

# Lab Module Assignment-Semester Project

## Name and Course

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Connected Devices, CSYE 6530, Fall Semester, 2018

## Description

In this assignment, we completed a physical network project from front-end to back-end, connecting Connected Device (Raspberry) and Connected Gateway through various IoT protocols, and interacting with the cloud. Among them, Connected Device is implemented in Python. Gateway is implemented in Java. I chose the Ubidots used in the previous work in the cloud. The following is the overall idea of my entire project:

Step1: Program the Raspberry Pi in Python and get a temperature information from SenseHat in the Raspberry Pi

Step2: If the temperature is higher than the alarm value I set, it will trigger the SMTP protocol and send an alarm email to itself via the SMTP protocol, and trigger the Actuator (LED).

Step3: I wrote the CoAP Server in the Raspberry Pi and wrote the CoAP Client in the Gateway. The temperature information is then passed to the Server in POST for later use.

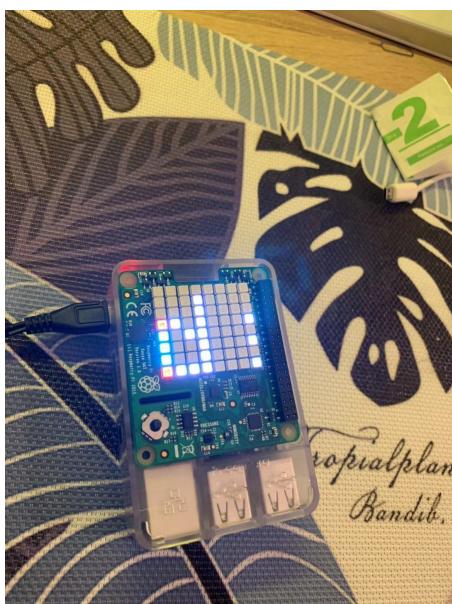
Step4: The MQTT protocol will be triggered when the temperature reaches the local

area. In this project, I mainly use the MQTT protocol to connect to the local and cloud. The temperature obtained from the Raspberry Pi is sent to Ubidots via the local MQTT client, and the Actuator is triggered by the preset Ubidots setting.

Step5: The local MQTT client can also subscribe to the Ubidots theme and get three variables.

I have established two Management Apps in Connected Devices and Connected Gateway to control these two pieces.

