

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:

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

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 cloud client can also subscribe to the Ubidots theme and get three variables. Then I will use MQTT Local Client to publish the variable to the mosquito server.

Step6: The MQTT local Client in Raspberry pi can subscribe the 'Feedback' topic from the mosquito.

Step7: The MQTT local Client in Raspberry pi will transmit the temperature message to the actuator(LED) and the LED will show the message in the screen (Mine is "please decrease xxx")

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
```

```

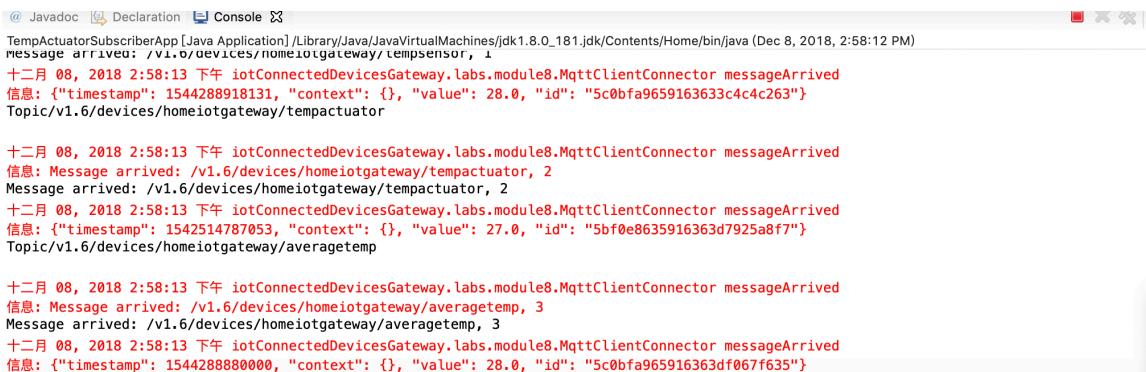
Creating CoAP client ref: <coaphon.client.helperclient.HelperClient object at 0x703148d0>
coap://192.168.0.148:5683
2018-12-07 17:40:06,801 - Thread-2 - coaphon.layers.messageLayer - DEBUG - send request - From None, To ('192.168.0.148', 5683), None-None, POST-VX, [Uri-Path: temp, ] 38.662261962890625...18 bytes
2018-12-07 17:40:06,801 - Thread-2 - coaphon.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 - coaphon.client.coap - DEBUG - Start receiver Thread
2018-12-07 17:40:06,813 - Thread-4 - coaphon.layers.messageLayer - DEBUG - retransmit loop ... enter
2018-12-07 17:40:06,813 - Thread-4 - coaphon.client.coap - DEBUG - retransmit loop ... retransmit Request
2018-12-07 17:40:06,819 - Thread-2 - coaphon.layers.messageLayer - 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 17:40:06,819 - Thread-2 - coaphon.client.coap - DEBUG - retransmit loop ... retransmit Request
2018-12-07 17:40:06,824 - Thread-2 - coaphon.layers.messageLayer - 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 17:40:06,824 - Thread-2 - coaphon.client.coap - DEBUG - retransmit loop ... retransmit Request
2018-12-07 17:40:06,826 - Thread-2 - coaphon.layers.messageLayer - 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 17:40:06,826 - Thread-2 - coaphon.client.coap - DEBUG - retransmit loop ... retransmit Request
2018-12-07 17:40:06,833 - Thread-2 - coaphon.layers.messageLayer - 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 17:40:06,833 - Thread-2 - coaphon.client.coap - DEBUG - retransmit loop ... exit
No response received for POST using resource: temp
2018-12-07 17:41:33,653 - Thread-4 - coaphon.client.coap - DEBUG - retransmit loop ... exit
--Signature: 38.662261962890625
Time: 2018-12-07 17:38:45.998591
Command: 1
Status Code: 1
Error Code: 0
State Data: Please decrease 18degrees
Value: 38.662261962890625
-----
Net sensor readings:
Temperature:
Time: 2018-12-07 17:41:33.654867
Current: 38.662261962890625
Average: 38.73340845349121
Samples: 2
Min: 38
Max: 38.8046989449918
handshake complete
Testing POST for resource: temp, payload: 39.05396270751953
Created CoAP client ref: <coaphon.client.helperclient.HelperClient object at 0x70314a30>
coap://192.168.0.148:5683
2018-12-07 17:41:43,676 - Thread-2 - coaphon.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 - coaphon.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 - coaphon.client.coap - DEBUG - Start receiver Thread
2018-12-07 17:41:43,684 - Thread-2 - coaphon.layers.messageLayer - DEBUG - retransmit loop ... enter
2018-12-07 17:41:43,684 - Thread-2 - coaphon.client.coap - DEBUG - retransmit loop ... retransmit Request
2018-12-07 17:41:43,684 - Thread-2 - coaphon.layers.messageLayer - 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 17:41:43,684 - Thread-2 - coaphon.client.coap - DEBUG - retransmit loop ... retransmit Request
2018-12-07 17:41:43,684 - Thread-2 - coaphon.layers.messageLayer - 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 17:41:43,684 - Thread-2 - coaphon.client.coap - DEBUG - retransmit loop ... retransmit Request
2018-12-07 17:42:04,213 - Thread-2 - coaphon.layers.messageLayer - DEBUG - retransmit loop ... retransmit Request

