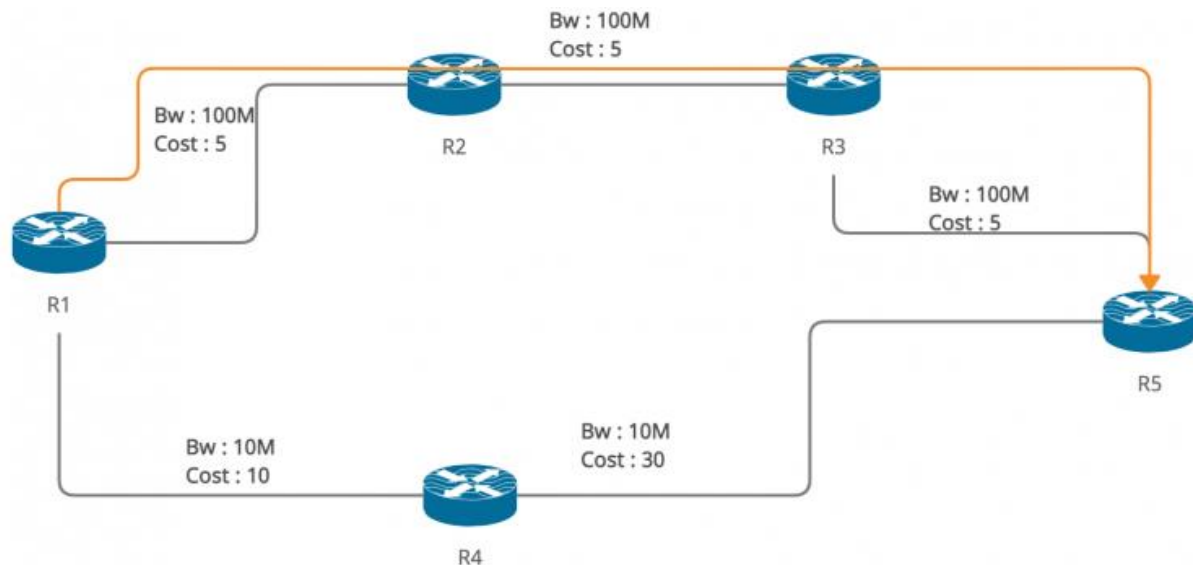


In the image above, if you use distance vector protocol for routing between R1 to R5 best path will be selected via R4 because hop count is less (R1 – R4 – R5) than path (R1 – R2 – R3 – R5).

## Link-State Routing Protocols:

Link-state protocols, on the other hand, use the Dijkstra algorithm and create a map of the network with nearby routers running the same routing protocol. Link-state protocols calculate the shortest path to a destination by measuring the speed of the links and the total cost of the path to a destination. In Addition, Link-state protocols calculate the best path to a destination by considering all available paths. The most common link-state protocol is Open Shortest Path First (OSPF).

- o As compare to distance routing Link State Routing Protocols operate totally differently.
- o Routers send information about the state of their links to the entire network or area.
- o In this way, in Link State Routing each router understands the entire network topology.
- o Run algorithm every time network change is announced to recalculate best routes.
- o As compare to other Link State Routing Protocols much more processor intensive.
- o The Link State Routing Protocols only send triggered updates not periodic updates.
- o Link State Protocols maintain three separate tables Neighbor, Topology & Routing Table.

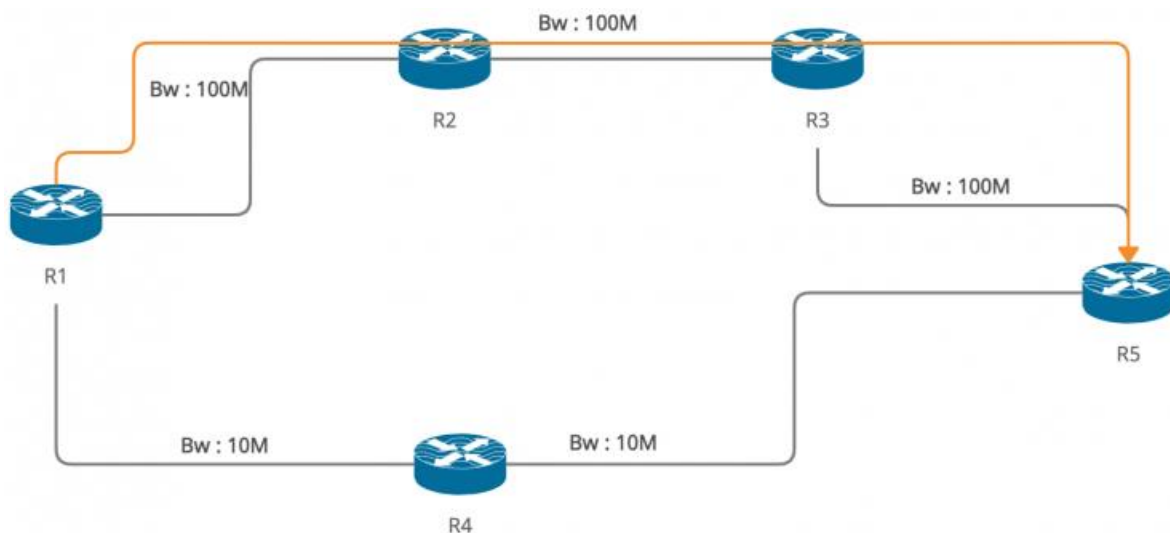


In the image above, amount cost via R1-R2-R3-R5 is 15 and (R1-R4-R5) is 40 then the best path will be selected via to R2-R3.

## Hybrid Routing Protocols:

Hybrid protocols are designed to take advantage of the best features of both distance vector and link-state routing protocols. One example is EIGRP, which uses a combination of these two methods and it is a Cisco proprietary protocol.

- o Hybrid Routing protocol has advantages of both Distance Vector & Link State Routing.
- o Hybrid Routing protocols merges both distance & link state protocol into new protocol.
- o Typically, the hybrid routing protocols are based on a Distance Vector protocol.
- o But contain many of the features and advantages of Link State Routing protocols.
- o Example of Hybrid Protocol is EIGRP (Enhanced Interior Gateway Routing Protocol).



In the image above, EIGRP will choose higher bandwidth via R1-R2-R3-R5 while (R1-R4-R5) is low bandwidth even less router in the path that's why best path will be selected via to R2-R3.