TrustFLEX Step by Step Guide Google Cloud Platform Connect

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1 Introduction

This document gives a detailed walk through of connecting securely to Google Could Platform. If familiar with Jupyter Notebook, can skip this section and move to Section 2.

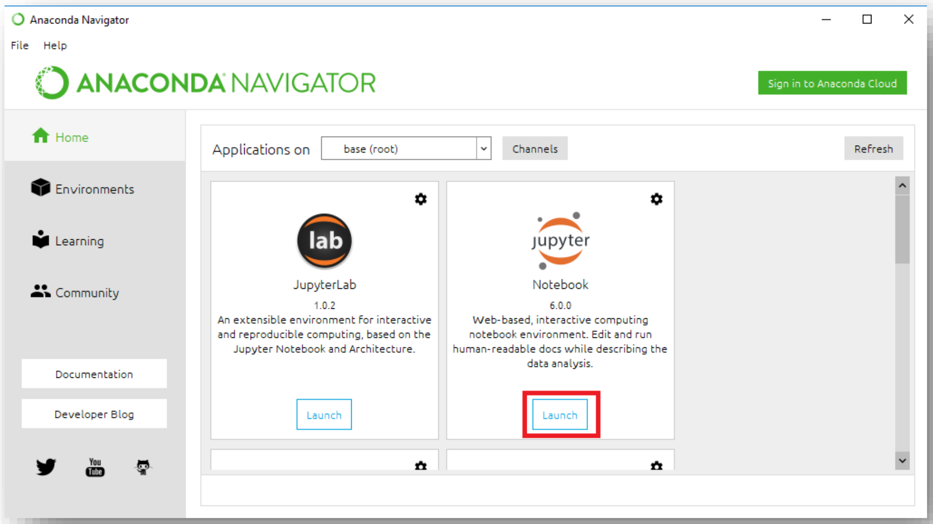
1.1 Getting started with Jupyter Notebook Tutorials

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.



An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.

Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.

1.2 Jupyter Notebook Basics

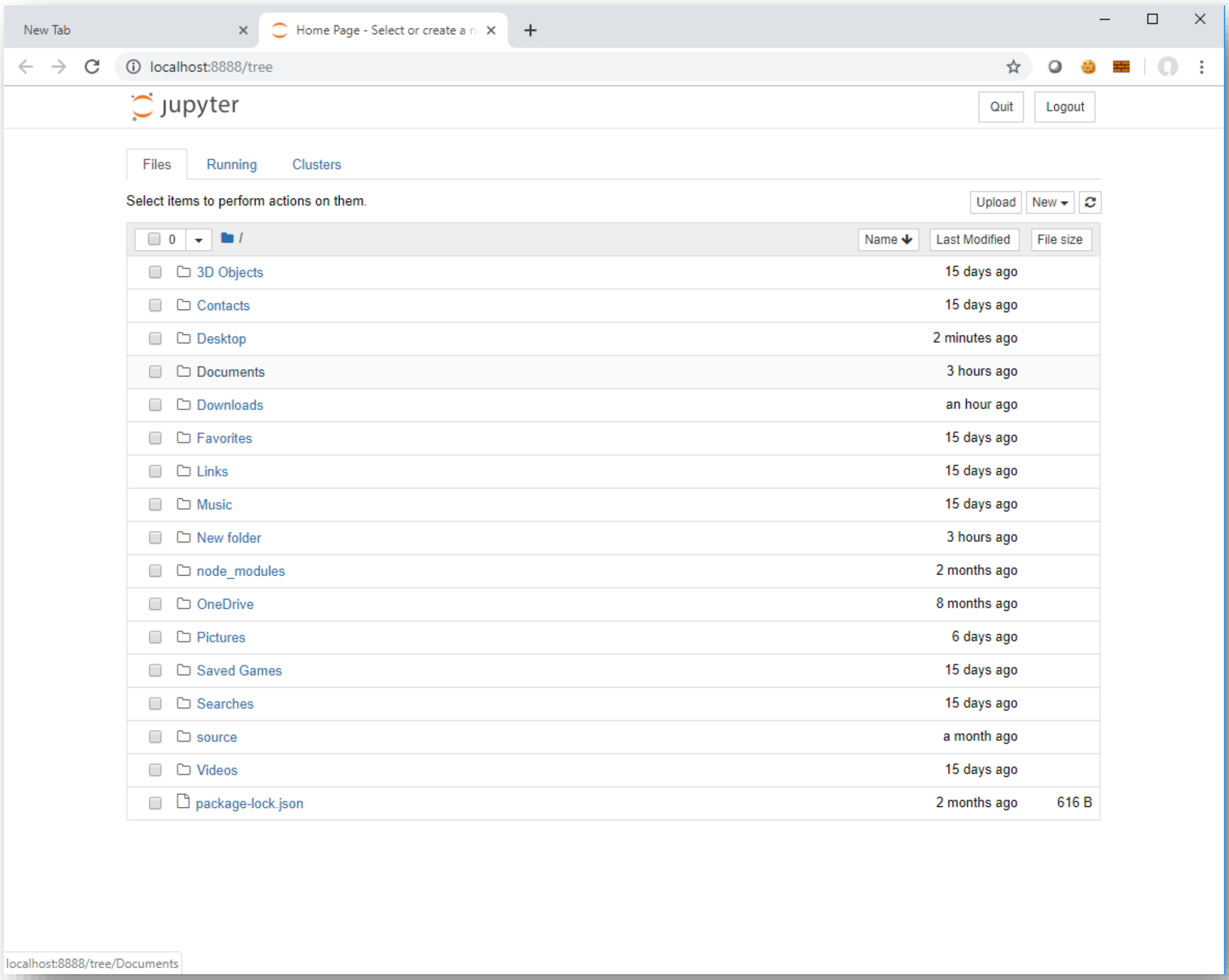
It is recommended to become familiar with Jupyter basic concepts with the online documentation, https://jupyter-notebook.readthedocs.io/en/stable/examples/Notebook/Notebook%20Basics.html

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 sub-directories in the notebook list, you can navigate your file system.



Select items to perform actions on them.

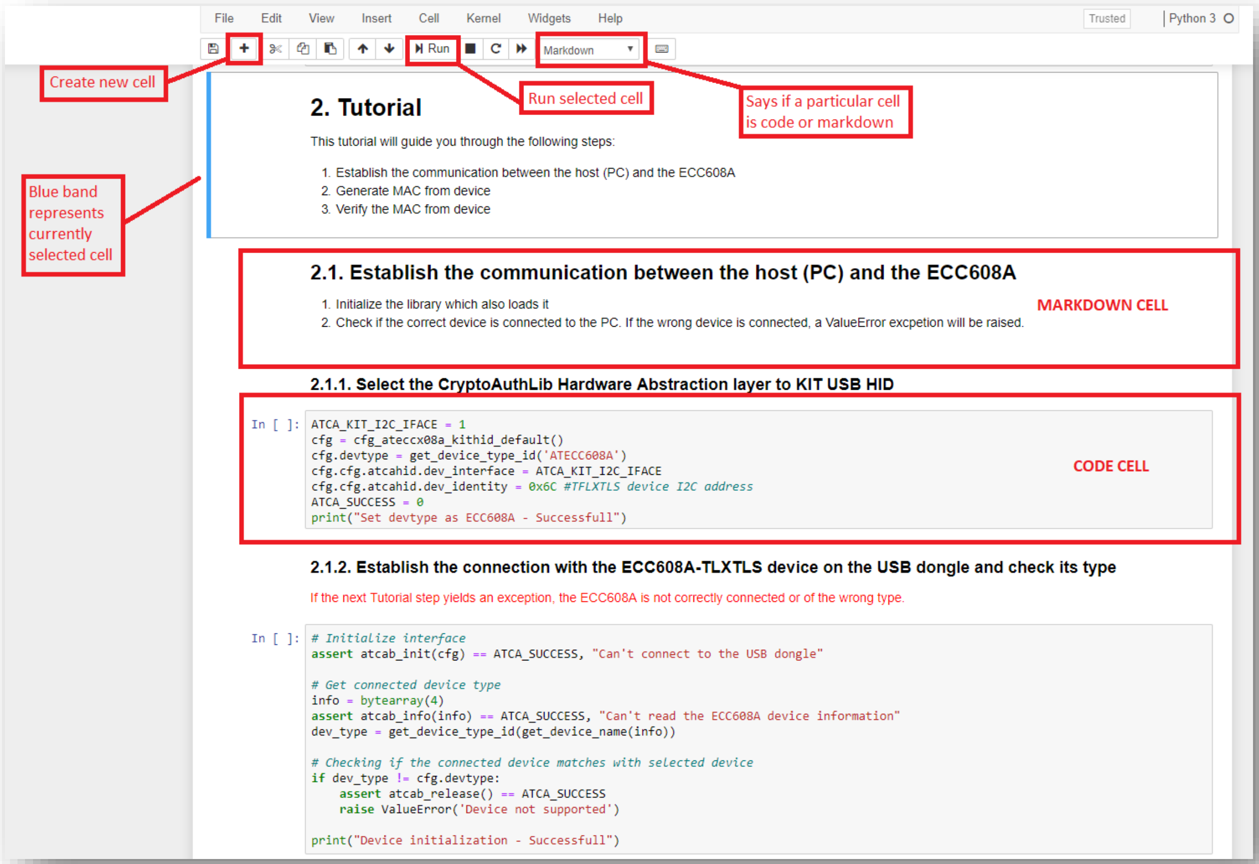
Name	Last Modified	File size
3D Objects	15 days ago	
Contacts	15 days ago	
Desktop	2 minutes ago	
Documents	3 hours ago	
Downloads	an hour ago	
Favorites	15 days ago	
Links	15 days ago	
Music	15 days ago	
New folder	3 hours ago	
node_modules	2 months ago	
OneDrive	8 months ago	
Pictures	6 days ago	
Saved Games	15 days ago	
Searches	15 days ago	
source	a month ago	
Videos	15 days ago	
package-lock.json	2 months ago	616 B

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 that explains 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**.



