SNS College of Engineering
Coimbatore - 641107

UNIT III

NETWORK LAYER

Services, Virtual circuit and Datagram networks, IP: Datagram-

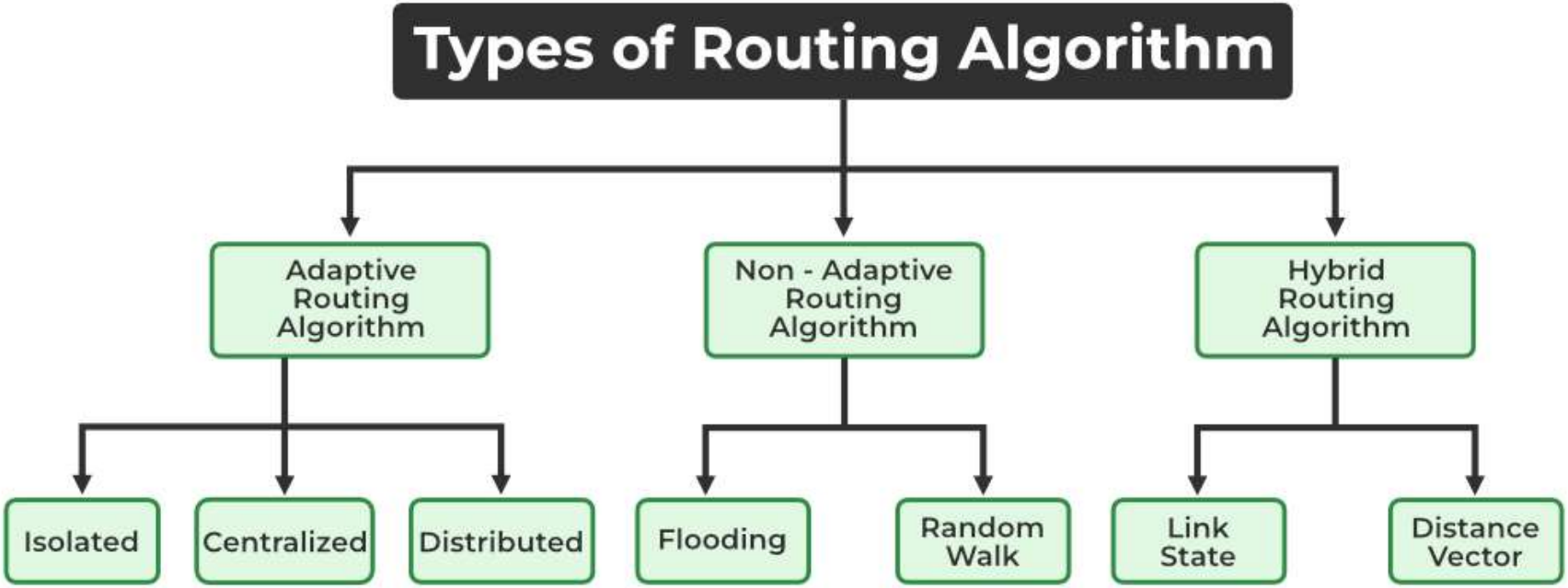
IPV4 Addressing-ICMPv4, IPv6 Protocol,

Routing Algorithms, Unicast Routing Protocols

Routing Algorithms

- Routing is the process of establishing the routes that data packets must follow to reach the destination.
- Various types of algorithms used to find efficient path

Classification



Adaptive Routing

- These are the algorithms that change their routing decisions whenever network topology or traffic load changes.
- Also known as dynamic routing, these make use of dynamic information such as current topology, load, delay, etc.

Types

- Centralized
- Isolation
- Decentralized

Centralized

- A node has entire information about the network and makes all the routing decisions
- Advantages of this algorithm is only one node is required to keep the information of the entire network
- **Example:** Link state algorithm

Isolation

- Each, node makes its routing decisions using the information it has without seeking information from other nodes
- **Examples:** Hot potato routing, backward learning

Distributed

- In this algorithm the node receives information from its neighbors and then takes the decision about routing the packets.
- It is also known as a decentralized algorithm as it computes the least-cost path between source and destination.

