Practical 4: Real-Time Communication Using MQTT Protocol (Mosquitto Broker)

Topic: Simulation of emergency communication system during large-scale events like Kumbh Mela using MQTT protocol.
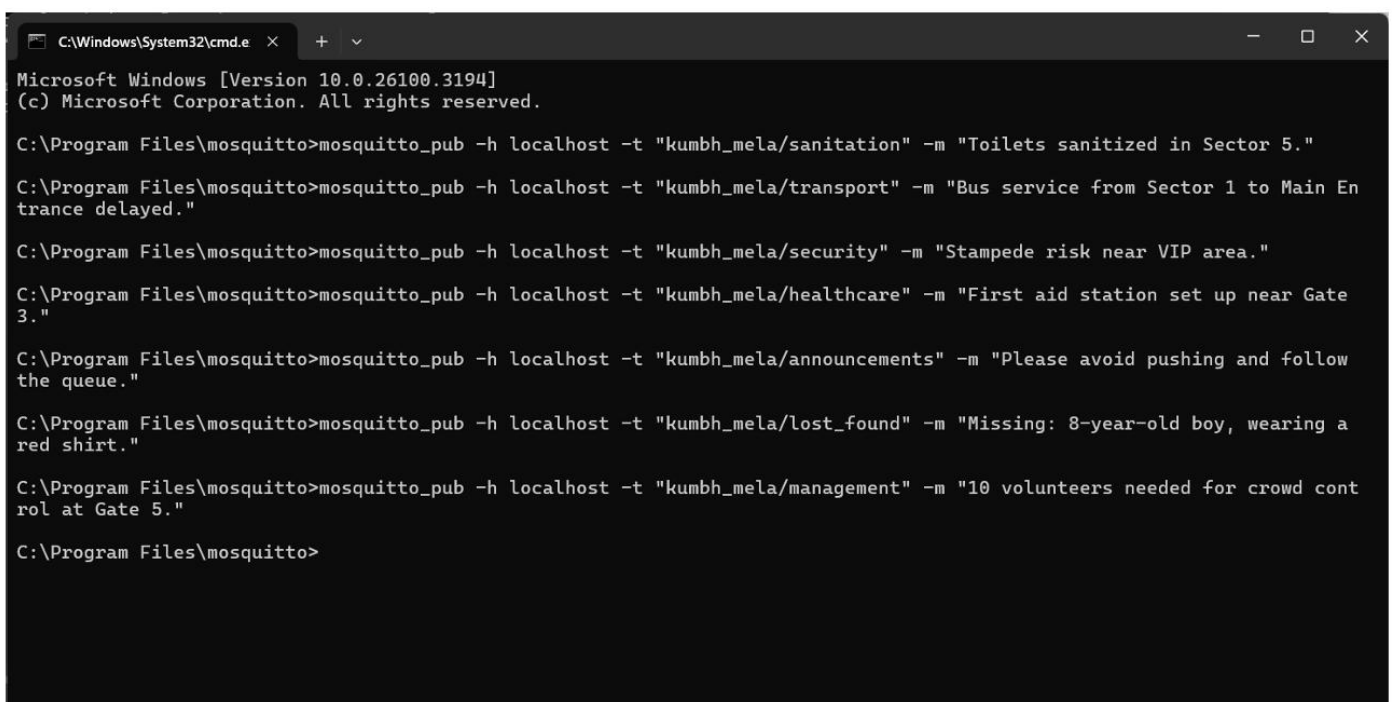

1.1 Introduction

In large gatherings such as the Kumbh Mela, timely dissemination of critical information—related to sanitation, transportation, security, healthcare, and lost-and-found—is essential to ensure smooth operations and public safety. MQTT (Message Queuing Telemetry Transport) is a lightweight messaging protocol ideal for real-time communication in IoT systems due to its low bandwidth usage and efficient publish/subscribe architecture. In this practical, Mosquitto is used as the MQTT broker to simulate communication between different departments during such an event.

1.2 Theory

MQTT (Message Queuing Telemetry Transport) is a lightweight and efficient messaging protocol designed for constrained devices and low-bandwidth networks. It follows a **publish-subscribe** model where devices (clients) either **publish** messages to a topic or **subscribe** to topics to receive messages. A central **broker** (like Mosquitto) handles the distribution of messages between publishers and subscribers.

Key components:

- **Publisher**: Sends data/messages to a specific topic.
- **Subscriber**: Receives messages from a topic it is subscribed to.
- **Broker**: Routes messages from publishers to subscribers. In this practical, the **Mosquitto broker** is used on a local machine.

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C:\Program Files\mosquitto>mosquitto_sub -h localhost -t "kumbh_mela/transport"
Bus service from Sector 1 to Main Entrance delayed.
```

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C:\Program Files\mosquitto>mosquitto_sub -h localhost -t "kumbh_mela/sanitation"
Toilets sanitized in Sector 5.
```

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C:\Program Files\mosquitto>mosquitto_sub -h localhost -t "kumbh_mela/security"
Stampede risk near VIP area.
```

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C:\Program Files\mosquitto>mosquitto_sub -h localhost -t "kumbh_mela/healthcare"
First aid station set up near Gate 3.
```

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C:\Program Files\mosquitto>mosquitto_sub -h localhost -t "kumbh_mela/announcements"
Please avoid pushing and follow the queue.
```

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C:\Program Files\mosquitto>mosquitto_sub -h localhost -t "kumbh_mela/lost_found"
Missing: 8-year-old boy, wearing a red shirt.
```