Output :



```
THIS IS THE FILE ADDRESS:../../data/ConnectedDevicesConfig.props
Configuration data...
<labs.common.configutil.ConfigUtil object at 0x767bd1f0>
THIS IS THE FILE ADDRESS:../../data/connectedDevicesConfig.props
Configuration data...
<labs.common.configutil.ConfigUtil object at 0x767bd250>
2018-12-07 19:41:58,326 MainThread - PIL.ImagePlugin - DEBUG - STREAM b'INFO' 16 13
2018-12-07 19:41:58,326 MainThread - PIL.ImagePlugin - DEBUG - STREAM b'INFO' 11 9
2018-12-07 19:41:58,326 MainThread - PIL.ImagePlugin - DEBUG - STREAM b'TIME' 67 7
2018-12-07 19:41:58,326 MainThread - PIL.ImagePlugin - DEBUG - b'TIME' [unknown]
2018-12-07 19:41:58,329 - MainThread - PIL.ImagePlugin - DEBUG - STREAM b'TEXT' 81 25
2018-12-07 19:41:58,329 - MainThread - PIL.ImagePlugin - DEBUG - STREAM b'DAT' 118 774
Host: 192.168.0.119
Port: 5683
Starting system performance app daemon thread...
Testing POST using resource: temp, payload: 37.184471130371094
Creating POST using resource: coapthon.client.helperclient.HelperClient object at 0x7679cb90<br/><coap://192.168.0.119:5683>
2018-12-07 19:41:58,417 - Thread-2 - coapthon.layers.messageLayer - DEBUG - send_request - From None, To ('192.168.0.119', 5683), None=None, POST-Df, [Uri-Path: temp, ] 37.184471130371094..18 bytes
2018-12-07 19:41:58,420 - Thread-2 - coapthon.client.coap - DEBUG - send_datagram - From None, To ('192.168.0.119', 5683), CON-12282, POST-Df, [Uri-Path: temp, ] 37.184471130371094..18 bytes
2018-12-07 19:41:58,423 - Thread-2 - coapthon.client.coap - DEBUG - receive_datagram - From ('192.168.0.119', 5683), CON-12282, POST-Df, [Uri-Path: temp, ] 37.184471130371094..18 bytes
2018-12-07 19:41:58,430 - Thread-2 - coapthon.client.coap - DEBUG - retransmit_loop ... enter
2018-12-07 19:42:00,588 - Thread-2 - coapthon.client.coap - DEBUG - retransmit_loop ... retransmit Request
2018-12-07 19:42:00,590 - Thread-2 - coapthon.client.coap - DEBUG - send_datagram - From None, To ('192.168.0.119', 5683), CON-12282, POST-Df, [Uri-Path: temp, ] 37.184471130371094..18 bytes
2018-12-07 19:42:00,593 - Thread-2 - coapthon.client.coap - DEBUG - receive_datagram - From ('192.168.0.119', 5683), CON-12282, POST-Df, [Uri-Path: temp, ] 37.184471130371094..18 bytes
2018-12-07 19:42:13,529 - Thread-2 - coapthon.client.coap - DEBUG - retransmit_loop ... retransmit Request
2018-12-07 19:42:13,531 - Thread-2 - coapthon.client.coap - DEBUG - send_datagram - From None, To ('192.168.0.119', 5683), CON-12282, POST-Df, [Uri-Path: temp, ] 37.184471130371094..18 bytes
2018-12-07 19:42:13,533 - Thread-2 - coapthon.client.coap - DEBUG - receive_datagram - From ('192.168.0.119', 5683), CON-12282, POST-Df, [Uri-Path: temp, ] 37.184471130371094..18 bytes
No response received for POST using resource: temp
```

```

New sensor readings:
37.451541900634769
sensor information:
37.451541900634769 Current: 37.451541900634766
