Connected Devices

Semester Project

Name and Course

- Name: Paavan Gopala Reddy
- Course: Connected Devices
- Semester and Year: Spring 2019

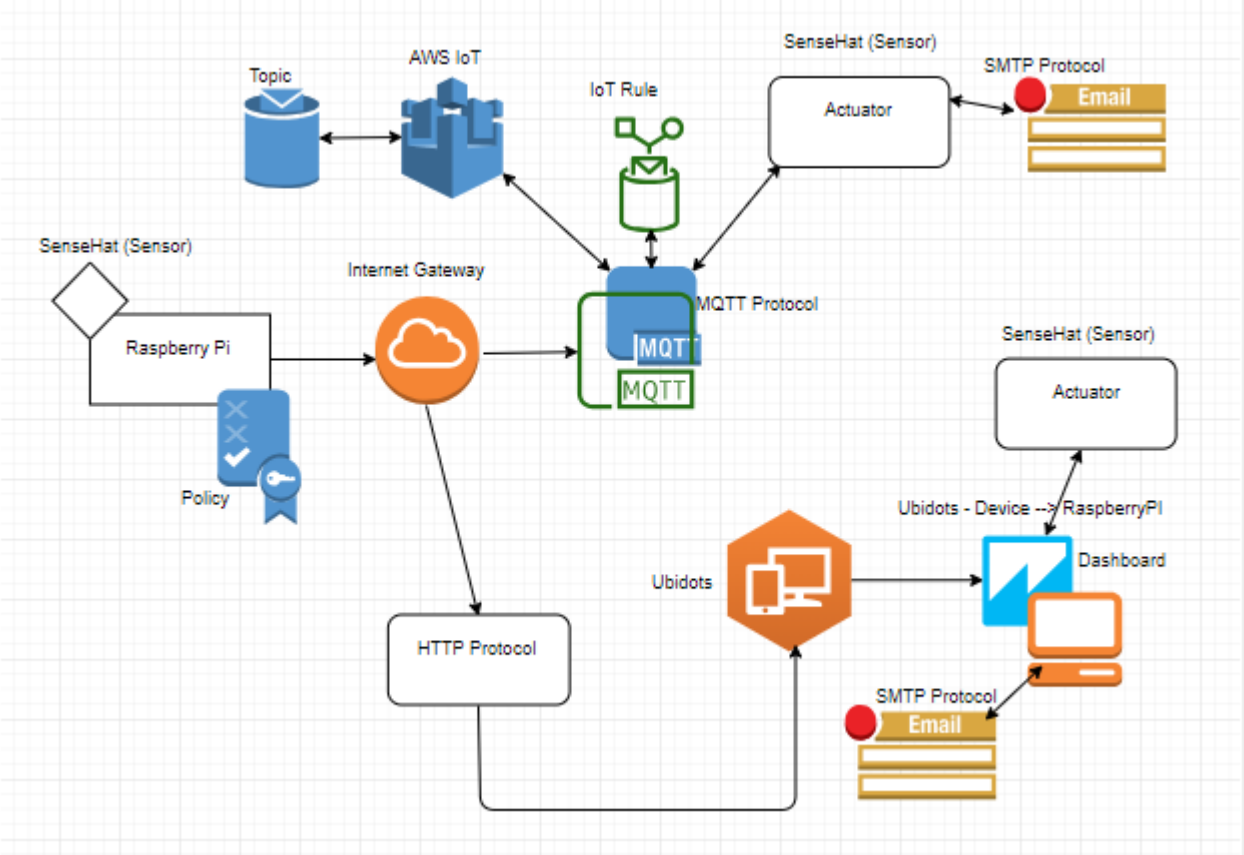
Description

- Description: **Streaming Sensor Data (Raspberry Pi and SenseHat) to AWS IoT and Ubidots**

  Using Raspberry Pi as the hardware and SenseHat which has Temperature, Humidity, Pressure sensors and stream this sensor related information to AWS IoT (Internet of Things) and Ubidots continuously.

  The goal of this project is to build two simple applications which can help us continuously stream all the SenseHat related sensor information continuously to (AWS IoT, Ubidots) cloud services so that we can control it remotely.

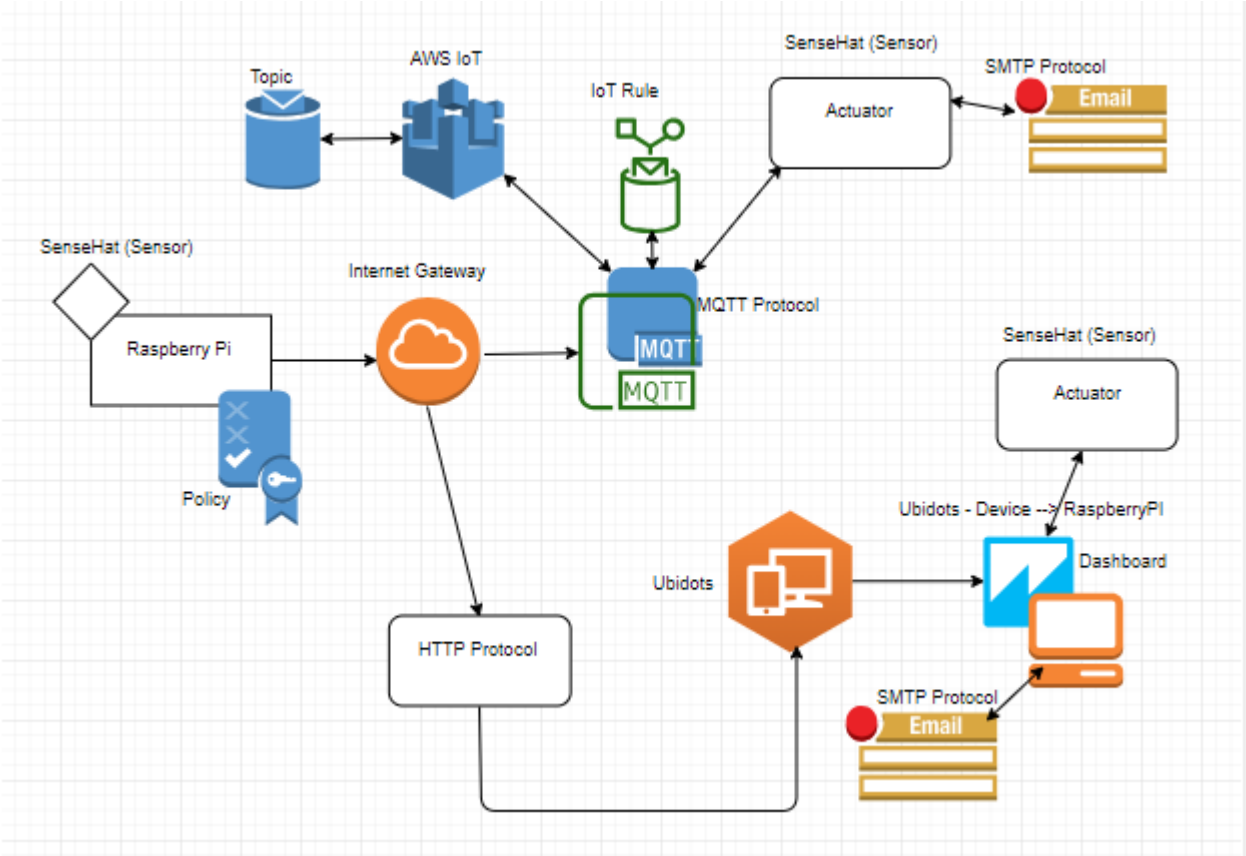
System Design Block Diagram



- What problem are we trying to solve?

  ➔ Continuously read all the SenseHat related sensors information which is residing at a particular residence and send those set of data to the cloud to analyze and act accordingly remotely. If there is any unusual increase in temperature or humidity beyond the threshold limit etc., then we can get the information and set the temperature or pressure back to its normal value.

- High Level Design Diagram:



- List the cloud services and capabilities you think you'll utilize.

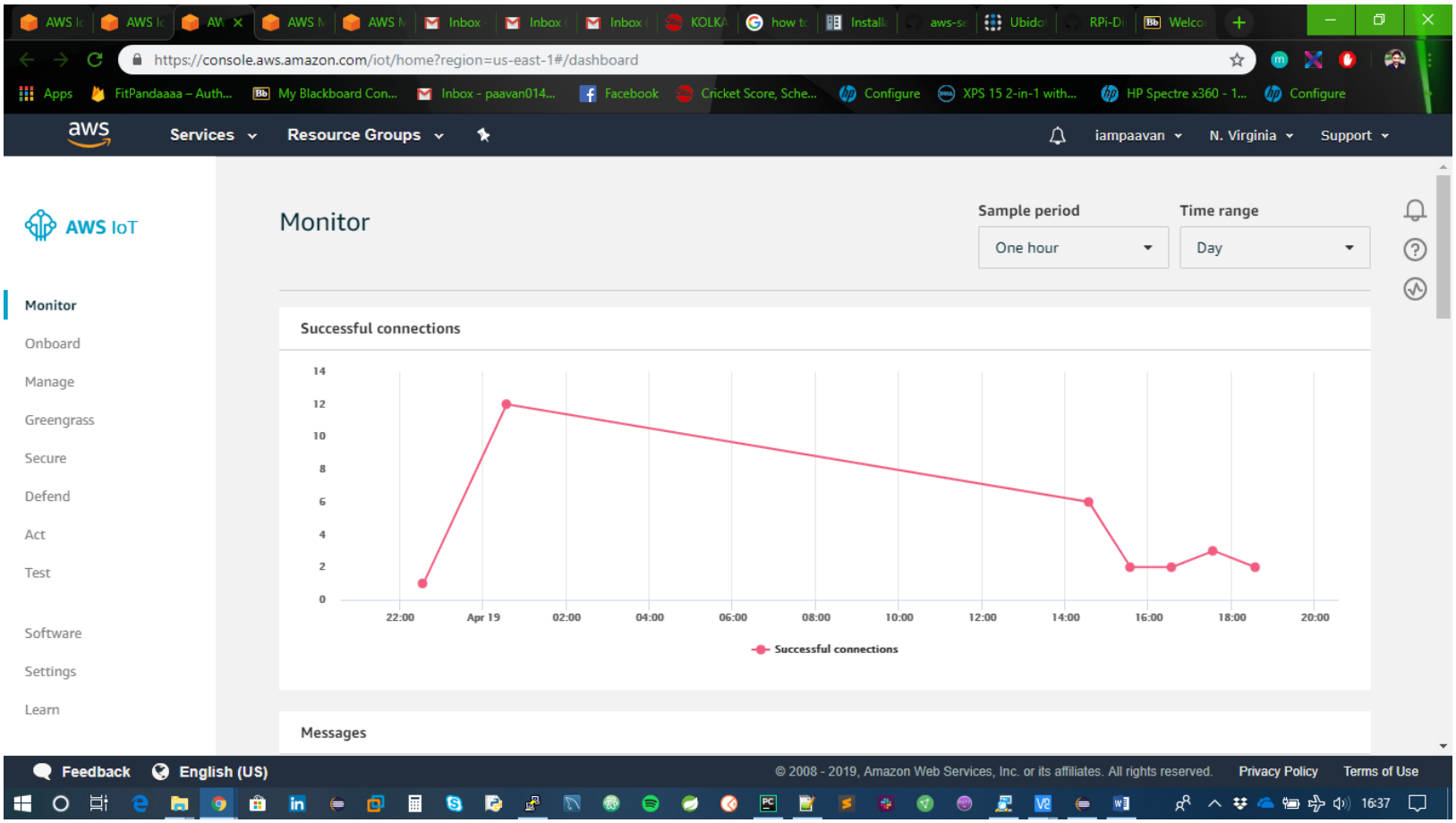
  ➔ AWS IoT, Ubidots Cloud Service, MQTT, SMPT and HTTP Protocols etc.

- If your project is successful, what outcome do you expect (e.g. what will happen if everything works)?

