



SOFE 4610U

Design & Analysis of IoT Software Systems

Assignment 1

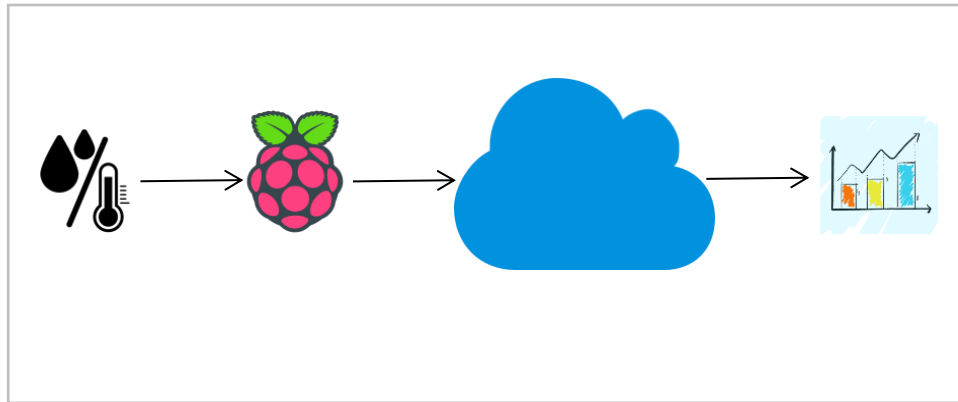
Due date: Nov. 8th 2018

Preamble: *The Sensorian Shield* is an add-on board for the Raspberry Pi computer, and consists of different types of sensors. It can sense ambient light, temperature, pressure, altitude, motion, magnetic fields, and capacitive touch.

ThingSpeak/ThingsBoard are examples of open source IoT platforms that provide APIs to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. Such platforms enable the creation of sensor logging applications, location tracking applications, and a social network of things with status updates. They also provide a wide range of analytics and data visualization techniques.

In this assignment, you will use Raspberry Pi, Sensorian Shield, and an online IoT platform of your choice to read, store and display sensor data (see figure below). The Raspberry Pi reads various sensor data from the Sensorian Shield board using MQTT pub/sub (or any other protocol you may see fit). The data should be stored in a local database (using MySQL for example on RPi) before it is sent to the online platform for processing. The rationale behind storing sensor data on a local database is to provide reliability and flexibility for data dissemination, should the Internet connection with RPi is down for any reason during data collection. Also, when you store data on the gateway (i.e., RPi), you can perform data redaction locally before it is sent to the backend server (e.g., perform data filtering, fusion, or summarization), therefore, we can control what data is sent out and at which granularity level. For example, you can collect the temperature every 1 minute, but only send it to the backend server every one hour. (Rational) We may collect the exact location of a person from his phone (long, and lat), but only send an abstract information (only city for instance) to the requester.

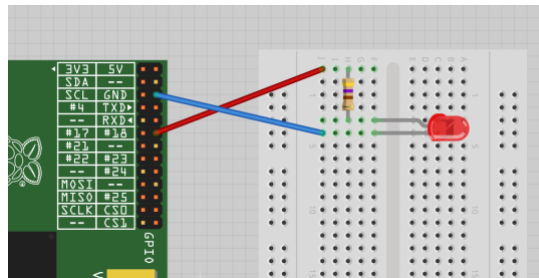
Your online dashboard should present sensor data with different formats (table, graph, etc.). The user should be able to see all sensor data on one screen and select one of them to show more details. The user also should be able to determine a date range to display historical data from a specific sensor.

**Deliverables:**

- The assignment should be submitted by the due date using the Blackboard drop box.
- This assignment should be done by groups of 4-5 students.
- Each group must get a Raspberry Pi computer, and a Sensorian Shield from the lab Instructor.
- Each group must check the validity of the components they receive.
- On the due date, each group must present a quick demo of the application.
- All of the group members must attend during the presentation.
- Each group must submit a report in double column IEEE format (<https://www.ieee.org/conferences/publishing/templates.html>) 8-10 pages that describes the application, and how to run the application.

BONUS 1 (due on time): Connect an LED to your RPi and send ON/OFF command to change the status based on the ambient light sensor from the Sensoriean Shield – so if it's too dark, switch the LED on, too bright, switch the LED off.

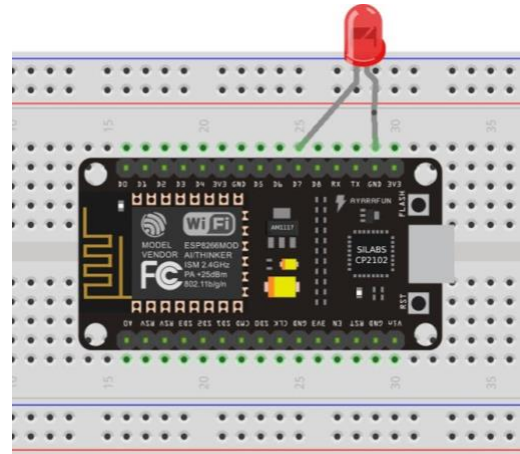
HINT:



BONUS 2 (replaces Assignment 2): Due Nov. 20, 2018

Connect your LED to RPi wirelessly and use the same previous procedure to control it.

HINT: ESP8266 module or similar



Sample code: <https://openhomeautomation.net/connect-esp8266-raspberry-pi>