Routing(RIP, OSPF, metrics)

The RIP protocol and OSPF protocol are two Interior Gateway Protocols (IGP) that intensively used in computer networks to specify the best routes for data transmission. RIP (Routing Information Protocol) is one of the oldest routing protocols in service, whereas OSPF (Open Shortest Path First) serves as the most widely adopted IGP for large enterprise networks. Network managers may find themselves in a dilemma when choosing between RIP vs OSPF. So, this blog will present a detailed description of these two routing protocols and key RIP vs OSPF differences.

OSPF:

- OSPF is a hierarchical IGP and uses Areas to achieve this. The top-level Area is known as Backbone Area, and the number of this Area must always be 0 or 0.0.0.0. All other Areas must be physically connected to this Backbone Area.
- One very important aspect of OSPF is that Areas must not be split. (If this cannot be avoided, a virtual link must be used to expand Area 0 over any other area.) Routers within an area are known as Area Routers.
- Routers connected to two or more areas are known as Area Border Routers (ABR) and routers connected to other autonomous systems are called Autonomous System Boundary Routers (ASBR).
- Routing information can be summarized on ABRs and ASBRs. It is not possible to summarize routing information within an area.
- The metric used by OSPF is cost. Every link has an associated cost value, derived from the link bandwidth. The metric to a destination is calculated by adding up all costs.
- If there are more possible paths to a destination, the route with the lowest cost is chosen as the best route. To advertise LSAs, the router must live in OSPF neighborship with other routers. When this neighborship is fully established, the interfaces begin sending the updates (LSAs).
- To build an adjacency, hello packets are continuously exchanged between neighboring routers. This also keeps track of the existence of the connected OSPF neighbors.
- To lower the number of updates exchanged on a broadcast medium (for example, Ethernet), LSAs are only sent to a so-called Designated Router (DR).
- This interface advertises the information to all other routers on the shared medium.
- Without a DR, an any-to-any neighborship between all OSPF routers on this segment would be needed.
- For backup reasons, a Backup DR (BDR) is elected. Each other router establishes neighborship only with the DR and BDR.

RIP vs OSPF: What Is RIP Protocol in Networking?

RIP (Routing Information Protocol), is an example of distance vector routing for local networks. RIP works to deliver the whole routing table to all active interfaces every 30 seconds. In RIP protocol, hop count is the only metrics to decide the best path to a remote network. Let’s take an example to see how RIP protocol works: Assuming, we have two paths available from the Source to the Destination. It is clear that Path 2 will be selected by RIP protocol since it has fewer hop counts.

RIP vs OSPF: What Is OSPF in Networking?

OSPF (Open Shortest Path First), a link-state routing protocol, is massively adopted in large enterprise networks. OSPF routing protocol collects link state information from routers in the network and determines the routing table information to forward packets. This occurs by creating a topology map for the network. Unlike RIP, OSPF only exchanges routing information when there's a change in network topology. OSPF protocol best fits for complex networks that comprise multiple subnets working to ease network administration and optimize traffic. It effectively calculates the shortest path with minimum network traffic when the change occurs.

