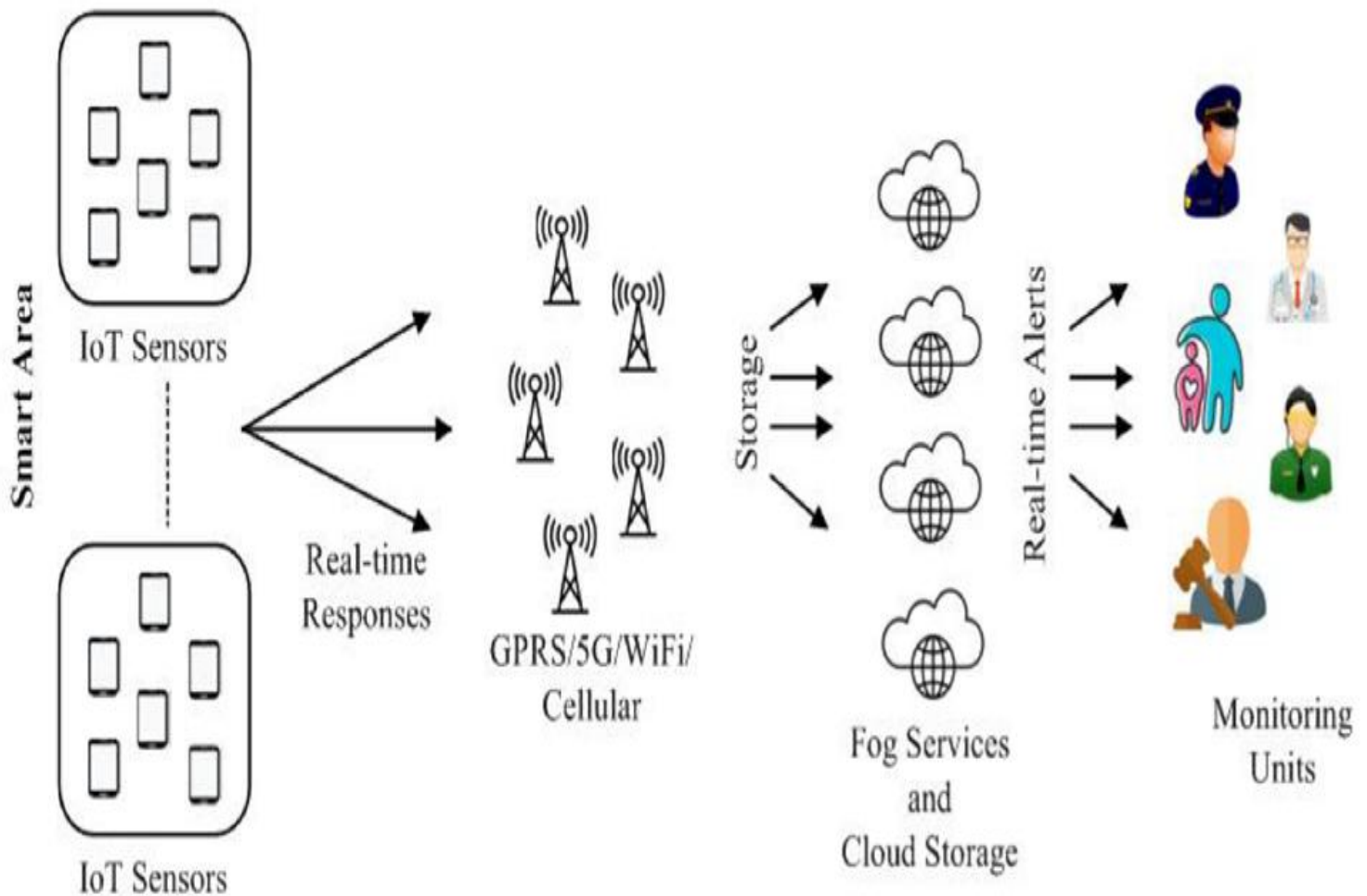


# SURVEY ROUTING PROTOCOLS

## Introduction to IoT Routing Protocols

The Internet of Things (IoT) is a network of physical devices embedded with sensors, actuators, and communication technologies that exchange data over the internet. Since these devices often operate under resource constraints (limited energy, memory, and computational power), efficient routing becomes critical.



