

CSS532(HW2)

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Student ID – 2303017

References –

1. YouTube videos referred –

- https://youtu.be/l-kodc4bs4I?si=IGkSPltNLjP_hbkP
- https://youtu.be/HN3tUbEjgb4?si=Qz_MgglWv3naHAVD
- <https://youtu.be/349bwtFkE8?si=bbpnTvYi-cTEHD6>
- <https://youtu.be/8Gg8EVcXGQ?si=eJylimnsBKAYTi3->

2. Microsoft Azure official documentation –

- <https://learn.microsoft.com/en-us/azure/azure-functions/functions-run-local?tabs=macos%2Cisolated-process%2Cnode-v4%2Cpython-v2%2Chttp-trigger%2Ccontainer-apps&pivots=programming-language-python>
- <https://learn.microsoft.com/en-us/azure/iot/howto-use-iot-explorer>

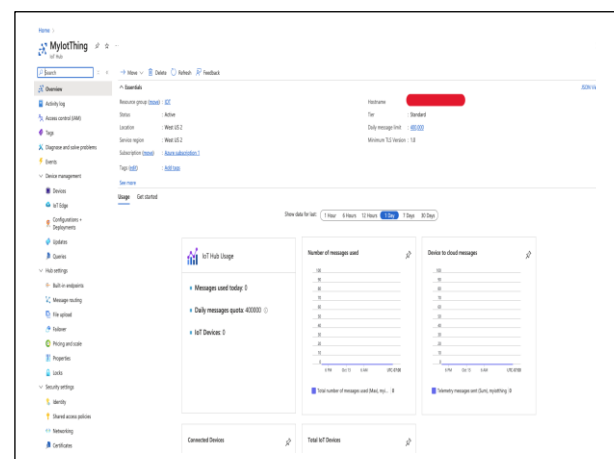
HW-2 Implementation:

Created an Azure account, installed Azure SDK on my laptop, and implemented a virtual IoT system using Azure and my laptop.

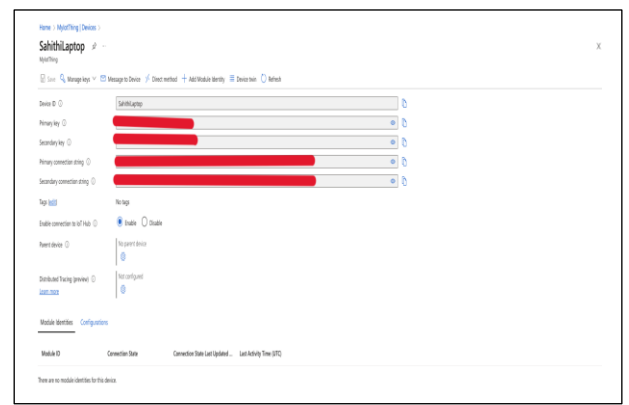
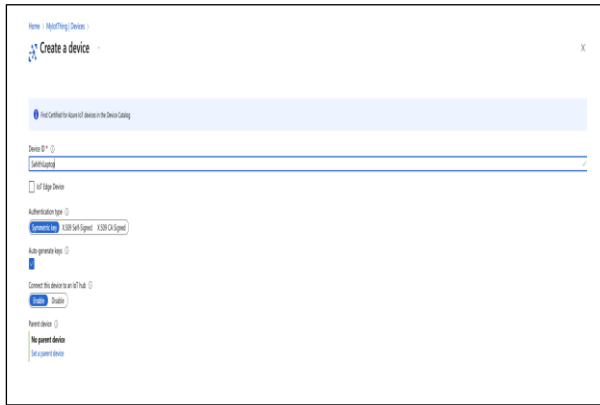
To configure my laptop as an IoT device, which can communicate with Azure IoT Hub, I created a new IOT Hub.

The screenshot shows the 'Create a resource' page for 'IoT Hub' in the Azure Marketplace. The 'Project details' section is active, showing the following configuration:

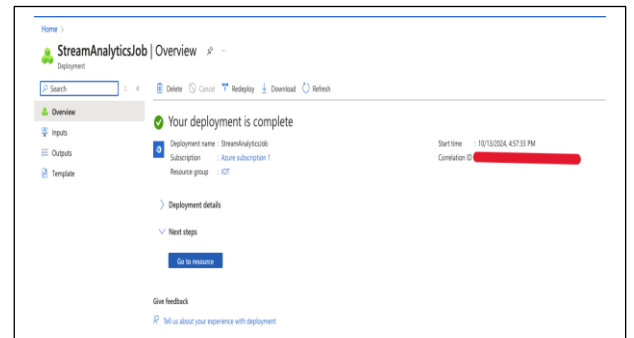
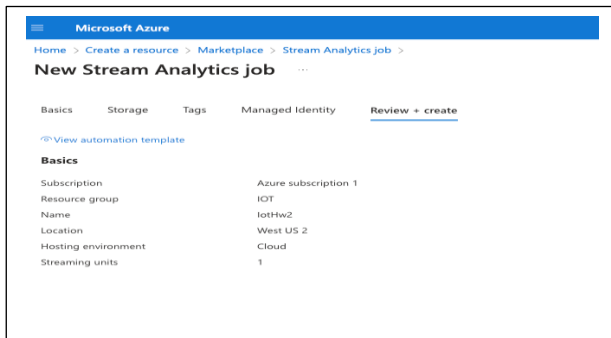
- Subscription: Azure subscription 1
- Resource group: (New) IOT
- Instance details:
 - IoT hub name: MyIotThing
 - Region: West US 2
 - Tier: Standard (most popular)
 - Daily message limit: 400,000 (\$25/month)