Non-adaptive Algorithm

- These are the algorithms that do not change their routing decisions once they have been selected.
- This is also known as static routing

Flooding

- This adapts the technique in which every incoming packet is sent on every outgoing line except from which it arrived

Contd.,

- These problems can be overcome with the help of sequence numbers, hop count, and spanning trees.

Random Walk

- In this method, packets are sent host by host or node by node to one of its neighbors randomly.
- This is a highly robust method that is usually implemented by sending packets onto the link which is least queued.

Hybrid Algorithms

- These algorithms are a combination of both adaptive and non-adaptive algorithms.
- In this approach, the network is divided into several regions, and each region uses a different algorithm.

Types

- Link State
- Distance vector

Link State

Parameter Problem Message Format

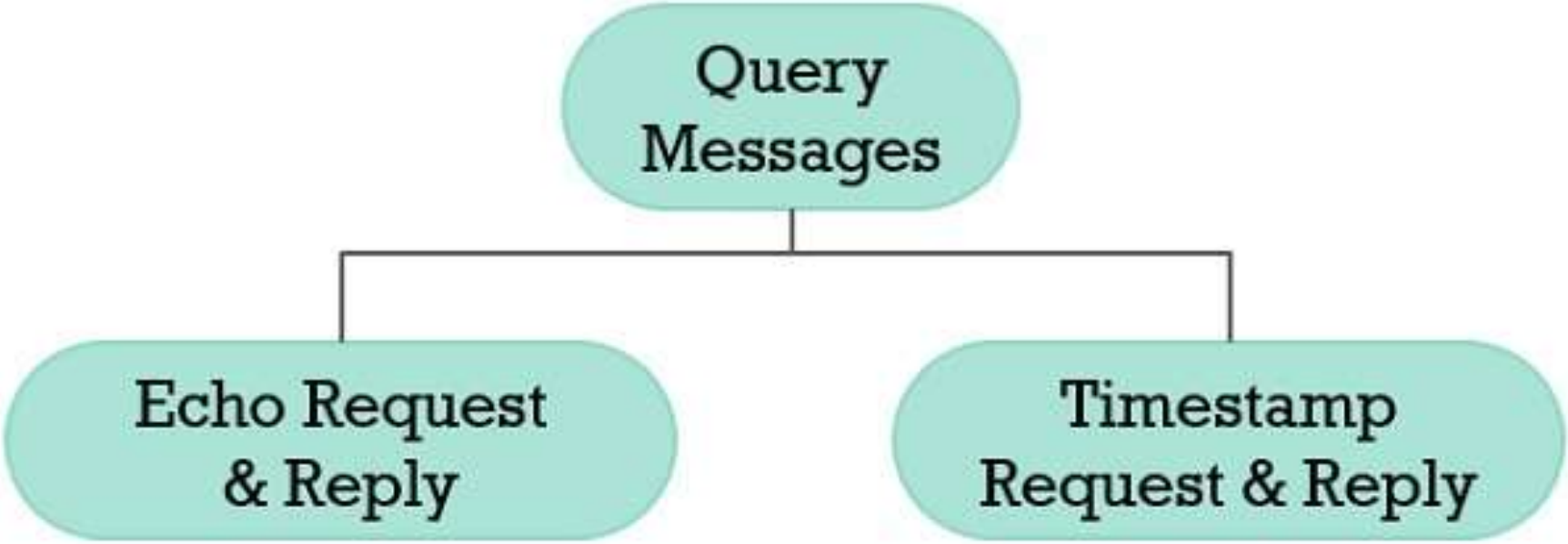
Code 0 defines that there is ambiguity in the header field