Average: 37.387445068539376
Samples: 5
Min: 0
Max: 37.55857209756564
Testing Coap resource ref: <coaphon.client.helperclient.HelperClient object at 0x6f19bc10>
coap://192.168.0.119:5683
2018-12-07 19:49:11, 198 - Thread-2 - coaphon.layers.messaginglayer DEBUG send request - From None, To ('192.168.0.119', 5683), None=None, POST-YY, [Uri-Path: temp, ] 37.914466857910156...18 bytes
2018-12-07 19:49:11, 198 - Thread-2 - coaphon.client.coap DEBUG - send datagram - From None, To ('192.168.0.119', 5683), CON-33691, POST-YY, [Uri-Path: temp, ] 37.914466857910156...18 bytes
2018-12-07 19:49:11, 198 - Thread-8 - coaphon.client.coap DEBUG Start receiver Thread
2018-12-07 19:49:11, 198 - Thread-8 - coaphon.client.coap DEBUG - start listening
2018-12-07 19:49:11, 198 - Thread-2 - coaphon.client.coap DEBUG - retransmit loop ... retransmit Request
2018-12-07 19:49:11, 198 - Thread-2 - coaphon.client.coap DEBUG - send datagram - From None, To ('192.168.0.119', 5683), CON-33691, POST-YY, [Uri-Path: temp, ] 37.914466857910156...18 bytes
2018-12-07 19:49:11, 198 - Thread-2 - coaphon.client.coap DEBUG - retransmit loop ... retransmit Request
2018-12-07 19:49:11, 198 - Thread-2 - coaphon.client.coap DEBUG - send datagram - From None, To ('192.168.0.119', 5683), CON-33691, POST-YY, [Uri-Path: temp, ] 37.914466857910156...18 bytes
2018-12-07 19:49:18, 457 - Thread-2-Retry-33691 - coaphon.client.coap DEBUG - retransmit loop ... retransmit Request
2018-12-07 19:49:18, 457 - Thread-2-Retry-33691 - coaphon.client.coap DEBUG - send datagram - From None, To ('192.168.0.119', 5683), CON-33691, POST-YY, [Uri-Path: temp, ] 37.914466857910156...18 bytes
2018-12-07 19:49:28, 188 - Thread-2-Retry-33691 - coaphon.client.coap DEBUG - retransmit loop ... retransmit Request
2018-12-07 19:49:28, 188 - Thread-2-Retry-33691 - coaphon.client.coap DEBUG - send datagram - From None, To ('192.168.0.119', 5683), CON-33691, POST-YY, [Uri-Path: temp, ] 37.914466857910156...18 bytes
2018-12-07 19:50:26,560 - Thread-2-Retry-33691 - coaphon.client.coap WARNING Give up on Message From None, To ('192.168.0.119', 5683), CON-33691, POST-YY, [Uri-Path: temp, ] 37.914466857910156...18 bytes
2018-12-07 19:50:26,574 - Thread-8 - coaphon.client.coap DEBUG - retransmit loop ... exit
No response received for POST using resource: temp
The thread has terminated at 19:50:26,574
This data has been updated
-----
Time: 2018-12-07 19:41:58.059489
Command: 1
Status Code: 1
Error: None
State Data: None
Value: 37.914466857910156
37.914466857910156
37.914466857910156

New sensor readings:
37.914466857910156
sensor information:
37.914466857910156 Current: 37.914466857910156
Average: 37.475202303232451
Samples: 5
Min: 0
Max: 37.514466857910156
Testing Coap resource ref: <coaphon.client.helperclient.HelperClient object at 0x6f19bff0>
coap://192.168.0.119:5683