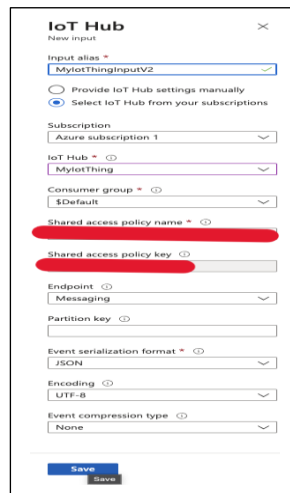
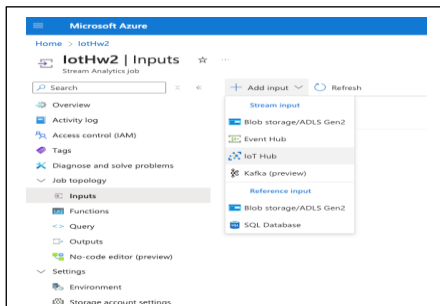
Registered and configure my laptop as an IoT device, which can communicate with Azure IoT Hub (Successfully created new device).



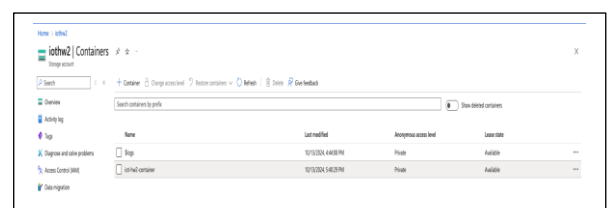
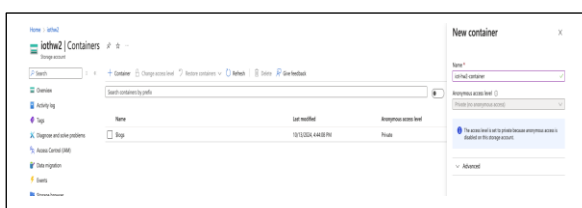
To configure Azure IoT Hub to receive messages from my device (laptop) and to show the result in Azure IoT Hub console, Successfully created a new Stream Analytics job.



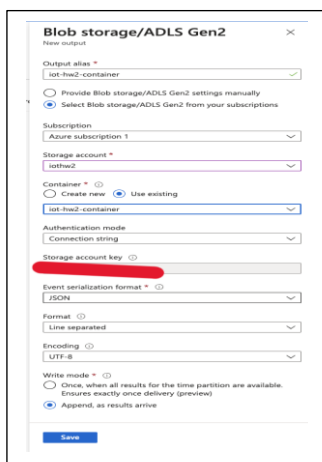
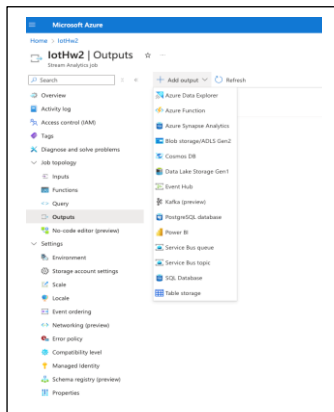
Added new input to Stream Analytics Job and selected IOT hub as an input for Stream Analytics Job. Successfully, created new input.



Successfully created a container for storing files.

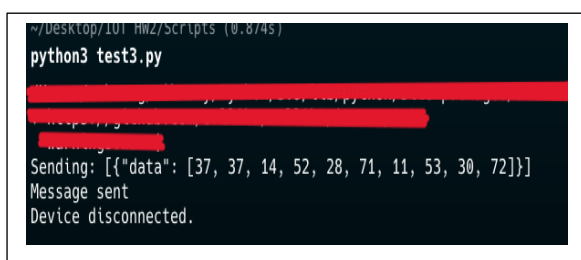


Added Blob Storage as output for Stream Analytics Job.

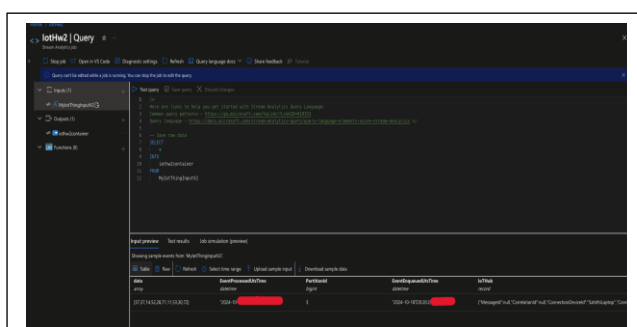


For sending messages from my device, I wrote a python script to generate random numbers list, send the data to Stream Analytics. Then wrote a SQL query to select the data from input of Stream Analytics and put the data into container.

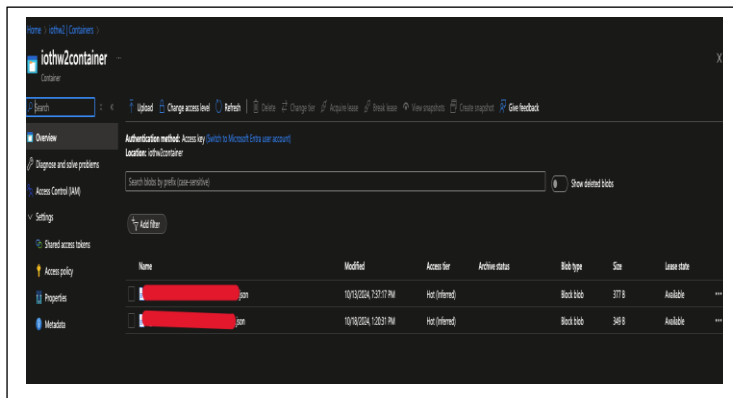
Then, I started Analytics job and ran the python script to send the data. Now, I was successfully able to preview the raw data.



