Trust&Go Step by Step Guide - Loading Manifest to AWS-IoT

Table of Contents

1 Introduction

This document explains step by step process involved in uploading a manifest file to AWS cloud. If you are already familiar with Jupyter Notebook you can skip this section and move to Section 2.

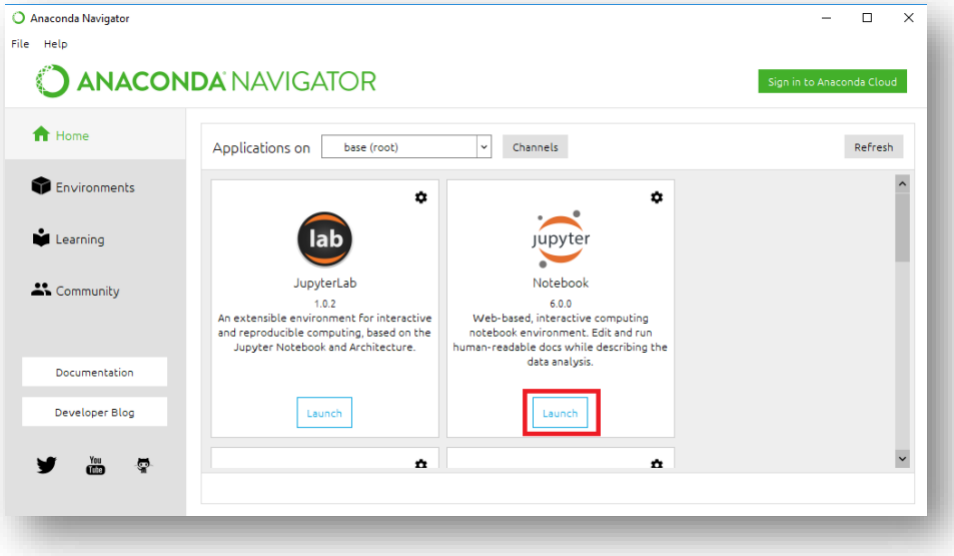
1.1 Getting started with Jupyter Notebook Tutorials

Jupyter Notebook is open source web application which allows you to create documents that contain code that you can execute in place as well as narrative text. It provides GUI elements, ability to execute code in place, ability to add images and gives it the look and feel that normal code files lack.

Jupyter notebooks are mainly used to explain/evaluate code in an interactive way.

1.1.1 Starting Jupyter Notebook

Jupyter notebook can be launched from the Anaconda Navigator main window.



