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| **Experiment-11**  **Publish the data to the cloud & Subscribe to a topic using Message Queue Telemetry Transport (MQTT) protocol:**   1. **What are the applications of MQTT protocol?**   MQTT protocol is widely used and some of the main applications of this protocol are given below:   * Used in Facebook messenger application * AWS * Google cloud * Microsoft Azure * Smart homes * Healthcare * Logistics  1. **What is meant by Topic in MQTT?**   In MQTT, the word topic refers to an UTF-8 string that the broker uses to filter messages for each connected client. The topic consists of one or more topic levels. Each topic level is separated by a forward slash (topic level separator). In comparison to a message queue, MQTT topics are very lightweight.   1. **What is MQTT-SN? Can we use this over a Zigbee based network?**   MQTT-SN is a publish/subscribe messaging protocol for wireless sensor networks (WSN), with the aim of extending the MQTT protocol beyond the reach of TCP/IP infrastructure for Sensor and Actuator solutions.  MQTT-S is designed in such a way that it can be run on low-end and battery-operated sensor/actuator devices and operate over bandwidth-constraint WSNs such as ZigBee-based networks.   1. **Illustrate the MQTT message format.**   The MQTT packet or message format consists of a 2 byte fixed header (always present) + Variable-header (not always present)+ payload (not always present).  Structure of an MQTT message.   1. **What is the significance of Mosquitto? Give the list of some popular IoT platforms that support MQTT.**   Mosquitto is lightweight and suitable for all devices, from single-board computers with low power consumption to complete servers. It is a lightweight open source message broker that Implements MQTT versions 3.1.0, 3.1.1 and version 5.0. It is written in C by Roger Light, and is available as a free download for Windows and Linux and is an Eclipse project.  **List of some popular IoT platforms that support MQTT.:**   * HiveMQ. * AWS IoT. * MS IoT Hub. * Adafruit MQTT * MyQTT Hub   **Lab Experiments:**   1. **Interfacing with MQTT using Raspberry Pi.**   **Code for Publisher:**  import paho.mqtt.publish as publish  publish.single("iot/temp","helo",hostname="test.mosquitto.org")  print("Done")  **Output:**  Done  **Code for Subscriber:**  import paho.mqtt.client as mqtt  def on\_connect(client, userdata, flags, rc):  #print("Connected with mqtt server "+str(rc))  client.subscribe("iot/temp")    def on\_message(client, userdata, msg):  print(msg.topic+" "+str(msg.payload))  client = mqtt.Client()  client.on\_connect = on\_connect  client.on\_message = on\_message  client.connect("test.mosquitto.org", 1883, 60)  client.loop\_forever()  **Output:**  iot/temp hello |