

# Assignment:

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Subject: Computer's networking (CC-214)

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➤ Classification of Routing protocols:

➤ **Routing protocol:**

“Routing protocols are standardized communication process that enable routers to exchange information and select the best path forwarding traffic between networks.

- **Significance:**

They play a crucial role in ensuring efficient and reliable data transmission in computer networks.

- **Classification of routing protocols:**

Routing protocols can be classified based on different criteria, including.

- **Operation:**

Static routing protocol: Manually configured routing tables that do not adapt to network changes.

Examples: RIP, OSPF, EIGRP.

Dynamic routing protocol: automatically adjust routing tables in response to network changes.

Examples: OSPF, IS-IS.

- **Behavior:**

Distance – vector routing protocols: Routers exchange routing tables with neighbors, calculating the best path based on distance (hop count).

Examples: RIP, IGRP.

Link-State Routing Protocols: Routers maintain a map of the network topology, calculating the best path based on link state.

Examples: OSPF, IS-IS.

- **Protocol Types:**

Interior Gateway Protocols (IGPs): Used within an autonomous system (AS) to exchange routing information.

Examples: RIP, OSPF, EIGRP.

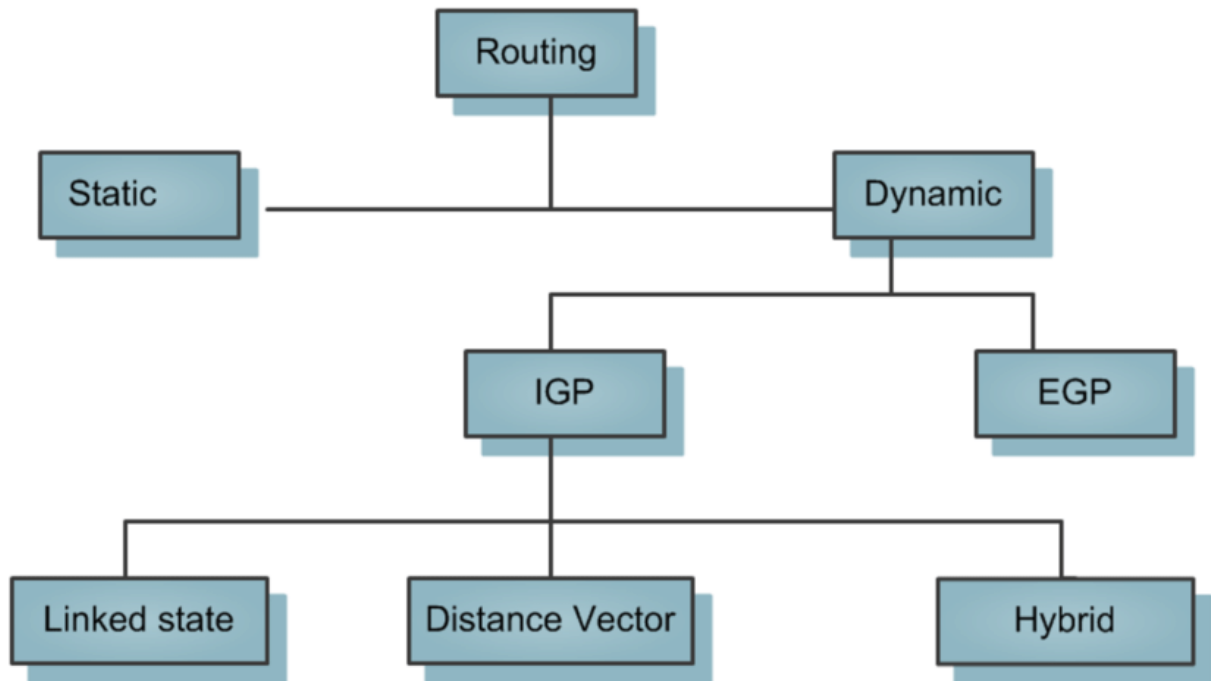
Exterior Gateway Protocols (EGPs): Used between autonomous systems to exchange routing information.

Examples: BGP.

Hybrid Routing Protocols: Combine elements of distance-vector and link-state.

Example: EIGRP.

**FLOWCHART:**



“Each classification has its strengths and weaknesses, and the choice of routing protocol depends on the specific network requirements and architecture.”

➤ **Overview of Distance Vector Routing Protocols:**

➤ **Distance vector routing protocol:**

Distance vector routing protocols are a type of routing protocol that uses the distance-vector algorithm to calculate the best path between nodes in a network.

• **Characteristics:**

- Each node maintains a routing table that lists the best path to each destination node.
- The routing table is updated periodically by exchanging routing information with neighboring nodes.
- The distance-vector algorithm is used to calculate the best path based on the minimum distance (hop count) to the destination node.

