Routing Information Protocol (RIP)

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 the 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 number 520.

Hop Count :
Hop count is the number of routers occurring in between the source and destination network. The path with the lowest hop count is considered as the best route to reach a network and therefore placed in the routing table. RIP prevents routing loops by limiting the number of hopes allowed in a path from source and destination. The maximum hop count allowed for RIP is 15 and hop count of 16 is considered as network unreachable.

Features of RIP :

1. Updates of the network are exchanged periodically.
2. Updates (routing information) are always broadcast.
3. Full routing tables are sent in updates.
4. Routers always trust on routing information received from neighbor routers. This is also known as *Routing on rumours*.

RIP versions :
There are three vesions of routing information protocol – **RIP Version1**, **RIP Version2** and **RIPng**.

Open Shortest Path First (OSPF) protocol States

Prerequisite – OSPF fundamentals
Open Shortest Path First (OSPF) is a link-state routing protocol that is used to find the best path between the source and the destination router using its own Shortest Path First). OSPF is developed by Internet Engineering Task Force (IETF) as one of the Interior Gateway Protocol (IGP), i.e, the protocol which aims at moving the packet within a large autonomous system or routing domain. It is a network layer protocol which works on the protocol number 89 and uses AD value 110. OSPF uses multicast address 224.0.0.5 for normal communication and 224.0.0.6 for update to designated router(DR)/Backup Designated Router (BDR).

OSPF terms –

1. **Router I'd –** It is the highest active IP address present on the router. First, highest loopback address is considered. If no loopback is configured then the highest active IP address on the interface of the router is considered.
2. **Router priority –** It is a 8 bit value assigned to a router operating OSPF, used to elect DR and BDR in a broadcast network.
3. **Designated Router (DR) –** It is elected to minimize the number of adjacency formed. DR distributes the LSAs to all the other routers. DR is elected in a broadcast network to which all the other routers shares their DBD. In a broadcast network, router requests for an update to DR and DR will respond to that request with an update.
4. **Backup Designated Router (BDR) –** BDR is backup to DR in a broadcast network. When DR goes down, BDR becomes DR and performs its functions.

DR and BDR election – DR and BDR election takes place in broadcast network or multi-access network. Here are the criteria for the election:

1. Router having the highest router priority will be declared as DR.
2. If there is a tie in router priority then highest router I'd will be considered. First, the highest loopback address is considered. If no loopback is configured then the highest active IP address on the interface of the router is considered.

OSPF states – The device operating OSPF goes through certain states. These states are:

1. **Down –** In this state, no hello packet have been received on the interface.
   Note – The Down state doesn't mean that the interface is physically down. Here, it means that OSPF adjacency process has not started yet.
2. **INIT –** In this state, hello packet have been received from the other router.
3. **2WAY –** In the 2WAY state, both the routers have received the hello packets from other routers. Bidirectional connectivity has been established.
   Note – In between the 2WAY state and Exstart state, the DR and BDR election takes place.
4. **Exstart –** In this state, NULL DBD are exchanged.In this state, master and slave election take place. The router having the higher router I'd becomes the master while other becomes the slave. This election decides Which router will send it's DBD first (routers who have formed neighbourship will take part in this election).
5. **Exchange –** In this state, the actual DBDs are exchanged.

6. **Loading –** In this sate, LSR, LSU and LSA (Link State Acknowledgement) are exchanged. **Important –** When a router receives DBD from other router, it compares it's own DBD with the other router DBD. If the received DBD is more updated than its own DBD then the router will send LSR to the other router stating what links are needed. The other router replies with the LSU containing the updates that are needed. In return to this, the router replies with the Link State Acknowledgement.
7. **Full –** In this state, synchronization of all the information takes place. OSPF routing can begin only after the Full state.

Is-is

The IS-IS (Intermediate System - Intermediate System) protocol is one of a family of IP Routing protocols, and 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.

IS-IS is a link-state routing protocol, which means that the routers exchange topology information with their nearest neighbors. The topology information is flooded throughout the AS, so that every router within the AS has a complete picture of the topology of the AS. This picture is then used to calculate end-to-end paths through the AS, normally using a variant of the Dijkstra algorithm. Therefore, in a link-state routing protocol, the next hop address to which data is forwarded is determined by choosing the best end-to-end path to the eventual destination.

The main advantage of a link state routing protocol is that the complete knowledge of topology allows routers to calculate routes that satisfy particular criteria. This can be useful for traffic engineering purposes, where routes can be constrained to meet particular quality of service requirements. The main disadvantage of a link state routing protocol is that it does not scale well as more routers are added to the routing domain. Increasing the number of routers increases the size and frequency of the topology updates, and also the length of time it takes to calculate end-to-end routes. This lack of scalability means that a link state routing protocol is unsuitable for routing across the Internet at large, which is the reason why IGPs only route traffic within a single AS.

IS-IS was originally devised as a routing protocol for CLNP, but has been extended to include IP routing; the extended version is sometimes referred to as Integrated IS-IS.

Each IS-IS router distributes information about its local state (usable interfaces and reachable neighbors, and the cost of using each interface) to other routers using a Link State PDU (LSP) message. Each router uses the received messages to build up an identical database that describes the topology of the AS.

From this database, each router calculates its own routing table using a Shortest Path First (SPF) or Dijkstra algorithm. This routing table contains all the destinations the routing protocol knows about, associated with a next hop IP address and outgoing interface.

BGP

https://en.wikipedia.org/wiki/Border_Gateway_Protocol