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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



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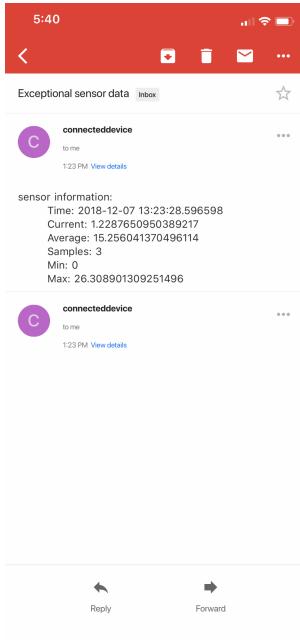
@ Javadoc Declaration Console
TempActuatorSubscriberApp [Java Application] /Library/Java/JavaVirtualMachines/jdk1.8.0_181.jdk/Contents/Home/bin/java (Dec 8, 2018, 2:58:12 PM)
message arrived: /v1.6/devices/homeiotgateway/tempsensor, 1
十二月 08, 2018 2:58:13 下午 iotConnectedDevicesGateway.labs.module8.MqttClientConnector messageArrived
信息: {"timestamp": 1544288918131, "context": {}, "value": 28.0, "id": "5c0bfa965916363c4c4c263"}
Topic/v1.6/devices/homeiotgateway/tempactuator

十二月 08, 2018 2:58:13 下午 iotConnectedDevicesGateway.labs.module8.MqttClientConnector messageArrived
信息: Message arrived: /v1.6/devices/homeiotgateway/tempactuator, 2
Message arrived: /v1.6/devices/homeiotgateway/tempactuator, 2
十二月 08, 2018 2:58:13 下午 iotConnectedDevicesGateway.labs.module8.MqttClientConnector messageArrived
信息: {"timestamp": 1542514787053, "context": {}, "value": 27.0, "id": "5bf0e8635916363d7925a8f7"}
Topic/v1.6/devices/homeiotgateway/averagetemp

