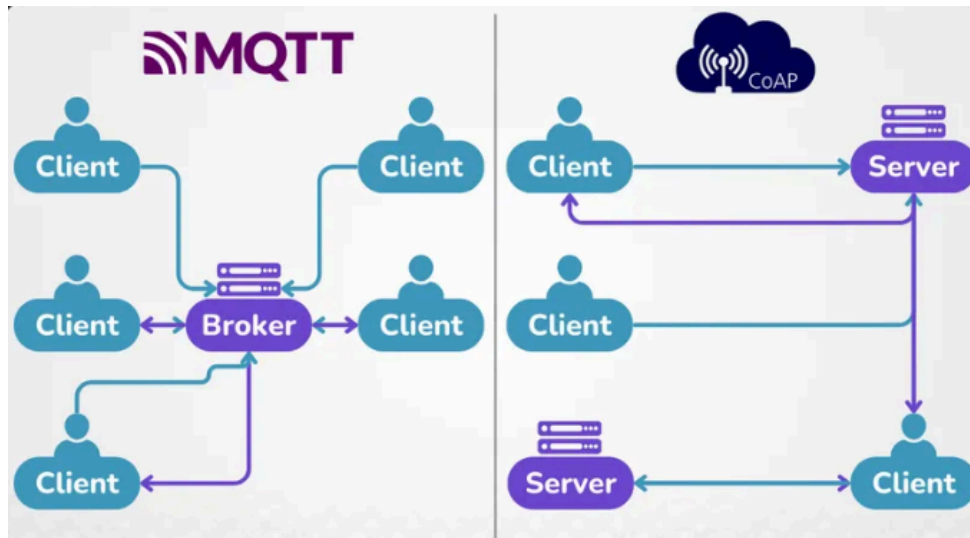


Practical - 2

Aim -

Basics of Network (CoAP, MQTT) and Cloud (ThingSpeak)

Theory -



This practical introduces students to key communication protocols used in IoT—**CoAP** and **MQTT**—alongside an introduction to **ThingSpeak**, a cloud platform for IoT data visualization. IoT devices often operate in constrained environments, requiring lightweight protocols for efficient data transfer. CoAP and MQTT are designed for such scenarios, ensuring minimal bandwidth usage and low latency.

Students learn how to structure sensor data, send it using CoAP/MQTT, and visualize it using cloud dashboards. ThingSpeak enables data logging, analysis, and visualization using MATLAB integration, making it ideal for real-time IoT applications. This hands-on session bridges the gap between edge computing and cloud-based data services.

Key Points:

- **CoAP (Constrained Application Protocol)** uses UDP and follows a request/response model, similar to HTTP.
- **MQTT (Message Queuing Telemetry Transport)** uses a publish-subscribe model over TCP, making it ideal for sensor data transmission.
- MQTT supports **broker-client communication**, typically using brokers like Mosquitto.

- Students learn how to **send data to a broker** and **subscribe to topics** using MQTT libraries in Python.
- **ThingSpeak** is a cloud platform that supports data collection via **HTTP GET/POST** and **MQTT**.
- It allows students to create **channels**, **visualize data**, and perform **cloud-side processing using MATLAB**.
- Practical demonstrates how IoT devices communicate with the cloud in real time.
- Learners implement **real-world IoT scenarios**, like temperature monitoring or motion detection.
- Helps understand **data flow from sensor → microcontroller → protocol → cloud platform**.
- Introduces important concepts in IoT networking and cloud integration.