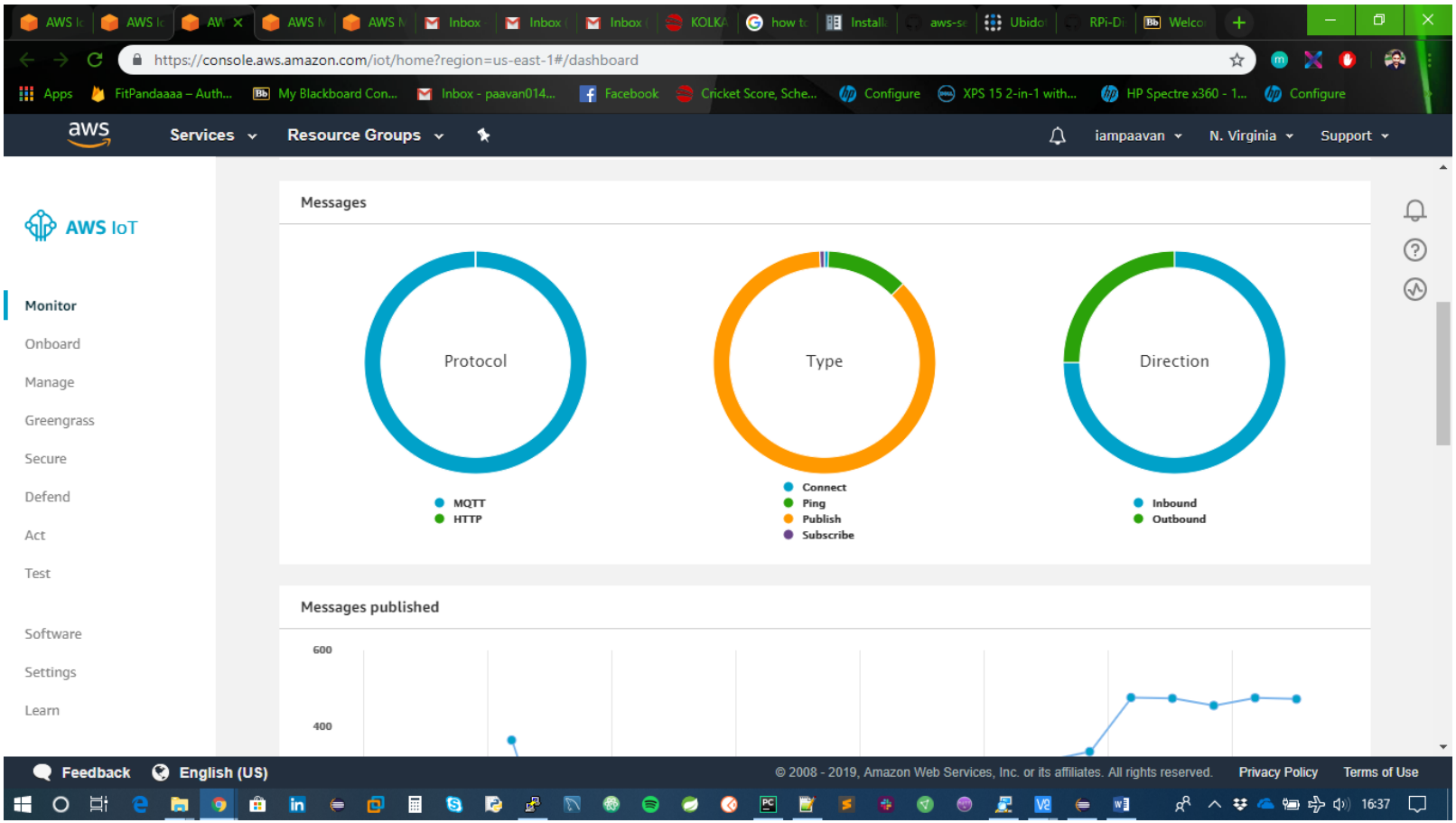
  ➔ We'll be able to successfully control and make necessary changes to our home automated devices if there are any unusual changes in the temperature or pressure or humidity for that matter. We can analyze the data remotely which is continuously being streamed to AWS IoT, Ubidots and Ubidots dashboard tells us all the information.

AWS IoT Dashboard:

Monitor the connections made from constrained device (Raspberry Pi)

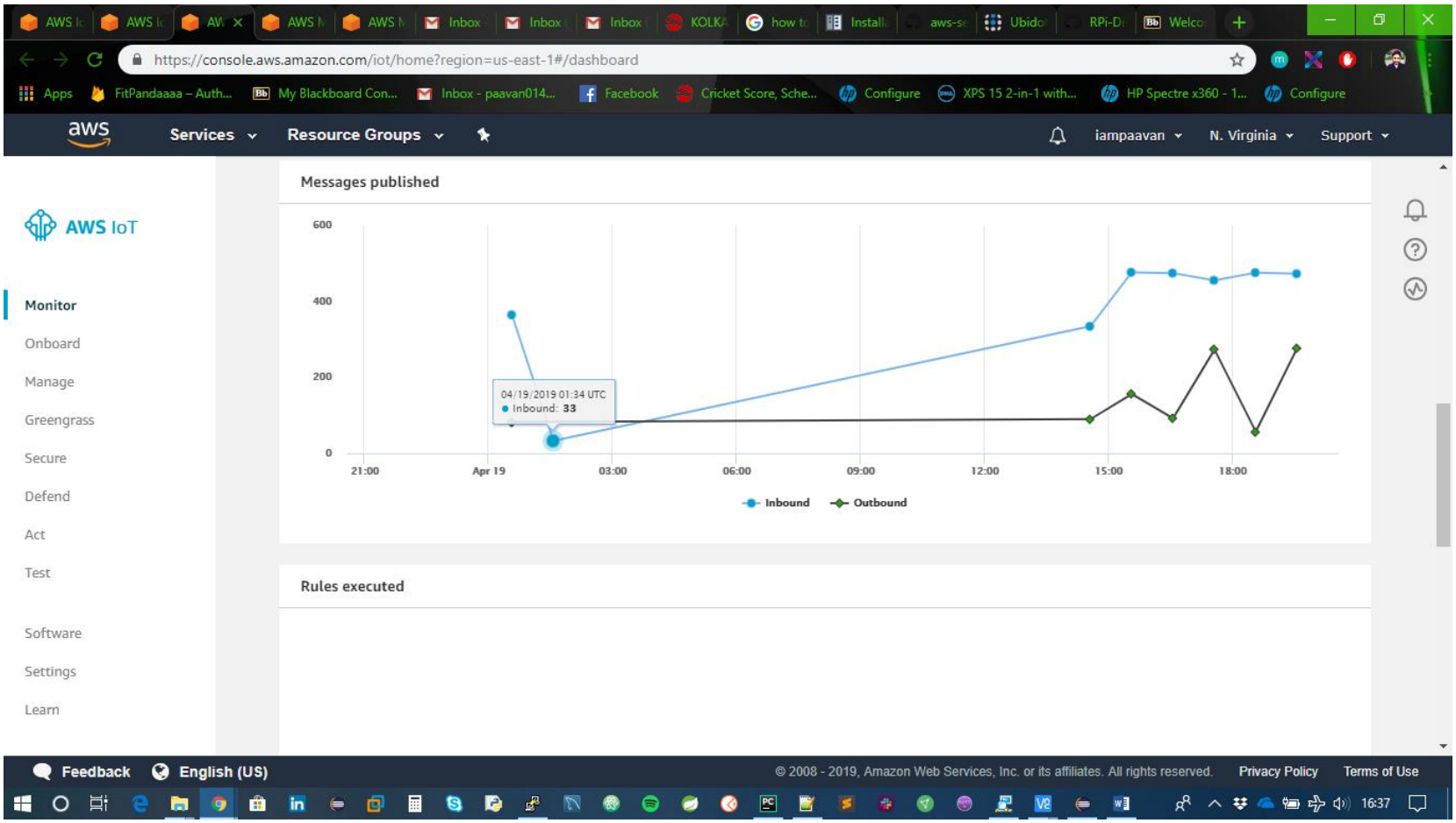


Messages Details: Protocol Used, Type of Messages and Direction of Messages

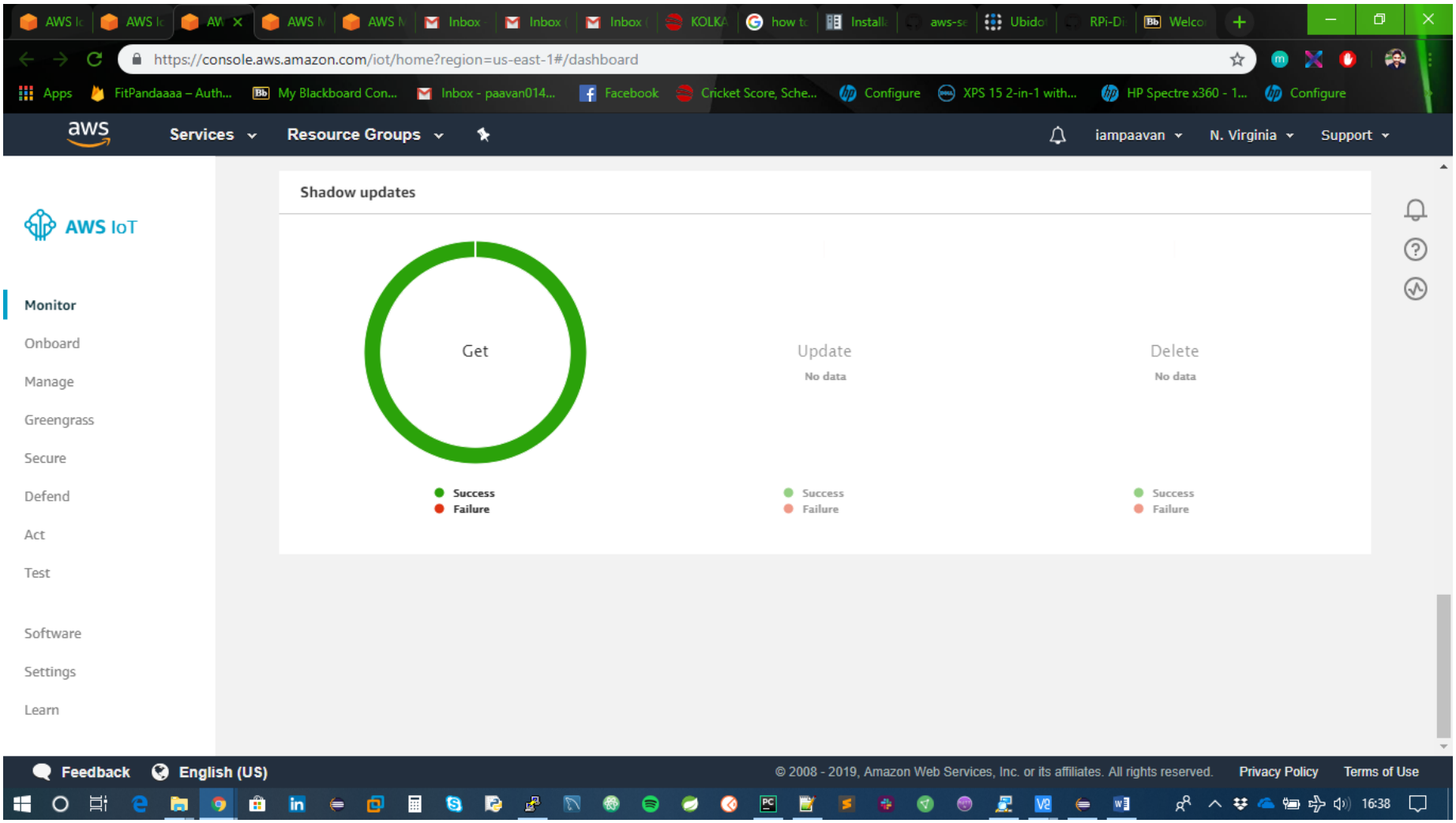


Messages Published: Sensor Data published from Constrained Device to AWS IoT

Also shows the time interval for a brief period of time. Streamed data for more than 6 to 8 hours.