Code 1 defines that the required part of the **header** is missing

Difference between Routing and Flooding

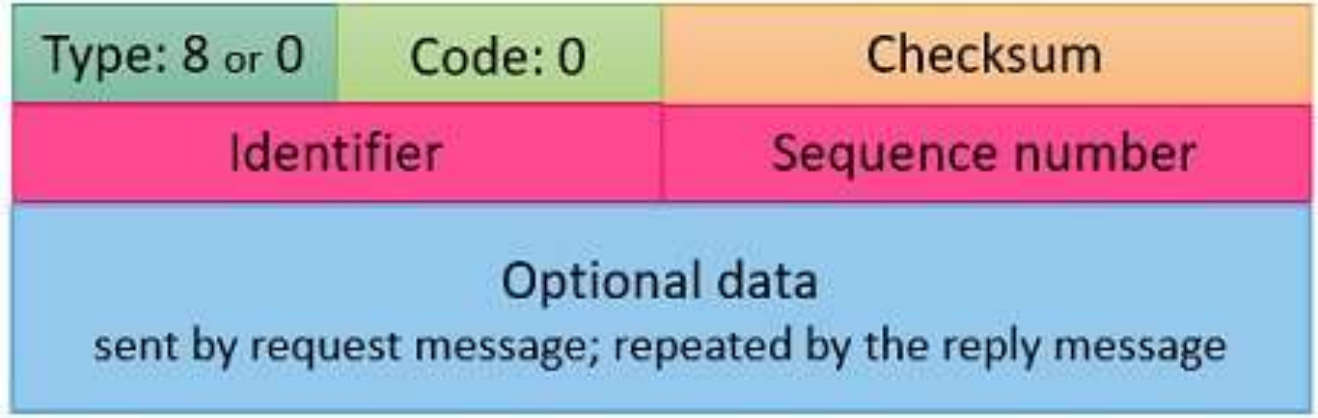
Routing	Flooding
A routing table is required.	No Routing table is required.
May give the shortest path.	Always gives the shortest path.
Less Reliable.	More Reliable.
Traffic is less.	Traffic is high.
No duplicate packets.	Duplicate packets are present.

Query Messages



Echo request and reply

Type 8: Request
Type 0: Reply

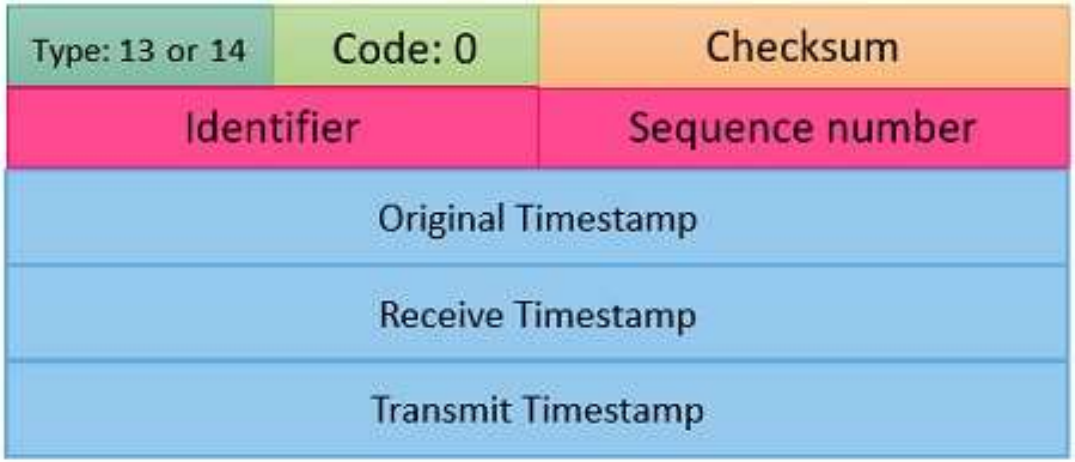


Echo Request and Reply Message Format

Timestamp request and reply

- Timestamp request and reply messages calculate the round trip time. It is the time required by an IP datagram to travel between two hosts or routers.

Type 13: Request
Type 14: Reply



Timestamp Request and Reply Message Format