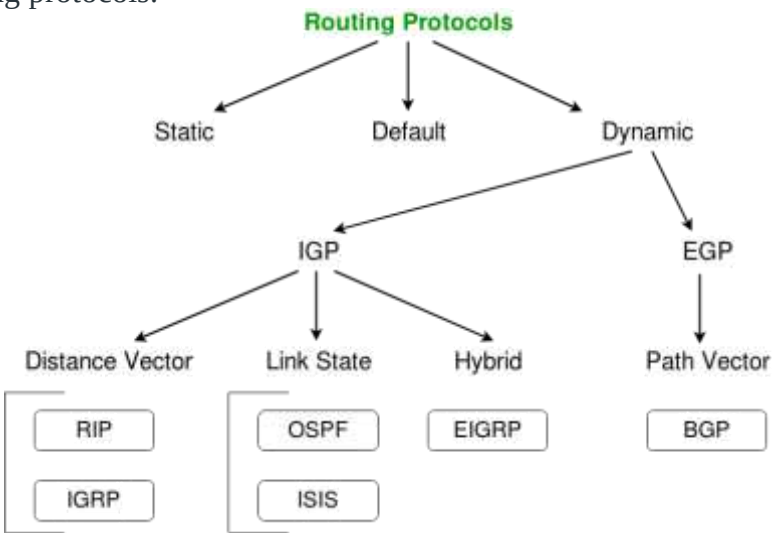
# Routing v/s Routed Protocols

The Network Layer of the OSI Model is responsible for providing logical addressing, which routers use to select best path for routing packets. There are two types of packets used at this layer :

1. **Data Packets –** The user data is transferred in the inter-network by these data packets. **Routed protocols** are those protocols which support such data traffic. Examples of routed protocols are IPv4, IPv6 and AppleTalk.
2. **Route Update Packets –** The information about the networks connected to all the routers is updated to the neighbouring routers through route update packets. **Routing protocols** are the ones that are responsible for sending them. Examples of routing protocols are RIP(Routing Information Protocol), EIGRP(Enhanced Interior Gateway Routing Protocol) and OSPF(Open Shortest Path First).

Now let's take an real-life analogy to better understand the difference between routed and routing protocols. Suppose you want to go to your home after your semester examinations. You book a cab or take a bus to your home. In the path of your journey, you encounter several sign boards which help you take proper or best path, or in case of a cab, Google Maps will help you in choosing the best route. In this analogy, consider yourself as the DATA, the bus or cab as the ROUTED PROTOCOL and the sign boards or the GPS installed in your driver's phone as the ROUTING PROTOCOL. Similarly, in a network routers use routing protocols to determine the best path for a packet to travel through the inter-network more efficiently. Routed protocols are assigned to an interface and determine the method of delivering the packet. Now, lets move on to the different types of routing protocols.




**Abbreviations – IGP** – Interior Gateway Protocol **EGP** – Exterior Gateway Protocol **RIP** – Routing Information Protocol **IGRP** – Interior Gateway Routing Protocol **OSPF** – Open Shortest Path First **ISIS** – Intermediate System to Intermediate System **EIGRP** – Enhanced Interior Gateway Routing Protocol **BGP** – Border Gateway Protocol.

Types of routing protocols :

- **Static Routing:** In static routing, the routes are manually configured by the network administrator and do not dynamically update based on network changes. This type of routing is best suited for small networks where the network topology does not change frequently.
- **Dynamic Routing:** In dynamic routing, the routes are automatically updated based on changes in the network topology. This type of routing is best suited for large, complex networks where

the network topology changes frequently. There are several types of dynamic routing protocols, including:

- **Distance Vector Routing Protocols:** Examples include Routing Information Protocol (RIP) and Interior Gateway Routing Protocol (IGRP).
- **Link-State Routing Protocols:** Examples include Open Shortest Path First (OSPF) and Intermediate System to Intermediate System (IS-IS).
- **Hybrid Routing Protocols:** Examples include Enhanced Interior Gateway Routing Protocol (EIGRP) and Border Gateway Protocol (BGP).
- **Hierarchical Routing:** In hierarchical routing, the network is divided into multiple levels or domains, with each level or domain having its own routing protocol. This type of routing is best suited for large, complex networks that need to be divided into manageable sections.
- **Source-Initiated Routing Protocols:** In source-initiated routing protocols, the source device initiates the routing process by sending out a route request. Examples include Routing Information Protocol version 2 (RIPv2) and Open Shortest Path First version 2 (OSPFv2).
- **Destination-Initiated Routing Protocols:** In destination-initiated routing protocols, the destination device initiates the routing process by sending out a route request. Examples include Distance Vector Multicast Routing Protocol (DVMRP) and Multicast Open Shortest Path First (MOSPF).