十二月 08, 2018 2:58:13 下午 iotConnectedDevicesGateway.labs.module8.MqttClientConnector messageArrived
信息: Message arrived: /v1.6/devices/homeiotgateway/averagetemp, 3
Message arrived: /v1.6/devices/homeiotgateway/averagetemp, 3
十二月 08, 2018 2:58:13 下午 iotConnectedDevicesGateway.labs.module8.MqttClientConnector messageArrived
信息: {"timestamp": 1544288880000, "context": {}, "value": 28.0, "id": "5c0bfa965916363df067f635"}

```

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



I set three different variables in Ubiots which are AverageTemp, Tempactuator and TempSensor.

Variable	Value	Last Activity
AverageTemp	28.00	3 hours ago
Tempactuator	24.00	4 hours ago
TempSensor	28.00	3 hours ago

This is a cloud actuator in the Ubidots. When the Tempsensor is higher than 39. It will send a text message to me. If the temperature is higher than 25, the actuator in Ubidots will be triggered and set the temperature to 24. If the temperature is lower than 20, the actuator in Ubidots will be triggered and set the temperature to 25.

ubidots FOR EDUCATION

Credits: 4,980 PeiyiYan

My Events

Variable TempSensor is greater or eq...

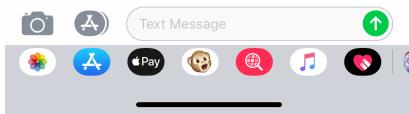
if TempSensor value is >= than 39.0 send sms to +16173692011

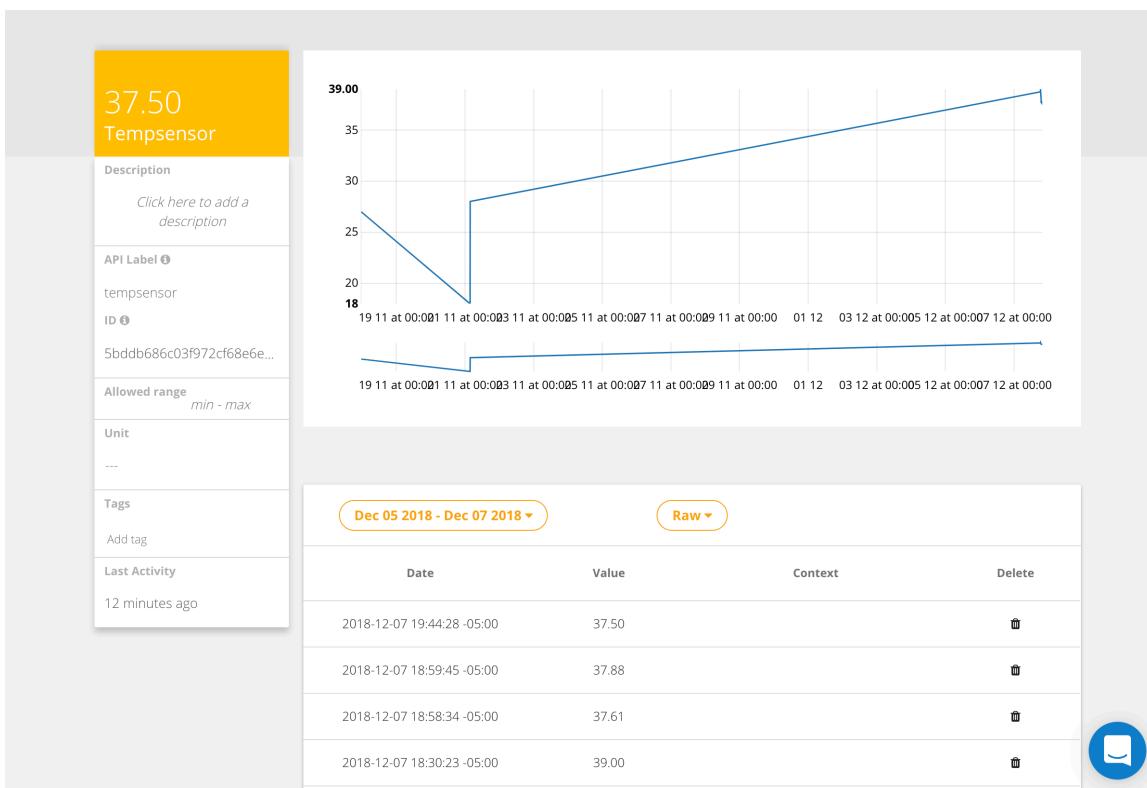
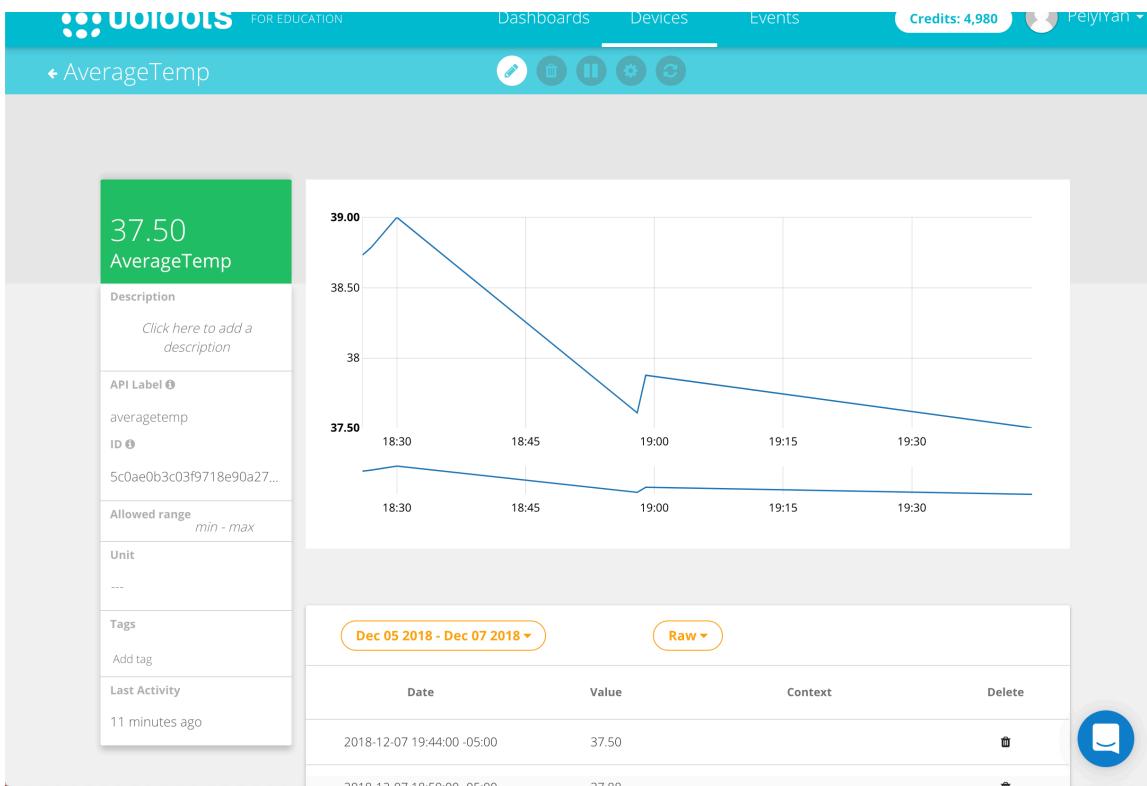
Variable TempSensor is greater or eq...

if TempSensor value is >= than 25.0 Set Tempactuator to 24.0

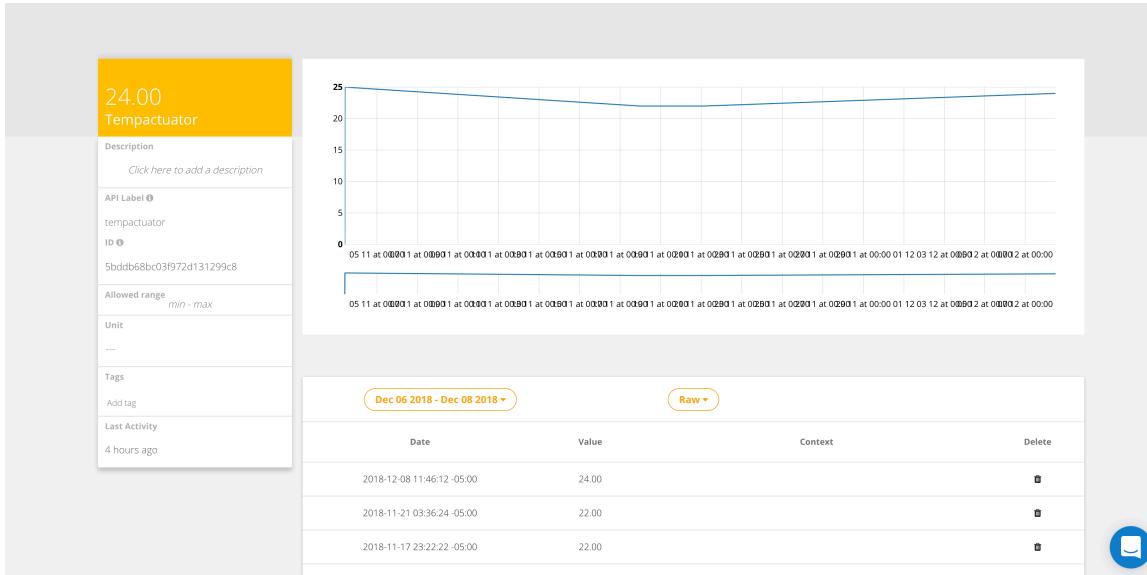