1.2 Jupyter Notebook Basics

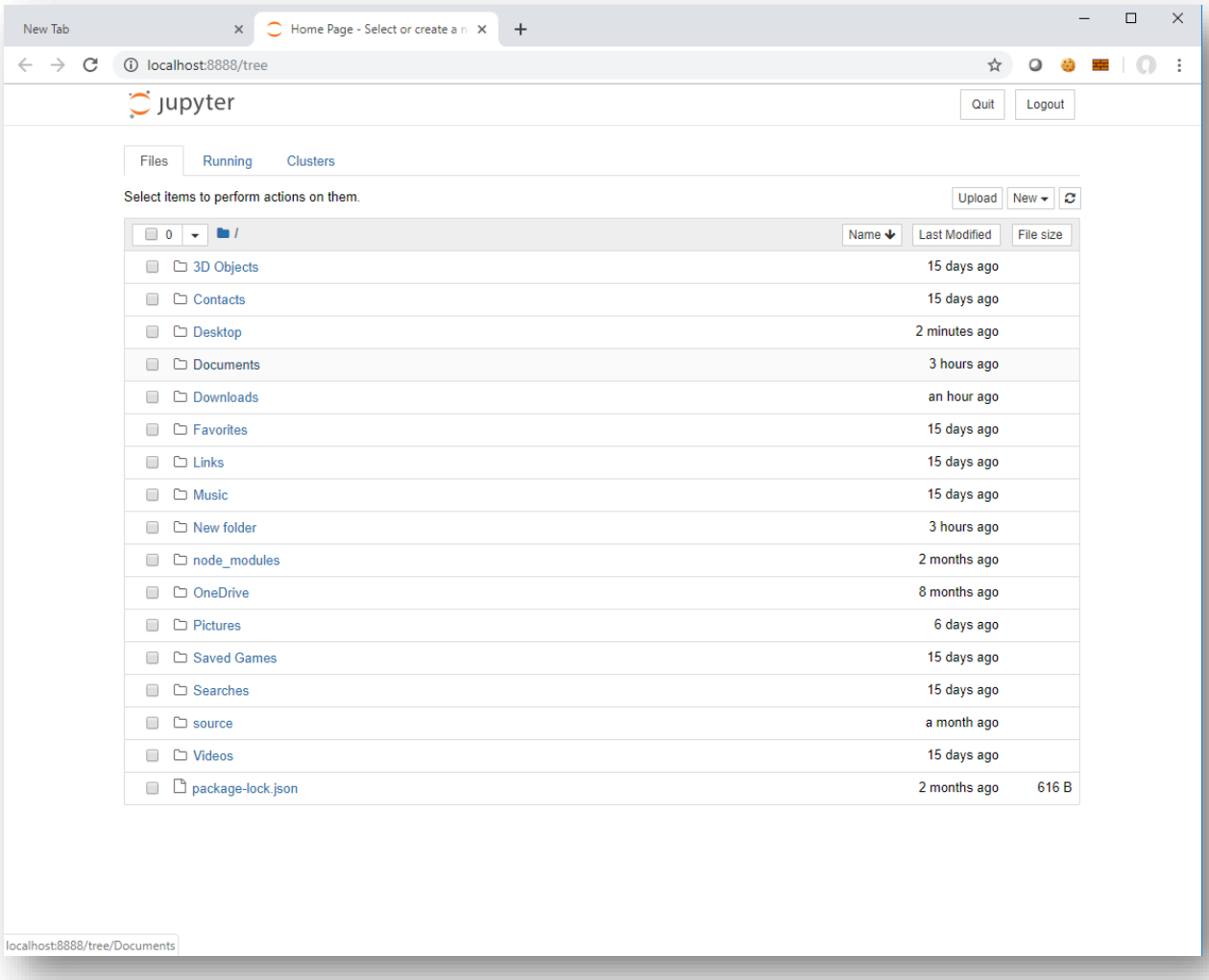
It is recommended to become familiar with Jupyter basic concepts with the online documentation, https://jupyter-notebook.readthedocs.io/en/stable/examples/Notebook/Notebook%20Basics.html

Some of the content is duplicated here for convenience. The online documentation should always be used as a reference.

1.2.1 The Notebook dashboard

When you first start the notebook server, your browser will open Notebook dashboard. The dashboard serves as a home page for the notebook. Its main purpose is to display the Notebooks and files in the current directory.

For example, here is a screenshot of the Jupyter dashboard. The top of the notebook list displays clickable breadcrumbs of the current directory. By clicking on these breadcrumbs or on sub-directories in the notebook list, you can navigate your file system.

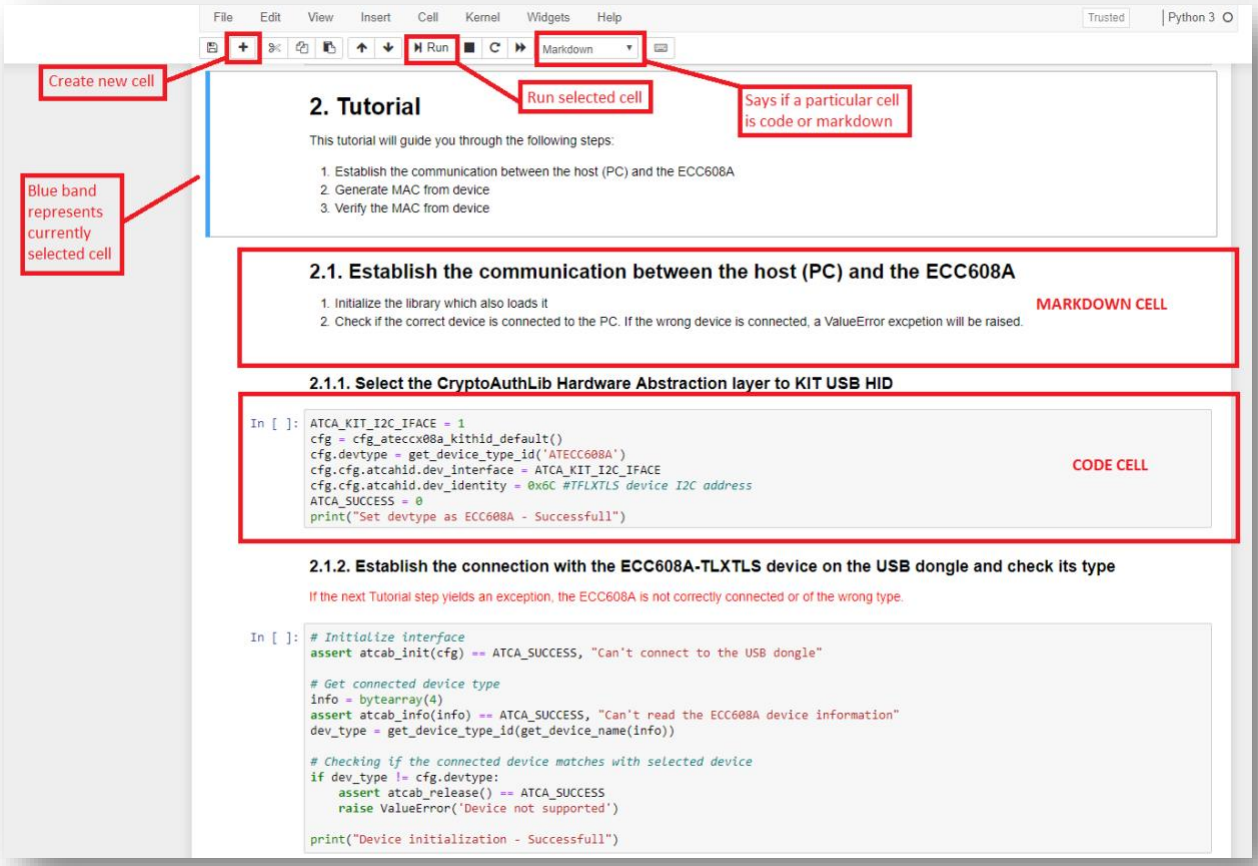


1.3 Introduction to Jupyter Notebook GUI.

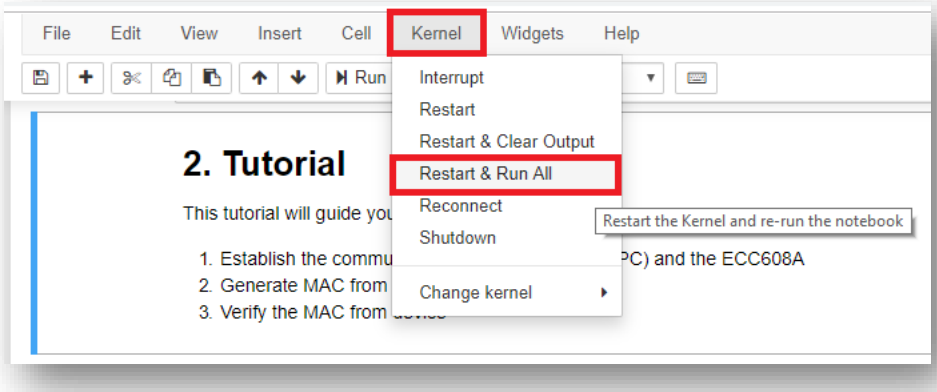
Jupyter Notebooks contain cells where you can either write code or markdown text. Notebooks contain multiple cells, some set as code and others markdown. Code cells contain code that can be executed live, and markdown contains text and images to explain the code.

Below image shows some options in a typical Jupyter Notebook. Individual cells can be executed by pressing on the RUN button as shown in the below image.

All cells in the Notebook can be executed in order by **Kernel->Restart & Run All**.



To run all cells in sequence.



2 Jupyter Notebook Tutorials

The TrustPlatform Design Suite comes with a Notebook Tutorials to easily prototype popular use cases for TrustFLEX and Trust&GO devices. Here are the available Jupyter Notebook Tutorials.

Jupyter Notebook Tutorials	Relative Path	Applicable devices
Manifest Generation	TNGTLS_Manifest_Generation\notebooks\TNGTLS Manifest File Generation.ipynb	Trust&GO
AWS IOT with TNG-TLS	TNGTLS_Use_Cases\notebooks\aws-iot\aws-iot with ECC608A-TNGTLS.ipynb	Trust&GO
Resource Generation	TFLXTLS_resource_generation\Crypto Resource Generator.ipynb	TrustFLEX
Accessory Authentication	TFLXTLS_Use_Cases\notebooks\accessory-authentication\ Accessory Authentication.ipynb	TrustFLEX
AWS Custom PKI	TFLXTLS_Use_Cases\notebooks\aws-iot\aws-iot with ECC608A-TLFXTLS.ipynb	TrustFLEX
Firmware Validation	TFLXTLS_Use_Cases\notebooks\secureboot\Firmware Validation with ECC608A-TFLXTLS Tutorial.ipynb	TrustFLEX
IP Protection	TFLXTLS_Use_Cases\notebooks\ipprotection\IP Protection with ECC608A-TFLXTLS Tutorial.ipynb	TrustFLEX
Secure Public Key Rotation	TFLXTLS_Use_Cases\notebooks\public-key-rotation\Public Key Rotation with ECC608A-TFLXTLS Tutorial.ipynb	TrustFLEX

3 Manifest Generation Notebook

Trust&GO device is one of the three devices available in the Trust Platform USB Dongle Board.

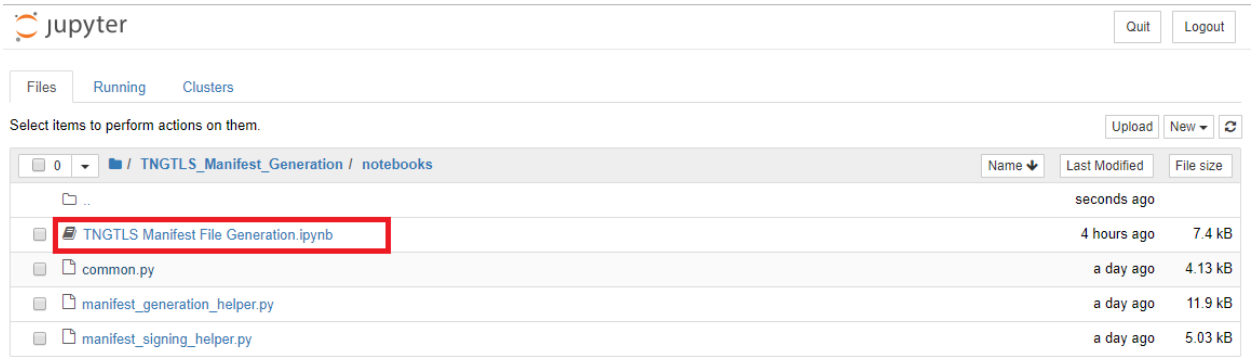
Trust&GO devices come with pre-programmed certificates in slots 10, 11 and 12, also slots 0-4 have pre-generated private keys, other than the previously mentioned slots all the other slots are locked.

The secure element manifest format is designed to convey the unique information about a device including its unique ID (e.g. serial number), public keys, and certificates. The manifest file generated can be used to register the device to cloud providers.

By default, Jupyter starts in Users directory ($HOME for MacOS or Linux systems). For the remainder of this document, it will be assumed that the Trust_Platform folder is contained in the Documents folder.

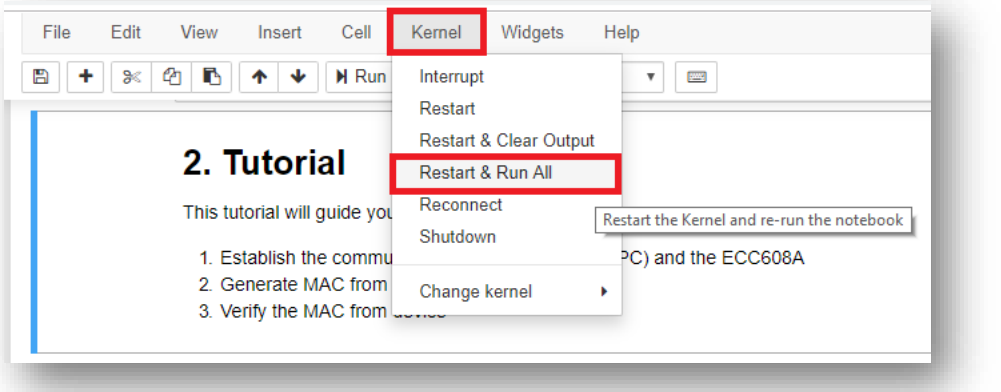
Within the Jupyter dashboard, navigate to TNGTLS_Manifest_Generation\notebooks folder

Select the TNGTLS Manifest File Generation.ipynb notebook



Run all cells of the TNGTLS_Manifest_Generation Notebook: Kernel->Restart & Run All

Note: Before executing the cells on Crypto Trust Platform, its required to have factory default program running on SAMD21 of Trust Platform. Refer to 4.1 CryptoAuth TrustPlatform Factory reset section for reloading default program.



The Notebook will be used to generate a manifest file which can be uploaded into the public cloud provider of your choice (Google GCP, AWS IoT and soon to be supported Microsoft Azure). TNGTLS Manifest Generation notebook needs to be run for all Trust&Go example Notebooks that require a Manifest file.

If all the steps are run without errors, you will see two download links as shown below.

Click on "Download Manifest" and "Download Logger Certificate" to download the manifest and logger file.

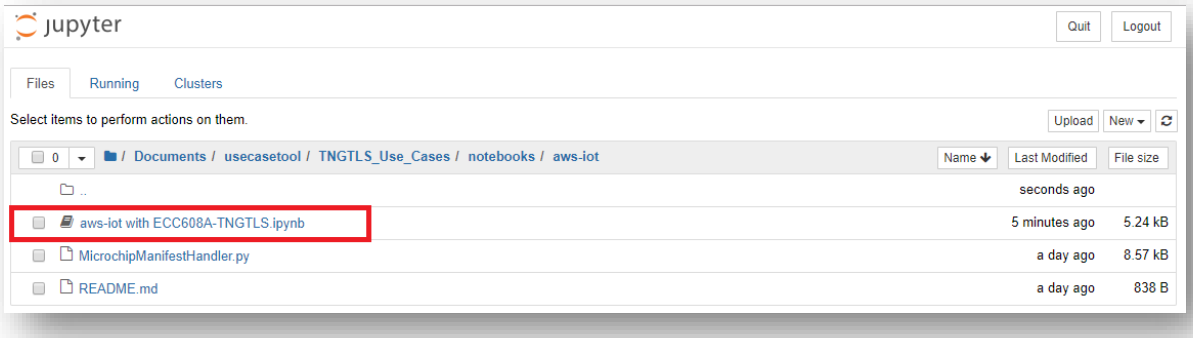
4 Loading Manifest to AWS-IoT

This hands-on lab is intended to demonstrate how to load a manifest file into AWS-IOT to enable device connectivity.

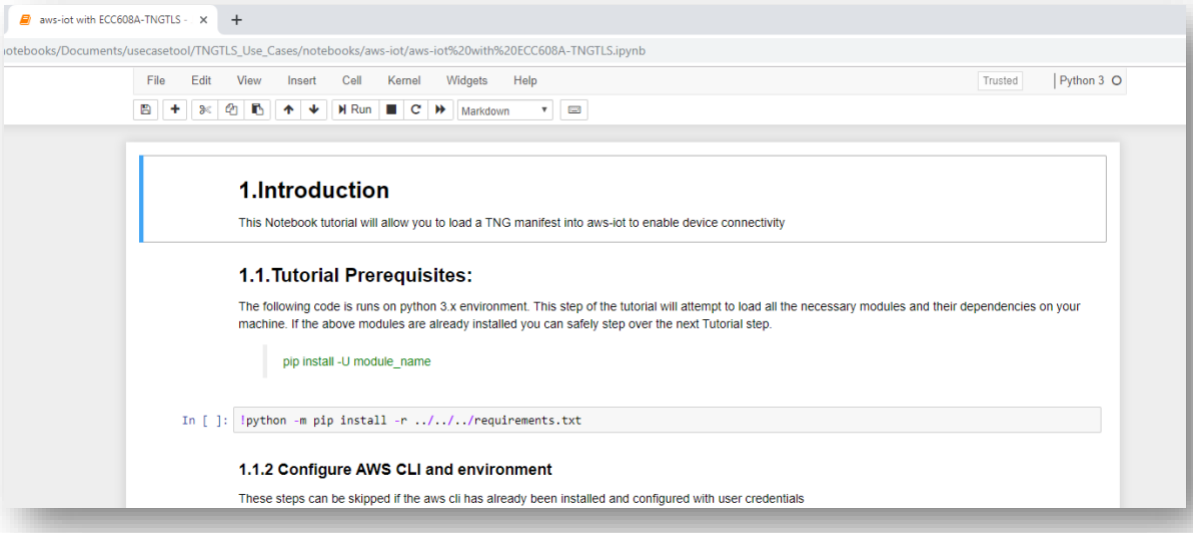
We would be using the manifest file and logger file generated in the TNGTLS Manifest File generation notebook. The Manifest file contains information about the device including serial number, public keys and certificates.

Loading a manifest file to AWS_IOT through Jupyter Notebook:

1. From the Jupyter Home page, navigate to **TNGTLS_Use_Cases/notebooks/aws-iot/aws-iot with ECC608A-TNGTLS.ipynb** notebook file and open it.



Opening the notebook from Jupyter home page should load the following on the browser.

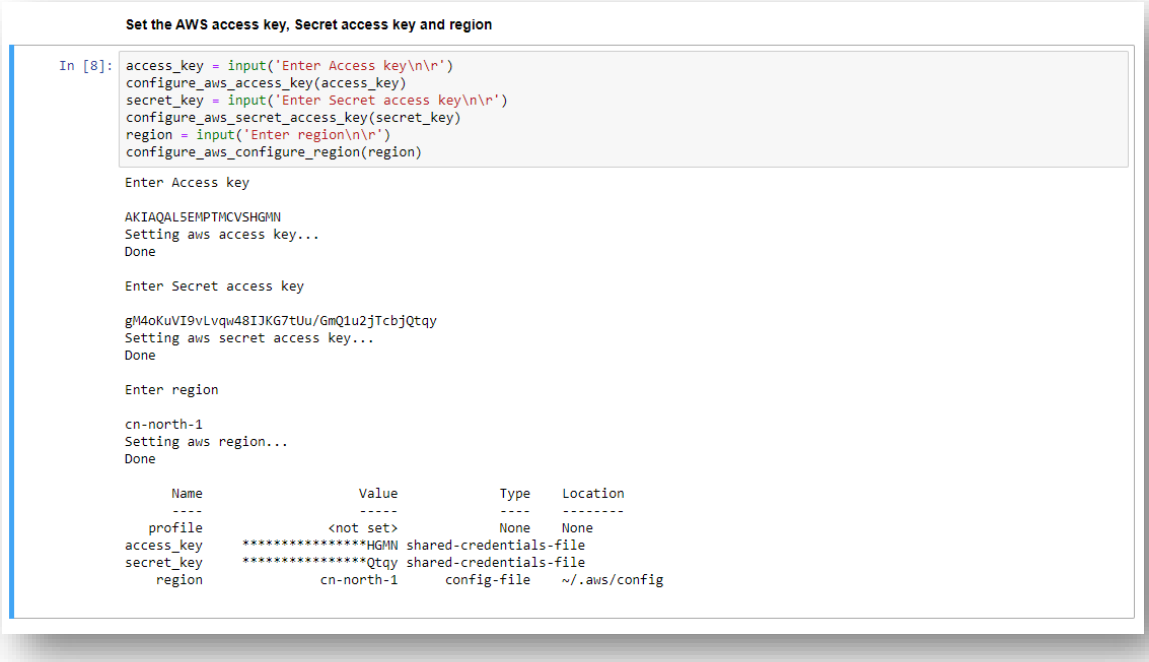


2. This notebook requires user input in some of the intermediary steps so Run All option in Jupyter is not recommended. Run steps 1.1 and 1.2, these steps will install all the modules required for the Notebook and import the required modules.

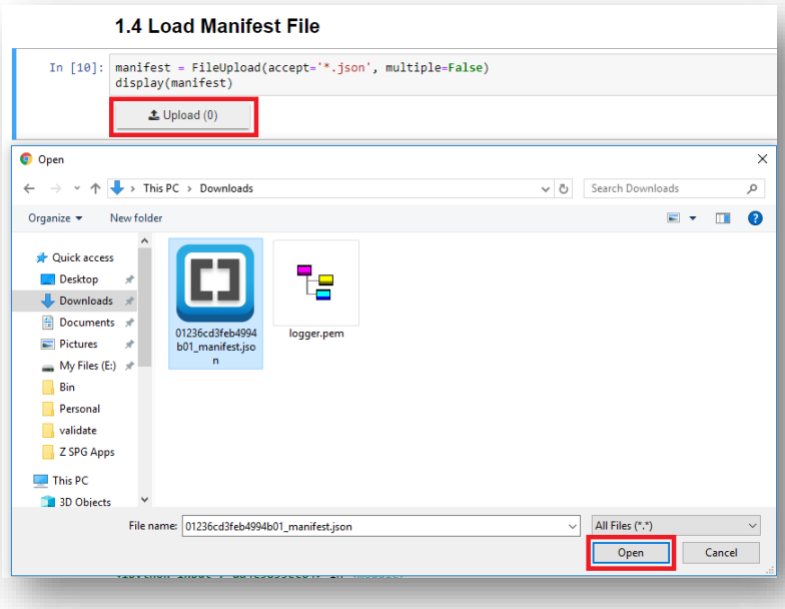
3. Run step 1.3, under step 1.3 it will prompt you to enter the following details
    a. Access key
    b. Secret key
    c. Region name

    These details will be used to setup AWS-CLI in your PC. You can get these details from your AWS account.

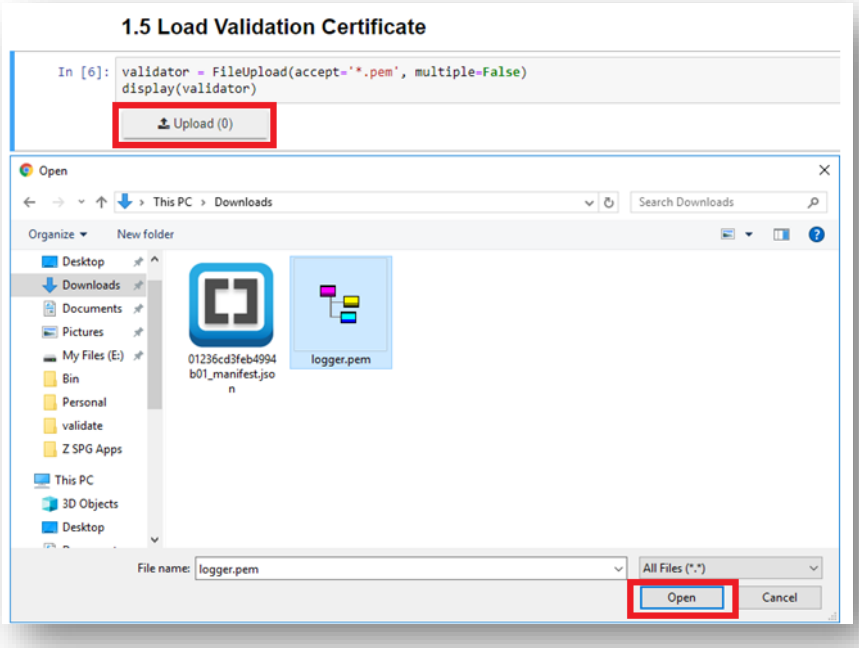
    The output after entering all the details will look like the image below. Credentials used in the below image should not be used, you are needed to enter the credentials tied to your own account.



4. Run step 1.4, it will create Upload button. Press on that button, it will open file explorer window, there you need to navigate and choose the manifest file generated using TNG Manifest Generation Notebook.



5. Run step 1.5, it will create Upload button. Press on that button, it will open file explorer window, there you need to navigate and choose the validation certificate file generated using TNG Manifest Generation Notebook.



6. Run step 1.6, the successful completion of the step will import the certificate.

In [4]:
```
manifest_data = json.loads(manifest.data[0])
validation_certificate = validator.data[0]

invoke_import_manifest('Default', manifest_data, validation_certificate)
```

```
number of certificates: 1

Loading the manifest_item
uniqueId: 01232d76543e3c1401
About to try certificate import
Response: {'ResponseMetadata': {'RequestId': 'c60038f5-5fbf-406b-b4d8-06ab5bdca2dc', 'HTTPStatusCode': 200, 'HTTPHeaders': {'da
te': 'Thu, 26 Sep 2019 19:46:49 GMT', 'content-type': 'application/json', 'content-length': '209', 'connection': 'keep-alive',
'x-amzn-requestid': 'c60038f5-5fbf-406b-b4d8-06ab5bdca2dc', 'access-control-allow-origin': '*', 'x-amz-apigw-id': 'ApBScE8MPHcF
wOg=', 'x-amzn-trace-id': 'Root=1-5d8d15a9-cefd96acde588bf47bbdc334'}, 'RetryAttempts': 0}, 'certificateArn': 'arn:aws:iot:us-w
est-2:257966804464:cert/e0d8082c7b88341b5df665f2308cf98461795c3bfd4ae57b306f7239dbda474a', 'certificateId': 'e0d8082c7b88341b5d
f665f2308cf98461795c3bfd4ae57b306f7239dbda474a'}
Certificate import complete - returning
MANIFEST_IMPORT SUCCESS arn:aws:iot:us-west-2:257966804464:cert/e0d8082c7b88341b5df665f2308cf98461795c3bfd4ae57b306f7239dbda474
a       arn:aws:iot:us-west-2:257966804464:thing/01232d76543e3c1401
```

7. Run step 1.7, successful execution of this step verifies that the manifest was successfully uploaded, and it outputs the corresponding unique ID

In [5]:
```
manifest_data = json.loads(manifest.data[0])
validation_certificate = validator.data[0]
invoke_validate_manifest_import(manifest_data, validation_certificate)
```

```
number of thingIds to check: 1

Checking the manifest_item
uniqueId: 01232d76543e3c1401
Manifest was loaded successfully
```

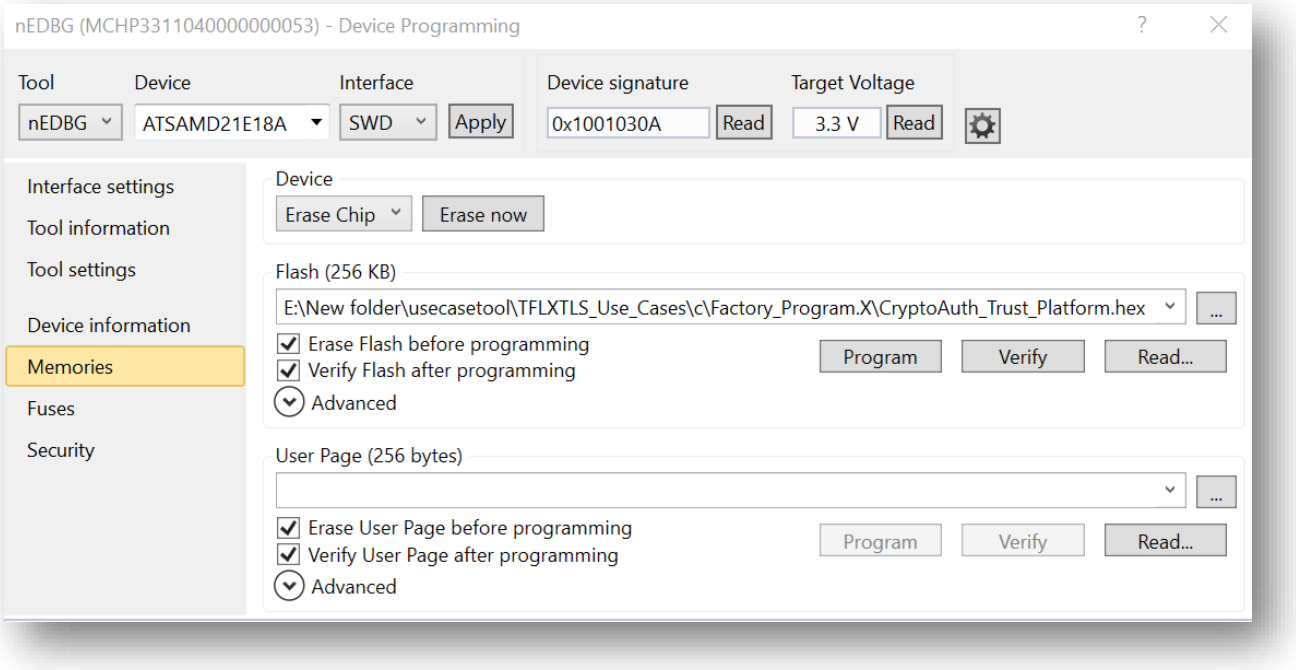
4.1 CryptoAuth TrustPlatform Factory reset

Once any of the embedded project is loaded to CrytoAuth TrustPlatform, the default program that enables interaction with TrustPlatform tools will be erased.

Before using the Platform with any other notebook or tools on PC, its required to reprogram the default .hex file. Default hex file is available at **TFLXTLS_Use_Cases\c\Factory_Program.X\CryptoAuth_Trust_Platform.hex**

To reprogram using Atmel Studio:

1. Navigate to AtmelStudio -> Tools -> Device Programming
2. Select Tool as nEDBG and Apply
3. Go to Memories and navigate to above path under Flash dropdown
4. Check both Erase Flash and Verify Flash
5. Click on Program



To reprogram using MPLAB:

1. Open **TFLXTLS_Use_Cases\c\Factory_Program.X** project in MPLAB IDE
2. Program the Crypto Trust platform by navigating to **CryptoAuth_Trust_Platform_Factory_Program -> Make and Program Device**

Now, Crypto Trust Platform contains factory programmed application that enables interactions with Notebooks and/or PC tools.

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