

Department of Electronic & Telecommunications Engineering

University of Moratuwa

EN3251 Internet of Things

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

2020 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 files.

Step 3:

- 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.