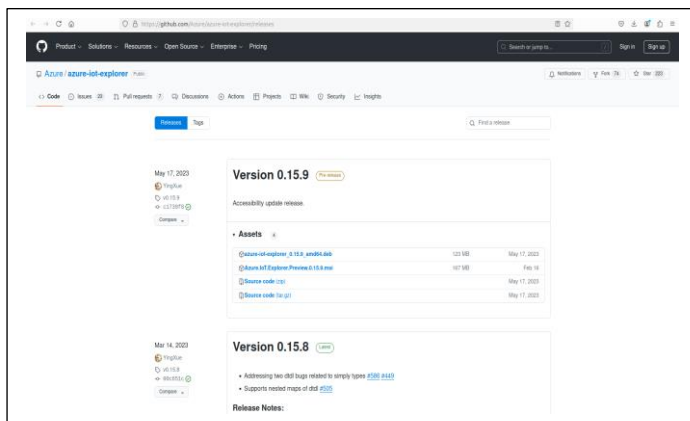
Stream Analytics successfully processed raw message.



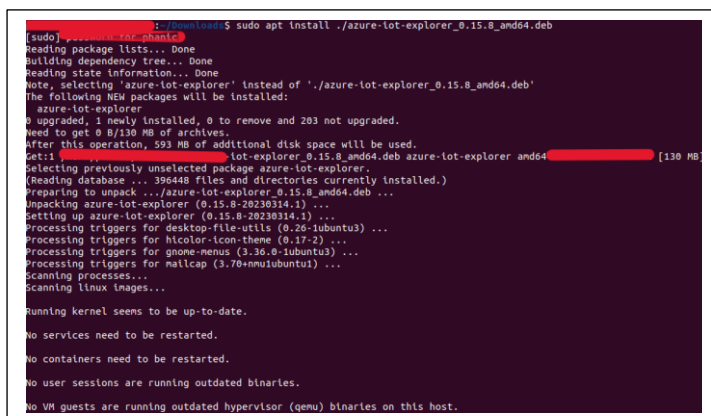
I was successfully able to store the raw data into output container.



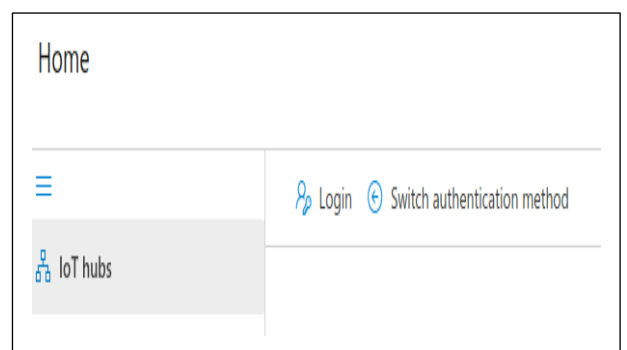
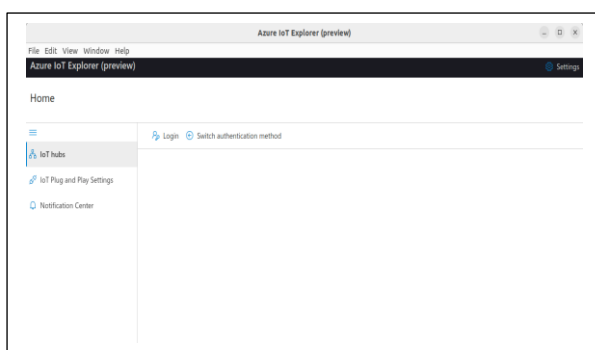
Now, to show the result in Azure IoT Hub console, I downloaded Azure IOT explorer installation file.

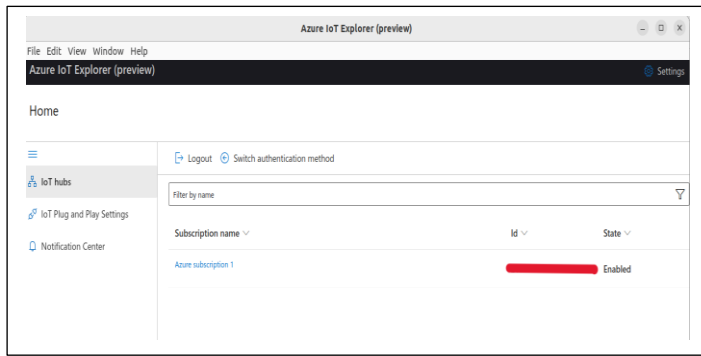


Installed Azure IOT explorer through terminal.

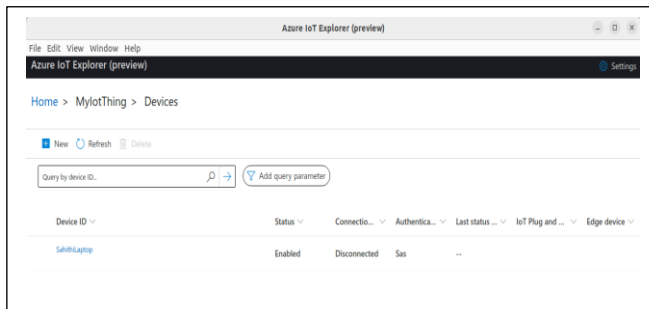
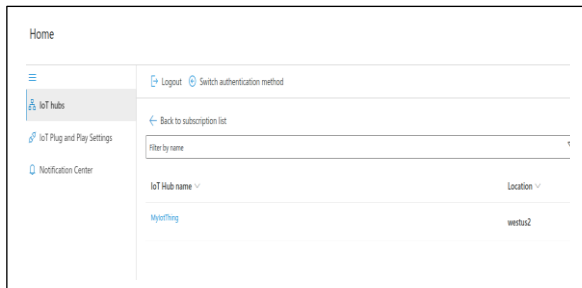


The, I opened the Azure IOT explorer, and successfully, logged into IOT hub.