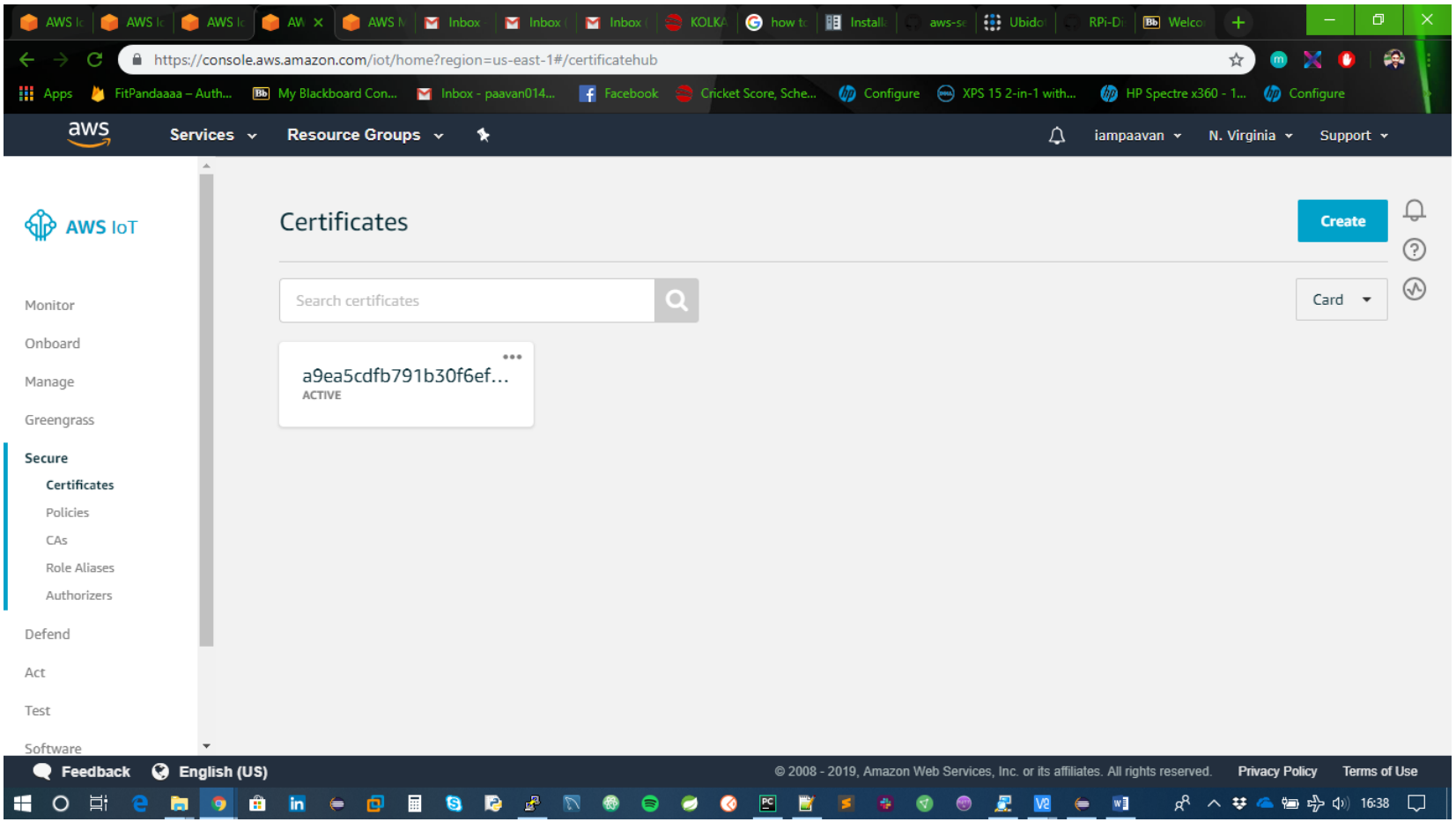
AWS IoT → Monitor → Shadow Updates



AWS Certificates:

a9ea5cdfb7-private.pem.key

aws.pem



https://console.aws.amazon.com/iot/home?region=us-east-1#/certificate/a9ea5cdfb791b30f6effc5e2f06fbba324b5cc59e0776d0dcd88e8c1a09302e2

aws Services Resource Groups iampaavan N. Virginia Support

CERTIFICATE

[redacted]

ACTIVE

Actions

Details

Policies

Things

Non-compliance

Certificate ARN

A certificate Amazon Resource Name (ARN) uniquely identifies this certificate. **Learn more**

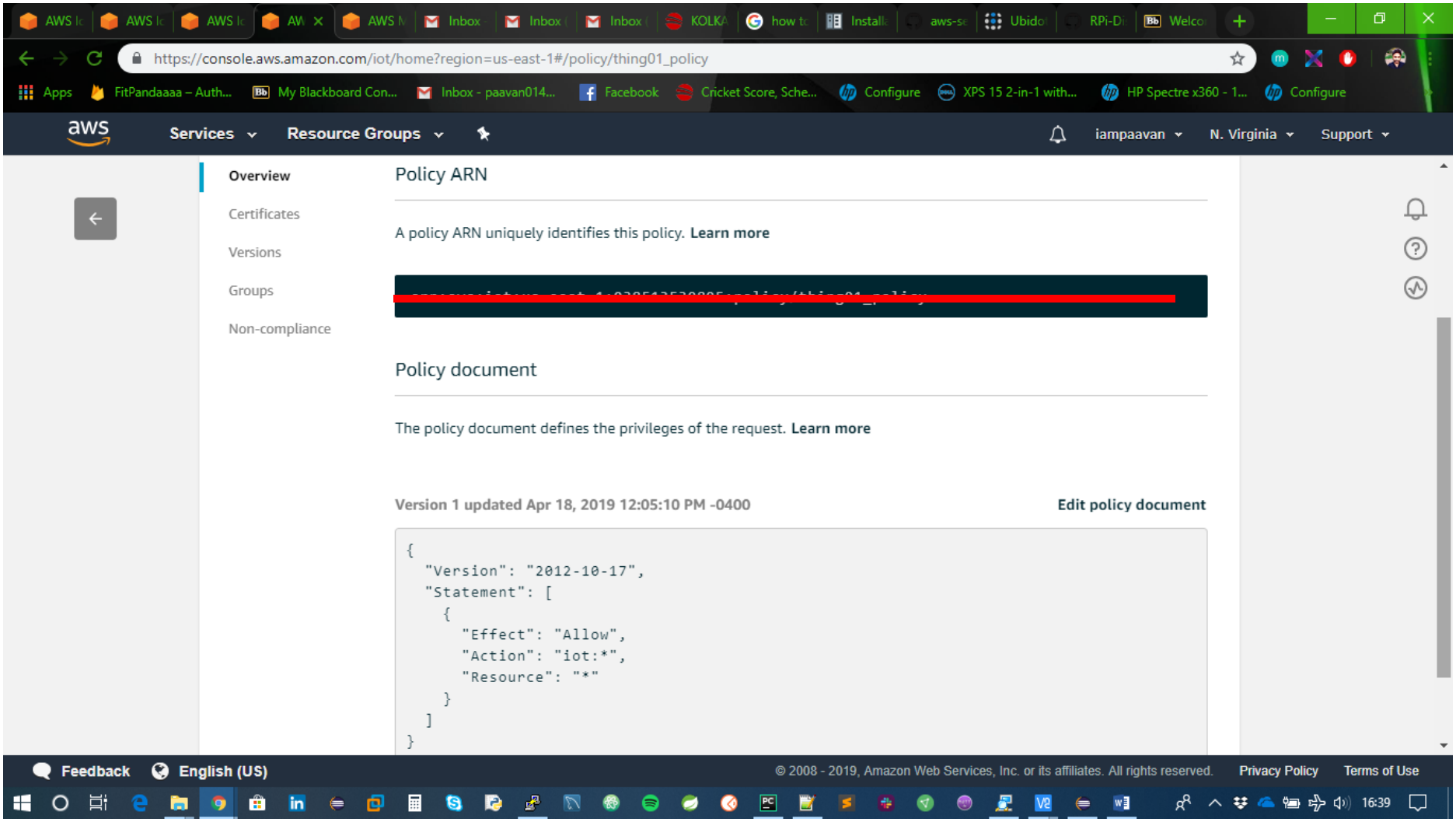
[redacted]

Details

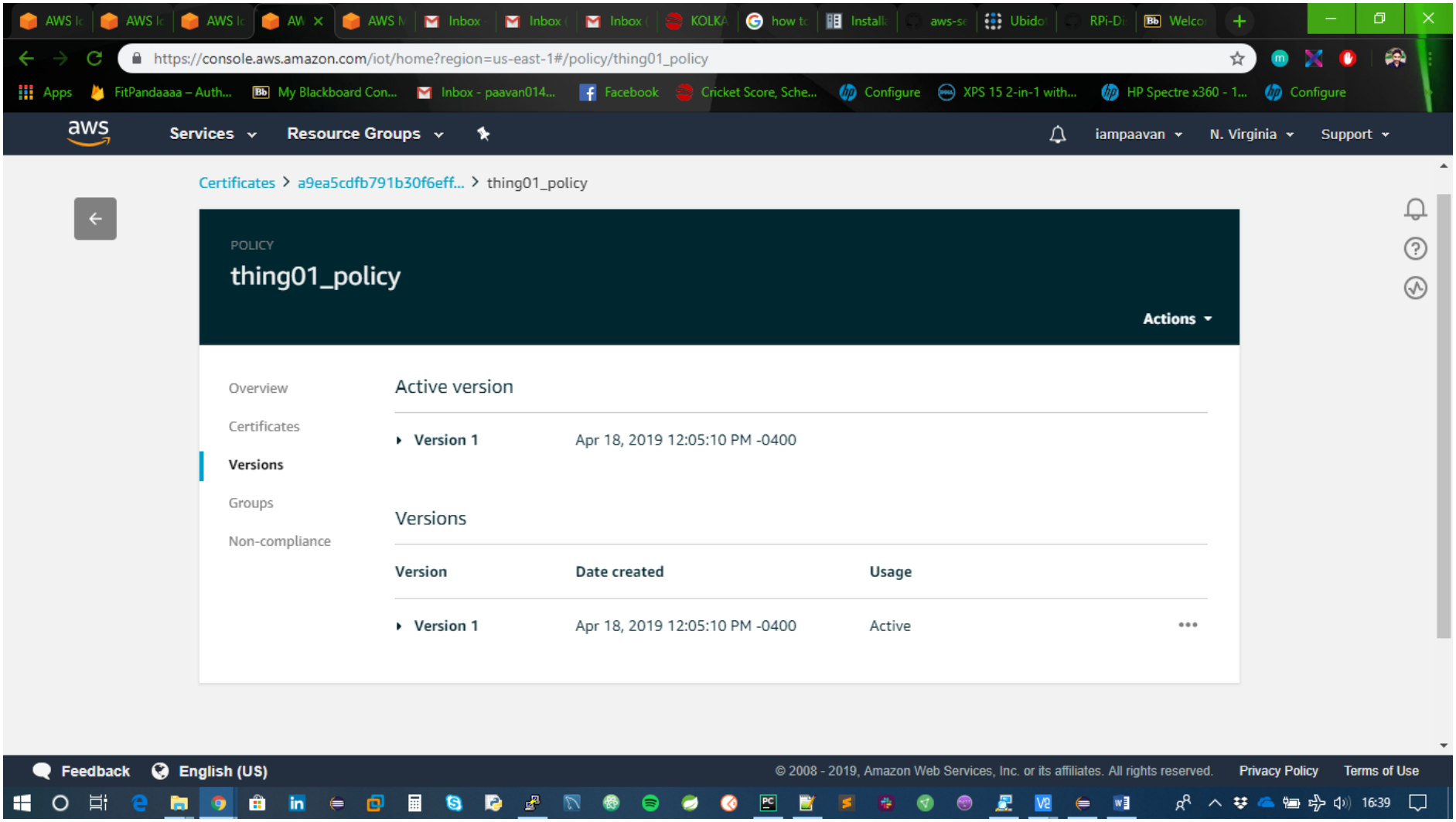
Issuer
OU=Amazon Web Services O\=Amazon.com Inc. L\=Seattle ST\=Washington C\=US
Subject
CN=AWS IoT Certificate
Create date
Apr 1, 2019 4:22:07 PM -0400
Effective date
Apr 1, 2019 4:20:07 PM -0400
Expiration date
Dec 31, 2049 6:59:59 PM -0500

Feedback English (US) Privacy Policy Terms of Use

AWS Policy: To allow constrained device to send data to AWS.

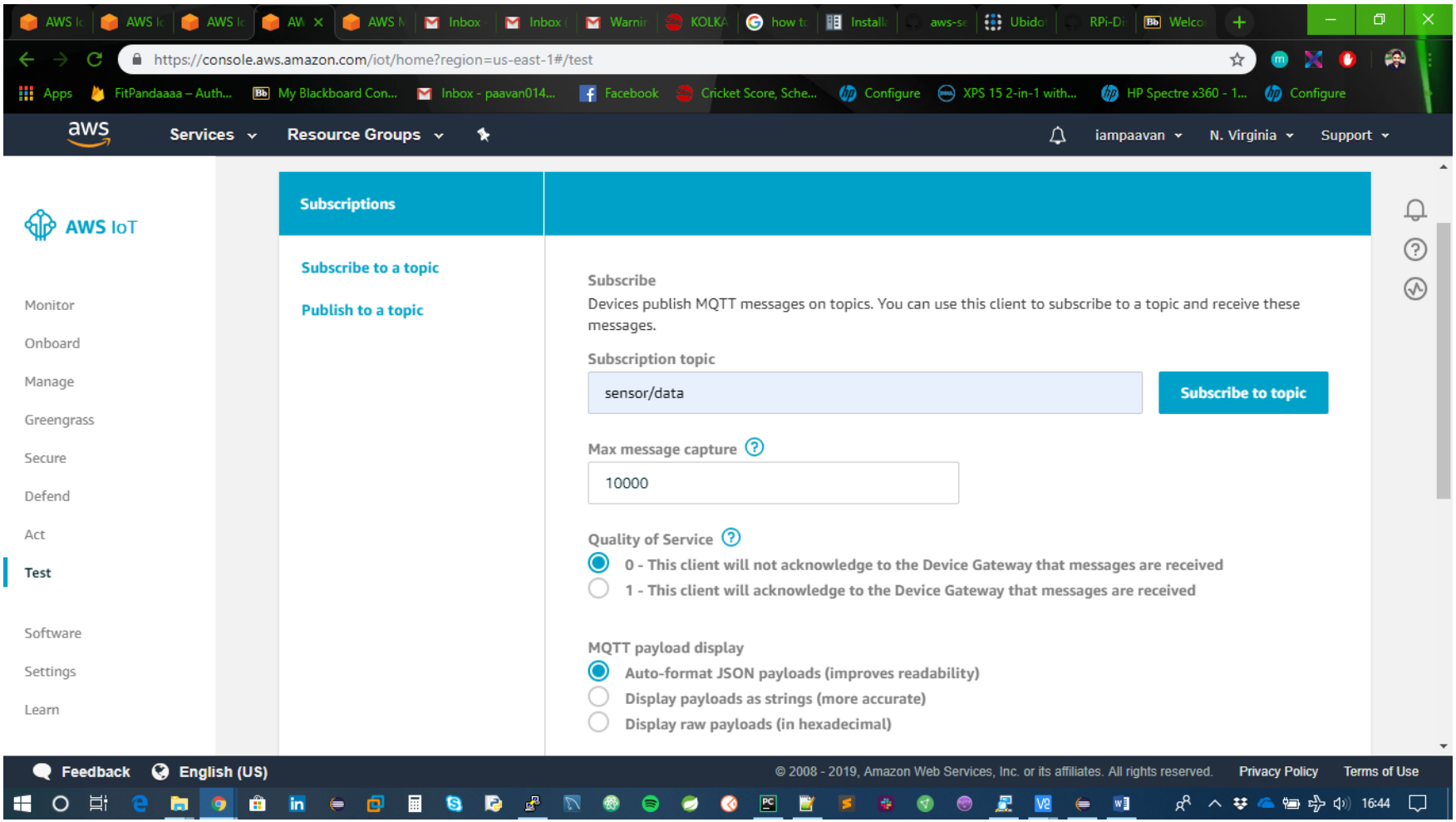


AWS Policy details attached to the certificate.

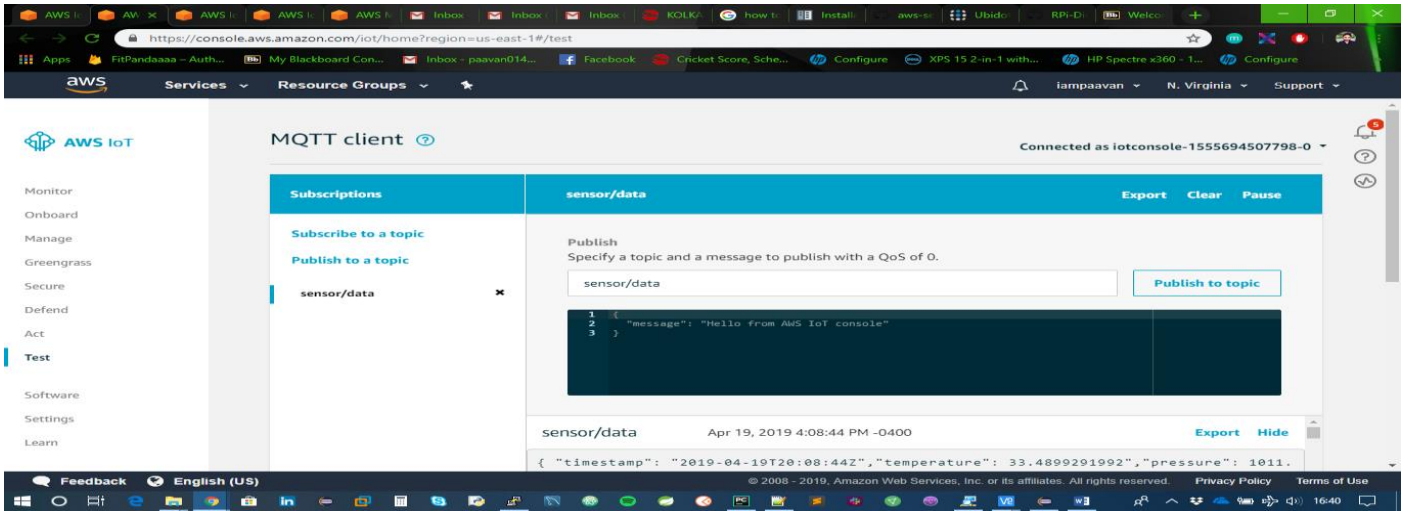


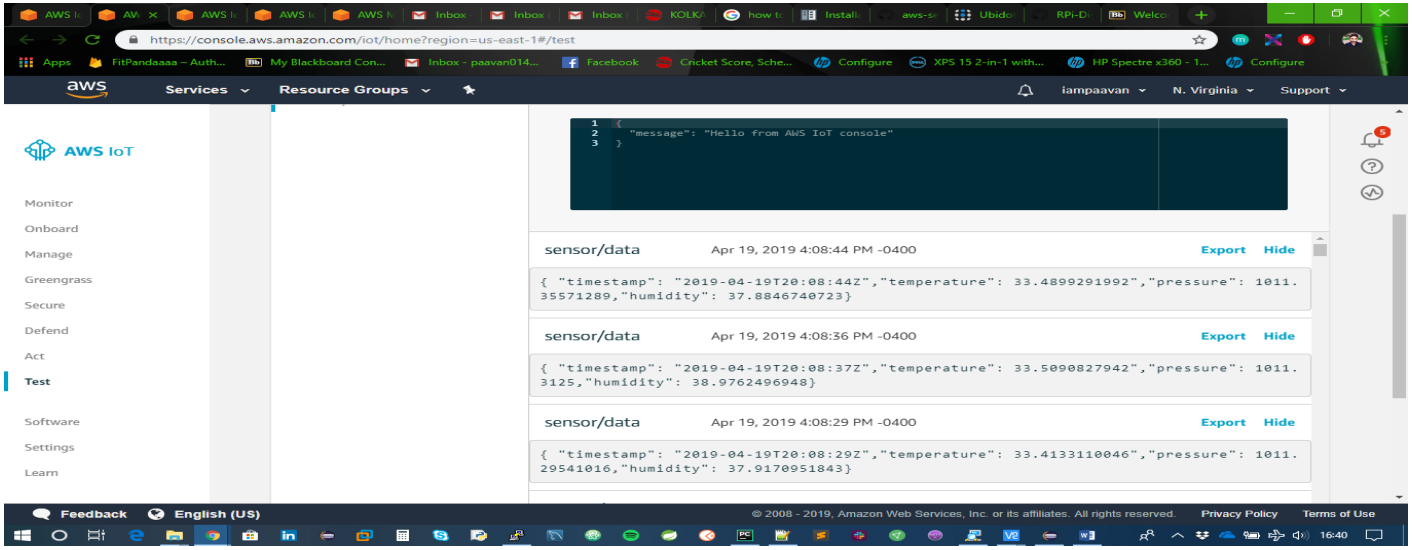
AWS IoT → MQTT Client

awsiot.py python script will publish the sensor data through a topic called sensor/data and through AWS IoT dashboard, we can subscribe to the same topic sensor/data.

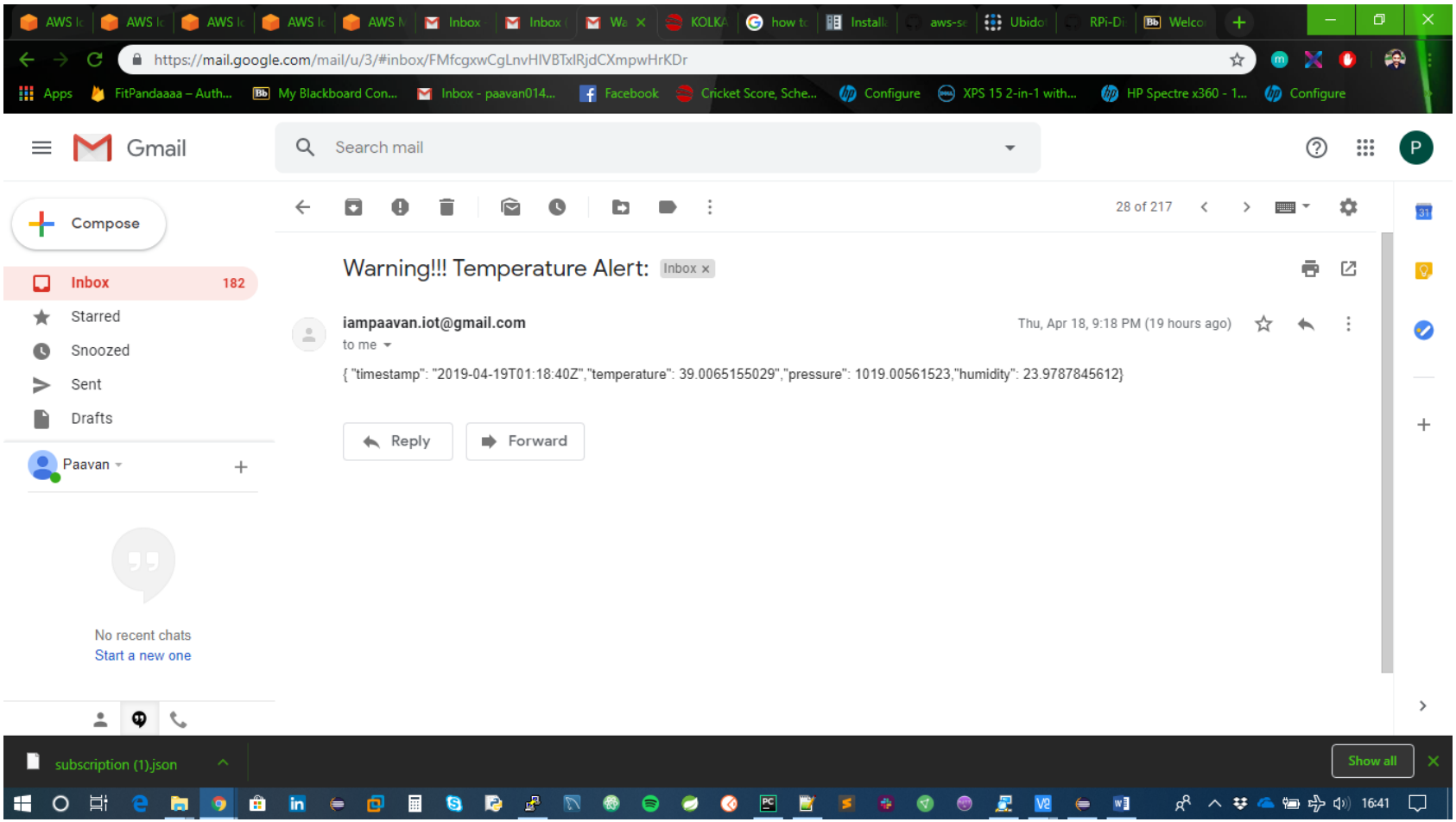


Payload received from constrained device to AWS IoT:

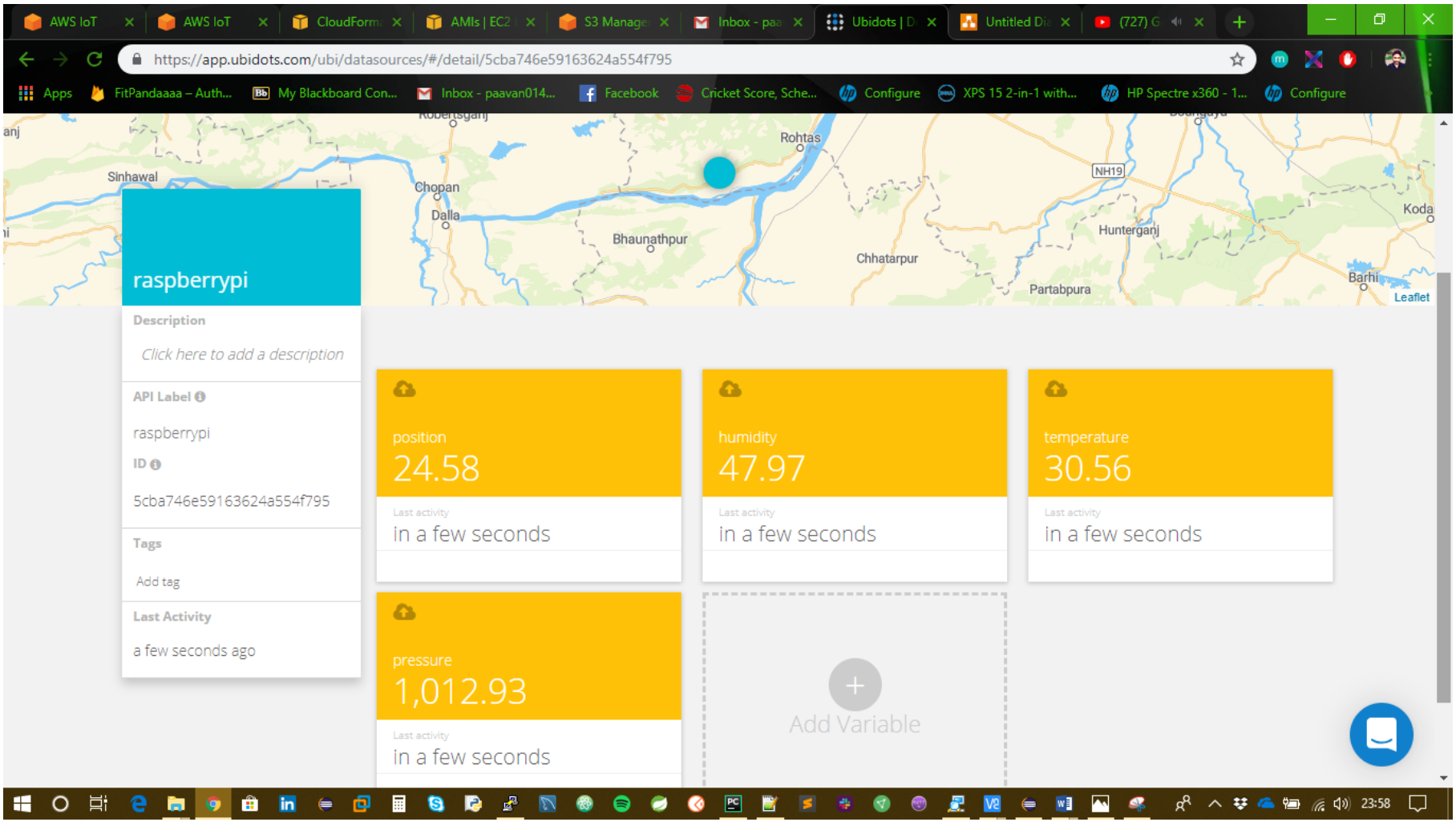




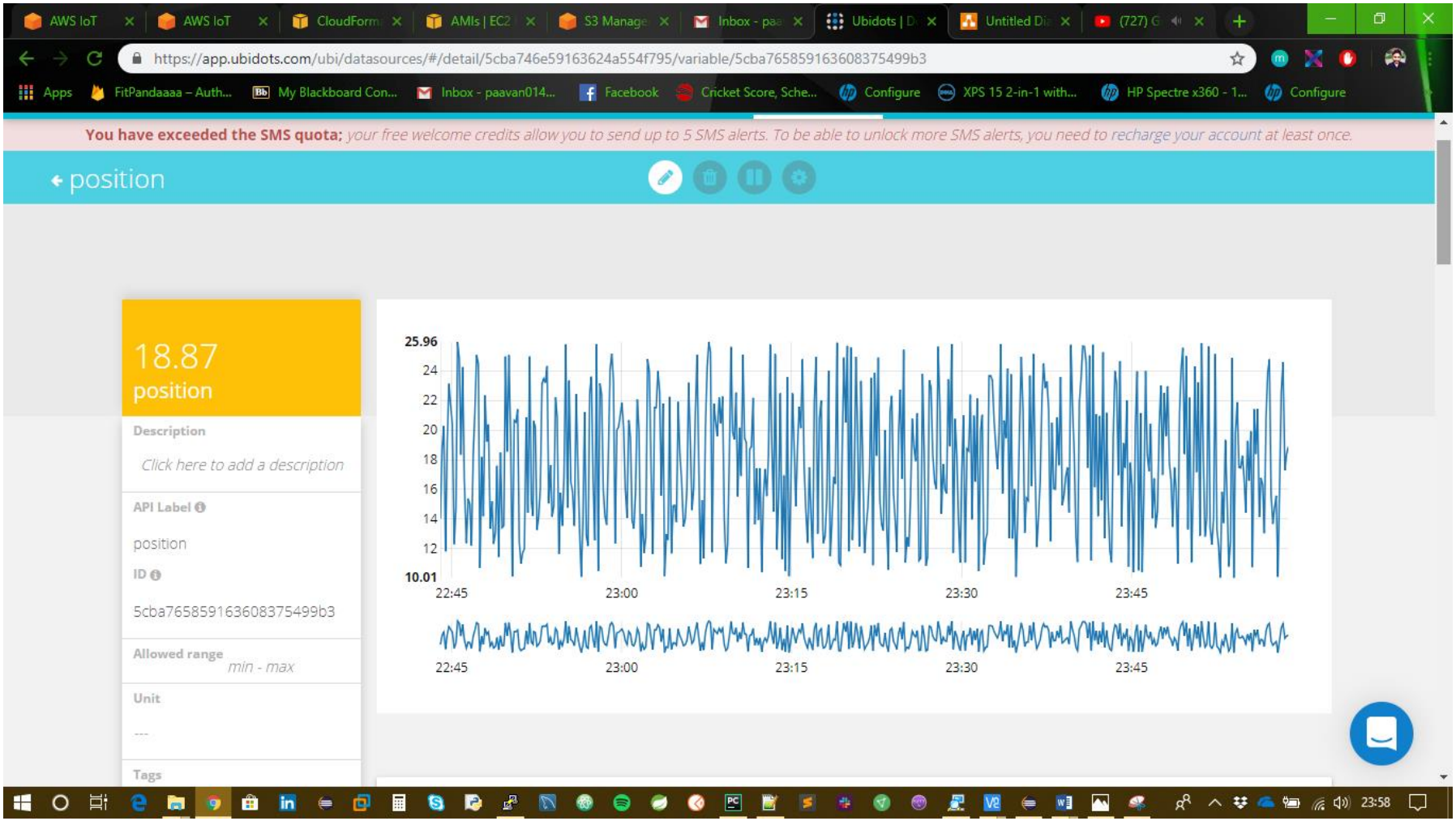
SMTP Protocol: Email Triggered from awsiot.py pythin script when the conditions are greater than the set threshold limit.



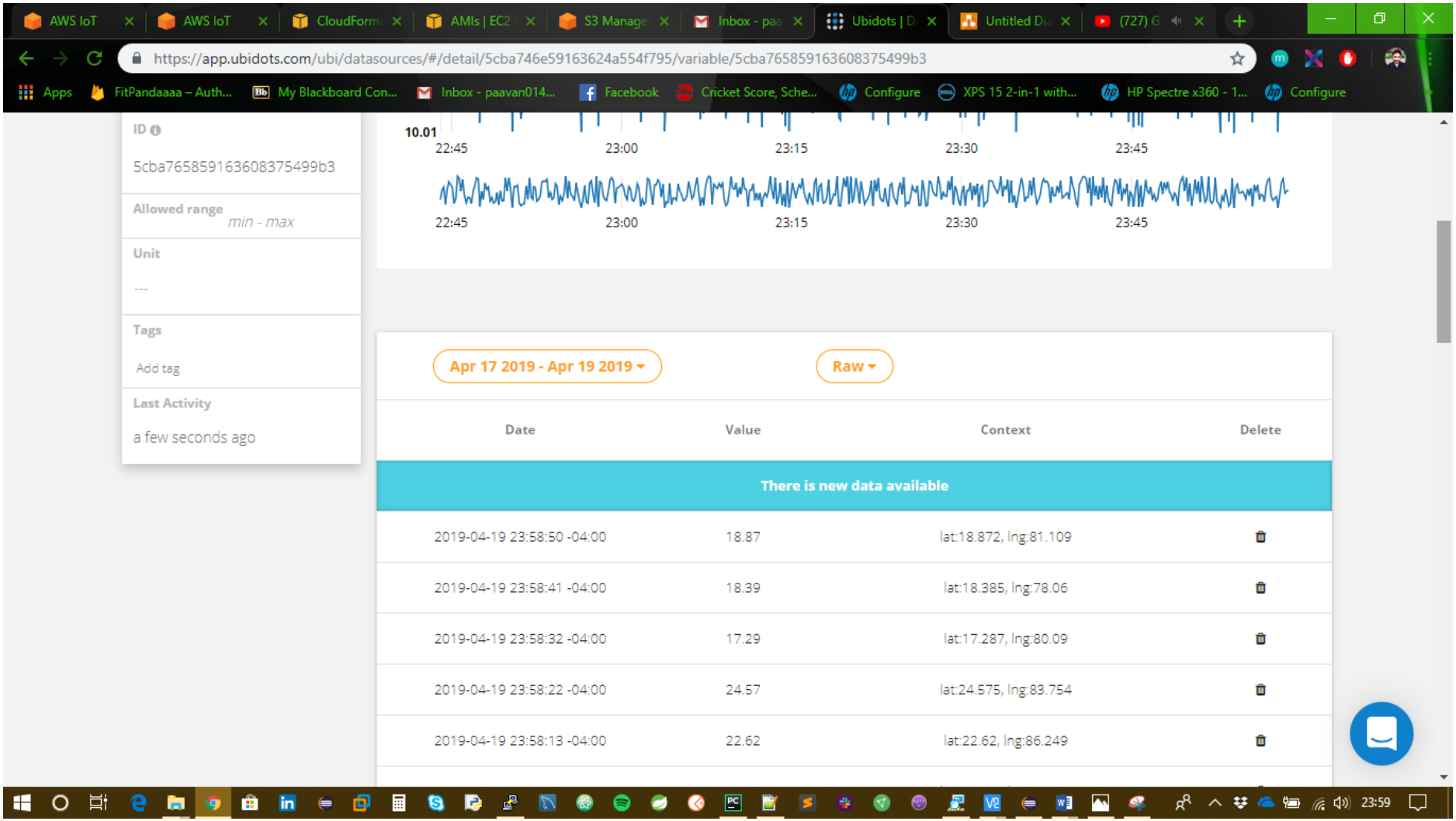
UBIDOTS: ubisots.py another python script which implements HTTP and SMTP protocol. Sends stream of sensor information to ubidots cloud



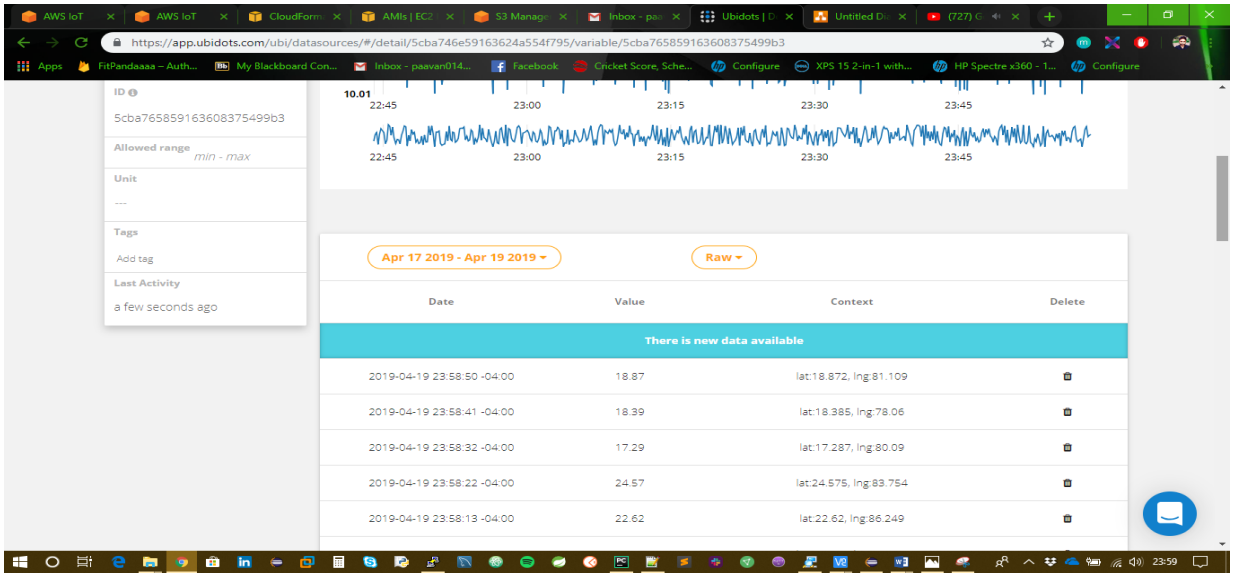
Position Details: Tells us the co-ordinates in terms of Latitude and Longitude. (In our case tells us the surroundings across India as a country)

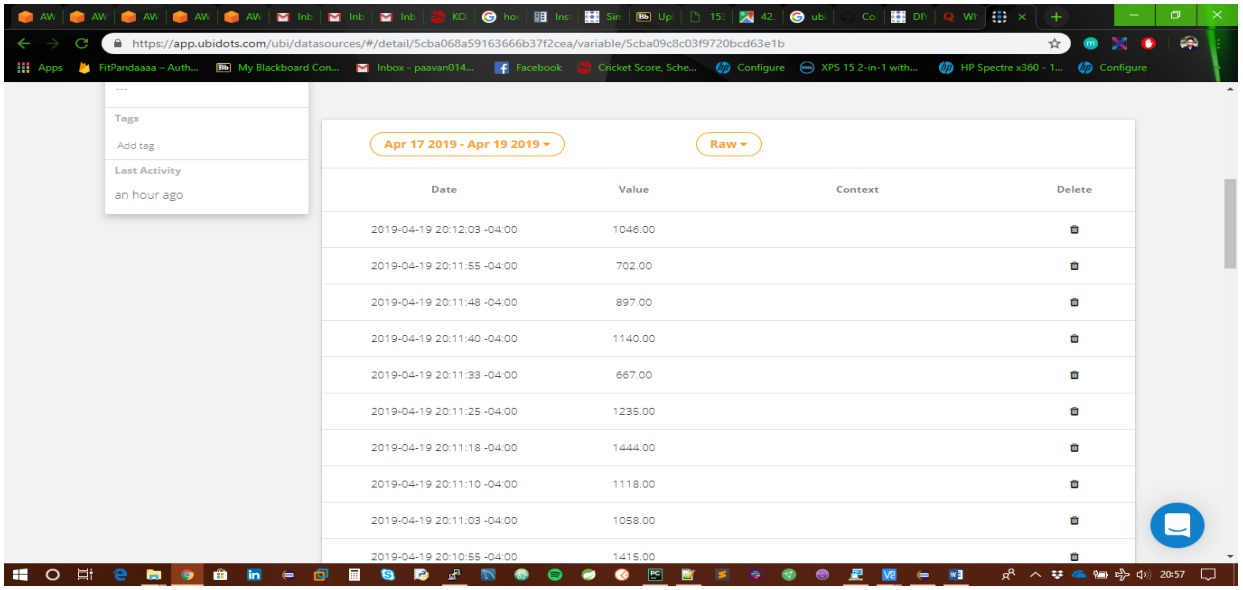


RAW Data along with the timestamps.

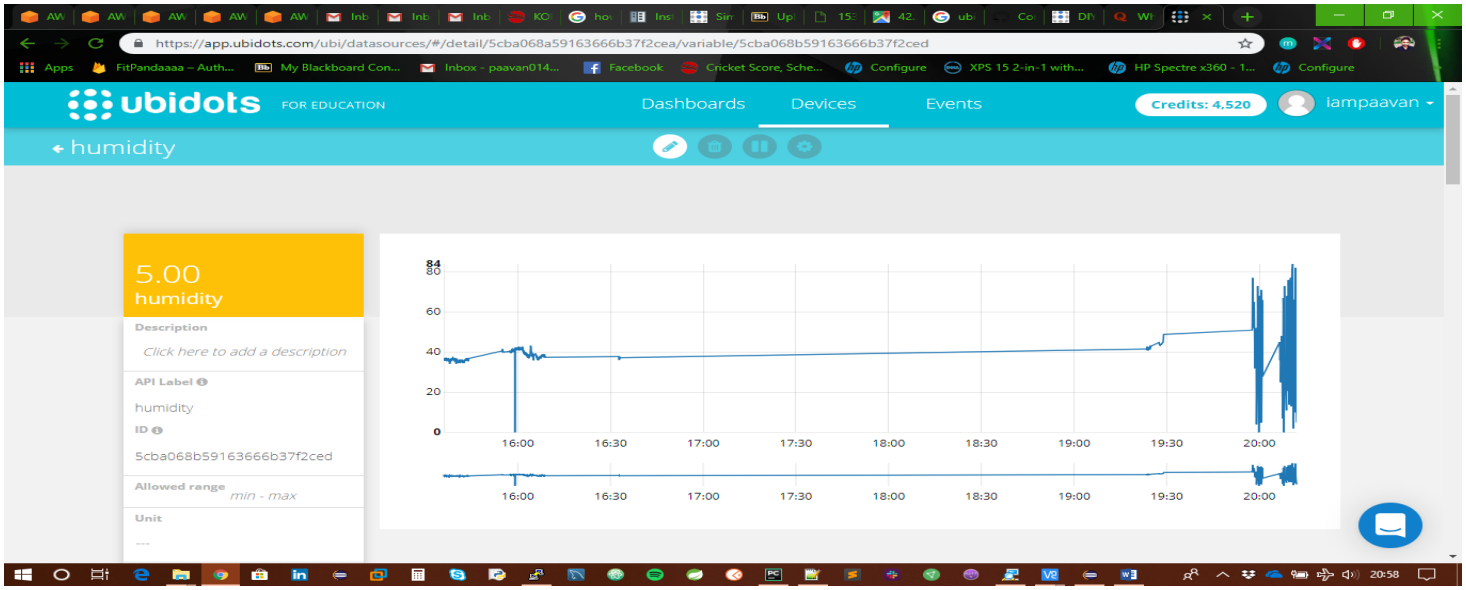


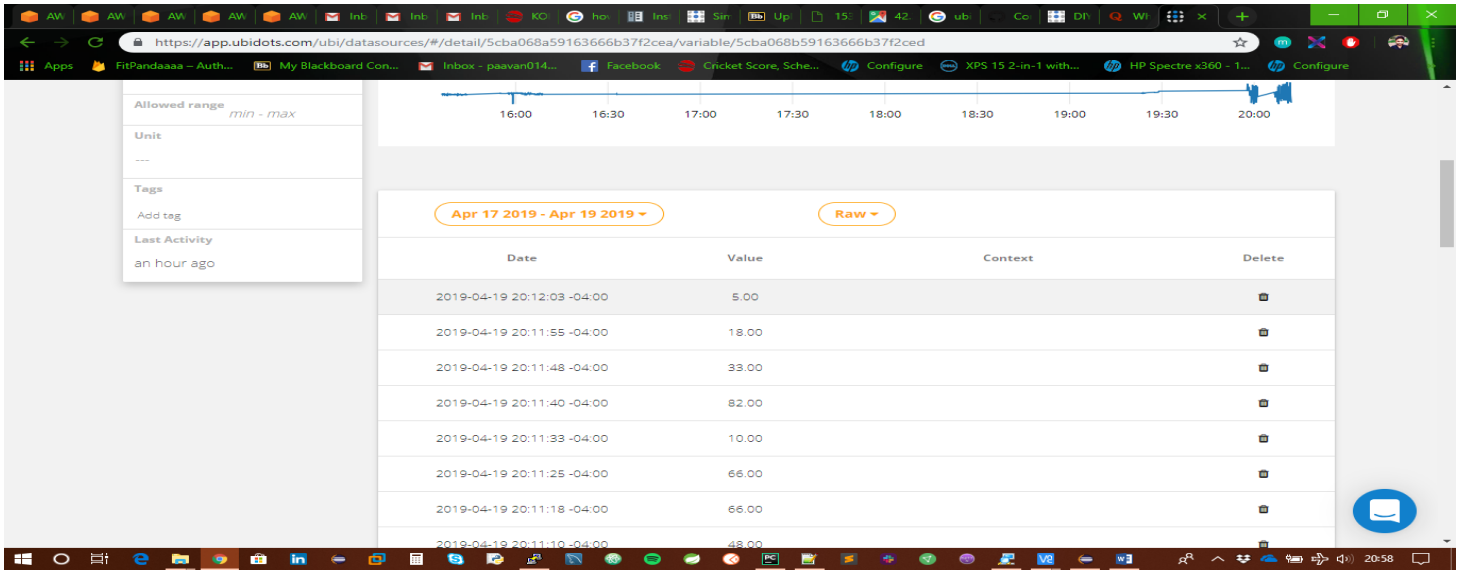
Pressure Details: Senses the pressure directly from sensehat of Raspberry Pi and publish the data as a payload to Ubidots.