```

```
localhost:11111 - - <coapthon.client.helperclient.Helperclient object at 0x703148d0>
COAP://192.168.0.148:5683
2018-12-07 17:40:06.807 - Thread-2 - coapthon.layers.messagelayer - DEBUG - send request - From None, To ('192.168.0.148', 5683), None=None, POST-VX, [Uri-Path: temp, ] 38.662261962890625...18 bytes
2018-12-07 17:40:06.807 - Thread-2 - coapthon.client.coap - DEBUG - send datagram - From None, To ('192.168.0.148', 5683), CON-46274, POST-VX, [Uri-Path: temp, ] 38.662261962890625...18 bytes
2018-12-07 17:40:06.812 - Thread-4 - coapthon.client.coap - DEBUG - Start receive Thread
2018-12-07 17:40:06.812 - Thread-4 - coapthon.client.coap - DEBUG - Start receive Thread
2018-12-07 17:40:09.617 - Thread-2 - coapthon.client.coap - DEBUG - retransmit loop ... enter
2018-12-07 17:40:09.617 - Thread-2 - coapthon.client.coap - DEBUG - retransmit loop ... enter
2018-12-07 17:40:09.617 - Thread-2 - coapthon.client.coap - DEBUG - retransmit Request
2018-12-07 17:40:09.619 - Thread-2 - coapthon.client.coap - DEBUG - send datagram - From None, To ('192.168.0.148', 5683), CON-46274, POST-VX, [Uri-Path: temp, ] 38.662261962890625...18 bytes
2018-12-07 17:40:15.222 - Thread-2 - coapthon.client.coap - DEBUG - retransmit loop ... enter
2018-12-07 17:40:15.222 - Thread-2 - coapthon.client.coap - DEBUG - retransmit Request
2018-12-07 17:40:15.222 - Thread-2 - coapthon.client.coap - DEBUG - send datagram - From None, To ('192.168.0.148', 5683), CON-46274, POST-VX, [Uri-Path: temp, ] 38.662261962890625...18 bytes
2018-12-07 17:40:20.429 - Thread-2 - coapthon.client.coap - DEBUG - retransmit loop ... enter
2018-12-07 17:40:20.429 - Thread-2 - coapthon.client.coap - DEBUG - retransmit Request
2018-12-07 17:40:20.429 - Thread-2 - coapthon.client.coap - DEBUG - send datagram - From None, To ('192.168.0.148', 5683), CON-46274, POST-VX, [Uri-Path: temp, ] 38.662261962890625...18 bytes
2018-12-07 17:41:33.648 - Thread-2 - coapthon.client.coap - DEBUG - retransmit loop ... enter
2018-12-07 17:41:33.648 - Thread-2 - coapthon.client.coap - DEBUG - retransmit Request
2018-12-07 17:41:33.648 - Thread-2 - coapthon.client.coap - DEBUG - send datagram - From None, To ('192.168.0.148', 5683), CON-46274, POST-VX, [Uri-Path: temp, ] 38.662261962890625...18 bytes
2018-12-07 17:41:33.653 - Thread-4 - coapthon.client.coap - DEBUG - retransmit loop ... exit
2018-12-07 17:41:33.653 - Thread-4 - coapthon.client.coap - DEBUG - Exiting receiver Thread due to request
--signal-
Time: 2018-12-07 17:38:45.898594
Command: 1
Status Code: 1
Error Code: 0
State Data: Please decrease 18degrees
Value: 38.662261962890625

New sensor readings:
Temperature:
Time: 2018-12-07 17:41:33.654807
Current: 38.662261962890625
Average: 38.73348045349121
Samples: 2
Min: 38.73348045349121
Max: 38.8046989440918
handlePost is working
Testing POST for resource: temp, payload: 39.05396270751953
Testing CoAP Client ref: <coapthon.client.helperclient.Helperclient object at 0x70314a30>
POST//192.168.0.148:5683/temp
2018-12-07 17:41:43.676 - Thread-2 - coapthon.layers.messagelayer - DEBUG - send request - From None, To ('192.168.0.148', 5683), None=None, POST-KY, [Uri-Path: temp, ] 39.05396270751953...17 bytes
2018-12-07 17:41:43.676 - Thread-2 - coapthon.client.coap - DEBUG - send datagram - From None, To ('192.168.0.148', 5683), CON-16740, POST-KY, [Uri-Path: temp, ] 39.05396270751953...17 bytes
2018-12-07 17:41:43.681 - Thread-5 - coapthon.client.coap - DEBUG - Start receive Thread
2018-12-07 17:41:43.681 - Thread-5 - coapthon.client.coap - DEBUG - Start receive Thread
2018-12-07 17:41:43.681 - Thread-5 - coapthon.client.coap - DEBUG - retransmit loop ... enter
2018-12-07 17:41:43.681 - Thread-5 - coapthon.client.coap - DEBUG - retransmit loop ... enter
2018-12-07 17:41:43.681 - Thread-5 - coapthon.client.coap - DEBUG - retransmit Request
2018-12-07 17:41:43.681 - Thread-5 - coapthon.client.coap - DEBUG - send datagram - From None, To ('192.168.0.148', 5683), CON-16740, POST-KY, [Uri-Path: temp, ] 39.05396270751953...17 bytes
2018-12-07 17:41:46.619 - Thread-2 - coapthon.client.coap - DEBUG - retransmit loop ... enter
2018-12-07 17:41:46.619 - Thread-2 - coapthon.client.coap - DEBUG - retransmit Request
2018-12-07 17:41:46.619 - Thread-2 - coapthon.client.coap - DEBUG - send datagram - From None, To ('192.168.0.148', 5683), CON-16740, POST-KY, [Uri-Path: temp, ] 39.05396270751953...17 bytes
2018-12-07 17:41:52.486 - Thread-2 - coapthon.client.coap - DEBUG - retransmit loop ... enter
2018-12-07 17:41:52.486 - Thread-2 - coapthon.client.coap - DEBUG - retransmit Request
2018-12-07 17:41:52.486 - Thread-2 - coapthon.client.coap - DEBUG - send datagram - From None, To ('192.168.0.148', 5683), CON-16740, POST-KY, [Uri-Path: temp, ] 39.05396270751953...17 bytes
2018-12-07 17:42:04.841 - Thread-2 - coapthon.client.coap - DEBUG - retransmit loop ... enter
2018-12-07 17:42:04.841 - Thread-2 - coapthon.client.coap - DEBUG - retransmit Request
```