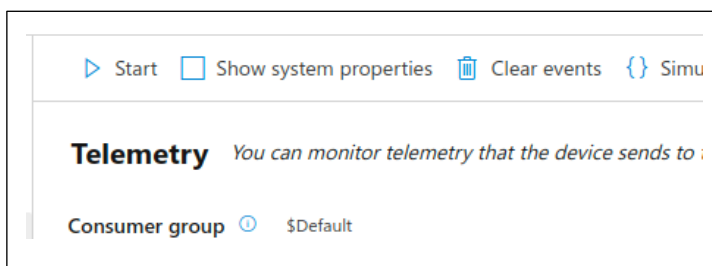
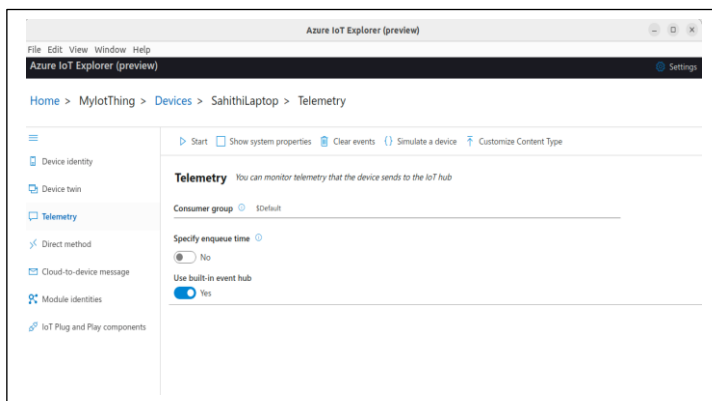


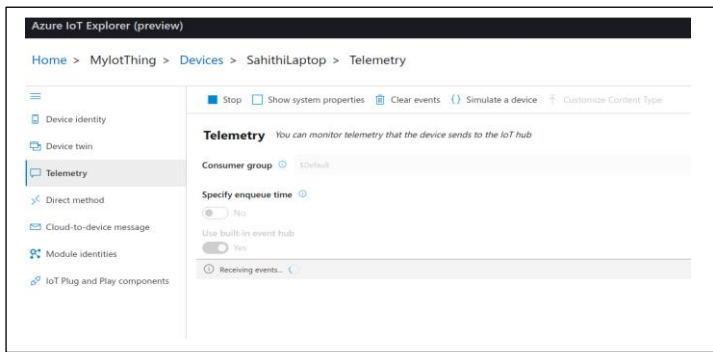


Then, I found the IOT hub and the device by ID.

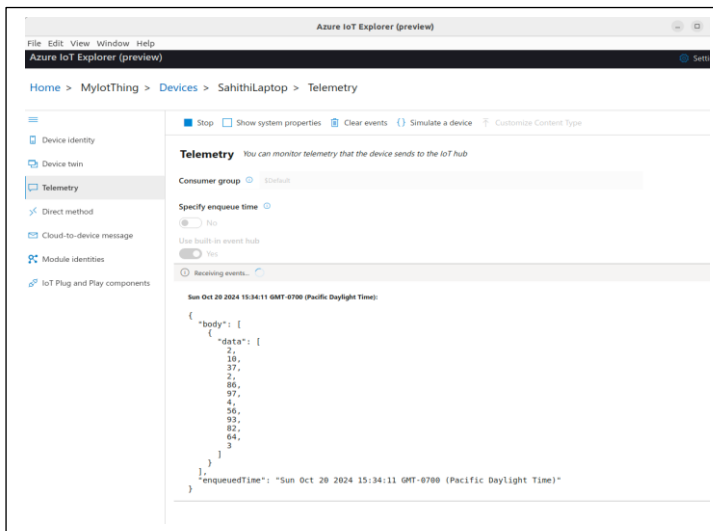
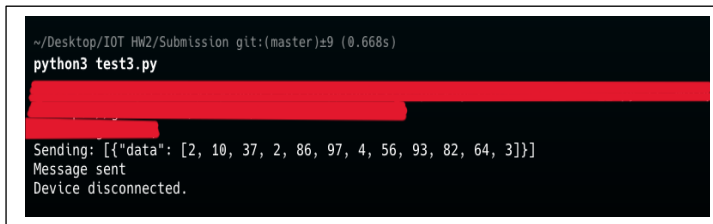


Now, I went to telemetry tab to start monitoring the messages. Successfully, started job to monitor the messages and waiting to receive the messages.



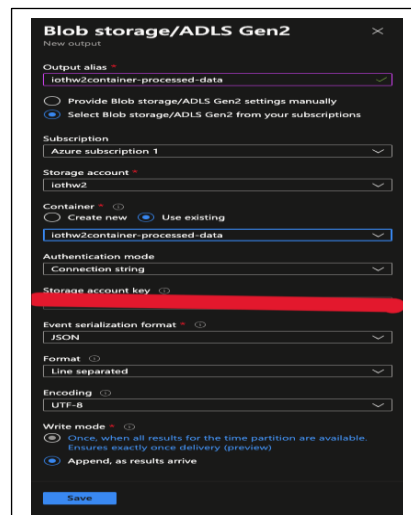
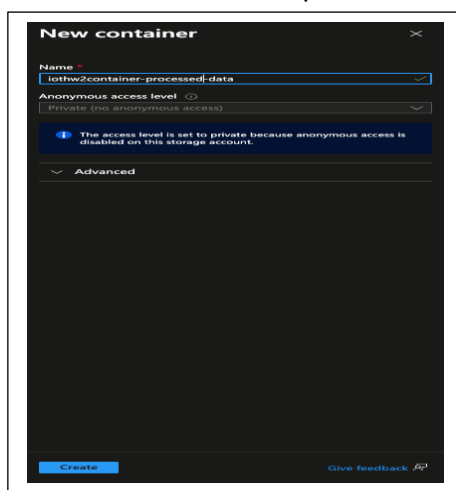


Now, I ran the python script to send the message and was successfully able to see the message on Azure IOT hub console.