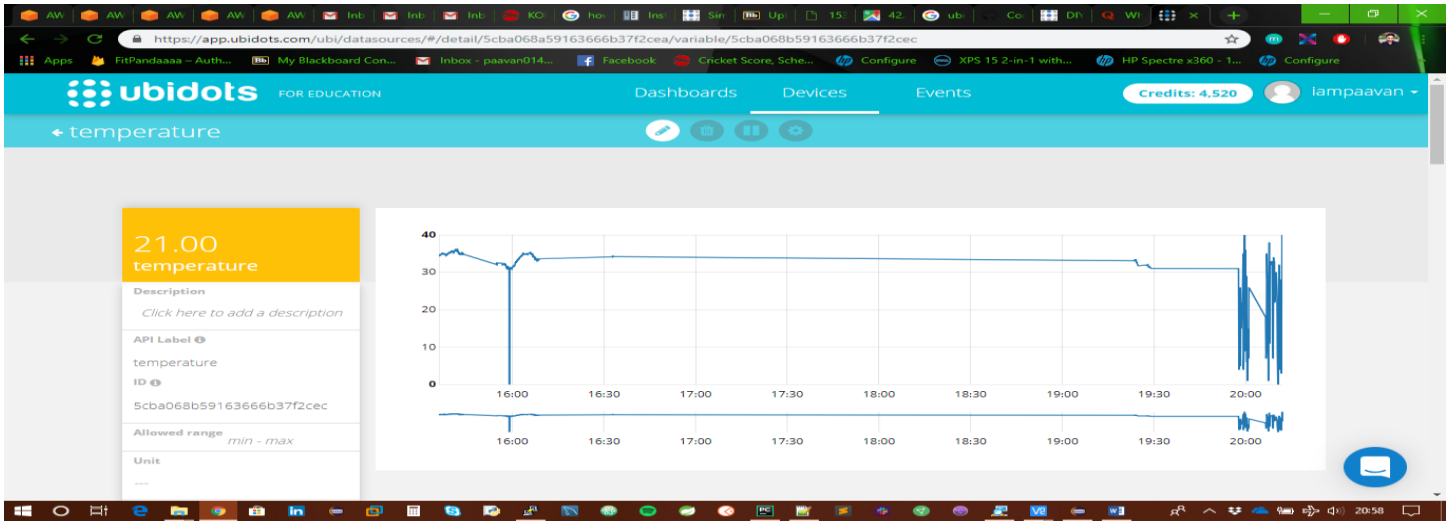


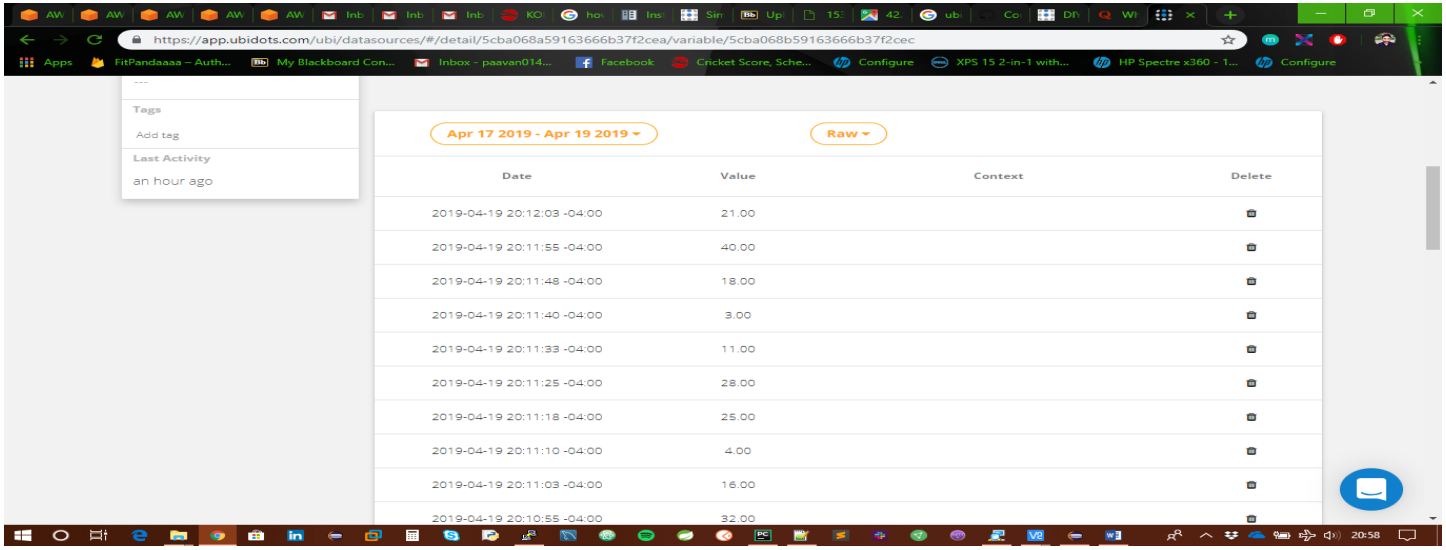
Humidity Details: Senses the pressure directly from sensehat of Raspberry Pi and publish the data as a payload to Ubidots.



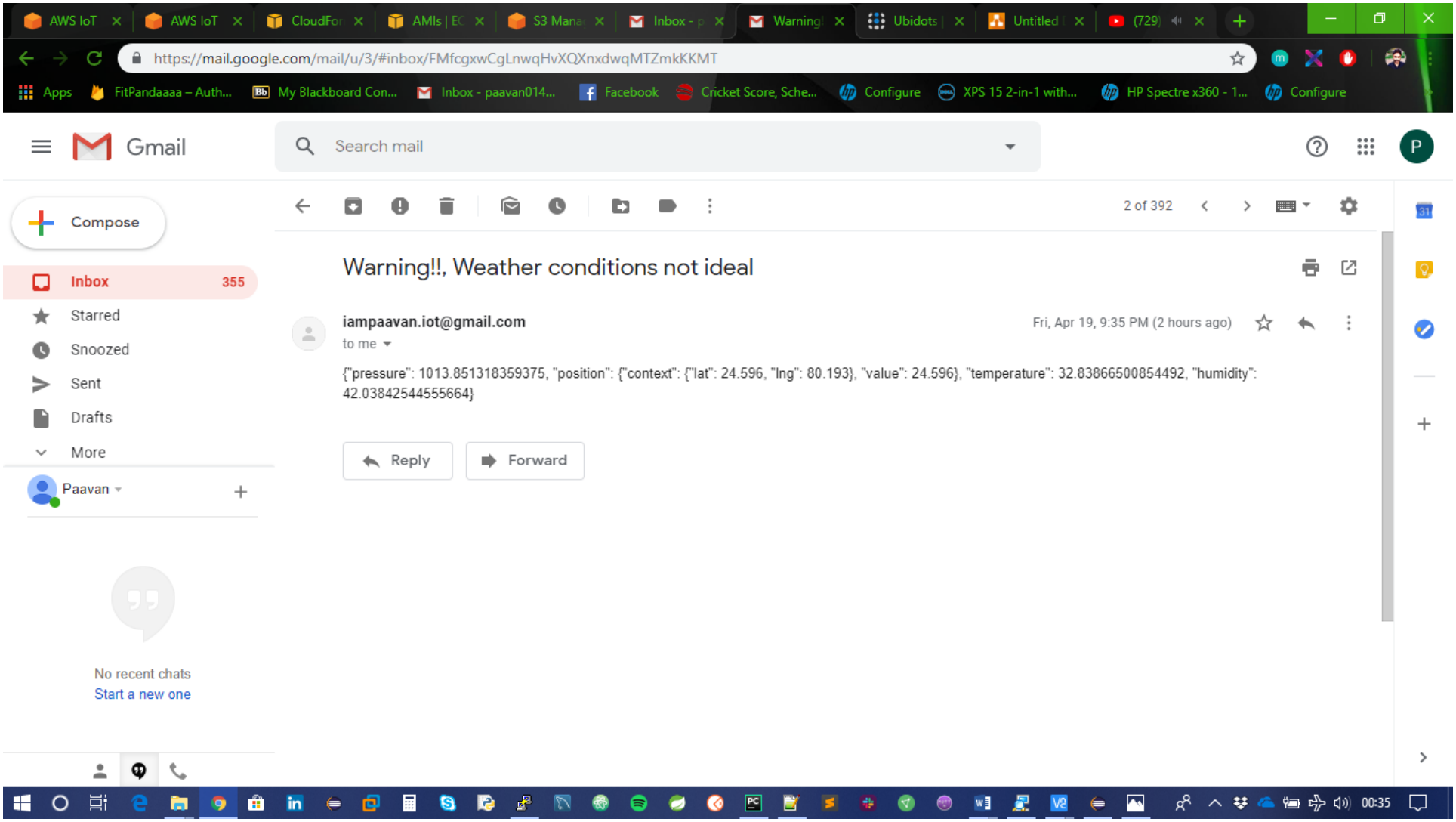


Temperature Details: Senses the pressure directly from sensehat of Raspberry Pi and publish the data as a payload to Ubidots.





Email Notification: When the conditions are triggered for more than the threshold limit.



Application Console: ubidots.py

pi@raspberrypi: ~/workspace/iot-d...e/connected-devices-python/apps

File Edit Tabs Help

```
[INFO] HTTP Request Successful. Your device is now connected and updated with se
{'pressure': 1013.304443359375, 'position': {'context': {'lat': 10.144, 'lng': 8
temperature': 32.110782623291016, 'humidity': 44.63947677612305}
[INFO] Payload sent successfully.
[INFO] Finished
Email Triggered.
[INFO] Attemping to send data
[INFO] HTTP Request Successful. Your device is now connected and updated with se
nsor details.
{'pressure': 1013.3056640625, 'position': {'context': {'lat': 12.965, 'lng': 87.
188}, 'value': 12.965}, 'temperature': 32.187400817871094, 'humidity': 45.702232
360839844}
[INFO] Payload sent successfully.
[INFO] Finished
Email Triggered.
[INFO] Attemping to send data
[INFO] HTTP Request Successful. Your device is now connected and updated with se
nsor details.
{'pressure': 1013.308349609375, 'position': {'context': {'lat': 12.596, 'lng': 8
1.112}, 'value': 12.596}, 'temperature': 31.995853424072266, 'humidity': 45.3347
7020263672}
[INFO] Payload sent successfully.
[INFO] Finished
```

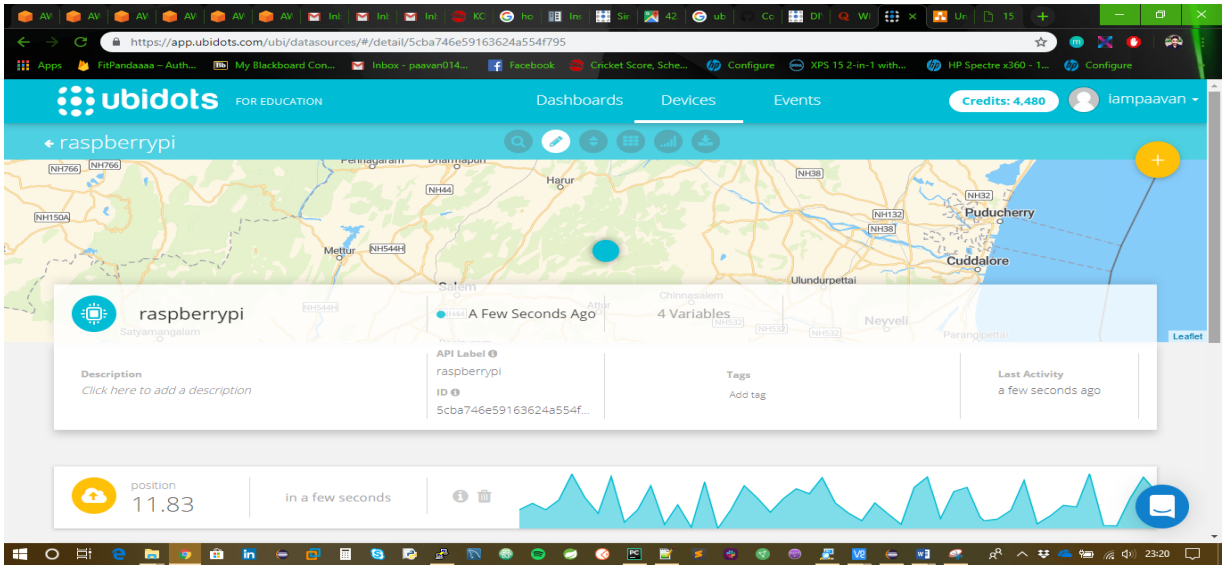
Application Console: awsiot.py

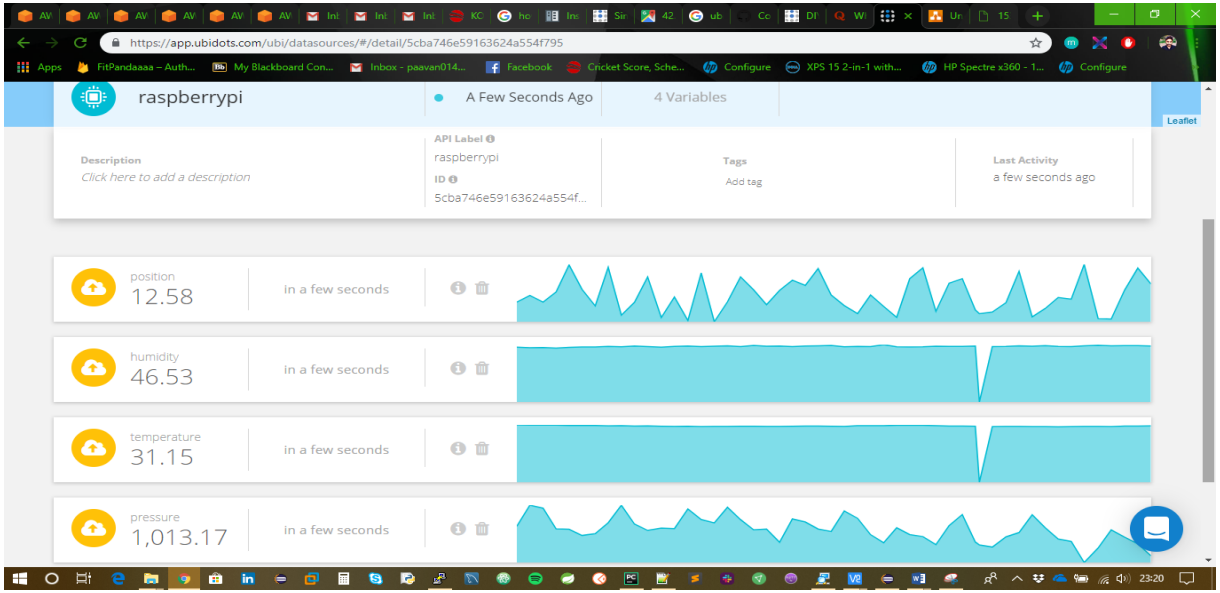
pi@raspberrypi: ~/workspace/iot-device/connected-devices-python/apps