## Published Succeed

```
十二月 07, 2018 7:42:14 下午 org.eclipse.californium.core.network.config.NetworkConfig createStandardWithFile
信息: Loading standard properties from file Californium.properties
十二月 07, 2018 7:42:14 下午 semesterproject.CoapServerConnector start
信息: Starting CoAP server...
十二月 07, 2018 7:42:14 下午 org.eclipse.californium.core.CoapServer start
信息: Starting server
十二月 07, 2018 7:42:14 下午 org.eclipse.californium.core.CoapServer start
信息: No endpoints have been defined for server, setting up server endpoint on default port 5683
十二月 07, 2018 7:42:14 下午 org.eclipse.californium.core.network.CoapEndpoint start
信息: Starting endpoint at 0.0.0.0/0.0.0:5683
37.237884521484375
十二月 07, 2018 7:43:12 下午 semesterproject.MqttClientConnectorCloud <init>
信息: PEM file valid. Using secure connection: /Users/rocky_yan/Desktop/ubidots_cert.pem
十二月 07, 2018 7:43:12 下午 semesterproject.MqttClientConnectorCloud <init>
```

## Subscribe Succeed

```
12月 07, 2018 5:43:50 下午 semester_project.MqttClientConnector <init>
信息: PEM file valid. Using secure connection: /Users/andyyuan/Desktop/ubidots.pem
12月 07, 2018 5:43:50 下午 semester_project.MqttClientConnector <init>
信息: Using URL for broker conn: ssl://things.ubidots.com:8883
12月 07, 2018 5:43:50 下午 semester_project.MqttClientConnector initSecureConnection
信息: Configuring TLS...
12月 07, 2018 5:43:51 下午 semester_project.MqttClientConnector connect
信息: Connected to broker: ssl://things.ubidots.com:8883

12月 07, 2018 5:43:51 下午 semester_project.MqttClientConnector messageArrived
信息: Message arrived: /v1.6/devices/homeiotgateway/tempactuator, 1
12月 07, 2018 5:43:51 下午 semester_project.MqttClientConnector messageArrived
信息: {"timestamp": 1544213790690, "context": {}, "value": 22.0, "id": "5c0ad51e5916363eaceaaf8a"}
12月 07, 2018 5:43:51 下午 semester_project.MqttClientConnector messageArrived
信息: Message arrived: /v1.6/devices/homeiotgateway/maxtemp, 2
12月 07, 2018 5:43:51 下午 semester_project.MqttClientConnector messageArrived
信息: {"timestamp": 1544220000000, "context": {}, "value": 39.0539627075, "id": "5c0af6795916363df067c602"}
```

When the temperature is higher than alert. It will send a e-mail to me.

5:40

<      >      ⌂      ⌂      ⌂      ⌂      ⌂

Exceptional sensor data    Inbox    ⭐

**C** connecteddevice to me    \*\*\*

1:23 PM View details

sensor information:

Time: 2018-12-07 13:23:28.596598  
 Current: 12.287650950389217  
 Average: 15.256041370496114  
 Samples: 3  
 Min: 0  
 Max: 26.308901309251496