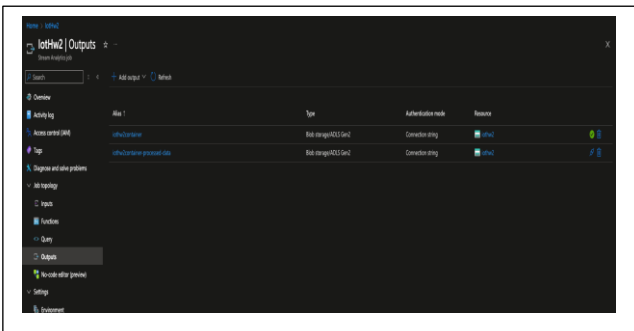


Now, to connect Azure Stream Analytics to my Azure IoT Hub to process received messages from devices and save the raw data (the data extracted from received messages) and the processed data (I used Stream Analytics to process the data) into Azure Blob.

For this, I created new container for processed data and added processed data container as new output to Stream Analytics Job.

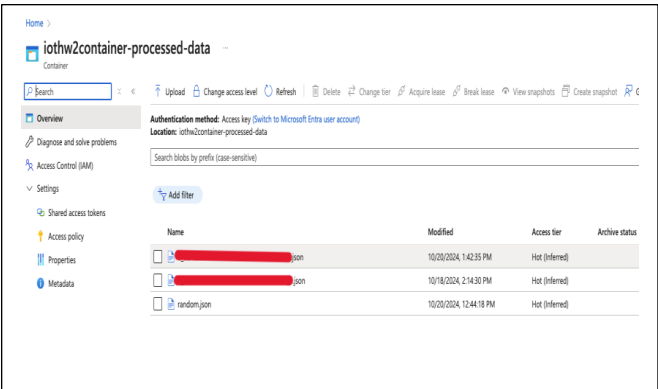


Successfully added new container as one of the outputs for the Stream Analytics Job.

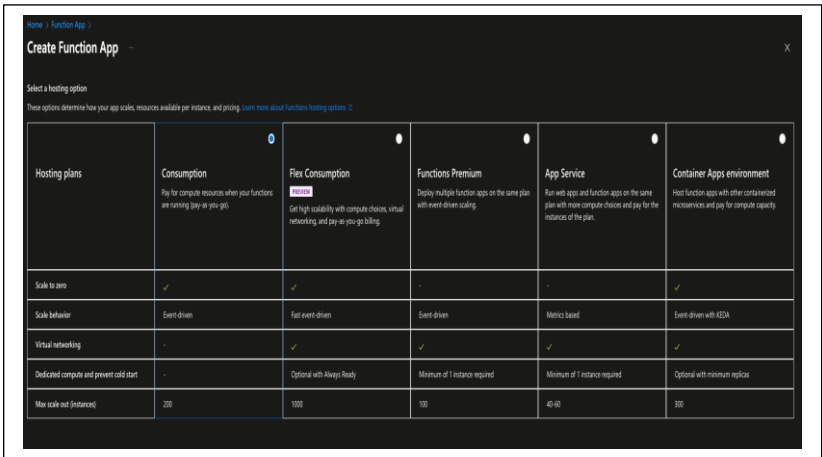


Now, for Azure IoT Hub to process received messages from the devices and save the raw data (the data extracted from received messages) and the processed data, I created a SQL Query and JavaScript script to take the raw data and process the raw data and sum the data and take average of data and store the processed (values of raw data and the average of the data) into the new output container.

Stream Analytics processed the message and stored it in the blob container for processed data.



Now, to connect Azure Functions to respond to Azure Blob events when new "processed data" is added, I created a new function app with consumption plan.



Updated the details like basics, networking, monitoring, deployment, and tags for function app and then review function details before creating.

Microsoft Azure

Upgrade

Search results

Home > Function App > Create function App >

Create Function App (Consumption)

BasicsNetworkingMonitoringDeploymentTagsReview & create

Create a function app, which lets you group functions as a logical unit for easier management, deployment, and sharing of resources. Functions lets you execute your code in a serverless environment without having to first create a VM or publish a web application.

Project Details

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription ⓘ

Resource Group ⓘ

Azure subscription 1

Need IoTHub2Function_group

Create new

Instance Details

Function App name *

Runtime stack *

Version *

Region *

Operating System *

IoTHub2Function

Python

3.11

West US 2

☒ Linux ☐ Windows

azurewebsites.net

Next: Networking >

Microsoft Azure

Upgrade

Home > Function App > Create Function App >

Create Function App (Consumption)

Basics

Networking

Monitoring

Deployment

Tags

Review + create

Summary

Function App

by Microsoft

Basic authentication for this app is currently disabled and may impact deployments. Click to learn more.