2. Tutorial

This tutorial will guide you through the following steps:

1. Establish the communication between the host (PC) and the ECC608A
2. Generate MAC from device
3. Verify the MAC from device

2.1. Establish the communication between the host (PC) and the ECC608A

1. Initialize the library which also loads it
2. Check if the correct device is connected to the PC. If the wrong device is connected, a ValueError excpetion will be raised.

2.1.1. Select the CryptoAuthLib Hardware Abstraction layer to KIT USB HID

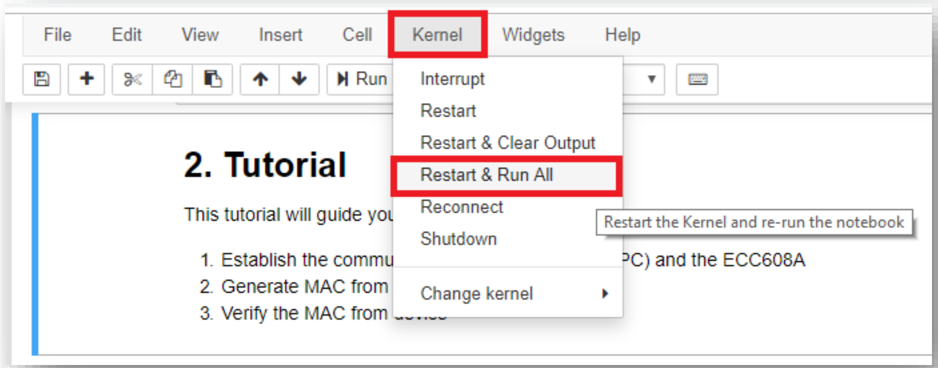
```
In [ ]: ATCA_KIT_I2C_IFACE = 1
        cfg = cfg_ateccx08a_kithid_default()
        cfg.devtype = get_device_type_id('ATECC608A')
        cfg.cfg.atcahid.dev_interface = ATCA_KIT_I2C_IFACE
        cfg.cfg.atcahid.dev_identity = 0x6C #TFLXTLS device I2C address
        ATCA_SUCCESS = 0
        print("Set devtype as ECC608A - Successfull")
```

2.1.2. Establish the connection with the ECC608A-TLXTLS device on the USB dongle and check its type

If the next Tutorial step yields an exception, the ECC608A is not correctly connected or of the wrong type.

```
In [ ]: # Initialize interface
        assert atcab_init(cfg) == ATCA_SUCCESS, "Can't connect to the USB dongle"

        # Get connected device type
        info = bytearray(4)
        assert atcab_info(info) == ATCA_SUCCESS, "Can't read the ECC608A device information"
        dev_type = get_device_type_id(get_device_name(info))

        # Checking if the connected device matches with selected device
        if dev_type != cfg.devtype:
            assert atcab_release() == ATCA_SUCCESS
            raise ValueError('Device not supported')

        print("Device initialization - Successfull")
```

To run all cells in sequence.



2 Jupyter Notebook Tutorials

The TrustPlatform Design Suite comes with several Notebook Tutorials to easily prototype popular use cases for TrustFLEX and Trust&Go devices. Here is the list of Jupyter Notebook Tutorials.

Jupyter Notebook Tutorials	**Relative Path**	**Applicable Devices**
Manifest Generation	TrustnGO\00_resource_generation\TNGTLS_manifest_file_generation.ipynb	TrustnGO
Resource Generation	TrustFLEX\00_resource_generation\TFLXTLS_resource_generator.ipynb	TrustFLEX
Accessory Authentication	TrustFLEX\01_accessory_authentication\notebook\ TFLXTLS_accessory_authentication.ipynb	TrustFLEX
Firmware Validation	TrustFLEX\02_firmware_validation\notebook\ TFLXTLS_firmware_validation.ipynb	TrustFLEX
GCP Connect	TrustFLEX\03_gcp_connect\notebook\TFLXTLS_GCP_connect.ipynb	TrustFLEX
IP Protection	TrustFLEX\04_ip_protection\notebook\ TFLXTLS_IP_protection.ipynb	TrustFLEX
Secure Public Key Rotation	TrustFLEX\05_public_key_rotation\notebook\ TFLXTLS_public_key_rotation.ipynb	TrustFLEX
AWS Custom PKI	TrustFLEX\06_custom_pki_aws\notebook\ TFLXTLS_aws_connect.ipynb	TrustFLEX
Azure Connect	TrustFLEX\07_custom_pki_azure\notebook\ TLFXTLS_azure_connect.ipynb	TrustFLEX

3 Generate Manifest files

In the real scenarios, the Manifest files for Trust&GO and TrustFLEX should be downloaded from microchipDirect. Once devices have shipped, you will be able to download the Manifest file from your Microchip Purchasing & Client Services Account. The file can then be uploaded into your cloud service account.

Kits, demonstration boards do not ship with a Manifest file.

The following sections provide steps to generate manifest files for Trust&GO and TrustFLEX devices during prototyping the Usecases.

Note: Before executing the cells on Crypto Trust Platform, its required to have factory default program running on SAMD21 of Trust Platform. Refer to 4.3 CryptoAuth TrustPlatform Factory reset section for reloading default program.

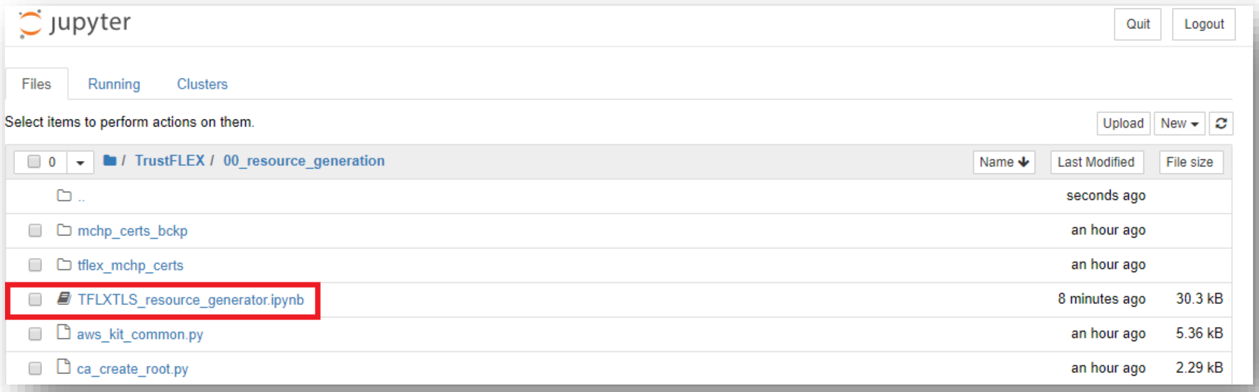
3.1 TrustFLEX – Manifest file generation

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

TrustFLEX devices come pre-programmed with certificates in slots 10, 11 and 12, also slots 0-4 have pre-generated private keys, other than the mentioned slots all the other slots have no meaningful data in them.

The Resource Generator Notebook will create development keys and certificates for all slots that can be further customized. Keys and Certificate chains are stored in the PC filesystem. These keys should never be used for production purposes as their generation is not handled in a secure environment. These development keys will be later used by the other notebooks to implement the various pre-defined use cases.

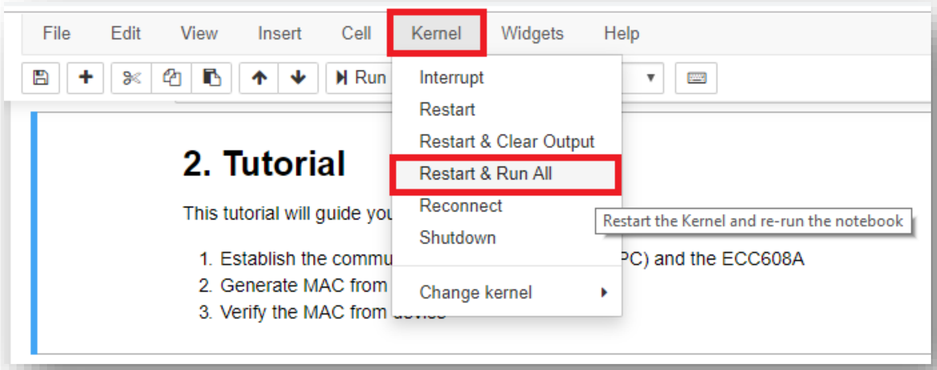
Within the Jupyter Dashboard, navigate **TrustFLEX\00_resource_generation** folder to open **TFLXTLS_resource_generator.ipynb** notebook


jupyter
Quit
Logout
Files
Running
Clusters
Select items to perform actions on them.
Upload
New
0
/ TrustFLEX / 00_resource_generation
Name
Last Modified
File size

Name	Last Modified	File size
..	seconds ago	
mchp_certs_bckp	an hour ago	
tflex_mchp_certs	an hour ago	
TFLXTLS_resource_generator.ipynb	8 minutes ago	30.3 kB
aws_kit_common.py	an hour ago	5.36 kB
ca_create_root.py	an hour ago	2.29 kB

Run all cells of the Crypto Resource Generator 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 4.3 CryptoAuth TrustPlatform Factory reset section for reloading default program.



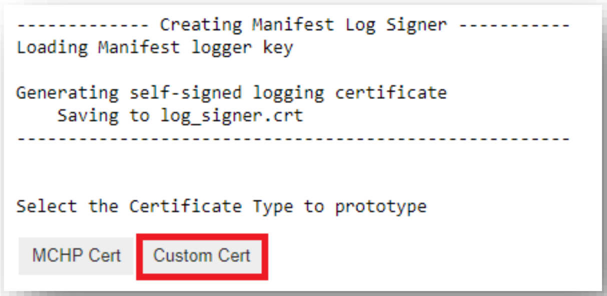
2. Tutorial

This tutorial will guide you

1. Establish the commu
2. Generate MAC from
3. Verify the MAC from

PC) and the ECC608A

It will execute and prompt you to choose between MCHP certificate and a custom certificate chain, press "Custom Cert" option for this use case.



```
------------- Creating Manifest Log Signer -----------
Loading Manifest logger key

Generating self-signed logging certificate
    Saving to log_signer.crt
------------------------------------------------------


Select the Certificate Type to prototype
```

Now it prompts you to enter the organization name, enter the name that will be used as an Organization Name in the certificate template. The name length is limited to 24 characters.

The Notebook will generate a number of keys and certificates. Make sure you have an error free output before continuing to the next steps of the training.

The output log should resemble this:

Loading root CA key

Generating self-signed root CA certificate
    Saving to root-ca.crt

```
Loading signer CA key

Generating signer CA CSR
   Saving to signer-ca.csr

Loading signer CA CSR
   Loading from signer-ca.csr

Loading root CA key
   Loading from root-ca.pem

Loading root CA certificate
   Loading from root-ca.crt

Generating signer CA certificate from CSR
   Saving to signer-ca.crt

--------------------------------------------

Signer Certificate written successfully to device
Device Certificate written successfully to device
Thing ID c162f7cedb44317696f7fcf7c80c43cbee4a6c97

--------------------------------------------

Generating signer certificate definition header file - cust_def_1_signer.h
Generating device certificate definition header file - cust_def_2_device.h
Generating signer certificate definition source file - cust_def_1_signer.c
Generating device certificate definition source file - cust_def_2_device.c

--------------------------------------------

Custom certificate generation and provisioning - SUCCESS

--------------------------------------------

Root Certificate loading from: root-ca.crt
Certificate:
   Data:
      Version: 3 (0x2)
      Serial Number:
         46:ae:32:e9:71:02:da:03:24:27:f0:1c:0b:b9:84:9d
      Signature Algorithm: ecdsa-with-SHA256
      Issuer: O = "custom_org            ", CN = Crypto Authentication Root CA 000
```

```
        Validity
            Not Before: Nov 19 06:38:32 2019 GMT
            Not After : Nov 12 06:38:32 2044 GMT
        Subject: O = "custom_org              ", CN = Crypto Authentication Root CA 000
        Subject Public Key Info:
            Public Key Algorithm: id-ecPublicKey
                Public-Key: (256 bit)
                pub:
                    04:f5:9b:35:8c:c5:5b:e8:30:94:ab:c0:d1:5a:0c:
                    40:45:7f:2b:21:a6:05:53:61:a9:d4:7e:fb:b9:7b:
                    a8:e6:7b:d8:ca:82:60:c3:57:f1:f8:a0:cf:f3:df:
                    39:d7:83:ba:d4:78:9f:7d:9b:6b:d3:99:e6:3a:57:
                    2e:9f:cd:c9:78
                ASN1 OID: prime256v1
                NIST CURVE: P-256
        X509v3 extensions:
            X509v3 Subject Key Identifier:
                8F:28:E9:74:55:D1:49:52:9D:09:3C:70:00:9F:BB:11:79:9B:FB:3B
            X509v3 Basic Constraints: critical
                CA:TRUE
    Signature Algorithm: ecdsa-with-SHA256
         30:45:02:21:00:d9:9c:f1:01:7e:39:09:43:63:e8:8a:62:3b:
         e8:91:4a:b8:28:0e:92:4f:74:e6:f3:fb:42:ff:a2:0f:de:35:
         6d:02:20:01:e4:10:ee:7d:b5:64:ee:ba:18:6a:9d:16:0a:03:
         c8:9a:25:c3:f6:e1:8e:c7:8a:bf:f5:06:d7:90:8b:fc:5a
-----BEGIN CERTIFICATE-----
MIIBzjCCAXSgAwIBAgIQRq4y6XEC2gMkJ/AcC7mEnTAKBggqhkjOPQQDAjBPMSEw
HwYDVQQKDBhjdXN0b21fb3JnICAgICAgICAgICAgICAxKjAoBgNVBAMMIUNyeXB0
byBBdXRoZW50aWNhdGlvbiBSb290IENBIDAwMDAeFw0xOTExMTkwNjM4MzJaFw00
NDExMTIwNjM4MzJaME8xITAfBgNVBAoMGGN1c3RvbV9vcmcgICAgICAgICAgICAg
IDEqMCgGA1UEAwwhQ3J5cHRvIEF1dGhlbnRpY2F0aW9uIFJvb3QgQ0EgMDAwMFkw
EwYHKoZIzj0CAQYIKoZIzj0DAQcDQgAE9Zs1jMVb6DCUq8DRWgxARX8rIaYFU2Gp
1H77uXuo5nvYyoJgw1fx+KDP898514O61HiffZtr05nmOlcun83JeKMyMDAwHQYD
VR0OBBYEFI8o6XRV0UlSnQk8cACfuxF5m/s7MA8GA1UdEwEB/wQFMAMBAf8wCgYI
KoZIzj0EAwIDSAAwRQIhANmc8QF+OQlDY+iKYjvokUq4KA6ST3Tm8/tC/6IP3jVt
AiAB5BDufbVk7roYap0WCgPImiXD9uGOx4q/9QbXkIv8Wg==
-----END CERTIFICATE-----

Validate Root Certificate:
OK

Signer Certificate loading from: signer-ca.crt
Certificate:
    Data:
        Version: 3 (0x2)
        Serial Number:
            67:f4:54:1e:c6:7b:9c:53:1a:eb:6c:71:c6:53:7e:11
        Signature Algorithm: ecdsa-with-SHA256
        Issuer: O = "custom_org              ", CN = Crypto Authentication Root CA 000
        Validity
            Not Before: Nov 19 06:00:00 2019 GMT
            Not After : Nov 19 06:00:00 2029 GMT
        Subject: O = "custom_org              ", CN = Crypto Authentication Signer FFFF
        Subject Public Key Info:
            Public Key Algorithm: id-ecPublicKey
                Public-Key: (256 bit)
                pub:
                    04:79:5c:1d:e1:c4:42:9c:fd:a4:25:26:92:a8:1c:
                    a5:bb:a5:e2:f4:00:24:b9:a9:93:45:44:45:94:d1:
                    61:5f:89:73:92:9d:f5:7d:90:6c:c0:be:93:89:ef:
                    69:cc:ce:80:b7:03:c6:2e:9e:b1:01:de:be:b0:4d:
                    20:26:33:b4:f9
                ASN1 OID: prime256v1
                NIST CURVE: P-256
        X509v3 extensions:
            X509v3 Key Usage: critical
                Digital Signature, Certificate Sign, CRL Sign
            X509v3 Basic Constraints: critical
                CA:TRUE, pathlen:0
            X509v3 Subject Key Identifier:
                1C:27:0D:E4:22:01:30:6A:37:0F:F9:68:E4:D8:91:04:C9:37:D5:82
            X509v3 Authority Key Identifier:
                keyid:8F:28:E9:74:55:D1:49:52:9D:09:3C:70:00:9F:BB:11:79:9B:FB:3B

    Signature Algorithm: ecdsa-with-SHA256
         30:45:02:21:00:c6:8d:c9:fd:a0:07:6f:6d:ab:c3:4e:cd:bf:
         d1:eb:61:a1:80:1b:fd:b0:6f:b3:6e:eb:fe:2c:ef:4b:f7:2d:
         6f:02:20:66:ed:8f:4a:60:1a:34:56:e3:6d:2b:e9:01:ba:3b:
         5b:37:b2:b7:7b:bf:a5:58:d7:37:cd:55:9b:a8:e4:15:eb
```

```
-----BEGIN CERTIFICATE-----
MIICAjCCAaigAwIBAgIQZ/RUHsZ7nFMa62xxxlN+ETAKBggqhkjOPQQDAjBPMSEw
HwYDVQQKDBhjdXN0b21fb3JnICAgICAgICAgICAgICAxKjAoBgNVBAMMIUNyeXB0
byBBdXRoZW50aWNhdGlvbiBSb290IENBIDAwMDAeFw0xOTExMTkwNjAwMDBaFw0y
OTExMTkwNjAwMDBaME8xITAfBgNVBAoMGGN1c3RvbV9vcmcgICAgICAgICAgICAg
IDEqMCgGA1UEAwwhQ3J5cHRvIEF1dGhlbnRpY2F0aW9uIFNpZ25lciBGRkZGMFkw
EwYHKoZIzj0CAQYIKoZIzj0DAQcDQgAEeVwd4cRCnP2kJSaSqBylu6Xi9AAkuamT
RURFlNFhX4lzkp31fZBswL6Tie9pzM6AtwPGLp6xAd6+sE0gJjO0+aNmMGQwDgYD
VR0PAQH/BAQDAgGGMBIGA1UdEwEB/wQIMAYBAf8CAQAwHQYDVR0OBBYEFBwnDeQi
```

```
ATBqNw/5aOTYkQTJN9WCMB8GA1UdIwQYMBaAFI8o6XRV0UlSnQk8cACfuxF5m/s7
MAoGCCqGSM49BAMCA0gAMEUCIQDGjcn9oAdvbavDTs2/0ethoYAb/bBvs27r/izv
S/ctbwIgZu2PSmAaNFbjbSvpAbo7Wzeyt3u/pVjXN81Vm6jkFes=
-----END CERTIFICATE-----

Validate Signer Certificate:
OK

Device Certificate loading from: device_cert.crt
Certificate:
  Data:
    Version: 3 (0x2)
    Serial Number:
      4b:58:a6:d8:9c:be:92:41:bc:f8:57:54:df:02:2b:3e
    Signature Algorithm: ecdsa-with-SHA256
    Issuer: O = "custom_org             ", CN = Crypto Authentication Signer FFFF
    Validity
      Not Before: Nov 19 06:00:00 2019 GMT
      Not After : Nov 19 06:00:00 2029 GMT
    Subject: O = "custom_org             ", CN = 01239E0A9490433401_ATECC
    Subject Public Key Info:
      Public Key Algorithm: id-ecPublicKey
        Public-Key: (256 bit)
        pub:
          04:0f:eb:6a:61:45:3e:f7:97:58:f9:dc:98:13:98:
          e0:20:10:99:7a:49:3e:c8:ab:29:01:79:bc:4e:13:
          7a:1e:cf:c3:e3:2e:89:66:7b:6e:cf:9c:0f:c3:10:
          15:c0:35:64:ac:28:b8:9f:8e:f4:68:d5:f3:d9:a2:
          4f:17:28:a9:0d
        ASN1 OID: prime256v1
        NIST CURVE: P-256
    X509v3 extensions:
      X509v3 Basic Constraints: critical
        CA:FALSE
      X509v3 Key Usage: critical
        Digital Signature, Certificate Sign, CRL Sign
      X509v3 Subject Key Identifier:
        C1:62:F7:CE:DB:44:31:76:96:F7:FC:F7:C8:0C:43:CB:EE:4A:6C:97
      X509v3 Authority Key Identifier:
        keyid:1C:27:0D:E4:22:01:30:6A:37:0F:F9:68:E4:D8:91:04:C9:37:D5:82

  Signature Algorithm: ecdsa-with-SHA256
     30:45:02:20:3f:e6:c7:a5:17:80:57:d6:69:04:36:01:34:5e:
     0e:c2:f3:8a:17:2f:a5:6b:41:ca:9e:79:23:42:1d:60:1e:6e:
        02:21:00:bb:d6:59:98:a0:a1:34:4e:81:b8:c9:1d:ae:54:18:
        7f:f2:57:46:34:5e:e9:03:ff:7f:39:4e:eb:d2:a3:72:8d
-----BEGIN CERTIFICATE-----
MIIB8zCCAZmgAwIBAgIQS1im2Jy+kkG8+FdU3wIrPjAKBggqhkjOPQQDAjBPMSEw
HwYDVQQKDBhjdXN0b21fb3JnICAgICAgICAgICAgICAxKjAoBgNVBAMMIUNyeXB0
byBBdXRoZW50aWNhdGlvbiBTaWduZXIgRkZGRjAeFw0xOTExMTkwNjAwMDBaFw0y
OTExMTkwNjAwMDBaMEYxITAfBgNVBAoMGGN1c3RvbV9vcmcgICAgICAgICAgICAg
IDEhMB8GA1UEAwwYMDEyMzlFMEE5NDkwNDMzNDAxX0FURUNDMFkwEwYHKoZIzj0C
AQYIKoZIzj0DAQcDQgAED+tqYUU+95dY+dyYE5jgIBCZekk+yKspAXm8ThN6Hs/D
4y6JZntuz5wPwxAVwDVkrCi4n470aNXz2aJPFyipDaNgMF4wDAYDVR0TAQH/BAIw
ADAOBgNVHQ8BAf8EBAMCAYYwHQYDVR0OBBYEFMFi987bRDF2lvf898gMQ8vuSmyX
MB8GA1UdIwQYMBaAFBwnDeQiATBqNw/5aOTYkQTJN9WCMAoGCCqGSM49BAMCA0gA
MEUCID/mx6UXgFfWaQQ2ATReDsLzihcvpWtByp55I0IdYB5uAiEAu9ZZmKChNE6B
uMkdrlQYf/JXRjRe6QP/fzlO69Kjco0=
-----END CERTIFICATE-----

Validate Device Certificate:
OK

Generated the manifest file 01239e0a9490433401_manifest.json
Custom Certificate processing completed successfully

---------------------------------------------
```

At the end of the execution, a Custom PKI chain will be generated on your PC and TrustFLEX device specific slots (10 through 12) will be overwritten with the custom certificates.

The Notebook has also generated a manifest file to be uploaded into the public cloud of your choice (Google GCP, AWS IoT and Microsoft Azure).

4 Use Case Prototyping

This hands-on lab is intended to demonstrate the usage of TrustFLEX/Trust&GO to secure a Google Cloud Platform connection.

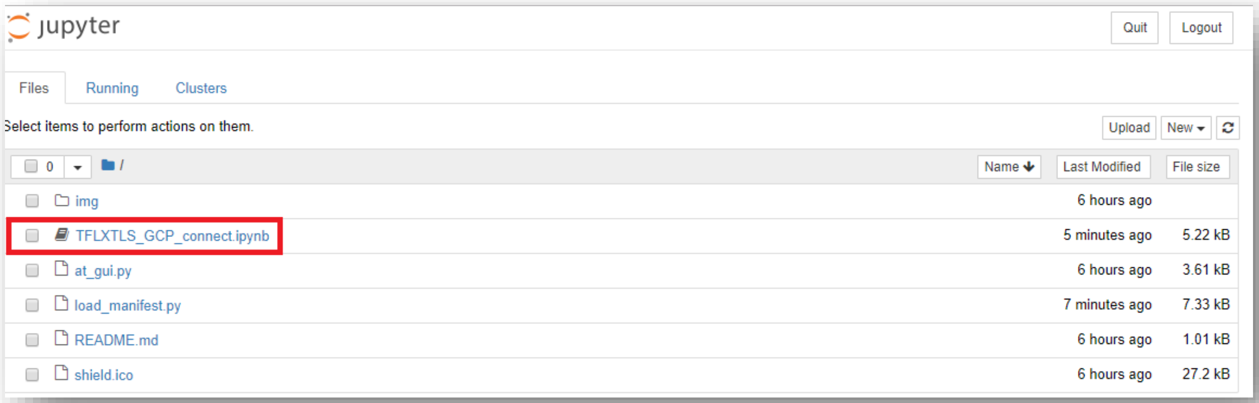
The reference implementation is provided with Embedded projects and Notebooks. The generation of manifest can be achieved through the execution of Jupyter Notebook Tutorials.

Note: It is required to have Google account test account setup prior to running this. Instruction to setup the account is provided in **docs\TrustFLEX GCP Account setup instructions.pdf**.

4.1 Running GCP example on Jupyter Notebook

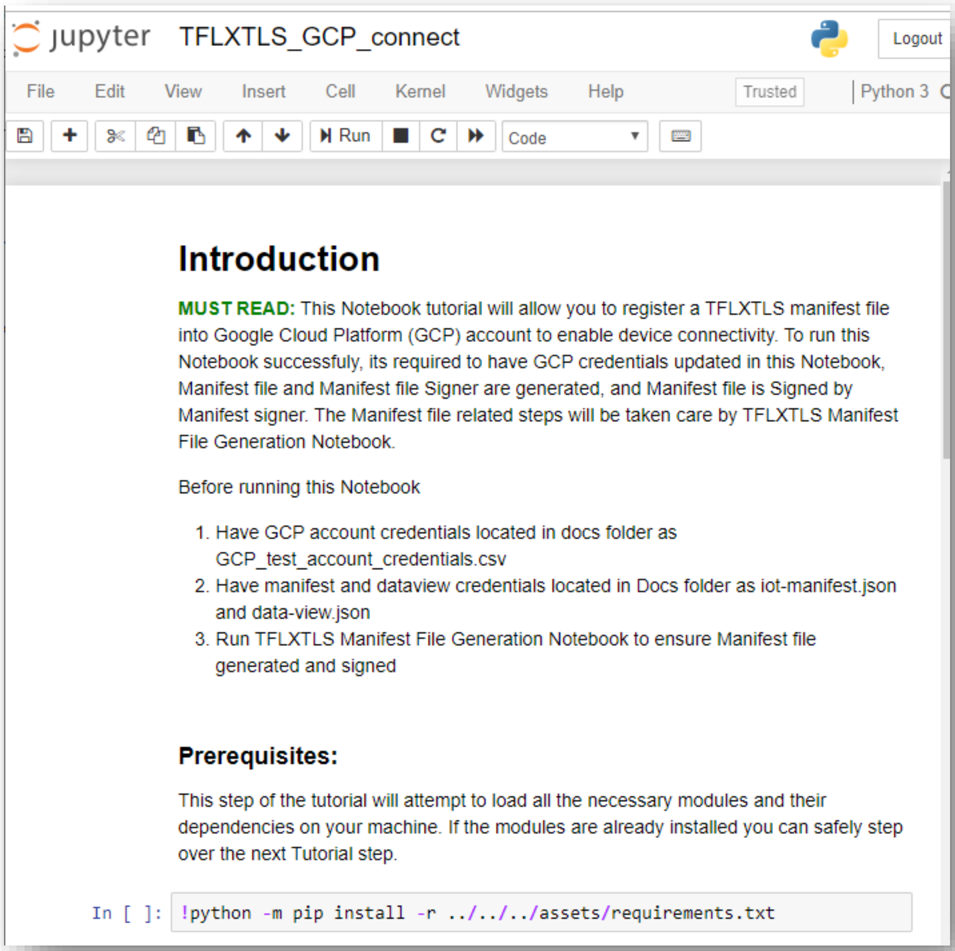
By running this step, one should be able to register the secure element to Google account by uploading device manifest file generated in the previous section. To run this Notebook, its required to have device manifest file (generated in previous section), google account credentials for manifest and data view (saved as part of GCP account setup).

1. From the Jupyter Home page, navigate to **TrustFLEX\03_gcp_connect\notebook\TFLXTLS_GCP_connect.ipynb** notebook file and open it.



Name	Last Modified	File size
img	6 hours ago	
TFLXTLS_GCP_connect.ipynb	5 minutes ago	5.22 kB
at_gui.py	6 hours ago	3.61 kB
load_manifest.py	7 minutes ago	7.33 kB
README.md	6 hours ago	1.01 kB
shield.ico	6 hours ago	27.2 kB

Opening the Jupyter notebook example should load the following on the browser.


jupyter TFLXTLS_GCP_connect
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
Python 3
Run
Code

Introduction

MUST READ: This Notebook tutorial will allow you to register a TFLXTLS manifest file into Google Cloud Platform (GCP) account to enable device connectivity. To run this Notebook successfuly, its required to have GCP credentials updated in this Notebook, Manifest file and Manifest file Signer are generated, and Manifest file is Signed by Manifest signer. The Manifest file related steps will be taken care by TFLXTLS Manifest File Generation Notebook.

Before running this Notebook

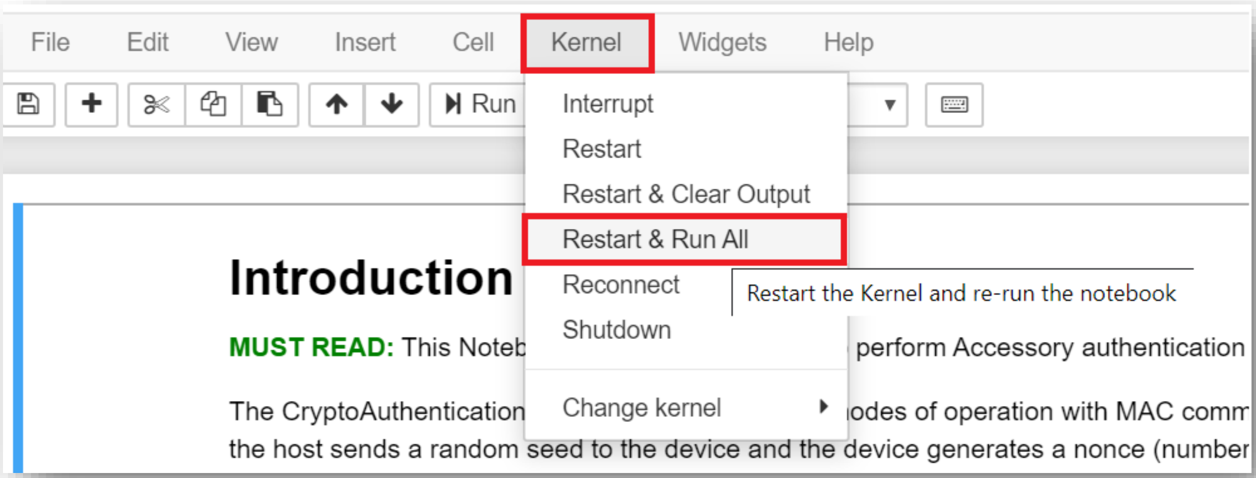
1. Have GCP account credentials located in docs folder as GCP_test_account_credentials.csv
2. Have manifest and dataview credentials located in Docs folder as iot-manifest.json and data-view.json
3. Run TFLXTLS Manifest File Generation Notebook to ensure Manifest file generated and signed

Prerequisites:

This step of the tutorial will attempt to load all the necessary modules and their dependencies on your machine. If the modules are already installed you can safely step over the next Tutorial step.

```
In [ ]: !python -m pip install -r ../../../assets/requirements.txt
```

2. Run All Cells by using Kernel -> Restart & Run All

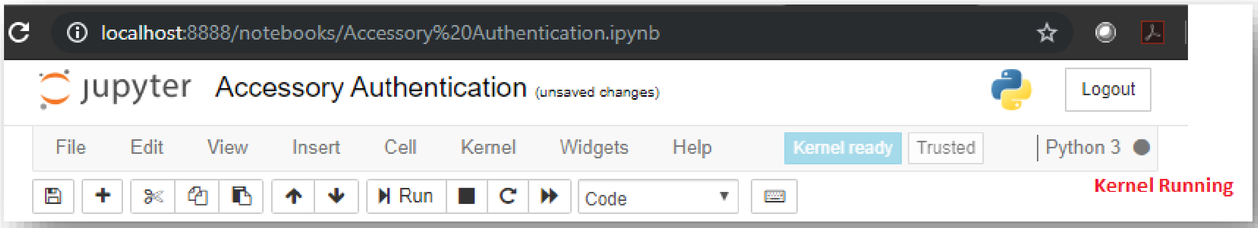

File Edit View Insert Cell Kernel Widgets Help
Run
Interrupt
Restart
Restart & Clear Output
Restart & Run All
Reconnect
Shutdown
Change kernel
Restart the Kernel and re-run the notebook

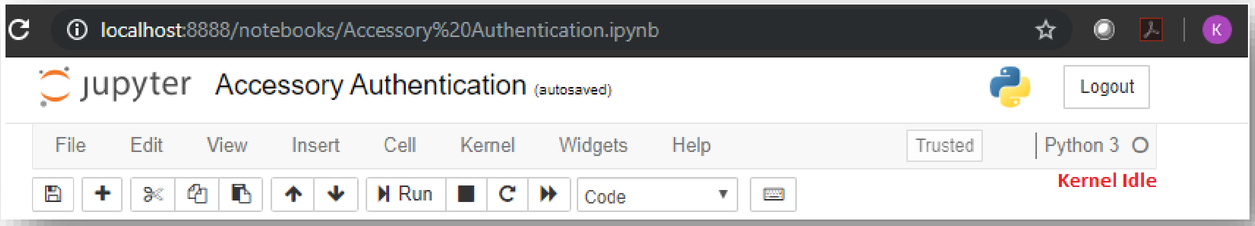
Introduction

MUST READ: This Noteb perform Accessory authentication

The CryptoAuthentication odes of operation with MAC comm the host sends a random seed to the device and the device generates a nonce (number

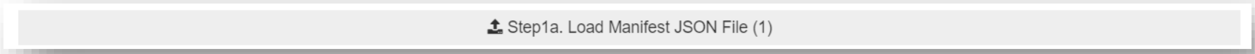
It may take a while to complete, wait for the kernel to complete all processing i.e. from Kernel Running to Kernel Idle state (Check circle above **RED** text)


localhost:8888/notebooks/Accessory%20Authentication.ipynb
jupyter Accessory Authentication (unsaved changes)
Logout
File Edit View Insert Cell Kernel Widgets Help
Kernel ready
Trusted
Python 3
Run
Code
Kernel Running

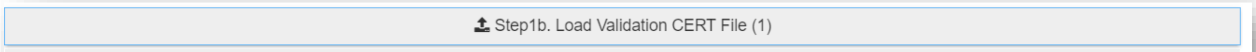

localhost:8888/notebooks/Accessory%20Authentication.ipynb
jupyter Accessory Authentication (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
Python 3
Run
Code
Kernel Idle

3. Navigate through different cells output for the description of the step and result from the execution.

4. There are 3 major steps:
   Load Manifest File:
   Under the section **Upload Manifest File**, click the button '**Load Manifest JSON File**' and select the
   manifest file generated from the TrustFlex Resource generation notebook.



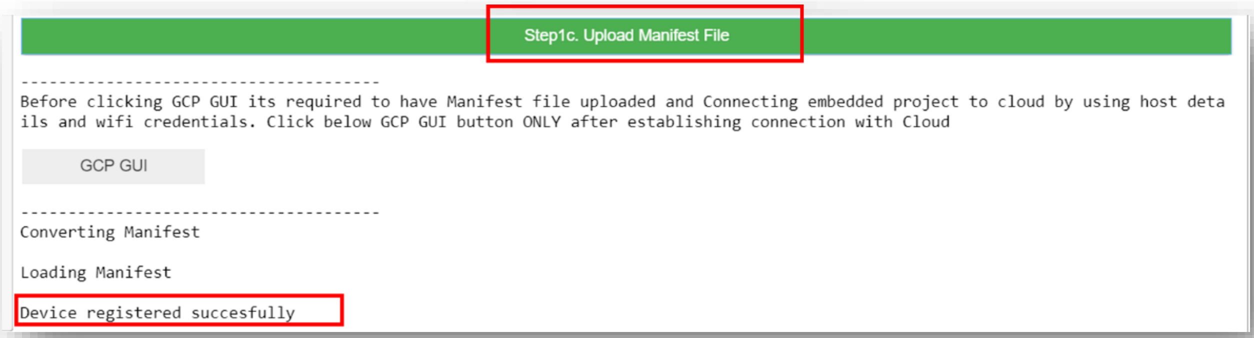
   Load validation certificate:
   click the button '**Load Validation CERT File**' and
   select the validation certificate which signed the manifest file and it should be present in the following folder with name log_signer.crt
   For TrustFLEX – TrustFLEX\00_resource_generation\
   For Trust&GO - TrustnGO\00_resource_generation\



   Register device manifest file:
   Code block of this step generates "**Upload manifest File**" button. Clicking the button, it registers the device manifest file to the GCP account. Once the manifest

file is registered, the gcp cloud authorizes the Trust Platform device and it will be able to
communicate to them.

Upon successful execution, the log should look like this.


Step1c. Upload Manifest File

```
-------------------------------------
Before clicking GCP GUI its required to have Manifest file uploaded and Connecting embedded project to cloud by using host deta
ils and wifi credentials. Click below GCP GUI button ONLY after establishing connection with Cloud
```

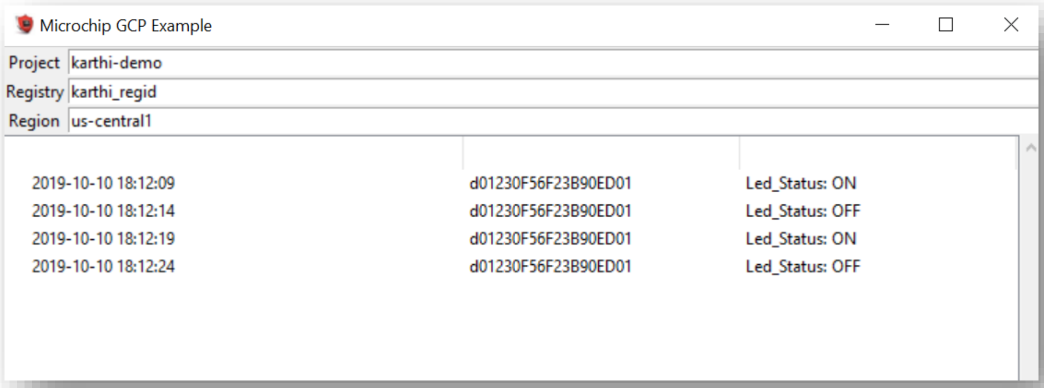
GCP GUI

```
-------------------------------------
Converting Manifest

Loading Manifest

Device registered succesfully
```

<u>WARNING:</u> It is required to execute C project successfully before executing the next step in the Jupyter notebook. To execute C project, refer "Running GCP IoT example on Embedded platform" next section.

<u>GCP GUI:</u>
Code block of this step generates "**GCP GUI**" button. Clicking the button, it will create a very basic graphical interface that will display the trust platform board LED status.

Below screenshot display the graphical interface


Microchip GCP Example

Project karthi-demo
Registry karthi_regid
Region us-central1

```
2019-10-10 18:12:09        d01230F56F23B90ED01        Led_Status: ON
2019-10-10 18:12:14        d01230F56F23B90ED01        Led_Status: OFF
2019-10-10 18:12:19        d01230F56F23B90ED01        Led_Status: ON
2019-10-10 18:12:24        d01230F56F23B90ED01        Led_Status: OFF
```

This GUI displays the packets exchanged between CryptoAuth Trust Platform and GCP.

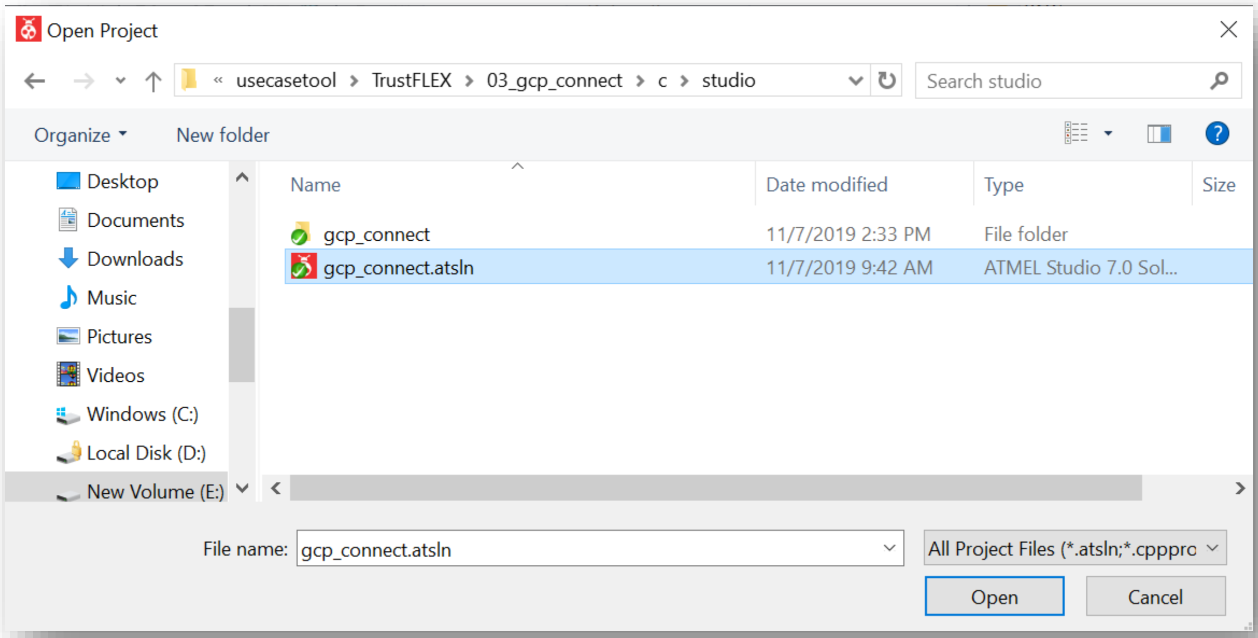
4.2 Running GCP example on Embedded platform

Once the resources are generated and manifest file uploaded to GCP account, both Atmel Studio and MPLAB projects provided can be used to run the use case on CryptoAuth Trust Platform.

This project establishes a TLS connection and subscribe to MQTT. It is required to use the GCP IoT Jupyter notebook to register the device through manifest file. Prior to executing the application, it is required to update Wifi credentials, GCP account details. Following steps provides the instructions for the same,

4.2.1 Atmel Studio:

1. Open **gcp_connect.atsln** project by navigating **TrustFLEX\03_gcp_connect\c\studio\gcp_connect.atsln**

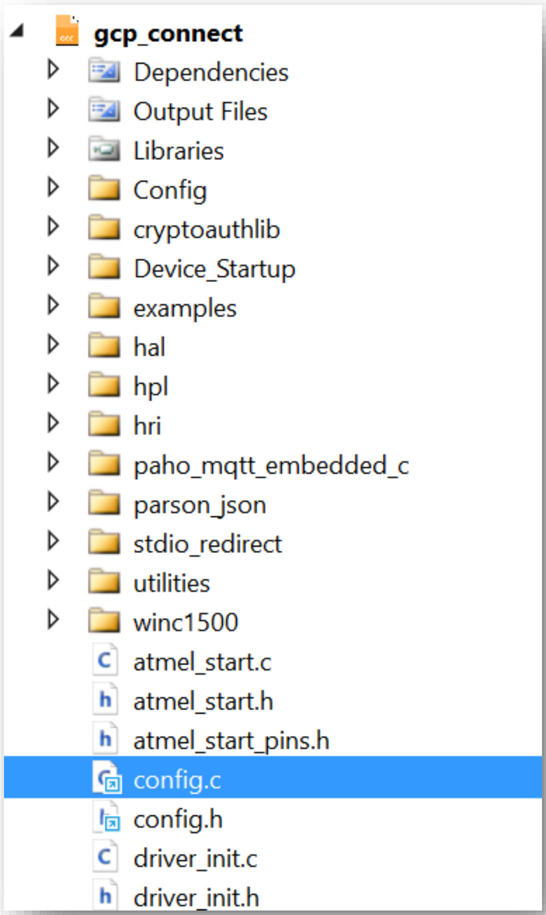


Name	Date modified	Type	Size
gcp_connect	11/7/2019 2:33 PM	File folder	
gcp_connect.atsln	11/7/2019 9:42 AM	ATMEL Studio 7.0 Sol...	

File name: gcp_connect.atsln

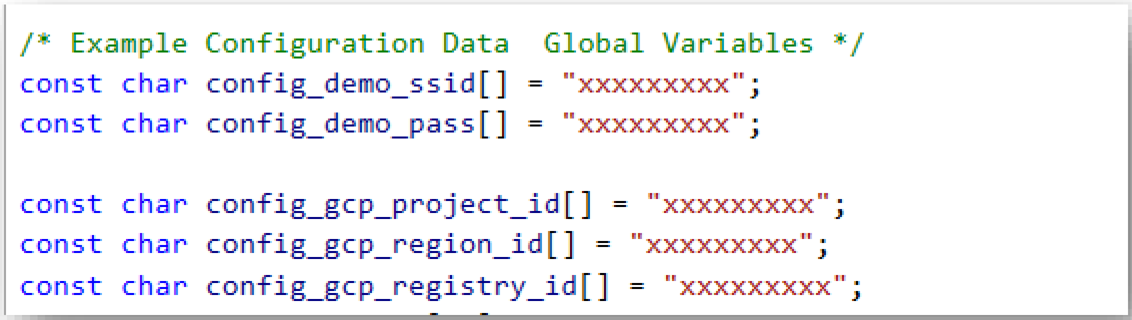
All Project Files (*.atsln;*.cpppro

2. In the project navigate to **gcp_connect -> config.c** file



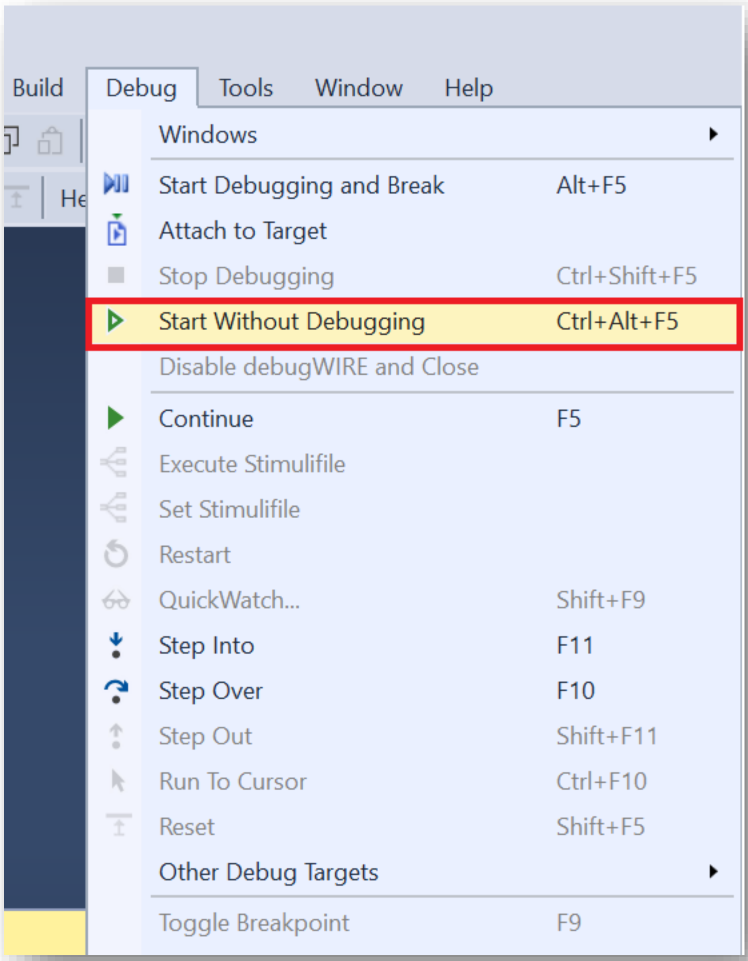
update the following constants before building the project:
The project id, region id and registry id should be same as in the gcp account setup.

- `config_demo_ssid`
- `config_demo_pass`
- `config_gcp_project_id`
- `config_gcp_region_id`
- `config_gcp_registry_id`



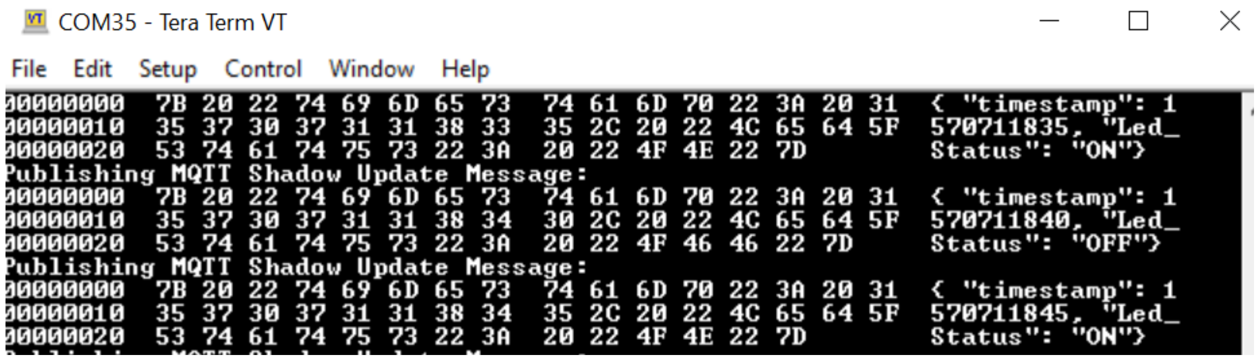
```
/* Example Configuration Data  Global Variables */
const char config_demo_ssid[] = "xxxxxxxxx";
const char config_demo_pass[] = "xxxxxxxxx";

const char config_gcp_project_id[] = "xxxxxxxxx";
const char config_gcp_region_id[] = "xxxxxxxxx";
const char config_gcp_registry_id[] = "xxxxxxxxx";
```

3. Program the CryptoAuth Trust Platform by navigating to **Debug -> Start Without Debugging**



This step may take some time, wait for Atmel Studio to compile and program the device.

Once the programming is done, reset the hardware (press the reset button) and view the Console messages by using applications like 'Tera Term'. Open the application with the COM related to CryptoAuth Trust Platform with 115200-8-N-1 settings.

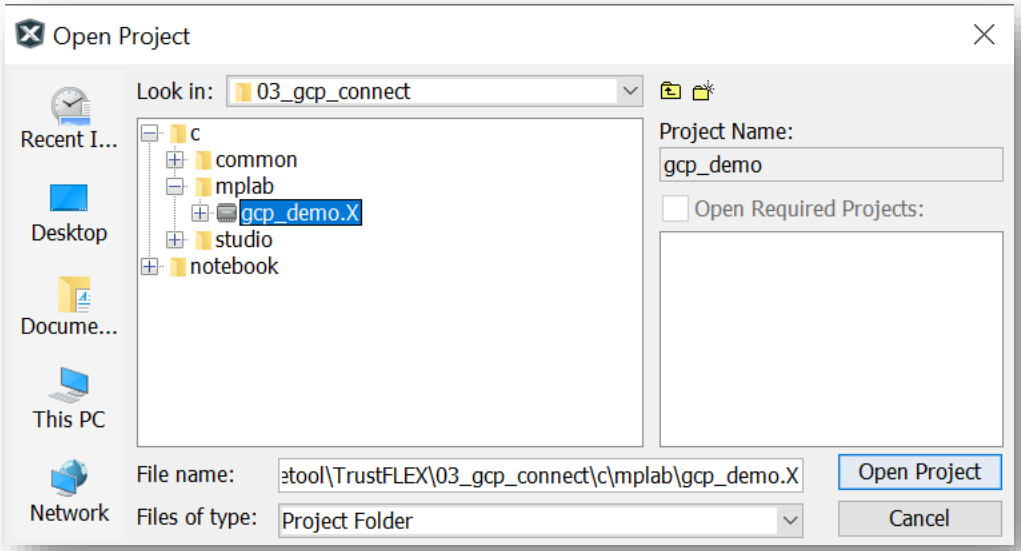


```
00000000  7B 20 22 74 69 6D 65 73  74 61 6D 70 22 3A 20 31  { "timestamp": 1
00000010  35 37 30 37 31 31 38 33  35 2C 20 22 4C 65 64 5F  570711835, "Led_
00000020  53 74 61 74 75 73 22 3A  20 22 4F 4E 22 7D        Status": "ON"}
Publishing MQTT Shadow Update Message:
00000000  7B 20 22 74 69 6D 65 73  74 61 6D 70 22 3A 20 31  { "timestamp": 1
00000010  35 37 30 37 31 31 38 34  30 2C 20 22 4C 65 64 5F  570711840, "Led_
00000020  53 74 61 74 75 73 22 3A  20 22 4F 46 46 22 7D     Status": "OFF"}
Publishing MQTT Shadow Update Message:
00000000  7B 20 22 74 69 6D 65 73  74 61 6D 70 22 3A 20 31  { "timestamp": 1
00000010  35 37 30 37 31 31 38 34  35 2C 20 22 4C 65 64 5F  570711845, "Led_
00000020  53 74 61 74 75 73 22 3A  20 22 4F 4E 22 7D        Status": "ON"}
```

Once successfully programmed the CryptoAuth Trust Platform, navigate to previous section 1.7 to run the last step (GCP GUI) in the Jupyter Notebook.

4.2.2 MPLAB:

1. Open **gcp_demo.X** project by navigating to MPLAB -> File -> Open Project -> **TrustFLEX\03_gcp_connect\c\mplab\gcp_demo.X**



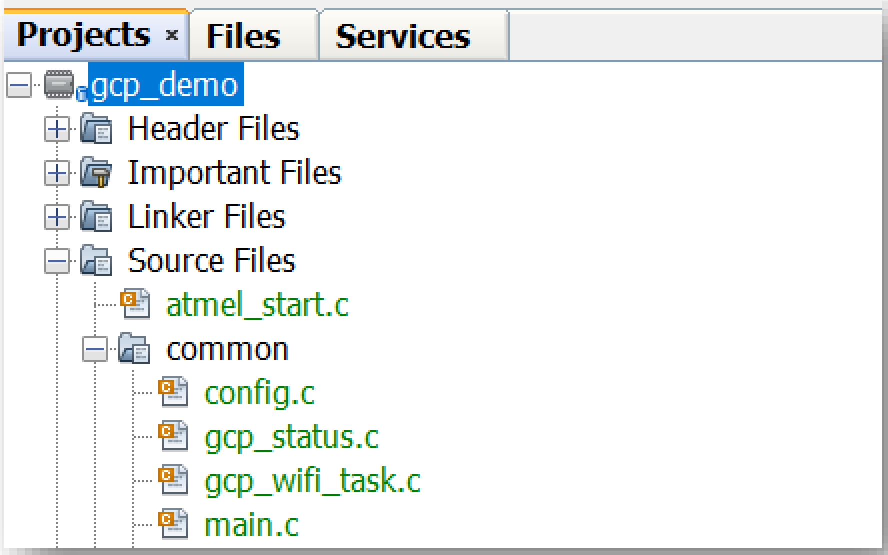
Project Name: gcp_demo

Open Required Projects:

File name: ,tool\TrustFLEX\03_gcp_connect\c\mplab\gcp_demo.X

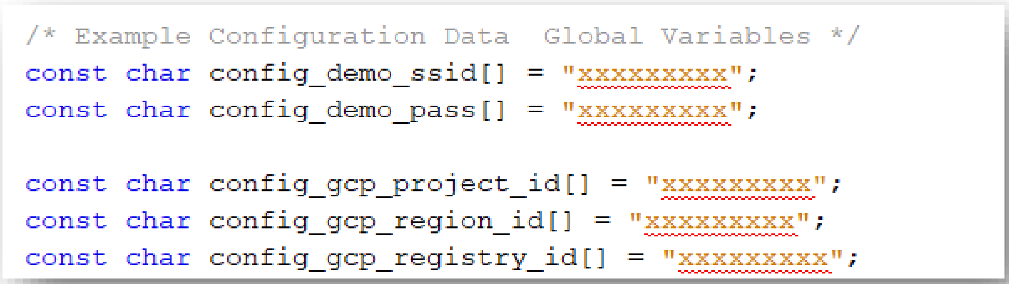
Files of type: Project Folder

2. Open **config.c file** by navigating to **gcp_demo-> Source Files ->common-> config.c**



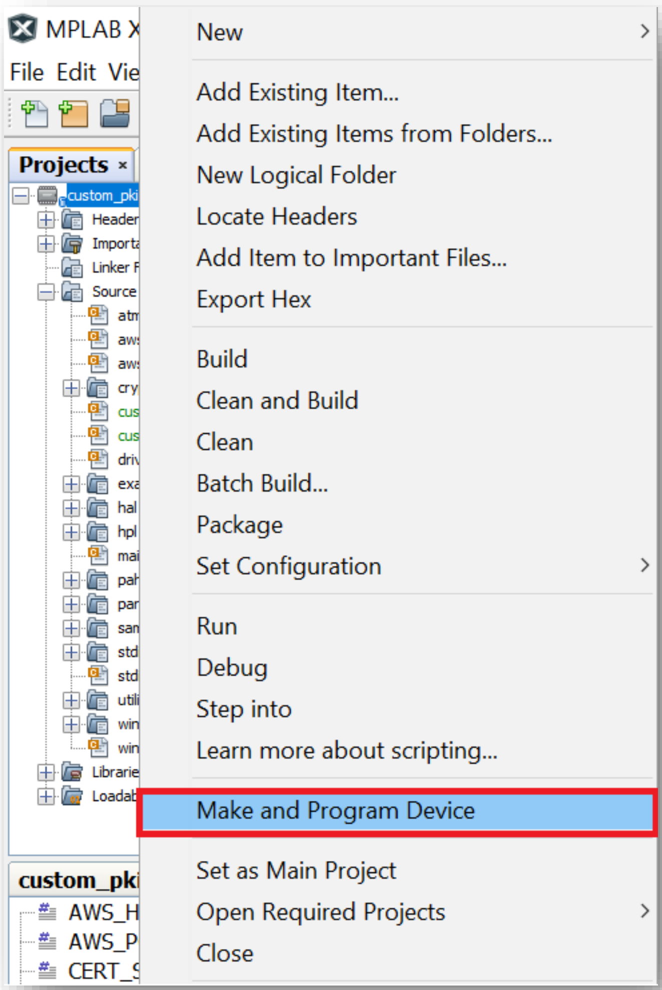
update the following constants before building the project:
The project id, region id and registry id should be same as in the gcp account setup.