**C** connecteddevice to me    \*\*\*

1:23 PM View details

Reply    Forward

---

HomeiotGateway

Dashboard Devices Events Credits: 4,980 PeiyYan

Map data ©2018 Google | Terms of Use | Report a map Leaflet

**HomeiotGateway**

Description Click here to add a description

API Label **homeiotgateway**

ID **5b0db63ec03f972ccb1901...**

Tags Add tag

Last Activity 2 minutes ago

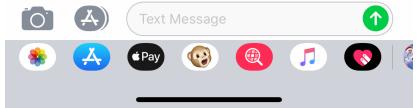
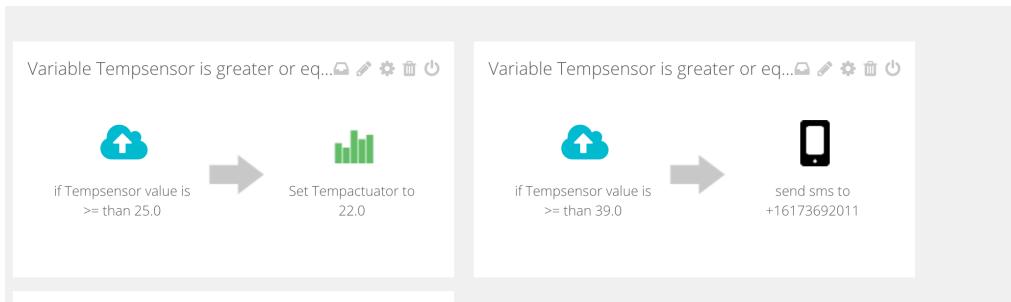
AverageTemp 37.50 Last activity 2 minutes ago