Details

Subscription

Resource Group

Name

Runtime stack

iothw2Function_group

iothw2Function

Python 3.11

Hosting

Plan (New)

Hosting options and plans

Name

Operating System

Region

SKU

Consumption

Linux

West US 2

Dynamic

Monitoring (New)

Application Insights

Name

Region

Enabled

iothw2Function

West US 2

Deployment

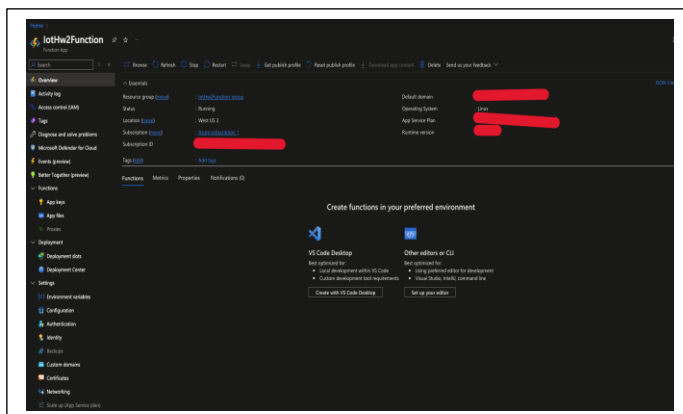
Create

Previous

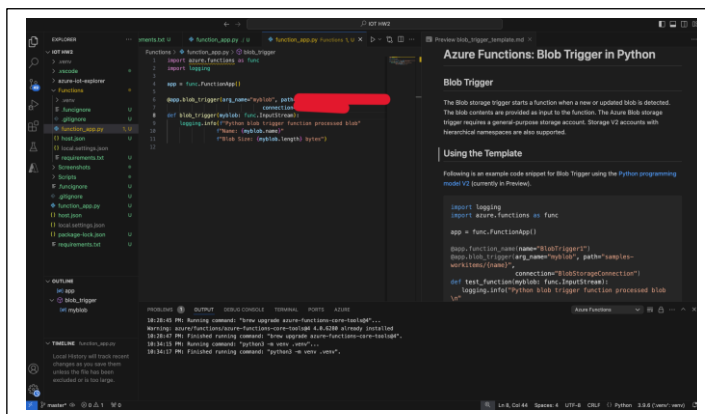
Next

Download a template for automation

Successfully created Azure function app.



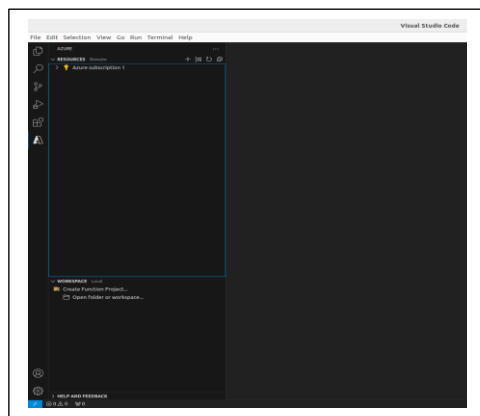
Successfully created new blob trigger function in VS code.



Installed azure.functions python module

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS AZURE
(.venv) [redacted] IOT HM2 % pip3 install azure.functions
Collecting azure.functions
  Downloading azure_functions-1.21.3-py3-none-any.whl (185 kB)
    [redacted] 185 kB 2.7 MB/s
Installing collected packages: azure.functions
Successfully installed azure.functions-1.21.3
WARNING: You are using pip version 21.2.4; however, version 24.2 is available.
You should consider upgrading via the '[redacted] IOT HM2/.venv/bin/python3 -m pip install --upgrade pip' command.
(.venv) [redacted] IOT HM2 %
```

Successfully installed Azure extensions like Azurite and Azure functions, Azure Resources, Azure core tools in VS code.



Now, installed the Microsoft package repository GPG key, to validate package integrity.

```
[redacted]~$ curl https://packages.microsoft.com/keys/microsoft.asc | gpg --dearmor > microsoft.gpg
sudo mv microsoft.gpg /etc/apt/trusted.gpg.d/microsoft.gpg
% Total % Received % Xferd Average Speed Time Time Time Current
Dload Upload Total Spent Left Speed
100 983 100 983 0 0 8036 0 --:--:-- --:--:-- --:--:-- 8057
```

I set up the APT source list before doing an APT update.

```
[redacted]~$ sudo sh -c 'echo "deb [arch=amd64] https://packages.microsoft.com/repos/microsoft-ubuntu-$(lsb_release -cs 2>/dev/null)-prod $(lsb_release -cs 2>/dev/null) main" > /etc/apt/sources.list.d/dotnetdev.list'
```

Now, I ran sudo apt-get update to update the APT.

```
[redacted]~$ sudo apt-get update
```

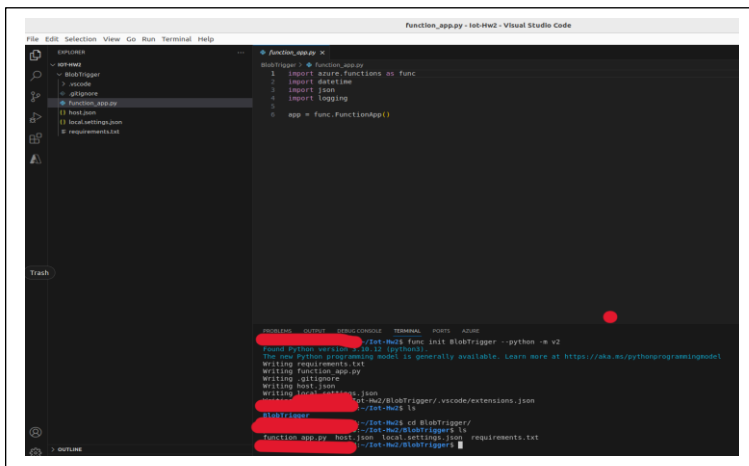
Installed, Azure-function-core-tools, successfully installed func.