The main uses of routing protocols are:

- **Path determination:** Routing protocols help routers determine the best path for data to reach its destination, based on factors such as network congestion, network latency, and network distance.
- **Network scalability:** Routing protocols allow networks to grow and change dynamically, without requiring manual reconfiguration of individual routers.
- **Load balancing:** Routing protocols can distribute the load of network traffic evenly across multiple paths, improving network performance and reliability.
- **Fault tolerance:** Routing protocols can detect network failures and redirect traffic to alternative paths, helping to maintain network connectivity even in the event of a network failure.
- **Security:** Routing protocols can be used to enforce network security policies, by filtering or blocking certain types of network traffic based on source or destination address, or other factors.
- **Internet connectivity:** Routing protocols are used to connect individual networks to the global Internet, allowing data to be exchanged between networks all over the world.

Types of routed protocols :

- **Interior Gateway Protocols (IGP):** These are routing protocols used within an autonomous system, such as OSPF (Open Shortest Path First) and IS-IS (Intermediate System to Intermediate System).
- **Exterior Gateway Protocols (EGP):** These are routing protocols used between autonomous systems, such as BGP (Border Gateway Protocol).
- **Distance-vector protocols:** These protocols determine the best path to a destination based on distance, such as Routing Information Protocol (RIP) and Routing Information Protocol v2 (RIPv2).
- **Link-state protocols:** These protocols maintain a map of the entire network, including information about all links and their states, such as OSPF and IS-IS.

- **Hybrid protocols:** These protocols combine features of both distance-vector and link-state protocols, such as EIGRP (Enhanced Interior Gateway Routing Protocol).

The main uses of routed protocols are:

- **Network Interconnectivity**: Routed protocols provide a means of interconnecting different networks and allowing data to be exchanged between them.
- **Path Selection:** Routed protocols help routers determine the best path for data to reach its destination, based on factors such as network congestion, network latency, and network distance.
- **Scalability:** Routed protocols allow networks to grow and change dynamically, without requiring manual reconfiguration of individual routers.
- **Load Balancing:** Routed protocols can distribute the load of network traffic evenly across multiple paths, improving network performance and reliability.
- **Fault Tolerance:** Routed protocols can detect network failures and redirect traffic to alternative paths, helping to maintain network connectivity even in the event of a network failure.
- **Security:** Routed protocols can be used to enforce network security policies, by filtering or blocking certain types of network traffic based on source or destination address, or other factors.
- **Internet Connectivity:** Routed protocols are used to connect individual networks to the global Internet, allowing data to be exchanged between networks all over the world.

**Advantages of Routing Protocols:**

1. Efficient Network Utilization: Routing protocols help in the efficient utilization of network resources by selecting the best path for data transmission based on factors such as network congestion, bandwidth, and latency.
2. Scalability: Routing protocols can scale to accommodate large and complex networks. They can dynamically adapt to network changes such as new devices, link failures, and changes in network topology.
3. Robustness: Routing protocols can provide robustness to the network by automatically rerouting data in case of link failures, congestion or other network issues.
4. Flexibility: Routing protocols are flexible and can accommodate a variety of network topologies, including hub-and-spoke, mesh, and hybrid.

**Advantages of Routed Protocols:**

1. End-to-End Communication: Routed protocols enable end-to-end communication between devices on a network, irrespective of the underlying network topology.
2. Interoperability: Routed protocols facilitate interoperability between devices and network types, allowing communication between devices running different network protocols.
3. Addressing: Routed protocols provide addressing schemes that allow devices to identify and communicate with each other across the network.
4. Reliability: Routed protocols ensure reliable delivery of data by providing error checking and correction mechanisms, ensuring that data is transmitted without errors.