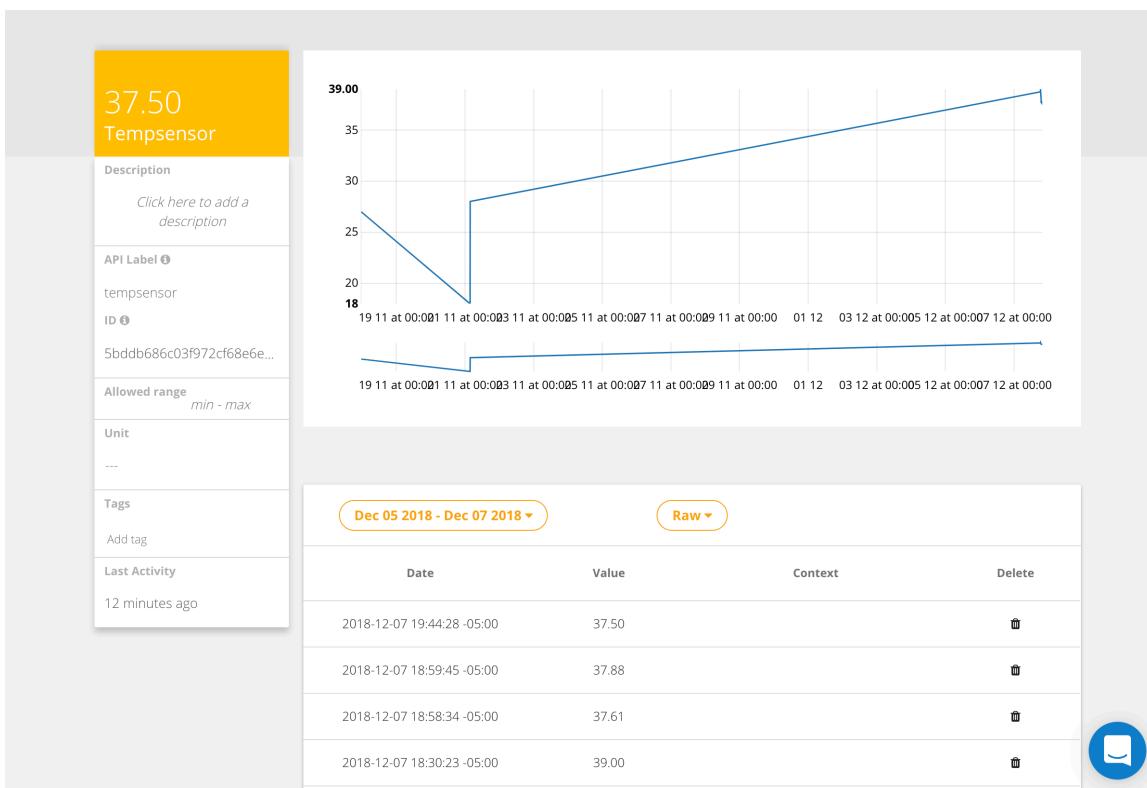
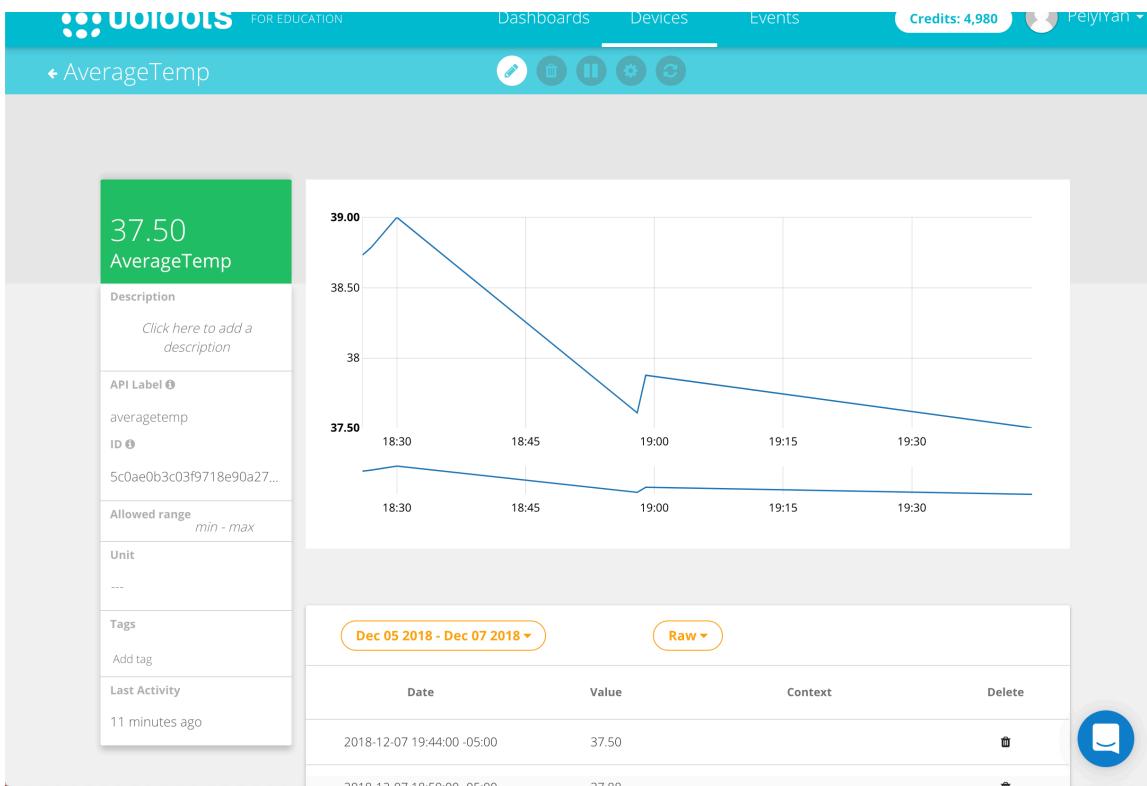
Tempactuator 22.00 Last activity 17 days ago

Tempsensor 37.50 Last activity 2 minutes ago

Add Variable

This is a cloud actuator in the Ubidots. When the Tempsensor is higher than 39. It will send a text message to me.