### **Operation of Distance Vector Routing Protocols:**

The Bellman-Ford algorithm is a widely used distance-vector algorithm that operates as follows:

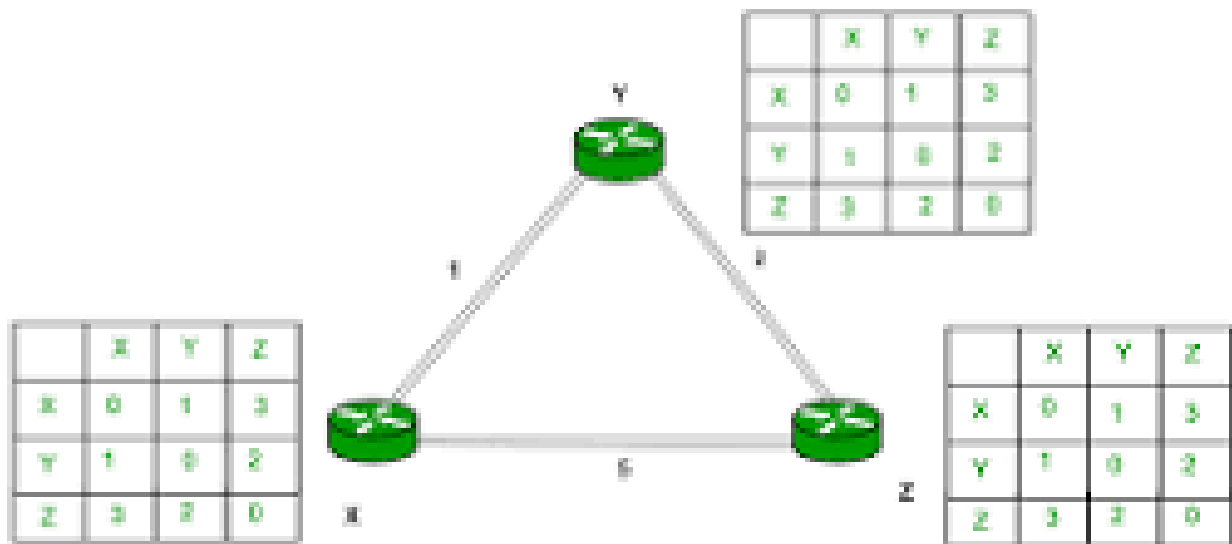
- Each node initializes its routing table with the directly connected neighbors and their corresponding distances.
- Each node exchanges its routing table with its neighbors.
- Each node updates its routing table based on the received routing information.
- The algorithm iterates until the routing tables converge.

### **Examples of Distance Vector Routing Protocols:**

- RIP (Routing Information Protocol): A widely used distance vector routing protocol that uses the Bellman-Ford algorithm.

RIP has a maximum hop count of 15 and is suitable for small to medium-sized networks.

- EIGRP (Enhanced Interior Gateway Routing Protocol): A proprietary distance vector routing protocol developed by Cisco Systems.



“In summary, distance vector routing protocols are a type of routing protocol that uses the distance-vector algorithm to calculate the best path between nodes in a network. RIP and

EIGRP are two examples of distance vector routing protocols that are widely used in computer networks.”

➤ **Overview of Link-State Routing Protocols:**

➤ *link-state routing protocols:*

Link-state routing protocols are a type of routing protocol that uses the link-state algorithm to calculate the best path between nodes in a network.

• **Characteristics:**

- Each node maintains a map of the network topology, including the state of each link (up or down).
- Each node exchanges its link-state information with its neighbors.
- The link-state algorithm is used to calculate the best path based on the shortest path to the destination node.
- Link-state protocols are more scalable and efficient than distance-vector protocols

**Operation of Link-State Routing Protocols:**

Dijkstra's algorithm is a widely used link-state algorithm that operates as follows:

- Each node initializes its link-state database with the directly connected neighbors and their corresponding link states.
- Each node exchanges its link-state information with its neighbors.
- Each node updates its link-state database based on the received link-state information.
- Dijkstra's algorithm is used to calculate the shortest path to each destination node.
- The algorithm iterates until the link-state database converges.

**Examples:**

- OSPF (Open Shortest Path First): A widely used link-state routing protocol that uses Dijkstra's algorithm.  
OSPF is suitable for large and complex networks.
- IS-IS (Intermediate System to Intermediate System): A link-state routing protocol that uses Dijkstra's algorithm.

IS-IS is suitable for large and complex networks, particularly in service provider environments.

“ In summary, link-state routing protocols are a type of routing protocol that uses the link-state algorithm to calculate the best path between nodes in a network. OSPF and IS-IS are two examples of link-state routing protocols that are widely used in computer networks.”



➤ **Overview of hybrid routing protocols:**

➤ **Hybrid routing protocol:**

“Hybrid routing protocols are a type of routing protocol that combines the characteristics of distance-vector and link-state protocols. Hybrid protocols aim to leverage the strengths of both types of protocols to provide a more efficient and scalable routing solution”

• **Characteristics:**

- Use a combination of distance-vector and link-state algorithms to calculate the best path.
- Maintain a routing table that includes information about neighboring routers and their distances.
- Exchange routing information with neighboring routers to update the routing table.
- Use a metric or cost function to determine the best path.

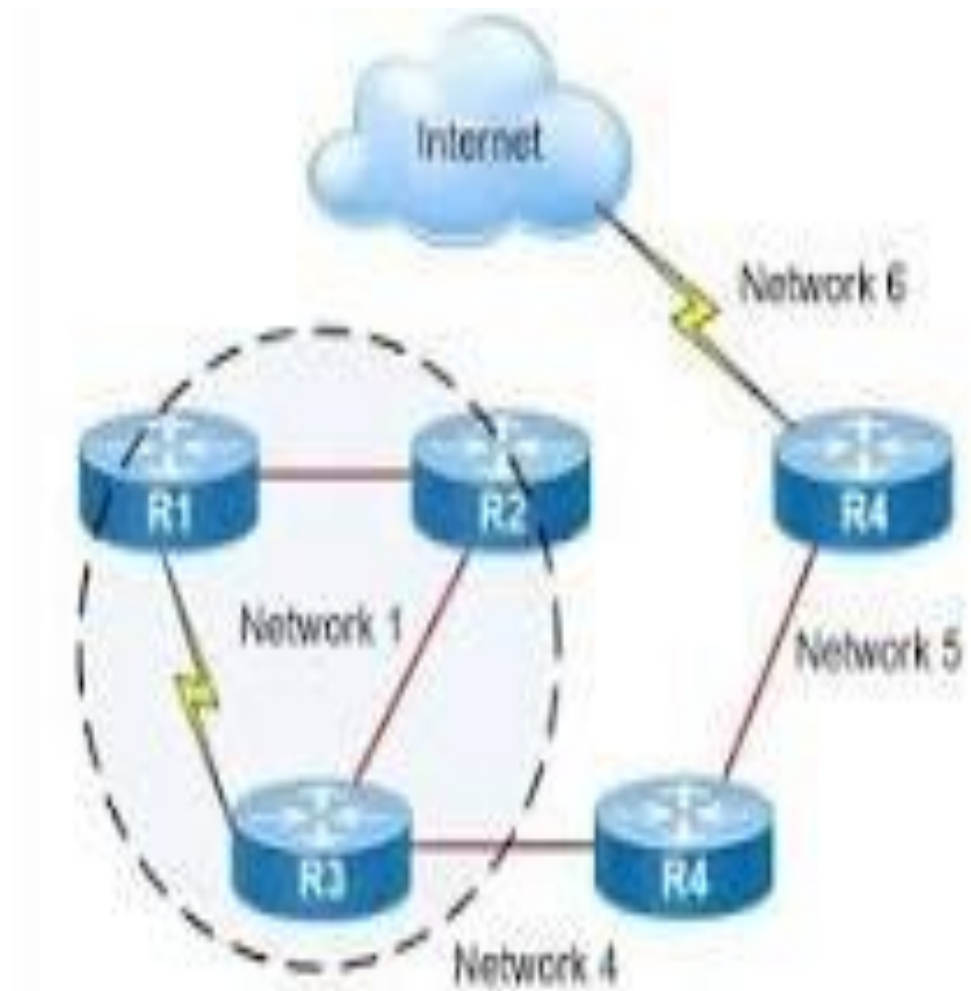
**Advantages:**

- Improved scalability: Hybrid protocols can handle large networks with many routers.

- Increased flexibility: Hybrid protocols can be used in a variety of network topologies.
- Better performance: Hybrid protocols can provide faster convergence times and improved routing decisions.
- Simplified configuration: Hybrid protocols can be easier to configure than link-state protocols.

**Examples:**

- BGP (Border Gateway Protocol): A hybrid routing protocol used for inter-domain routing. BGP uses a combination of distance-vector and link-state algorithms to calculate the best path.
- EIGRP (Enhanced Interior Gateway Routing Protocol): A hybrid routing protocol developed by Cisco Systems. EIGRP uses a combination of distance-vector and link-state algorithms to calculate the best path.
- DUAL (Diffusing Update Algorithm): A hybrid routing protocol used in EIGRP. DUAL uses a combination of distance-vector and link-state algorithms to calculate the best path.



“In summary, hybrid routing protocols combine the strengths of distance-vector and link-state protocols to provide a more efficient and scalable routing solution. BGP, EIGRP, and DUAL are examples of hybrid routing protocols used in computer networks”.

➤ **Comparison of Routing Protocols:**

Here's a comparative analysis of distance vector, link-state, and hybrid routing protocols:

Routing Protocol	Distance Vector	Link-State	Hybrid
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Algorithm	Bellman-Ford	Dijkstra's	Combination
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Scalability	Limited	High	High
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Convergence Time	Slow	Fast	Fast
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Overhead	Low	High	Medium
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➤ **Conclusion:**

In conclusion, routing protocols play a crucial role in computer networks. Understanding the different types of routing protocols, including distance vector, link-state, and hybrid protocols, is essential for designing and managing efficient and reliable networks.

These all protocols have their own unique properties. Above we discuss all the advantages and characteristics which are efficient for our network.

➤ **References**

"Computer Networks" by Andrew S. Tanenbaum.

"Routing Protocols and Concepts" by Cisco Systems.

Also from Meta AI and google.

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