Variable TempSensor is less or equal...

if TempSensor value is <= than 20.0 Set Tempactuator to 25.0





Because the temperature is always higher than 35. So the actuator is always be the 24 which is I set.



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-device/apps/labs/semesterproject>

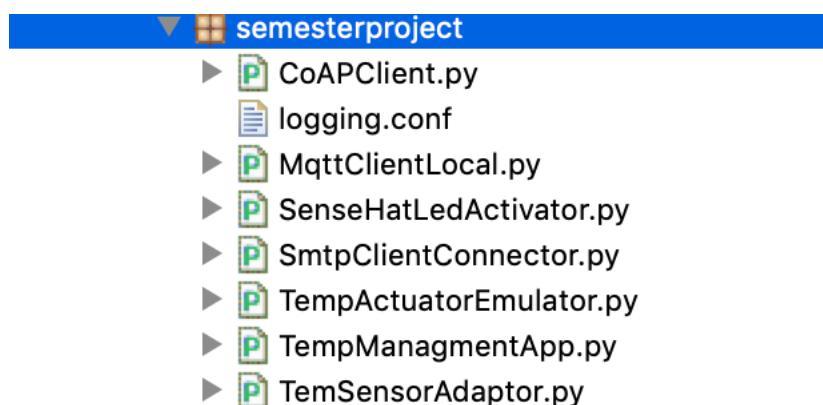
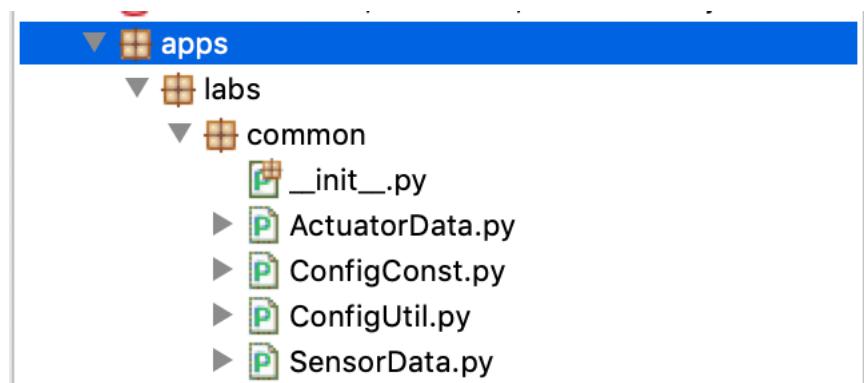
[gateway/src/main/java/semesterproject](#)

Video :

<https://youtu.be/cR92fsPM64w>

Listing of all modules:

IOT-CONNECTED DEVICES:



IOT-GATEWAY:

▼ 📁 semesterproject

- 📁 CoapServerConnector.java
- 📁 GatewayManagementApp.java
- ⚠️ MqttClientConnectorCloud.java
- ⚠️ MqttClientConnectorLocal.java
- 📁 TempResourceHandler.java

Block Diagram:

