Department of Electronic & Telecommunications Engineering

University of Moratuwa

EN3251 Internet of Things

Laboratory Exercise 2: Information transfer with MQTT and HTTP using JSON

2021 Batch   **Semester 5**

Overview:

In this exercise you will become familiar with JSON (JavaScript Object Notation) as a means of information transfer between a client and a server/broker.

JSON is a lightweight data interchange format that is easy for both humans and machines to exchange information. A JSON object is a fundamental data structure used in JSON to organize and store data. It represents a collection of key-value pairs, where each key is a string and each value can be a string, number, boolean, null, array, or another JSON object.

Objective:

To implement information exchange via MQTT and HTTP using JSON objects.

Learning outcomes covered:

LO5: Use appropriate devices, software and tools to implement an end-to-end IoT system.

Prerequisites:

- Python installed and running on your computer and an IDE such as Python
- The [paho-mqtt library](#) installed on your computer
- Wireshark installed and running on your computer
- The [MQTT.Cool test client](#)
- Introductory Python code for manipulating JSON objects
    a. jsonintro.py
    b. jsonintro2.py

- API key and url from https://openweathermap.org
- Request (for HTTP requests) library for Python

Activities:

Step 1:

Learn about JSON and its use in IoT.

Step 2:

Run jsonintro.py to understand the basics of JSON

objects. Run jsonintro2.py to read/write objects from/to

Step 3: files.

A. Write an MQTT publisher which reads an object containing multiple string-value pairs from a file, and publish it to a Broker on a Topic of your choice. Test its operation. Use Wireshark to investigate the MQTT publish operation with JSON objects as message contents.
B. Write an MQTT subscriber which receives an object containing multiple string-value pairs that you published in part A and writes it to a file. Test its operation. Use Wireshark to investigate the MQTT subscribe operation with JSON objects as message contents.

Step 4:

Use the API key you obtained from OpenWeather and write a Python program to use an HTTP request to obtain the weather information of a user-selectable City anywhere in the world.

Homework:

Develop a Node-Red flow to create a dashboard for data from OpenWeather. You may investigate and use other APIs from OpenWeather.

Report:

Submit your report (one per group). The report should include:

- A discussion of your observations in Step 3. Submit your Python code for the Publisher and the Subscriber, and the corresponding Wireshark files.
- Your Python code for Step 4 and a sample output of the program when given City and Country of your choice.
- Your Node-Red flow for the Homework assignment.