```
[redacted]~$ sudo apt-get install azure-functions-core-tools-4
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  azure-functions-core-tools-4
```

```
~$ func --version  
4.0.6280
```

Now, I was successfully able to create local project with init.

```
~/Iot-Hw2$ func init BlobTrigger --python -m v2  
Found Python version 3.10.12 (python3).  
The new Python programming model is generally available. Learn more at https://aka.ms/pythonprogrammingmodel  
Writing requirements.txt  
Writing function_app.py  
Writing .gitignore  
Writing host.json  
Writing local.settings.json  
Writing /Iot-Hw2/BlobTrigger/.vscode/extensions.json
```



Now, I installed Azure functions from requirements.txt file.

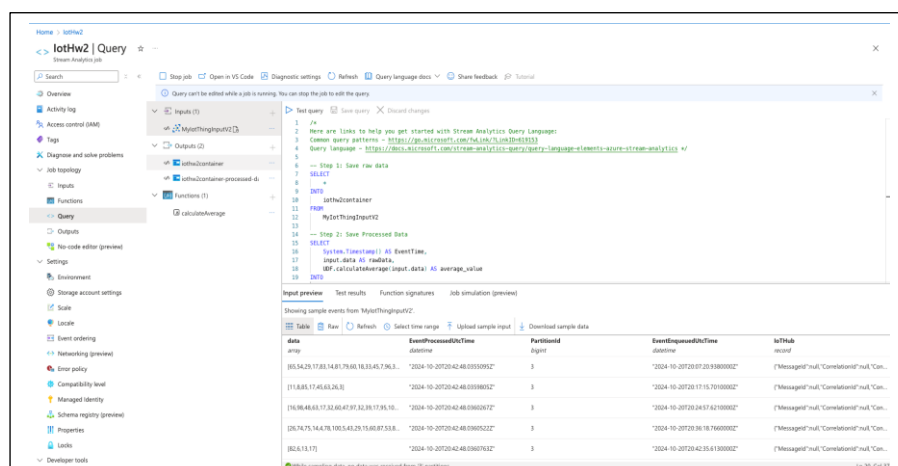
```
~/Iot-Hw2/BlobTrigger$ pip3 install -r requirements.txt  
Defaulting to user installation because normal site-packages is not writeable  
Collecting azure-functions  
  Downloading azure_functions-1.21.3-py3-none-any.whl (185 kB)  
    185.7/185.7 KB 3.9 MB/s eta 0:00:0  
Installing collected packages: azure-functions  
Successfully installed azure-functions-1.21.3
```

The, I wrote the sample code for function to try deploying it to Azure. Finally, I was able to deploy the function to Azure.

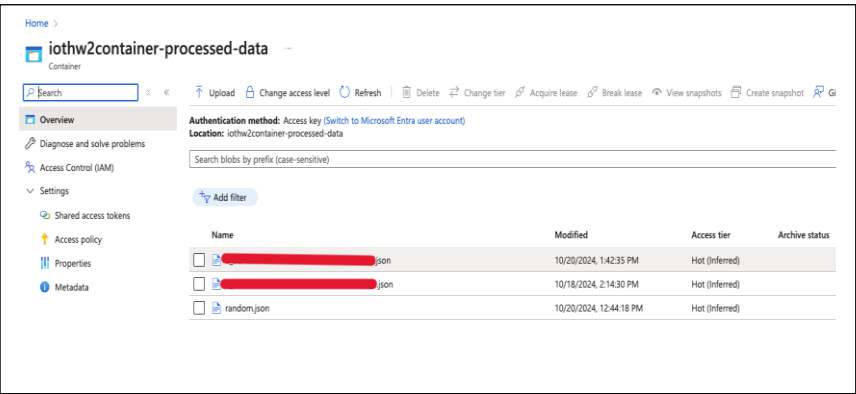
```
~/Iot-Hw2/BlobTrigger$ func azure functionapp publish IotHw2
```