## **Code repository**

URI:

**ConnectedDevices:**

<https://github.com/PeiyiYan/ConnectedDevicesSemesterProject/tree/master/eclipse-workspace-Connected%20Devices-Fall6530/iot-device/apps/labs/semesterproject>

**ConnectedGateway:**

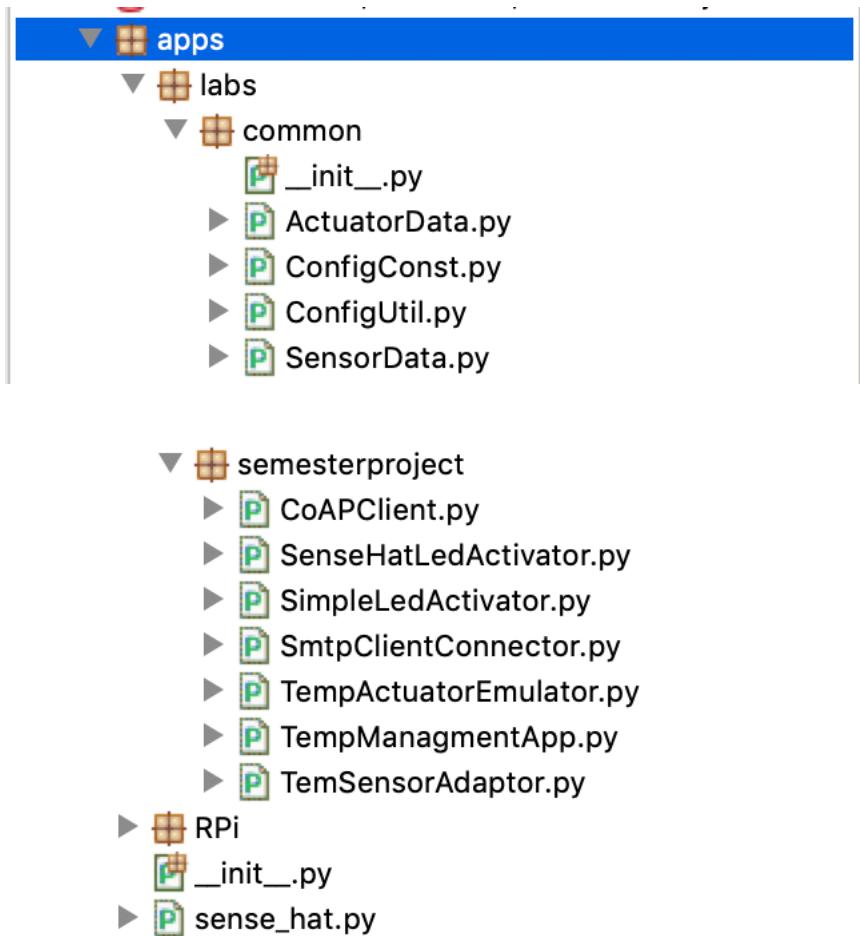
<https://github.com/PeiyiYan/ConnectedDevicesSemesterProject/tree/master/eclipse-workspace-Connected%20Devices-Fall6530/iot-gateway/src/main/java/semesterproject>

**Video :**

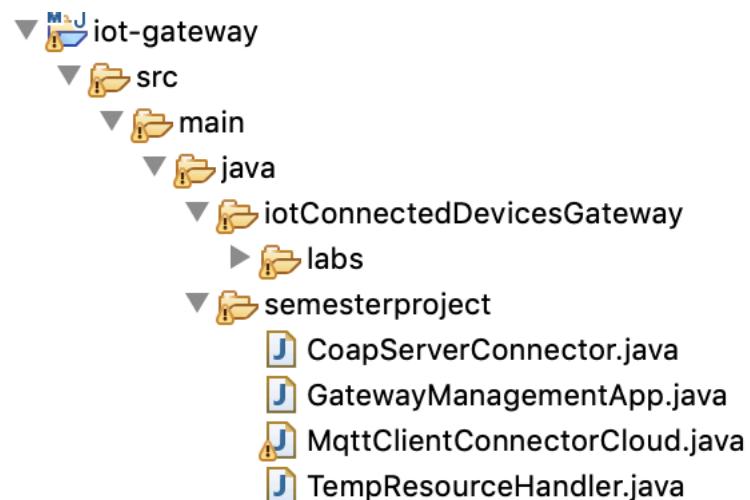
<https://youtu.be/cR92fsPM64w>

**Listing of all modules:**

IOT-CONNECTED DEVICES:



IOT-GATEWAY:



## Block Diagram:

