Trust&GO Step by Step Guide Google Cloud Platform Connect

Table of Contents

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.

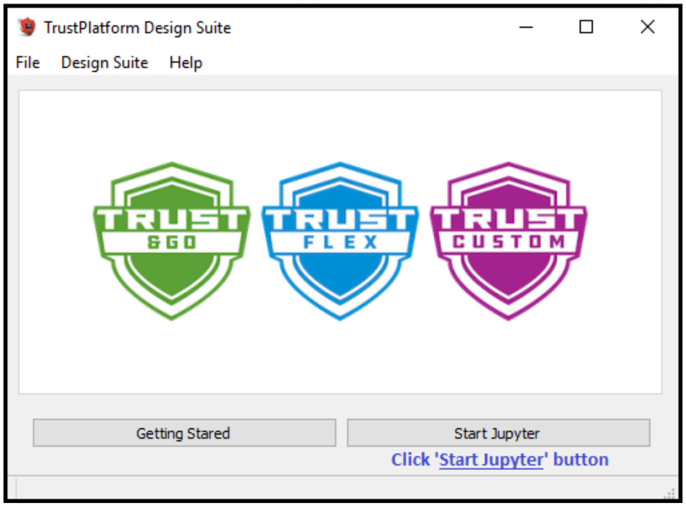
1.1 Getting started with Jupyter Notebook Tutorials

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.

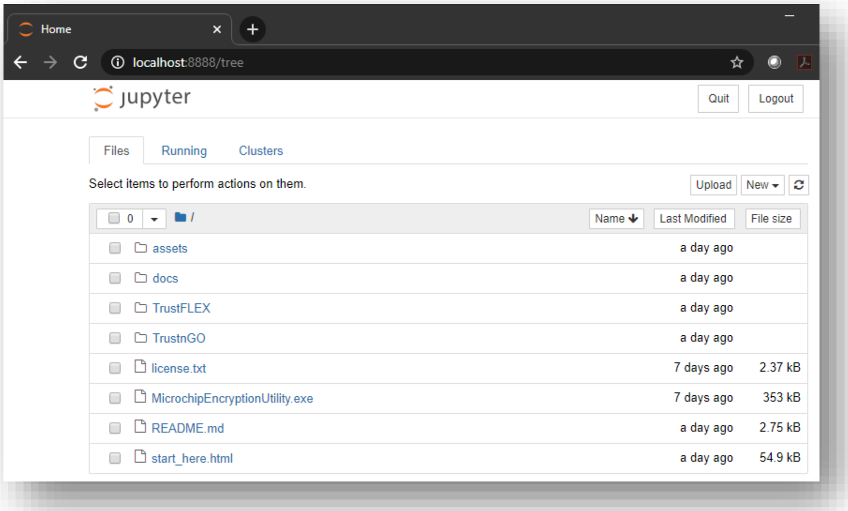
1.1.1 Starting Jupyter Notebook

Jupyter notebook can be launched from Trust Platform GUI Main window. Run START -> Trust Platform x.x.x icon. Click on 'Start Jupyter' button to launch Jupyter local server.



Click 'Start Jupyter' button

Clicking on Start Jupyter should be web browser tab like below,



Select items to perform actions on them.

Name	Last Modified	File size
assets	a day ago	
docs	a day ago	
TrustFLEX	a day ago	
TrustnGO	a day ago	
license.txt	7 days ago	2.37 kB
MicrochipEncryptionUtility.exe	7 days ago	353 kB
README.md	a day ago	2.75 kB
start_here.html	a day ago	54.9 kB

1.2 Jupyter Notebook Basics

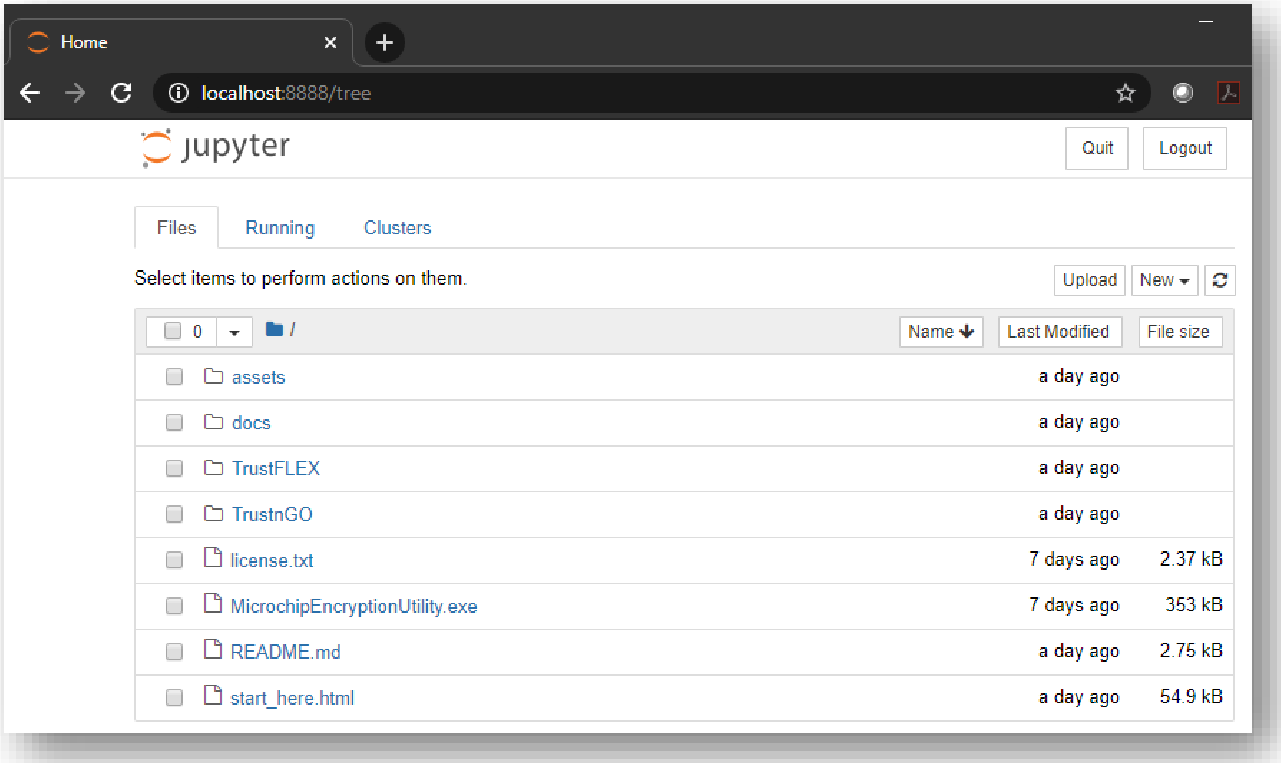
It is recommended to become familiar with Jupyter basic concepts with the online documentation, https://jupyter-notebook.readthedocs.io/en/stable/examples/Notebook/Notebook%20Basics.html

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.

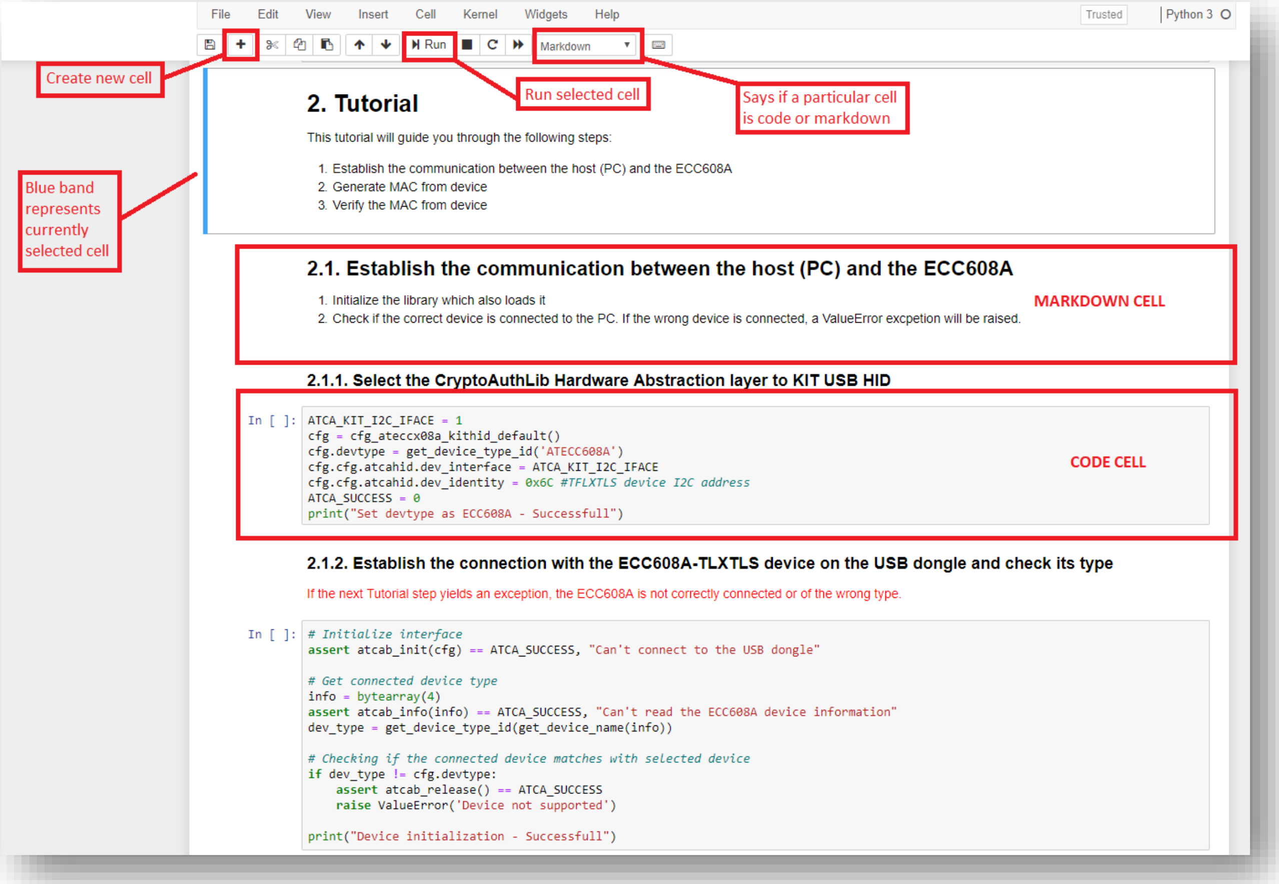
Name	Last Modified	File size
assets	a day ago	
docs	a day ago	
TrustFLEX	a day ago	
TrustnGO	a day ago	
license.txt	7 days ago	2.37 kB
MicrochipEncryptionUtility.exe	7 days ago	353 kB
README.md	a day ago	2.75 kB
start_here.html	a day ago	54.9 kB

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**.



Create new cell

Run selected cell

Says if a particular cell is code or markdown

Blue band represents currently selected cell

MARKDOWN CELL

CODE CELL

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

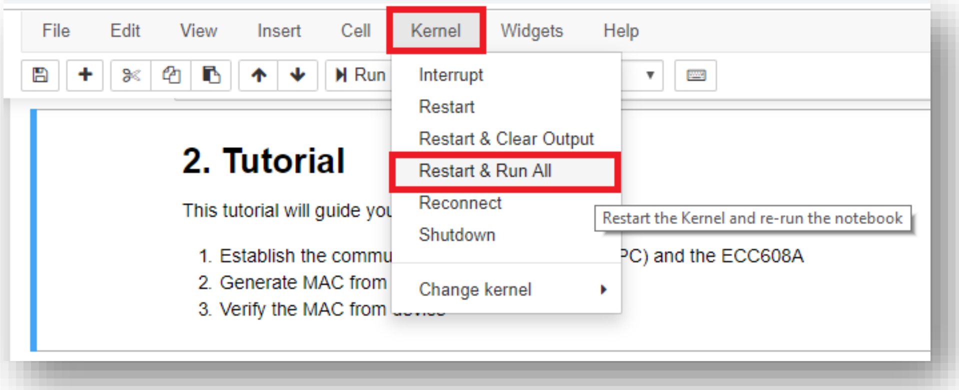
```
ATCA_KIT_I2C_IFACE = 1
cfg = cfg_ateccx08a_kithid_default()
cfg.devtype = get_device_type_id('ATECC608A')
cfg.cfg.atcahid.dev_interface = ATCA_KIT_I2C_IFACE
cfg.cfg.atcahid.dev_identity = 0x6C #TFLXTLS device I2C address
ATCA_SUCCESS = 0
print("Set devtype as ECC608A - Successfull")
```

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.

```
# 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 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	Trust&GO
GCP Connect	TrustnGO\05_cloud_connect\notebook\gcp\TNGTLS_GCP_connect.ipynb	Trust&GO
AWS Connect	TrustnGO\05_cloud_connect\notebook\aws\TNGTLS_aws_connect.ipynb	Trust&GO
Azure Connect	TrustnGO\05_cloud_connect\notebook\azure\ TNGTLS_azure_connect.ipynb	Trust&GO
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
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
Asymmetric authentication	08_asymmetric_authentication\notebook\ TFLXTLS_asymmetric_authentication.ipynb	TrustFLEX
GCP Connect	TrustFLEX\10_cloud_connect\notebook\gcp\TFLXTLS_GCP_connect.ipynb	TrustFLEX
AWS Custom PKI	TrustFLEX\10_cloud_connect\notebook\aws\ TFLXTLS_aws_connect.ipynb	TrustFLEX
Azure Connect	TrustFLEX\10_cloud_connect\notebook\azure\ 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 Use cases.

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

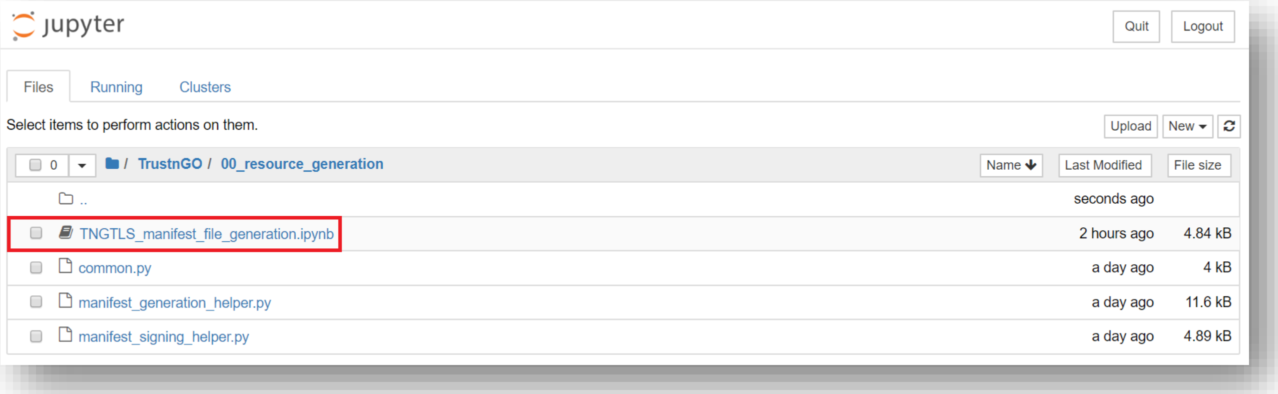
3.1 Trust&GO – Manifest file generation

Trust&GO device is one of the three devices available in the Crypto Auth Trust Platform 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.

Within the Jupyter Dashboard, navigate **TrustnGO\00_resource_generation** folder to open **TNGTLS_manifest_file_generation.ipynb**

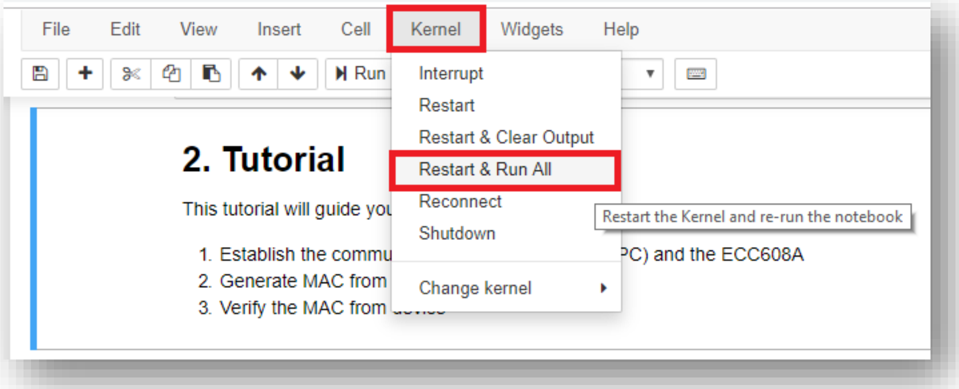


Select items to perform actions on them.

/ TrustnGO / 00_resource_generation

Name	Last Modified	File size
..	seconds ago	
TNGTLS_manifest_file_generation.ipynb	2 hours ago	4.84 kB
common.py	a day ago	4 kB
manifest_generation_helper.py	a day ago	11.6 kB
manifest_signing_helper.py	a day ago	4.89 kB

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



2. Tutorial

This tutorial will guide you

1. Establish the commu ... PC) and the ECC608A
2. Generate MAC from
3. Verify the MAC from

If all the steps ran without errors, you will see result as shown below.

```
Root Certificate loading from Device...OK
-----BEGIN CERTIFICATE-----
MIIB8TCCAZegAwIBAgIQd9NtlW7IrmIF5Y46y5hagTAKBggqhkjOPQQDAjBPMSEw
HwYDVQQKDBhNaWNyb2NoaXAgVGVjaG5vbG9neSBJbmMxKjAoBgNVBAMMIUNyeXB0
byBBdXRoZW50aWNhdGlvbiBSb290IENBIDAwMjAgFw0xODExMDgxOTEyMTlaGA8y
MDU4MTEwODE5MTIxOVowTzEhMB8GA1UECgwYTWljcm9jaGlwIFRlY2hub2xvZ3kg
SW5jMSowKAYDVQQDDCFDcnlwdG8gQXV0aGVudGljYXRpb24gUm9vdCBDQSAwMDIw
WTATBgcqhkjOPQIBBggqhkjOPQMBBwNCAAS9VOZt44dUhABrU64VgNUKoGnnit9V
eNhc4tVN1bgwKWv/3W5vclb72Z7xoRaxHTOtSRA6oYWHOdz65DfhnWNOo1MwUTAd
BgNVHQ4EFgQUeu19bca3eJ2yOAGl6EqMsKQOKowwHwYDVR0jBBgwFoAUeu19bca3
eJ2yOAGl6EqMsKQOKowwDwYDVR0TAQH/BAUwAwEB/zAKBggqhkjOPQQDAgNIADBF
AiEAodxjRZDsgZ7h3luBEmVRrdTCxPjllSgu4EvnaOx8AnMCID5rp06eTArWjCSw
+y7nk9LmvpRlyhXQ6lvIf1V5mVyt
-----END CERTIFICATE-----

Certificate:
    Data:
        Version: 3 (0x2)
        Serial Number:
            77:d3:6d:95:6e:c8:ae:62:05:e5:8e:3a:cb:98:5a:81
        Signature Algorithm: ecdsa-with-SHA256
        Issuer: O=Microchip Technology Inc, CN=Crypto Authentication Root CA 002
        Validity
            Not Before: Nov  8 19:12:19 2018 GMT
            Not After : Nov  8 19:12:19 2058 GMT
        Subject: O=Microchip Technology Inc, CN=Crypto Authentication Root CA 002
        Subject Public Key Info:
            Public Key Algorithm: id-ecPublicKey
                Public-Key: (256 bit)
                pub:
                    04:bd:54:e6:6d:e3:87:54:84:00:6b:53:ae:15:80:
                    d5:0a:a0:69:e7:8a:df:55:78:d8:5c:e2:d5:4d:d5:
                    b8:30:29:6b:ff:dd:6e:6f:72:56:fb:d9:9e:f1:a1:
                    16:b1:1d:33:ad:49:10:3a:a1:85:87:39:dc:fa:e4:
                    37:e1:9d:63:4e
                ASN1 OID: prime256v1
                NIST CURVE: P-256
        X509v3 extensions:
            X509v3 Subject Key Identifier:
                7A:ED:7D:6D:C6:B7:78:9D:B2:38:01:A5:E8:4A:8C:B0:A4:0E:2A:8C
            X509v3 Authority Key Identifier:
                keyid:7A:ED:7D:6D:C6:B7:78:9D:B2:38:01:A5:E8:4A:8C:B0:A4:0E:2A:8C

            X509v3 Basic Constraints: critical
                CA:TRUE
    Signature Algorithm: ecdsa-with-SHA256
         30:45:02:21:00:a1:dc:63:45:90:ec:81:9e:e1:de:5b:81:12:
         65:51:ad:d4:c2:c4:f8:e5:95:28:2e:e0:4b:e7:68:ec:7c:02:
         73:02:20:3e:6b:a7:4e:9e:4c:0a:d6:8c:24:b0:fb:2e:e7:93:
         d2:e6:be:94:65:ca:15:d0:ea:5b:c8:7f:55:79:99:5c:ad


Validate Root Certificate...OK
------------------------------------------------------
Signer Certificate loading from Device...OK
-----BEGIN CERTIFICATE-----
MIICBTCCAaqgAwIBAgIQfDEW4DQGWyXgU7+wniYaZjAKBggqhkjOPQQDAjBPMSEw
HwYDVQQKDBhNaWNyb2NoaXAgVGVjaG5vbG9neSBJbmMxKjAoBgNVBAMMIUNyeXB0
byBBdXRoZW50aWNhdGlvbiBSb290IENBIDAwMjAgFw0xODEyMTQxOTAwMDBaGA8y
MDQ5MTIxNDE5MDAwMFowTzEhMB8GA1UECgwYTWljcm9jaGlwIFRlY2hub2xvZ3kg
SW5jMSowKAYDVQQDDCFDcnlwdG8gQXV0aGVudGljYXRpb24gU2lnbmVyIEY2NDAw
WTATBgcqhkjOPQIBBggqhkjOPQMBBwNCAAQOfzKV8utGQPSqOUzl5SDX2bULuVT1
w/i7bz8sGFpNuZCRvK9J6gb8S8xcKifI0AIrGpvwG/RG3ZrFYjBMejh2o2YwZDAO
BgNVHQ8BAf8EBAMCAYYwEgYDVR0TAQH/BAgwBgEB/wIBADAdBgNVHQ4EFgQU62ID
K4yBWBZCmhyr8b6MIh63pskwHwYDVR0jBBgwFoAUeu19bca3eJ2yOAGl6EqMsKQO
KowwCgYIKoZIzj0EAwIDSQAwRgIhAOB47QYnFfAxMvDvMZcipUni4YYoc7Xyt18o
PuN9E268AiEA32h2vgUirn/pFYSC+ghFjdqc8wgXL9ZgdPwRkHowR3s=
-----END CERTIFICATE-----

Certificate:
    Data:
        Version: 3 (0x2)
        Serial Number:
            7c:31:16:e0:34:06:5b:25:e0:53:bf:b0:9e:26:1a:66
        Signature Algorithm: ecdsa-with-SHA256
        Issuer: O=Microchip Technology Inc, CN=Crypto Authentication Root CA 002
        Validity
            Not Before: Dec 14 19:00:00 2018 GMT
            Not After : Dec 14 19:00:00 2049 GMT
        Subject: O=Microchip Technology Inc, CN=Crypto Authentication Signer F640
        Subject Public Key Info:
            Public Key Algorithm: id-ecPublicKey
                Public-Key: (256 bit)
                pub:
                    04:0e:7f:32:95:f2:eb:46:40:f4:aa:39:4c:e5:e5:
                    20:d7:d9:b5:0b:b9:54:f5:c3:f8:bb:6f:3f:2c:18:
                    5a:4d:b9:90:91:bc:af:49:ea:06:fc:4b:cc:5c:2a:
                    27:c8:d0:02:2b:1a:9b:f0:1b:f4:46:dd:9a:c5:62:
                    30:4c:7a:38:76
                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:
                EB:62:03:2B:8C:81:58:16:42:9A:1C:AB:F1:BE:8C:22:1E:B7:A6:C9
            X509v3 Authority Key Identifier:
                keyid:7A:ED:7D:6D:C6:B7:78:9D:B2:38:01:A5:E8:4A:8C:B0:A4:0E:2A:8C
    Signature Algorithm: ecdsa-with-SHA256
         30:46:02:21:00:e0:78:ed:06:27:15:f0:31:32:f0:ef:31:97:
         22:a5:49:e2:e1:86:28:73:b5:f2:b7:5f:28:3e:e3:7d:13:6e:
         bc:02:21:00:df:68:76:be:05:22:ae:7f:e9:15:84:82:fa:08:
         45:8d:da:9c:f3:08:17:2f:d6:60:74:fc:11:90:7a:30:47:7b


Validate Signer Certificate...OK
------------------------------------------------------
Device Certificate loading from Device...OK
-----BEGIN CERTIFICATE-----
MIIB9TCCAZugAwIBAgIQc0PaLGk8Q6DyF0sMb9xx7TAKBggqhkjOPQQDAjBPMSEw
HwYDVQQKDBhNaWNyb2NoaXAgVGVjaG5vbG9neSBJbmMxKjAoBgNVBAMMIUNyeXB0
byBBdXRoZW50aWNhdGlvbiBTaWduZXIgRjY0MDAgFw0xOTA3MzEyMzAwMDBaGA8y
MDQ3MDczMTIzMDAwMFowRjEhMB8GA1UECgwYTWljcm9jaGlwIFRlY2hub2xvZ3kg
SW5jMSEwHwYDVQQDDBgwMTIzOUE2REYyRUNFQ0RDMDEgQVRFQ0MwWTATBgcqhkjO
PQIBBggqhkjOPQMBBwNCAAQYjmZv6hNvOGfiXtqRPqKJr7hnh0Hf6AI68KjrRy8/
93zhXWIzlG2VexKLeER97Y6wU2fysMJ4rWQjUgQ54iX5o2AwXjAMBgNVHRMBAf8E
AjAAMA4GA1UdDwEB/wQEAwIDiDAdBgNVHQ4EFgQUnbEcKNb3ZxBz/s1zs0GfTC95
UfEwHwYDVR0jBBgwFoAU62IDK4yBWBZCmhyr8b6MIh63pskwCgYIKoZIzj0EAwID
SAAwRQIhAMG4O+JnJdJ+4qwg6HEyZu/sHkqSUqnbmW5jfSCsSQjSAiB3rimVHLb9
bIheMqsIbK2tXTjtLhCs5s15WvpNvKev1Q==
-----END CERTIFICATE-----

Certificate:
    Data:
        Version: 3 (0x2)
        Serial Number:
            73:43:da:2c:69:3c:43:a0:f2:17:4b:0c:6f:dc:71:ed
        Signature Algorithm: ecdsa-with-SHA256
        Issuer: O=Microchip Technology Inc, CN=Crypto Authentication Signer F640
        Validity
            Not Before: Jul 31 23:00:00 2019 GMT
            Not After : Jul 31 23:00:00 2047 GMT
        Subject: O=Microchip Technology Inc, CN=01239A6DF2ECECDC01 ATECC
        Subject Public Key Info:
            Public Key Algorithm: id-ecPublicKey
                Public-Key: (256 bit)
                pub:
                    04:18:8e:66:6f:ea:13:6f:38:67:e2:5e:da:91:3e:
                    a2:89:af:b8:67:87:41:df:e8:02:3a:f0:a8:eb:47:
                    2f:3f:f7:7c:e1:5d:62:33:94:6d:95:7b:12:8b:78:
                    44:7d:ed:8e:b0:53:67:f2:b0:c2:78:ad:64:23:52:
                    04:39:e2:25:f9
                ASN1 OID: prime256v1
                NIST CURVE: P-256
        X509v3 extensions:
            X509v3 Basic Constraints: critical
                CA:FALSE
            X509v3 Key Usage: critical
                Digital Signature, Key Agreement
            X509v3 Subject Key Identifier:
                9D:B1:1C:28:D6:F7:67:10:73:FE:CD:73:B3:41:9F:4C:2F:79:51:F1
            X509v3 Authority Key Identifier:
                keyid:EB:62:03:2B:8C:81:58:16:42:9A:1C:AB:F1:BE:8C:22:1E:B7:A6:C9

    Signature Algorithm: ecdsa-with-SHA256
         30:45:02:21:00:c1:b8:3b:e2:67:25:d2:7e:e2:ac:20:e8:71:
         32:66:ef:ec:1e:4a:92:52:a9:db:99:6e:63:7d:20:ac:49:08:
         d2:02:20:77:ae:29:95:1c:b6:fd:6c:88:5e:32:ab:08:6c:ad:
         ad:5d:38:ed:2e:10:ac:e6:cd:79:5a:fa:4d:bc:a7:af:d5
```

```
Validate Device Certificate...OK
------------------------------------------------------
--------------------------------------------
Generating manifest data...OK (saved to TNGTLS_devices_manifest.json)
--------------------------------------------
```

By default, TNGTLS_devices_manifest.json, manifest_ca.key and manifest_ca.crt files will be created. manifest_ca.crt to be used as cert to verify the content while providing manifest file.

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 Microsoft Azure). TNGTLS Manifest Generation notebook needs to be run for all Trust&Go example Notebooks that require a Manifest file.

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.

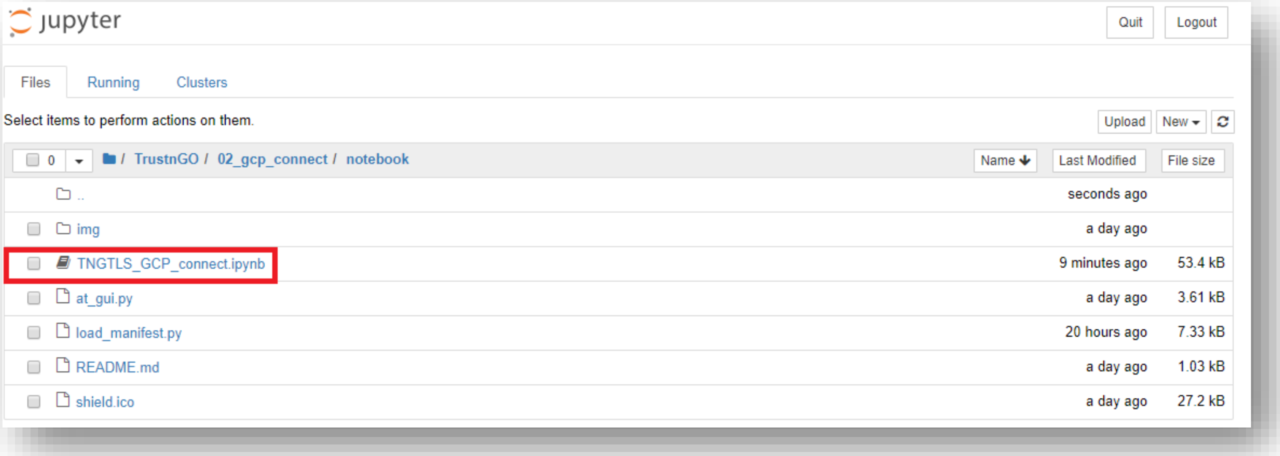
The reference implementation is provided with Embedded projects and Notebooks. The generation of manifest can be achieved through the execution of Jupyter Notebook Tutorials.

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_guide_GCP_demo_account_setup.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 **TrustnGO\05_cloud_connect\notebook\gcp\TNGTLS_GCP_connect.ipynb** notebook file and open it.

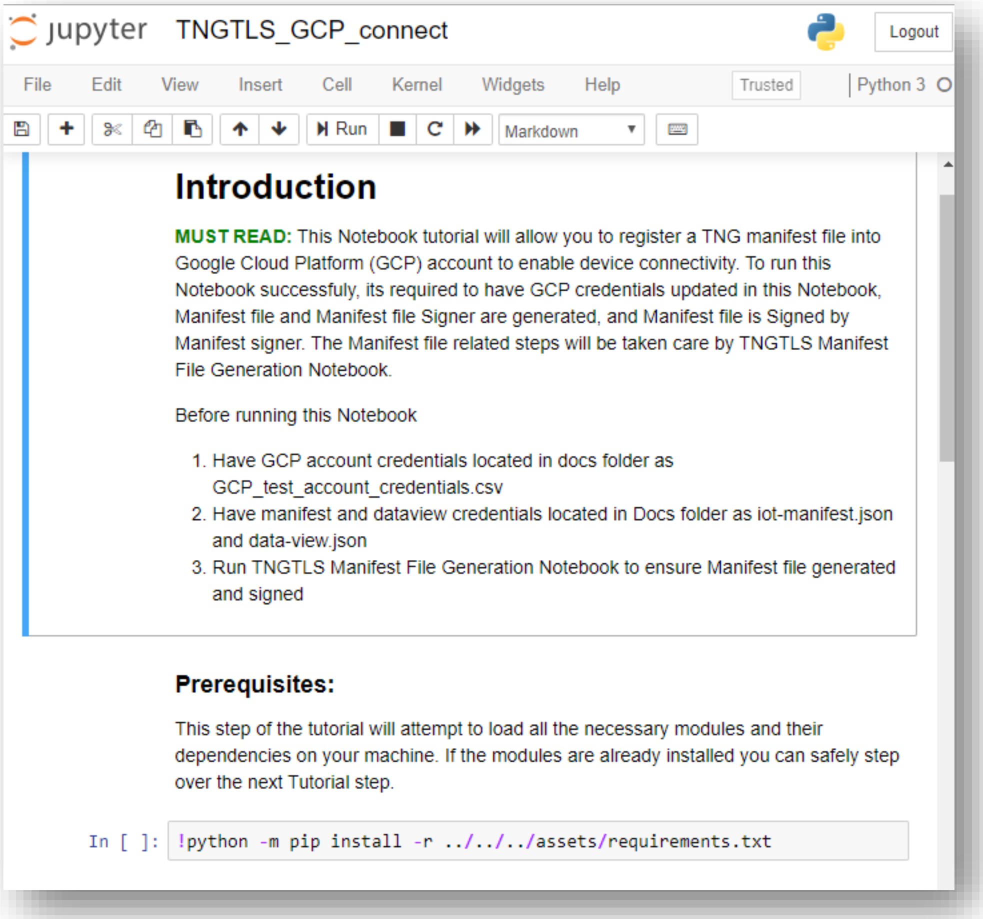


Select items to perform actions on them.

/ TrustnGO / 02_gcp_connect / notebook

Name	Last Modified	File size
..	seconds ago	
img	a day ago	
TNGTLS_GCP_connect.ipynb	9 minutes ago	53.4 kB
at_gui.py	a day ago	3.61 kB
load_manifest.py	20 hours ago	7.33 kB
README.md	a day ago	1.03 kB
shield.ico	a day ago	27.2 kB

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



Introduction

MUST READ: This Notebook tutorial will allow you to register a TNG 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 TNGTLS Manifest File Generation Notebook.

Before running this Notebook

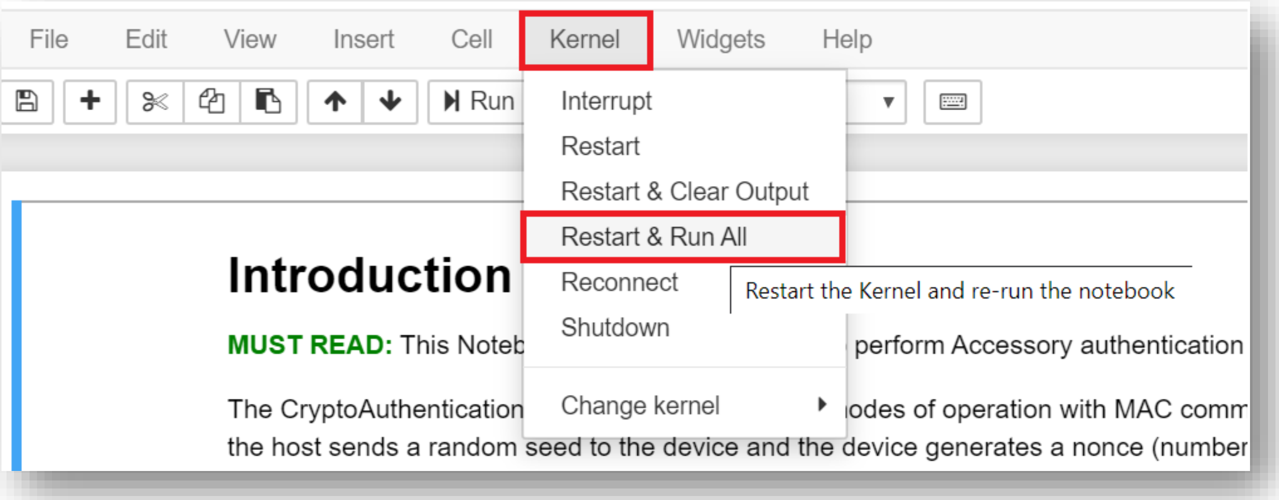
1. Have GCP account credentials located in docs folder as GCP_test_account_credentials.csv
2. Have manifest and dataview credentials located in Docs folder as iot-manifest.json and data-view.json
3. Run TNGTLS Manifest File Generation Notebook to ensure Manifest file generated and signed

Prerequisites:

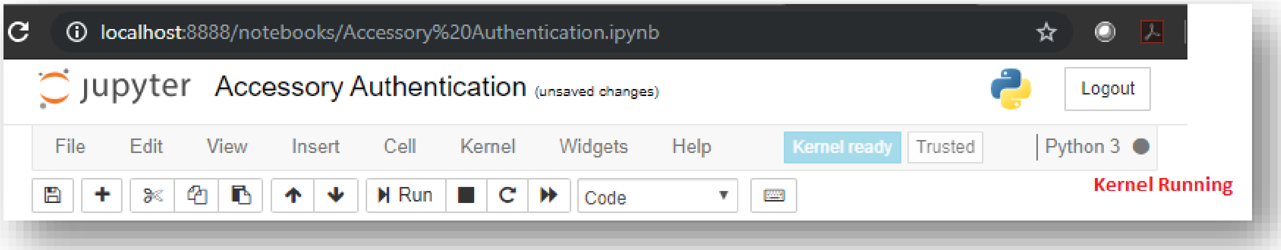
This step of the tutorial will attempt to load all the necessary modules and their dependencies on your machine. If the modules are already installed you can safely step over the next Tutorial step.

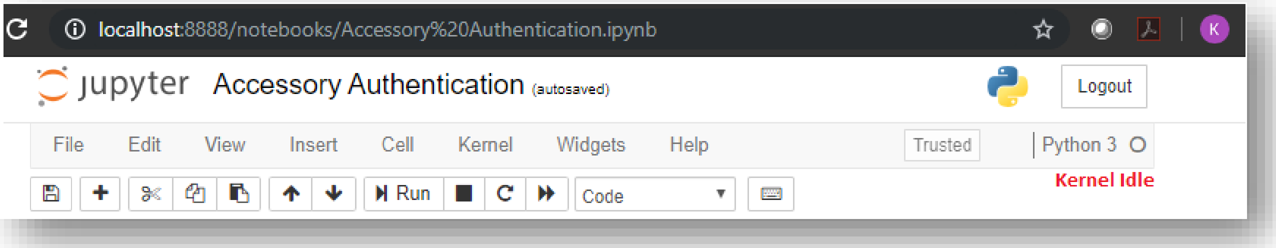
```
In [ ]: !python -m pip install -r ../../../assets/requirements.txt
```

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

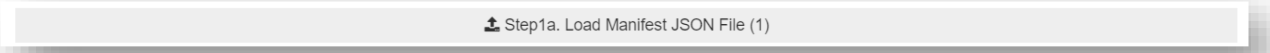
It may take a while to complete, wait for the kernel to complete all processing i.e. from Kernel Running to Kernel Idle state (Check circle above **RED** text)



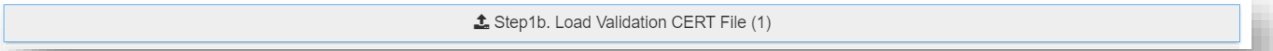

localhost:8888/notebooks/Accessory%20Authentication.ipynb
jupyter
Accessory Authentication (autosaved)
Logout
File
Edit
View
Insert
Cell
Kernel
Widgets
Help
Trusted
Python 3 ○
Run
Code
Kernel Idle

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

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

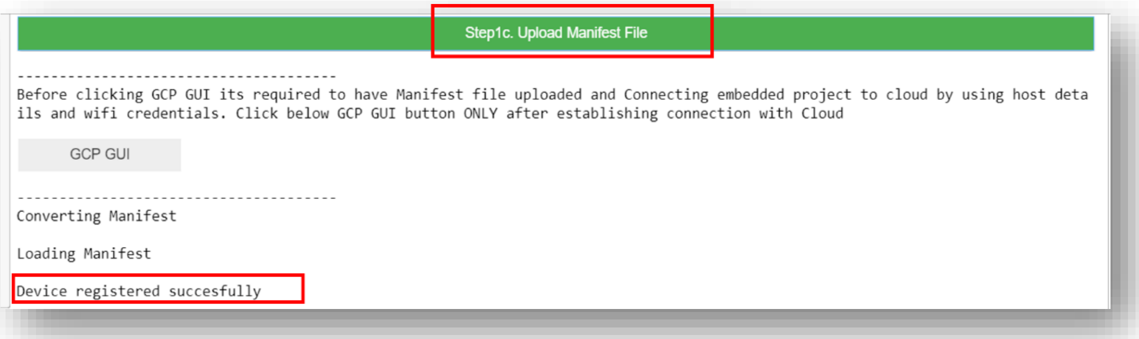


Load validation certificate:
click the button '**Load Validation CERT File**' and
select the validation certificate which signed the manifest file and it should be present in the following folder with name log_signer.crt
For Trust&GO - TrustnGO\00_resource_generation\



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.

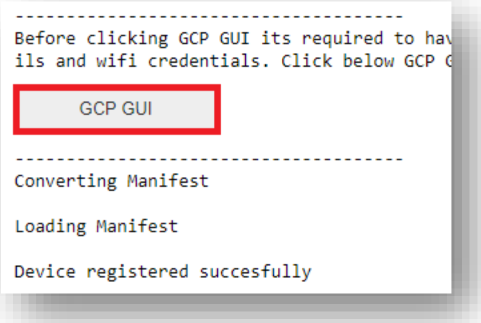
Upon successful execution, the log should look like this.



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

-------------------------------------
Converting Manifest

Loading Manifest

Device registered succesfully
```

WARNING: 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.

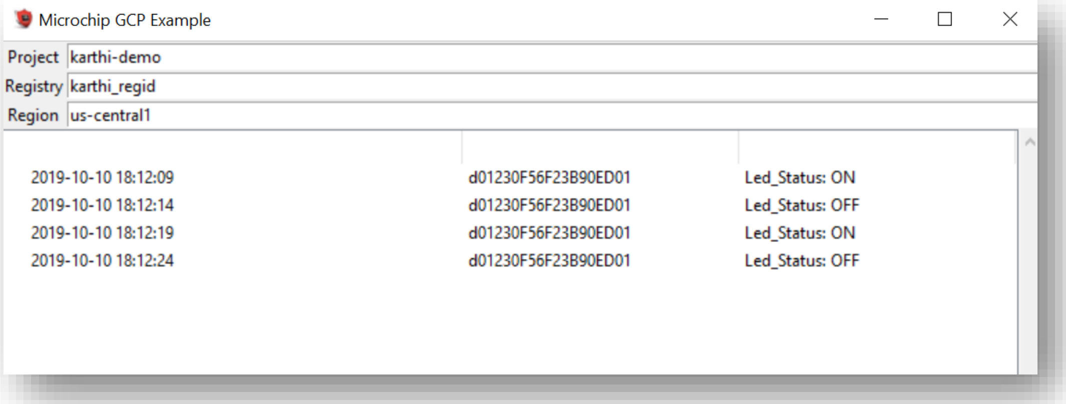
GCP GUI:
Code block of this step generates "**GCP GUI**" button. Clicking the button, it will create a very basic graphical interface that will display the trust platform board LED status.



```
-------------------------------------
Before clicking GCP GUI its required to hav
ils and wifi credentials. Click below GCP G
```

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

Loading Manifest

Device registered succesfully
```

Below screenshot display the graphical interface



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 Crypto Auth Trust Platform and GCP.

4.2 Running GCP example on Embedded platform

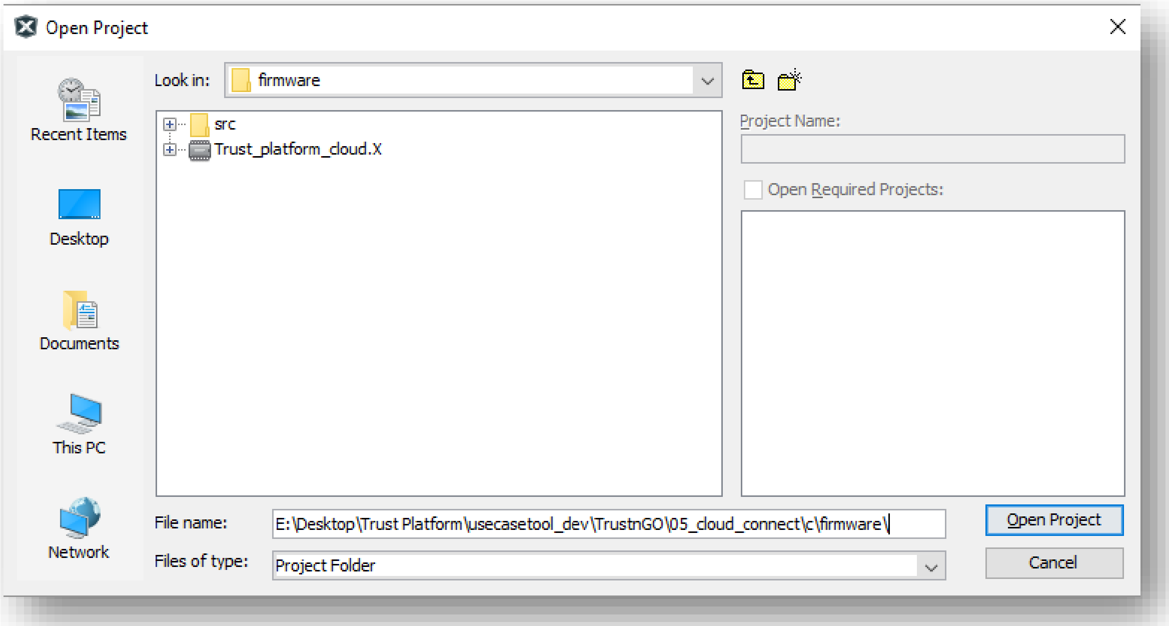
Once the resources are generated and manifest file uploaded to GCP account, MPLAB projects provided can be used to run the use case on Crypto Auth Trust Platform.

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,

Prerequisite: It is required that WINC firmware is updated to latest version / version that is available in this package. Update the WINC firmware using package available in cloned repository at **assets\winc_firmware_upgrade**

4.2.1 MPLAB:

1. Open **Trust_platform_cloud.X** project by navigating to MPLAB -> File -> Open Project -> **TrustnGO\05_cloud_connect\firmware**



Look in: firmware

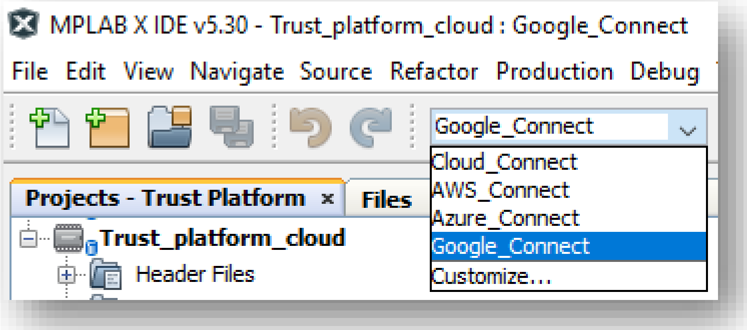
src

Trust_platform_cloud.X

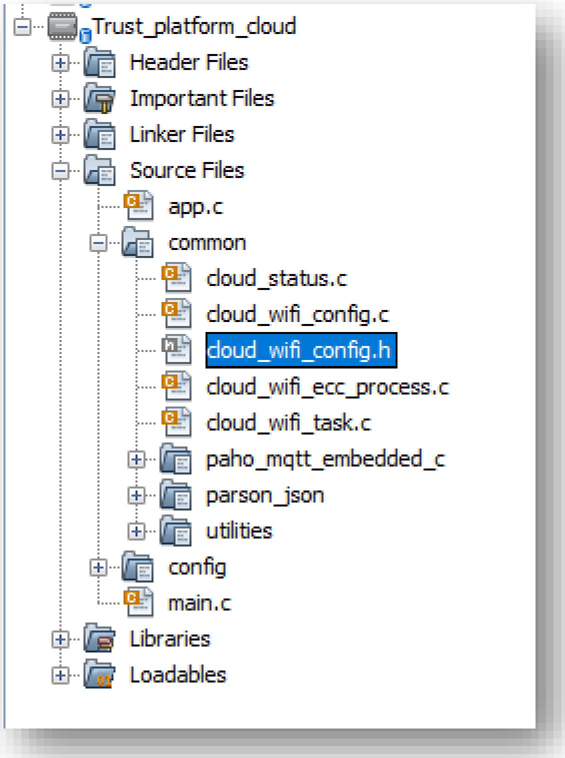
File name: E:\Desktop\Trust Platform\usecasetool_dev\TrustnGO\05_cloud_connect\c\firmware\

Files of type: Project Folder

2. Select the Build configuration as Google_Connect

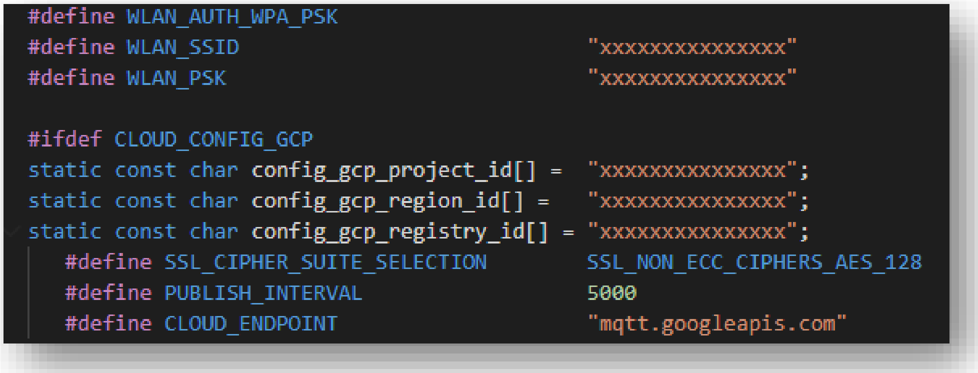

MPLAB X IDE v5.30 - Trust_platform_cloud : Google_Connect
File Edit View Navigate Source Refactor Production Debug
Google_Connect
Cloud_Connect
AWS_Connect
Azure_Connect
Google_Connect
Customize...
Projects - Trust Platform ×
Files
Trust_platform_cloud
Header Files

3. Open **cloud_wifi_config.h file** by navigating to **Trust_patform_cloud-> Source Files ->common**



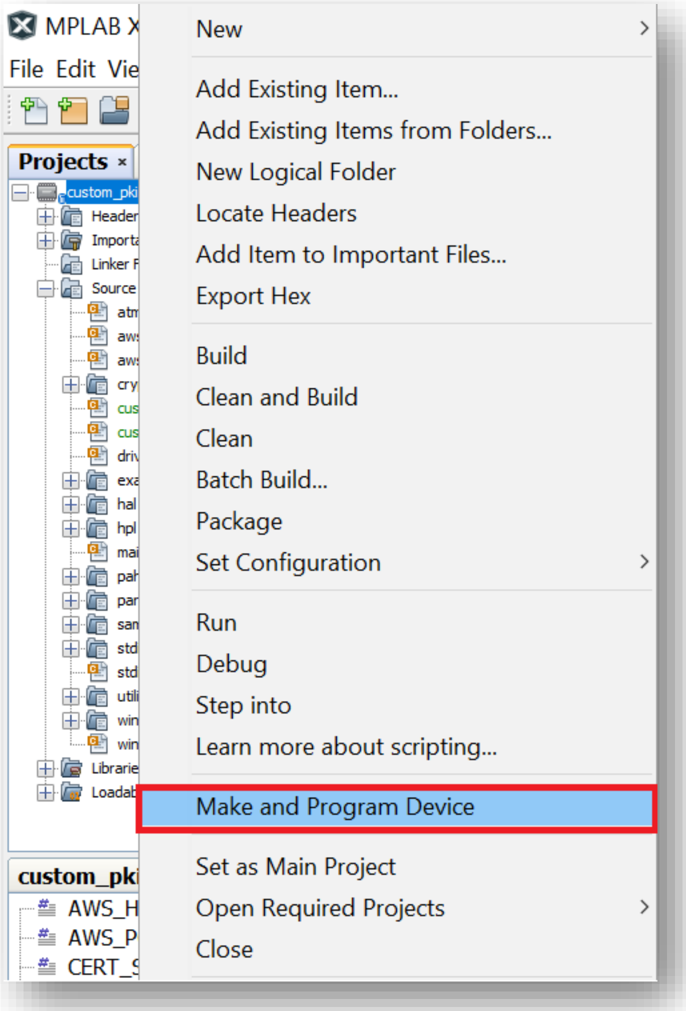
Update the following constants before building the project:
The project id, region id and registry id should be same as in the gcp account setup.

- WLAN_SSID
- WLAN_PSK
- config_gcp_project_id
- config_gcp_region_id
- config_gcp_registry_id

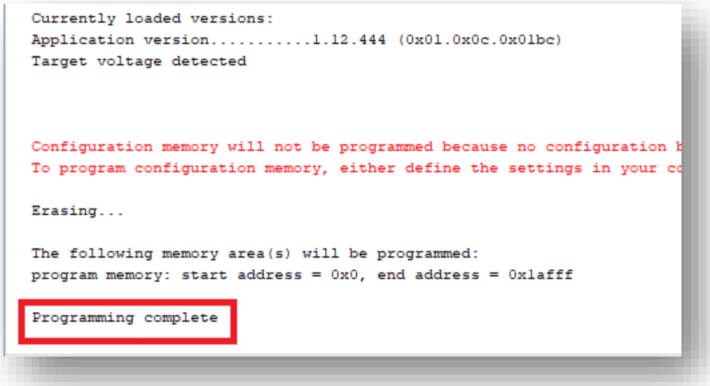


```
#define WLAN_AUTH_WPA_PSK
#define WLAN_SSID                                    "xxxxxxxxxxxxxxx"
#define WLAN_PSK                                     "xxxxxxxxxxxxxxx"

#ifdef CLOUD_CONFIG_GCP
static const char config_gcp_project_id[] =  "xxxxxxxxxxxxxxx";
static const char config_gcp_region_id[] =   "xxxxxxxxxxxxxxx";
static const char config_gcp_registry_id[] = "xxxxxxxxxxxxxxx";
   #define SSL_CIPHER_SUITE_SELECTION          SSL_NON_ECC_CIPHERS_AES_128
   #define PUBLISH_INTERVAL                    5000
   #define CLOUD_ENDPOINT                      "mqtt.googleapis.com"
```

4. Program the Crypto Auth Trust platform by navigating to **Trust_patform_cloud -> Make and Program Device**

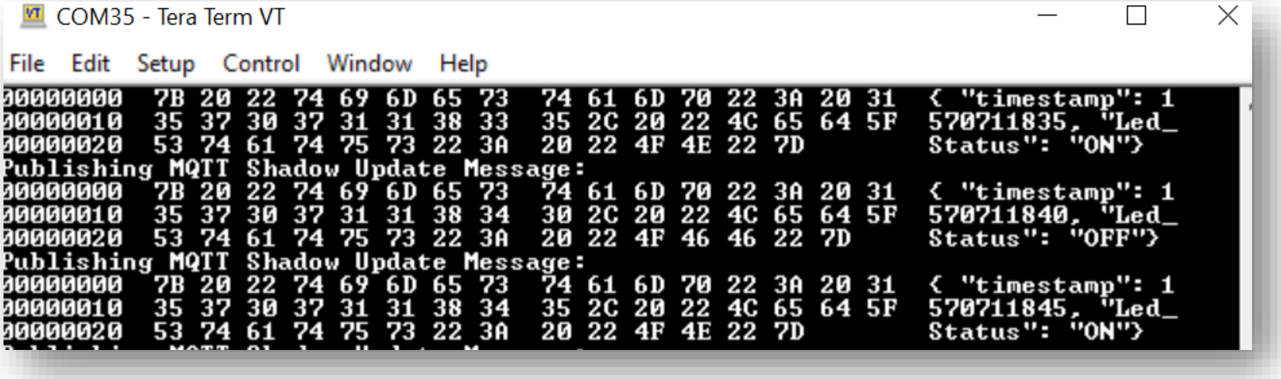


This step may take some time, wait for MPLAB to program the device. Once it is done programming you will see “**Programming complete**” message in Output Window.



```
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 4.1 to run the last step (GCP GUI) in the Jupyter Notebook.

4.3 Crypto Auth Trust Platform Factory reset

Once any of the embedded project is loaded to Crypto Auth Trust Platform, the default program that enables interaction with Trust Platform 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 in cloned repository at **assets\Factory_Program.X\CryptoAuth_Trust_Platform.hex**

If Trust Platform GUI is provided with MPLAB X IDE installation location, notebooks can program the Factory reset hex file if its not available by default.

This can also be done manually by MPLAB

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, Crypto Auth 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 "Crypto Auth Trust Platform 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 "Crypto Auth Trust Platform Factory reset" section any usecase TrustFLEX Guide for reloading it.

3. **Why does my C projects generates No such file or directory with ../../../ 00_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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