# Routing Protocols and Their Limitations

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**Abstract:** Routing protocols define how routers communicate with each other. They calculate the path taken by the data travelling in a network. This article discusses routing protocols and how they work. Then it defines the characteristics an ideal routing protocol should have and the problems faced by routing protocols right now. The article ends with an exploration and discussion of types of routing protocols.

***Key Words*— Routing Protocol, Interior Gateway Protocol, Exterior Gateway Protocol, Link State Protocols, Distance Vector Protocols.**

## I. INTRODUCTION

Routing protocols define how routers communicate with each other. They calculate the path taken by the data travelling in a network. Routing protocol enables the network to make dynamic adjustments according to the situation. Routing protocol share information about the routers neighbouring nodes to the network this way the routers become aware of the topology of the network. Some famous routing protocols are:

Open Shortest Path First (OSPF), Intermediate System to Intermediate System (IS-IS)Interior Gateway Routing Protocol (IGRP), Routing Information Protocol (RIP), and Border Gateway Protocol (BGP).

## II. WORKING

Routing algorithms determine the specific choice of route. Routing protocols are all about routing your packets from the source to the destination. Now it is up to you to decide which protocol is best suited in your situation. In general, routing protocols are an information distribution mechanism. They need to distribute enough information so that each node in the network can compute paths through the topology. There are varying ways of doing this, but the two most common approaches are known as "distance vector" and "link-state" protocols.

If the network is directly connected, then the router already knows how to get to the destination. If the networks are not attached, the router must learn how to get to the remote network with either static routing (administrator manually enters the routes in the router's table) or dynamic routing (happens automatically using routing protocols).

## III. IDEAL CHARACTERISTICS

- **Adaptive to Topology Changes:** It should be adaptive to frequent topology changes caused by mobility of the nodes.
- **Limited Broadcasts:** It should have limited number of broadcasts made by each node to limit the number of packet collision.
- **Convergence:** It must have a quick convergence in which it converges to the optimal route in case of any path breakage.
- **Loop Free:** It must be loop free.
- **Less Nodes:** It should have minimum number of nodes in route computation and maintenance.
- **Scarce Use of Resources:** There should be scarce use of resources like power of computing and battery, bandwidth, memory and bandwidth.
- **Localization:** It must be localized meaning it should be fully distributed.
- **Quality of Service:** It should support and provide quality of service (QOS) for applications which require it and should also support time sensitive traffic.

## IV. PROBLEMS

- **Mobility:** Routing protocols are adaptive to topology changes but due to mobility there are many chances of breakage of paths due to which many times it has to change its topology.
- **Terminal Problems:** There are numbers of broadcast to send packets so that none of them collide with each other but there is a problem when two nodes that are hidden from each other sends data to same node results in collision of

data(can be minimize by using RTS, CTS and ACK messages). There are multiple ways of broadcast but sometimes one node is prevented from sending data because of neighboring transmitter.

- **Resource Constraint:** Due to topology change more bandwidth is use there is no scarce use of bandwidth. Due to mobility there is problem of battery life it has limited battery life and less processing speed and less memory for storage.
- **Path Updation:** We have to update the routing path it does not store the stable path automatically rather use unstable path if we don't update the routing path.
- **Security:** The data on mobile nodes are extremely attractive and vulnerable by attackers. A new type of Denial of Service (DoS) attack forces network nodes to replay packets to exhaust their limited battery power and hijack the network bandwidth.

## V. TYPES

Routing Protocols can be divided into two types:

- Interior Gateway Protocols
- Exterior Gateway Protocols

Figure 1 shows the relation between IGP and EGP.

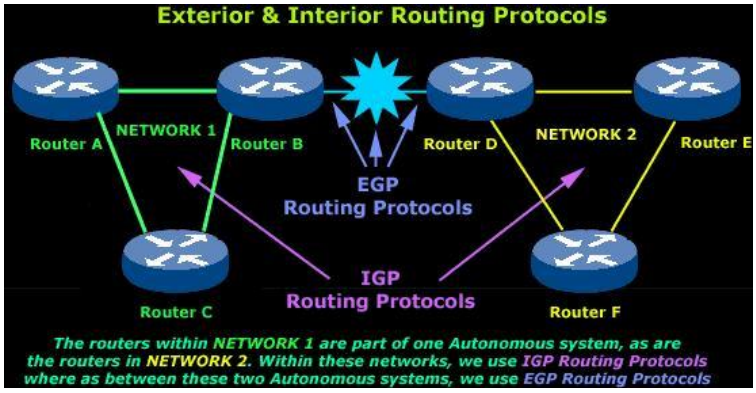


Figure 1. Relation between Exterior Gateway and Interior Gateway Protocols.

*A. Exterior Gateway Protocols*

Exterior Gateway Protocols (EGP's) are found between autonomous systems. Example of an EGP is the Border Gateway Protocol (BGP) which is also used amongst the Internet routers.

*B. Interior Gateway Protocols*

Interior Gateway Protocols (IGP's) are found within autonomous systems. Examples of IGP protocols are RIP, IGRP, EIGRP.

IGP's have further two types:

- Distance Vector Protocols
- Link State Protocols

Figure 2 shows all the types of routing protocols.

| **Distance Vector** | **Link State** |
|---|---|
| Sends the entire routing table | Sends only link state information |
| Slow convergence | Fast convergence |
| Susceptible to routing loops | Less susceptible to routing loops |
| Updates are sometimes sent using broadcast | Always uses multicast for the routing updates |
| Doesn't know the network topology | Knows the entire network topology |

| | |
|---|---|
| Simple to configure | Can be harder to configure |

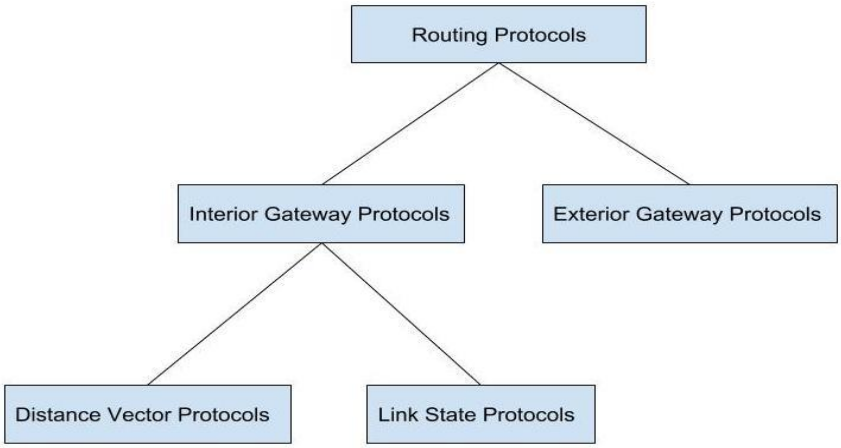


Figure 2. Types of Routing Protocols.

## VI. CONCLUSIONS

This article discussed routing protocols and how they work. It listed out ideal characteristics that should be in a routing protocols and the problems faced by them right now. Finally it discusses different types of routing protocols.

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