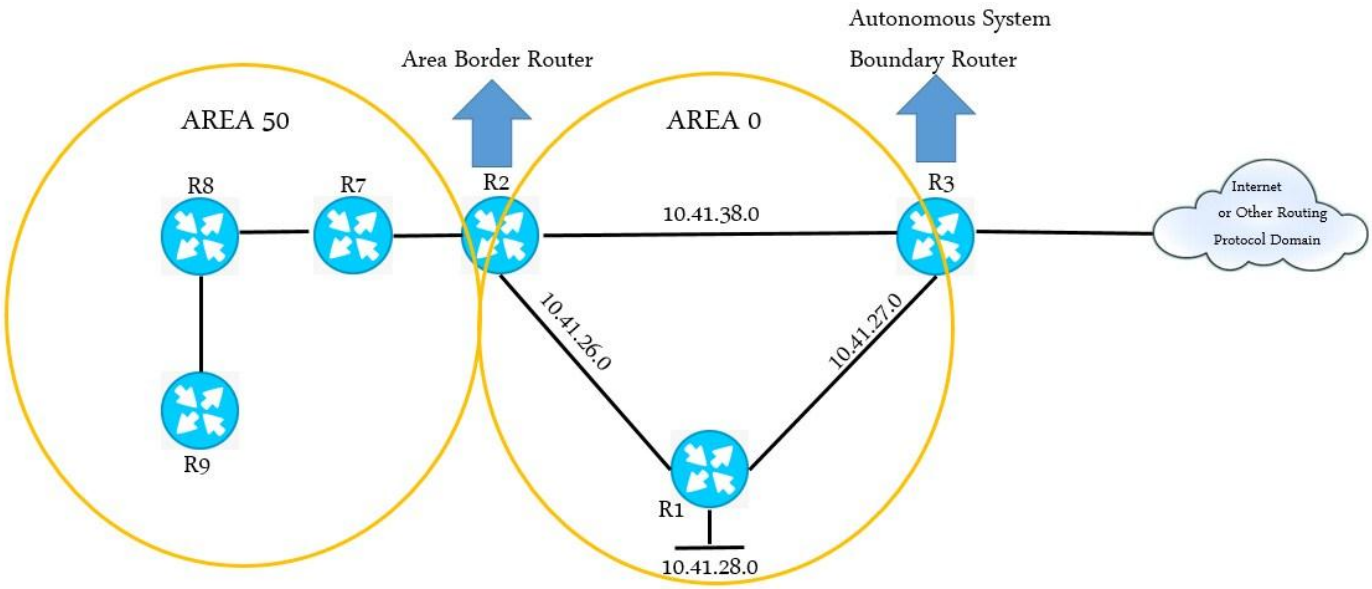

Figure: OSPF Design and Terminology

Pros and Cons of OSPF Protocol

Pros:

- OSPF routing protocol has complete knowledge of network topology, allowing routers to calculate routes based on incoming requests.
- OSPF protocol has no limitations in hop count, unlike RIP protocol that has only 15 hops at most. So OSPF converges faster than RIP and has better load balancing.
- OSPF multicasts link-state updates and sends the updates only when there is a change in the network.

Cons:

- OSPF protocol demands advanced knowledge about complex networks, making it not as easy to learn as some other protocols.
- OSPF routing doesn't scale when there are more routers added to the network. The lack of scalability in OSPF protocol makes it unsuitable for routing across the Internet.
- OSPF protocol maintains multiple copies of routing information, increasing the amount of memory needed.

RIP vs OSPF: What Is the Difference?

RIP and OSPF are Interior Gateway Protocols that routing information within an autonomous system and RIP vs OSPF differs in many aspects.

Features	RIP Protocol	OSPF Protocol
Routing Protocol Type	Distance vector routing protocol (uses the distance or hop counts to determine the transmission path)	Link State Routing Protocol (analyzes different sources like the speed, cost, and path congestion while identifying the shortest path)
Network Table Construction	The router consolidates the routing table from the neighboring devices to construct its own routing table and sends it to neighboring devices at a regular interval.	The router consolidates the routing table by getting only required information from the neighboring devices, never gets the entire routing table.
Default Metric	Based on hop count	Based on bandwidth
Hop Count Restriction	RIP protocol allows only up to 15 hops	OSPF protocol has no such restriction
Administrative Distance	120	110
Algorithm Used	Bellman-Ford algorithm	Dijkstra algorithm
Network Classification	In RIP, the networks are classified as areas and tables.	In OSPF, the networks are classified as areas, sub-areas, autonomous systems, and backbone areas.
Complexity Level	relatively simpler	much more complex
Network Application	RIP suits better for smaller networks as it has hop count restrictions	OSPF serves great for larger networks
Design	Flat network	Hierarchical network possible
Convergence Time	Slow	Fast
Device Resource Requirements	Much less memory and CPU intensive than OSPF	Memory and CPU intensive
Network Resource Requirements	Bandwidth consuming; whole routing table is sent	Less than RIP; only small updates are sent

Table: Key Differences Between RIP and OSPF