## Challenges Addressed by Routing Protocols in IoT:

- Scalability
- Energy efficiency
- Mobility support
- Reliable data transmission
- Latency optimization

Routing protocols in IoT are designed to ensure minimal resource consumption while maintaining reliable and timely data delivery.

### Classification of IoT Routing Protocols

IoT routing protocols are typically classified based on operational behavior, topology management, and energy efficiency:

Type	Key Idea
<b>Proactive (Table-driven)</b>	Maintain fresh routing tables periodically
<b>Reactive (On-demand)</b>	Establish routes only when needed

<b>Hybrid</b>	Combination of proactive and reactive strategies
<b>Geographic-based</b>	Routing based on the physical location of nodes
<b>Cluster-based</b>	Hierarchical routing using cluster heads for communication

### **A. Proactive Routing Protocols (Table-Driven)**

#### **Description:**

Maintain updated routes for all destinations at all times, regardless of communication demand.

#### **Examples:**

- DSDV (Destination-Sequenced Distance Vector)
- OLSR (Optimized Link State Routing)
- WRP (Wireless Routing Protocol)

#### **Key Characteristics:**

- Routing tables are regularly updated.

- Low latency for data transmission (routes already available).

### **Advantages:**

- Minimal delay in data transfer.
- Reliable for frequent communication scenarios.

### **Disadvantages:**

- High control overhead (frequent updates).
- Wastes energy in low-traffic networks.

## **B. ★ Reactive Routing Protocols (On-demand) ★**

### **Description:**

Routes are created only when data needs to be transmitted, conserving energy and bandwidth.

### **Examples:**

- AODV (Ad hoc On-demand Distance Vector)
- DSR (Dynamic Source Routing)

### **Key Characteristics:**

- Route discovery process is triggered by demand.

- Reduces unnecessary updates.

### **Advantages:**

- Energy-efficient in low-traffic scenarios.
- Reduced control message overhead.

### **Disadvantages:**

- Initial delay due to route discovery process.
- Possible packet loss if route discovery fails or is delayed.

## **C. Hybrid Routing Protocols**

### **Description:**

Blend of proactive and reactive approaches. Maintain local routing proactively, while discovering distant routes reactively.

### **Examples:**

- ZRP (Zone Routing Protocol)
- TORA (Temporally-Ordered Routing Algorithm)

### **Key Characteristics:**

- Network divided into zones.

- Proactive within zone; reactive for inter-zone routing.

### **Advantages:**

- Balanced trade-off between delay and resource consumption.
- Adaptive to both dense and sparse traffic conditions.

### **Disadvantages:**

- More complex to design and manage.
- May not always adapt quickly to rapid network topology changes.

## **D. Other Routing Strategies**

### **Geographic-based Routing:**

Uses GPS or other localization to make forwarding decisions.

- Examples: GPSR (Greedy Perimeter Stateless Routing)

### **Cluster-based Routing:**

Nodes are grouped into clusters, and cluster heads handle data aggregation and communication.

- Examples: LEACH (Low-Energy Adaptive Clustering Hierarchy)

## Comparison Table of Routing Protocols in IoT

Parameter	Proactive	Reactive	Hybrid	Geographic-Based	Cluster-Based
<b>Route Availability</b>	Always available	On-demand	Partial (Zonal)	Based on location	Cluster-based
<b>Control Overhead</b>	High	Low	Medium	Low	Medium
<b>Latency</b>	Low	High	Medium	Low	Varies
<b>Energy Efficiency</b>	Low	High	Moderate	High	High
<b>Scalability</b>	Moderate	Moderate	High	High	High
<b>Complexity</b>	Low	Moderate	High	Moderate	High
<b>Mobility Support</b>	Limited	Better	Good	Poor (static-based)	Poor to Moderate
<b>Example Protocols</b>	DSDV, OLSR	AODV, DSR	ZRP, TORA	GPSR	LEACH, TEEN