```
Deployment successful. deployer = Push-Deployer deploymentPath = Functions App ZipDeploy. Extract zip. Remote build  
Remote build succeeded!  
[2024-10-20T19:42:27.031Z] Syncing triggers...  
Functions in IotHw2:  
  BlobTriggerV2 - [blobTrigger]
```

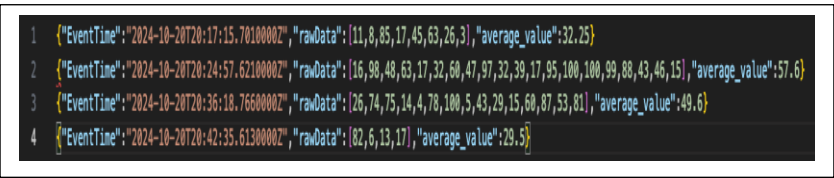
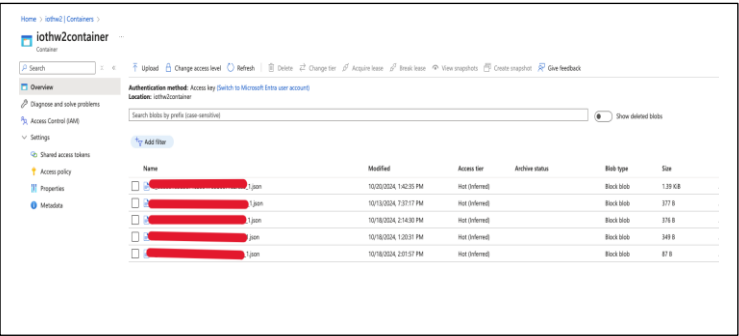
I was successfully able to see sample blob invocations.



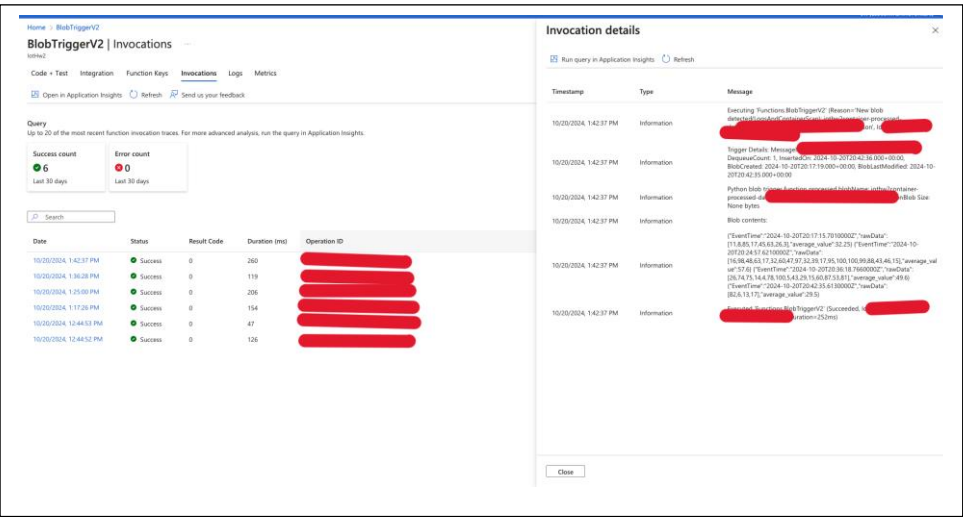
Stream Analytics Job successfully processed the message and stored it in the Blob.

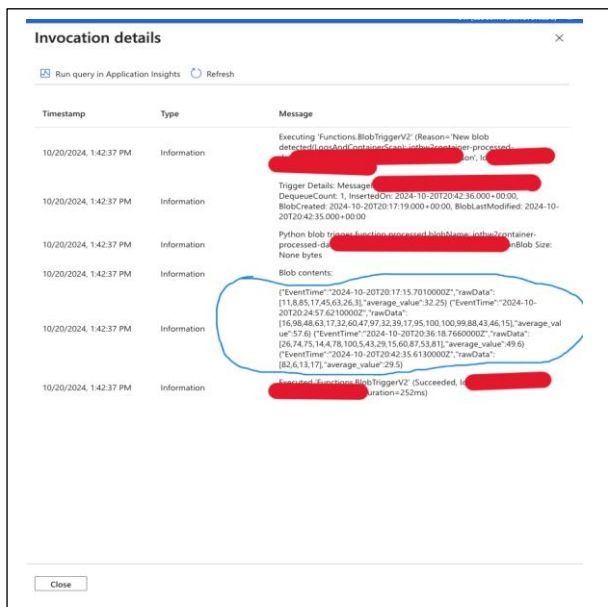
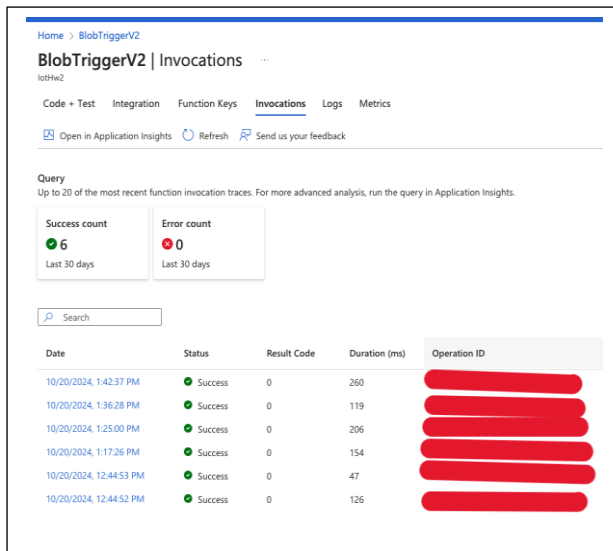
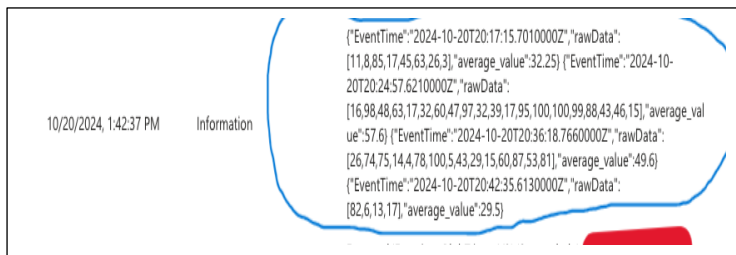


I was able to see raw and processed data in separate containers in Blob storage.



Finally, I was successfully able to invoke the Blob trigger function and print out the content of newly added data, which is the "processed data", Success count, and invocations.





Problems encountered while working on HW-2:

- 1.) Had difficulty while creating Function after creating function app.
- 2.) Had difficulty deploying the function to Azure as the documentation was very scattered and I also implemented a sample HTTP trigger function to test before Blob trigger function.

```
Deployment successful, deployer = Push-Deployer deploymentPath = Functions App ZipDeploy. Extract zip. Remote build
Remote build succeeded!
[2024-10-20T18:43:13.284Z] Syncing triggers...
Functions in IoTHub2:
  FirstHTTPFunction - [httpTrigger]
    Invoke url: [REDACTED]
  MyFirstBlobFunction - [blobTrigger]
  ReadFileBlobFunction - [blobTrigger]
  SecondHTTPFunction - [httpTrigger]
    Invoke url: [REDACTED]
```

3.) Had to install a lot of dependencies for running and deploying the function.

Amount of time you spent on this assignment:

I spent nearly 55 ~ 60 hours for this assignment.