- config_demo_ssid
- config_demo_pass
- config_gcp_project_id
- config_gcp_region_id
- config_gcp_registry_id

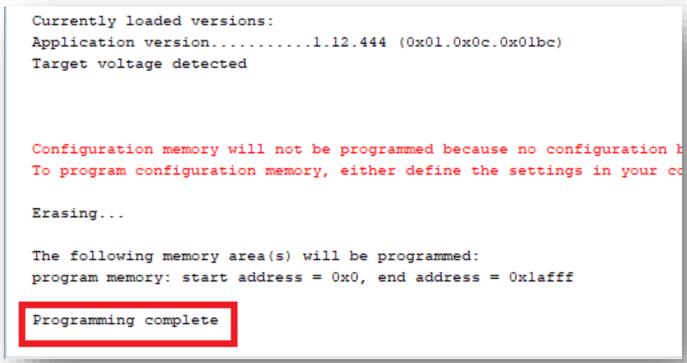


```
/* Example Configuration Data  Global Variables */
const char config_demo_ssid[] = "xxxxxxxxx";
const char config_demo_pass[] = "xxxxxxxxx";

const char config_gcp_project_id[] = "xxxxxxxxx";
const char config_gcp_region_id[] = "xxxxxxxxx";
const char config_gcp_registry_id[] = "xxxxxxxxx";
```

3. Program the CryptoAuth Trust platform by navigating to **gcp_connect -> Make and Program Device**

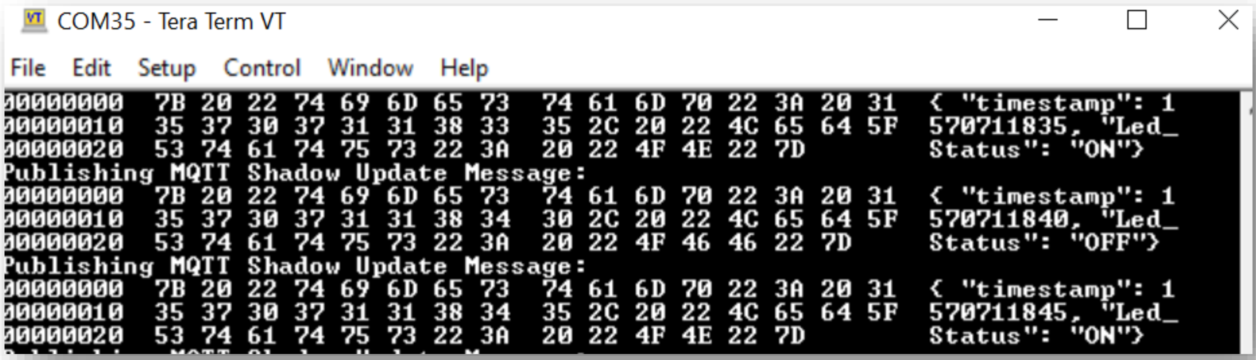


This step may take some time, wait for MPLAB to program the device. Once it is done programming you will see "**Programming complete**" message in Output Window.



```
Currently loaded versions:
Application version...........1.12.444 (0x01.0x0c.0x01bc)
Target voltage detected



Configuration memory will not be programmed because no configuration b
To program configuration memory, either define the settings in your co

Erasing...

The following memory area(s) will be programmed:
program memory: start address = 0x0, end address = 0x1afff

Programming complete
```

Once the programming is done, reset the hardware (press the reset button) and view the Console messages by using applications like 'Tera Term'. Open the application with the COM related to CryptoAuth Trust Platform with 115200-8-N-1 settings.



```
00000000  7B 20 22 74 69 6D 65 73  74 61 6D 70 22 3A 20 31  { "timestamp": 1
00000010  35 37 30 37 31 31 38 33  35 2C 20 22 4C 65 64 5F  570711835, "Led_
00000020  53 74 61 74 75 73 22 3A  20 22 4F 4E 22 7D        Status": "ON"}
Publishing MQTT Shadow Update Message:
00000000  7B 20 22 74 69 6D 65 73  74 61 6D 70 22 3A 20 31  { "timestamp": 1
00000010  35 37 30 37 31 31 38 34  30 2C 20 22 4C 65 64 5F  570711840, "Led_
00000020  53 74 61 74 75 73 22 3A  20 22 4F 46 46 22 7D     Status": "OFF"}
Publishing MQTT Shadow Update Message:
00000000  7B 20 22 74 69 6D 65 73  74 61 6D 70 22 3A 20 31  { "timestamp": 1
00000010  35 37 30 37 31 31 38 34  35 2C 20 22 4C 65 64 5F  570711845, "Led_
00000020  53 74 61 74 75 73 22 3A  20 22 4F 4E 22 7D        Status": "ON"}
```

Once successfully programmed the CryptoAuth Trust Platform, navigate to previous section 1.7 to run the last step (GCP GUI) in the Jupyter Notebook.

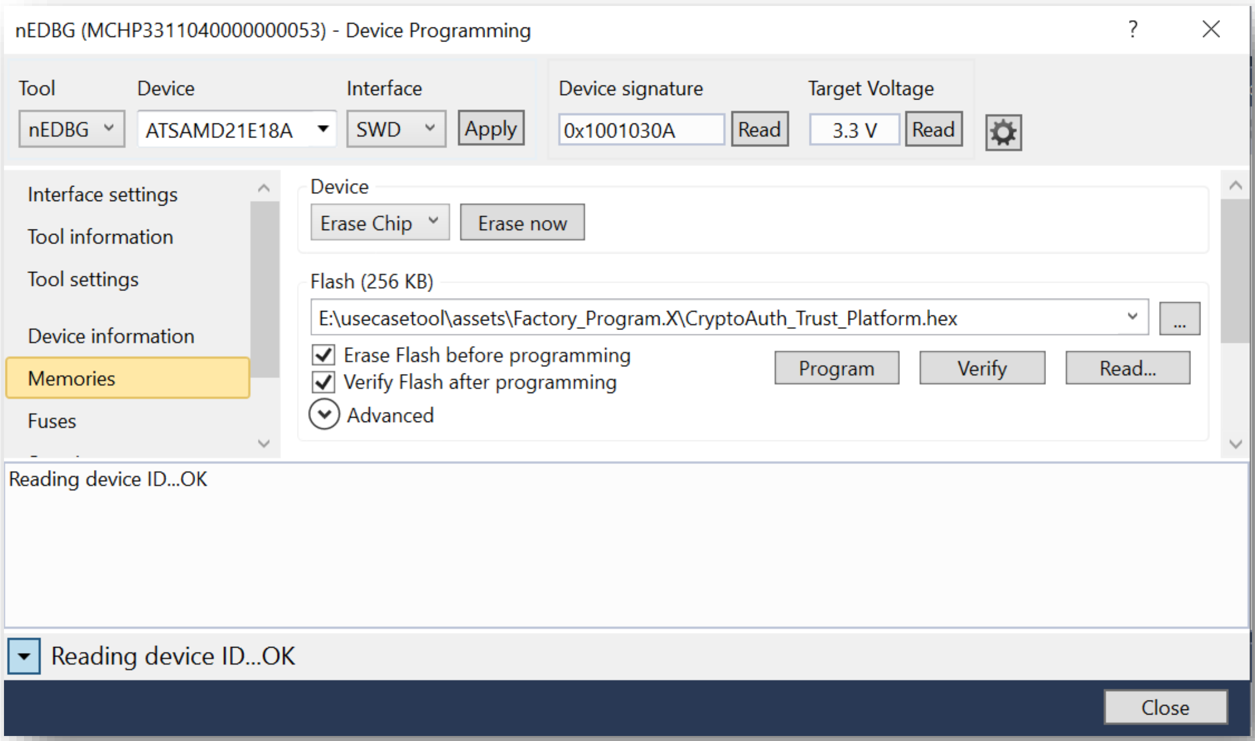
4.3 CryptoAuth Trust Platform Factory reset

If any embedded project is loaded to CryptoAuth Trust Platform, the default program that enables interaction with CryptoAuth Trust Platform tools will be erased.

Before using the CryptoAuth Trust Platform with any other notebook or tools on PC, its required to reprogram the default firmware. Default hex file is available at **assets\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



nEDBG (MCHP3311040000000053) - Device Programming

Tool: nEDBG | Device: ATSAMD21E18A | Interface: SWD | Device signature: 0x1001030A | Target Voltage: 3.3 V

Flash (256 KB)

E:\usecasetool\assets\Factory_Program.X\CryptoAuth_Trust_Platform.hex

- [x] Erase Flash before programming
- [x] Verify Flash after programming

Advanced

```
Reading device ID...OK
```

Reading device ID...OK

To reprogram using MPLAB:

1. Open **assets\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, CryptoAuth Trust Platform contains factory application that enables interactions with Notebooks and/or PC tools.

5 FAQ

1. **What are the reasons for "AssertionError: Can't connect to the USB dongle" error?**
   There are many possibilities like,
    1. Crypto Trust Platform is having different application than factory reset firmware. Refer to "CryptoAuth TrustPlatform Factory reset" section any usecase TrustFLEX Guide for reloading it
    2. Check the switch positions on Crypto Trust Platform and/or ATECC608A Trust board
        a. Correct Trust device should be connected and only one device of that type is allowed on the I2C bus. Multiple devices with same address results in error
    3. Check USB connections to Crypto Trust Platform

2. **How to reload factory default application to Crypto Trust Platform?**
   Refer to "CryptoAuth TrustPlatform Factory reset" section any usecase TrustFLEX Guide for reloading it.

3. **Why does my C projects generates No such file or directory with ../../../ TFLXTLS_resource_generation/?**
   C project generates this error when the resources are not generated prior to using embedded projects. Running the resource generation notebook ensures these files and secrets are generated.

4. **Before running any use case notebook and/or C project, why is it mandate to execute resource generation?**
   When resource generation notebook is executed, it generates and programs the required resources like secrets, keys and certificates. These are only prototyping keys and cannot be used for production. These keys will be used part of Usecase notebooks and C projects

5. **How to know the resources being used in a use case?**
   Refer to individual Usecase description html for details on transaction diagrams, resources being used and other details. The resources required for given use case is mentioned in INFER CRYPTOGRAPHIC ASSETS section.

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- Technical Support

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Fax: 49-89-627-144-44

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Fax: 44-118-921-5820