File Edit Tabs Help

```
1013.32910156,"humidity": 45.6842193604}
No Email Triggered.
{ "timestamp": "2019-04-20T03:04:57Z","temperature": 32.1299362183","pressure":
1013.30566406,"humidity": 45.3671951294}
No Email Triggered.
{ "timestamp": "2019-04-20T03:05:04Z","temperature": 32.2640228271","pressure":
1013.37890625,"humidity": 45.4716682434}
No Email Triggered.
{ "timestamp": "2019-04-20T03:05:12Z","temperature": 32.1682472229","pressure":
1013.33862305,"humidity": 45.8571395874}
No Email Triggered.
{ "timestamp": "2019-04-20T03:05:20Z","temperature": 32.3406410217","pressure":
1013.33422852,"humidity": 45.3852081299}
No Email Triggered.
{ "timestamp": "2019-04-20T03:05:27Z","temperature": 32.2640228271","pressure":
1013.31518555,"humidity": 45.450050354}
No Email Triggered.
{ "timestamp": "2019-04-20T03:05:35Z","temperature": 32.3023300171","pressure": 1013.3295
8984,"humidity": 45.8427314758}
No Email Triggered.
{ "timestamp": "2019-04-20T03:05:42Z","temperature": 32.2065582275","pressure": 1013.30517578,"humidity":
 45.6193733215}
No Email Triggered.
```

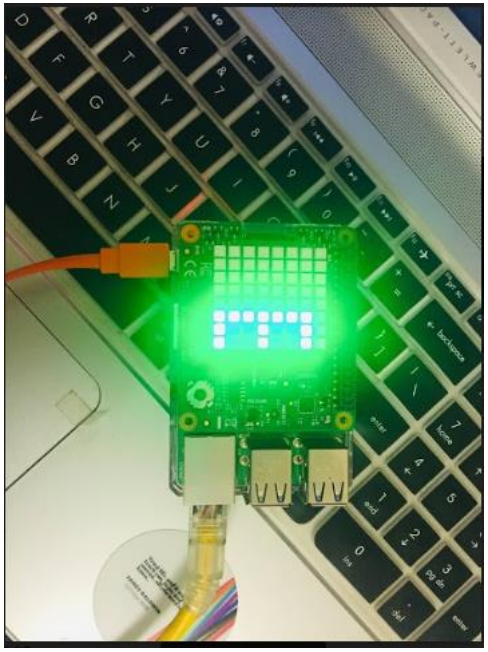
UBIDOTS DASHBOARD:

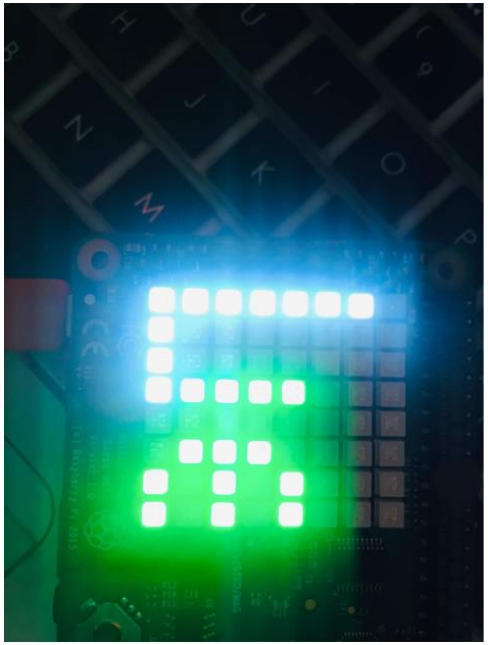




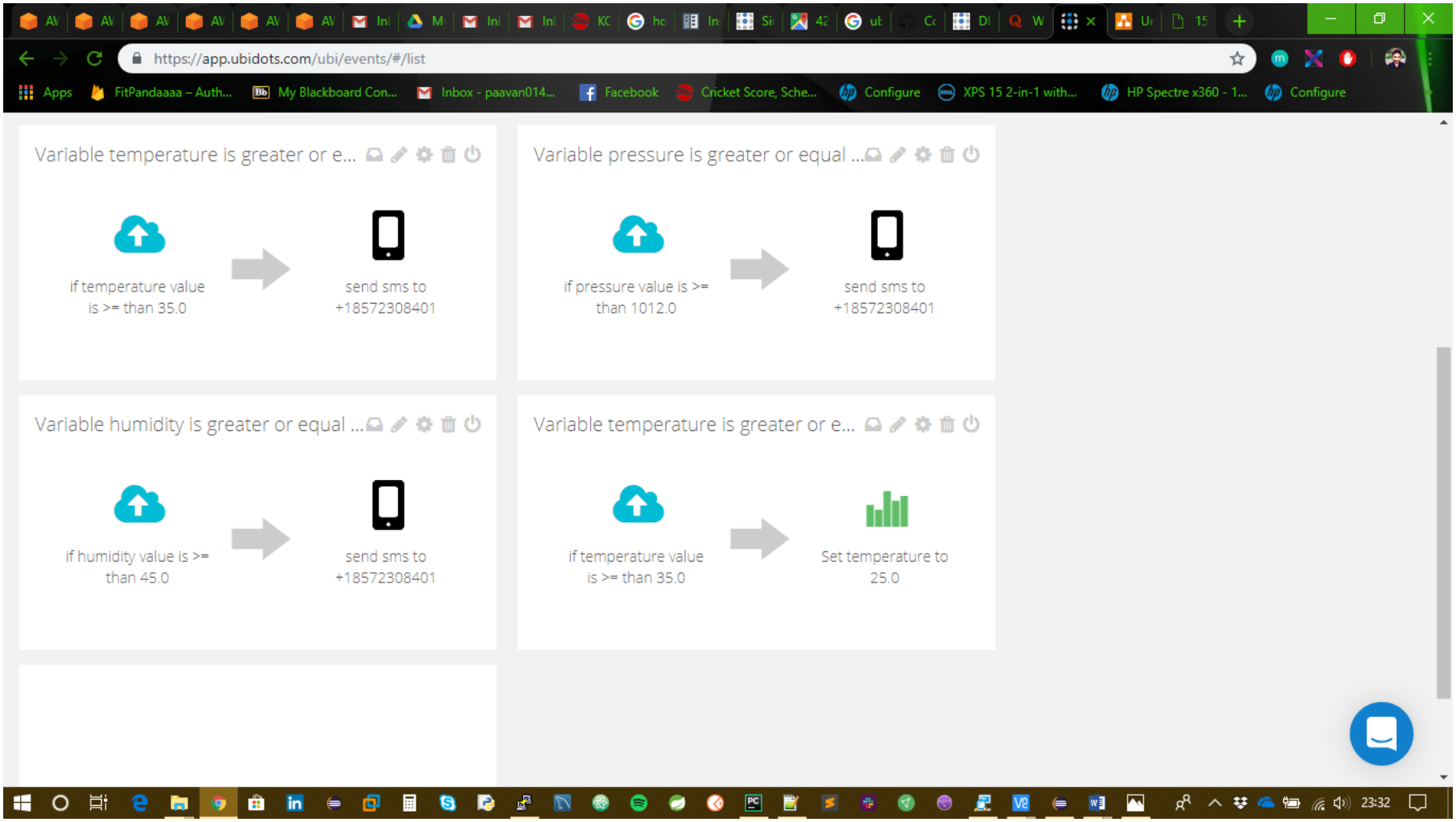
Live Demo → Link → https://drive.google.com/drive/u/0/my-drive

SenseHat Pictures:

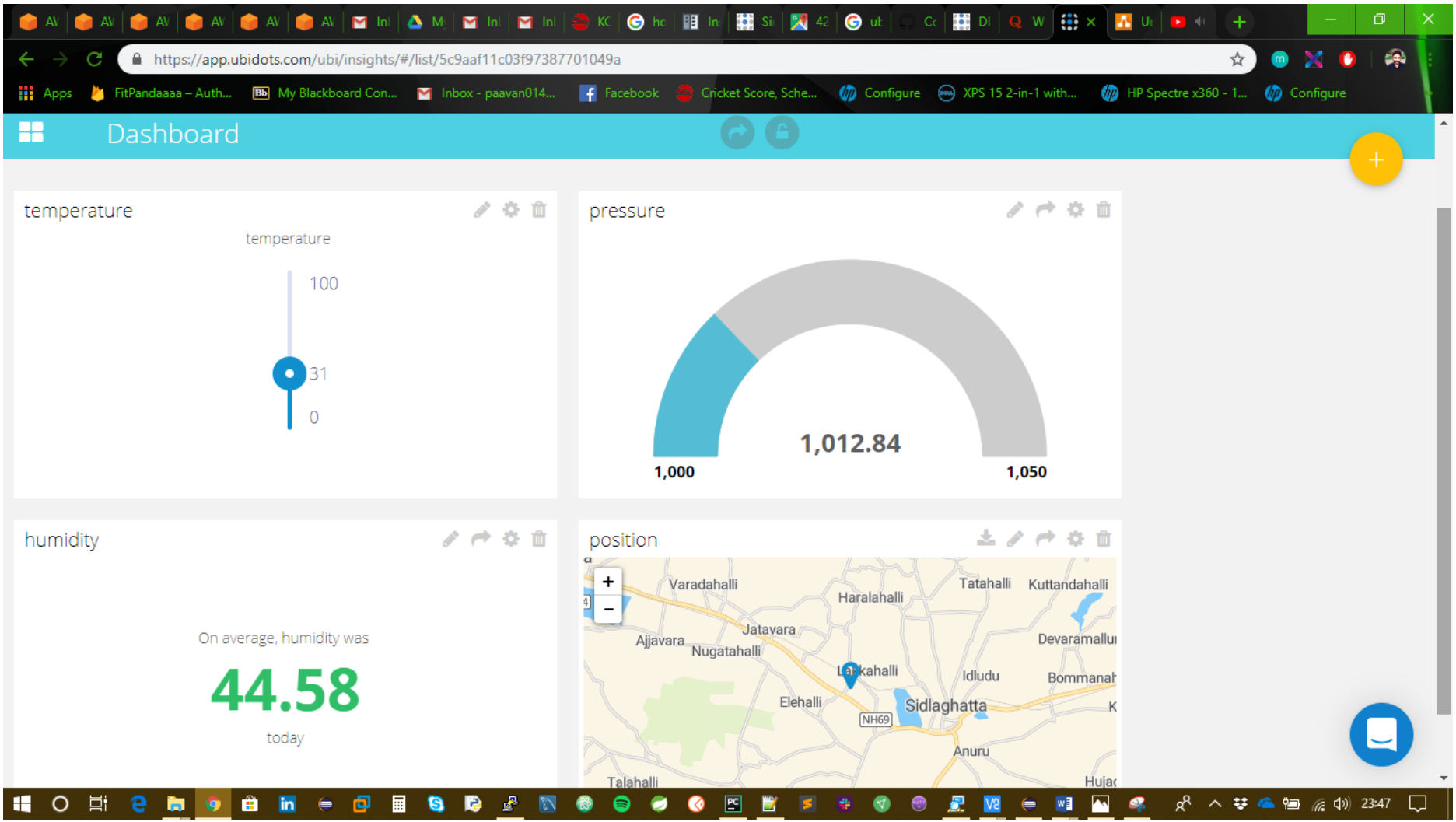




Events Created in Ubidots:



Ubidots Dashboard:



SMS Notifications:

Project Files and Documents:

values_device_raspberrypi_pot4t.csv

subscription (2).json

aws.pem

a9ea5cdfb7-public.pem.key

a9ea5cdfb7-private.pem.key

a9ea5cdfb7-certificate.pem.crt