Getting started with AIROC™ IFW56810-00 single-band Wi-Fi 4 Cloud Connectivity Manager

About this document

Scope and purpose

This document guides the user to set up and connect the AWS IoT ExpressLink IFW56810-00 Cloud Connectivity Manager module to the AWS IoT Core in a few simple steps without involving any firmware development. This document also provides an overview of the module, the evaluation kit, steps to connect to the AWS Cloud, and usage of the AT command set.

Intended audience

Customers who are new to IoT and/or require a turnkey solution to get their products connected to the cloud.

Table of contents

Table of contents

1 Overview

AIROC™ IFW56810-00 Single-band Wi-Fi 4 Cloud Connectivity Manager Module (CCM) is a configurable Wi-Fi connectivity module that provides a simple, secure, plug-and-play solution for connecting products to AWS IoT cloud services. The IFW56810-00 CCM module is preprogrammed with a tested secured firmware and supports an easy-to-use AT command interface for configuration, and provides end-to-end security.

- The device identity certificate is built into the module and can run only Infineon-signed firmware.
- The module connects to the cloud using secure connections.
- Devices are managed securely in the cloud.

The IFW56810-00 CCM module features a 1x1 single-band (2.4 GHz) device operating at 20-MHz channels supporting IEEE 802.11 b/g/n. See the **datasheet** for details.

The host processor system interacts with the IFW56810-00 CCM module through AT commands over UART. The IFW56810-00 CCM module handles all networking-related operations to connect to the AWS IoT Core through MQTT over Wi-Fi.

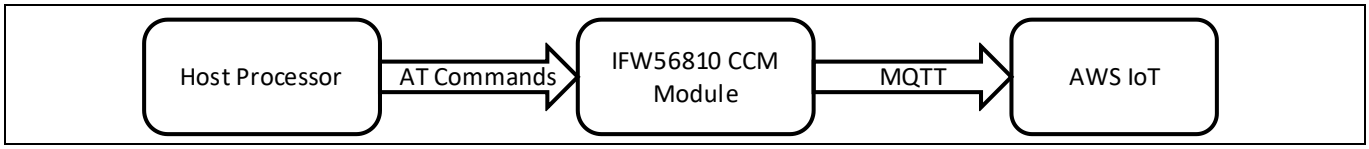


Figure 1 System architecture for products using the IFW56810-00 CCM module

2 Kit contents

- IFW956810 single-band Wi-Fi 4 Cloud Connectivity Manager evaluation kit to evaluate the IFW56810-00 single-band Wi-Fi 4 Cloud Connectivity Manager Module
- USB Type-A (male) to Type-C (female) cable
- Quick start guide

Note: Follow the quick start guide provided along with thekKit before starting with the current document.

3 Hardware

The IFW956810 CCM evaluation kit consists of an IFW56810-00 single-band Wi-Fi 4 Cloud Connectivity Manager module with secure processor, a PCB antenna, an FTDI chip for the USB to serial interface, and an 8x2 pin header.

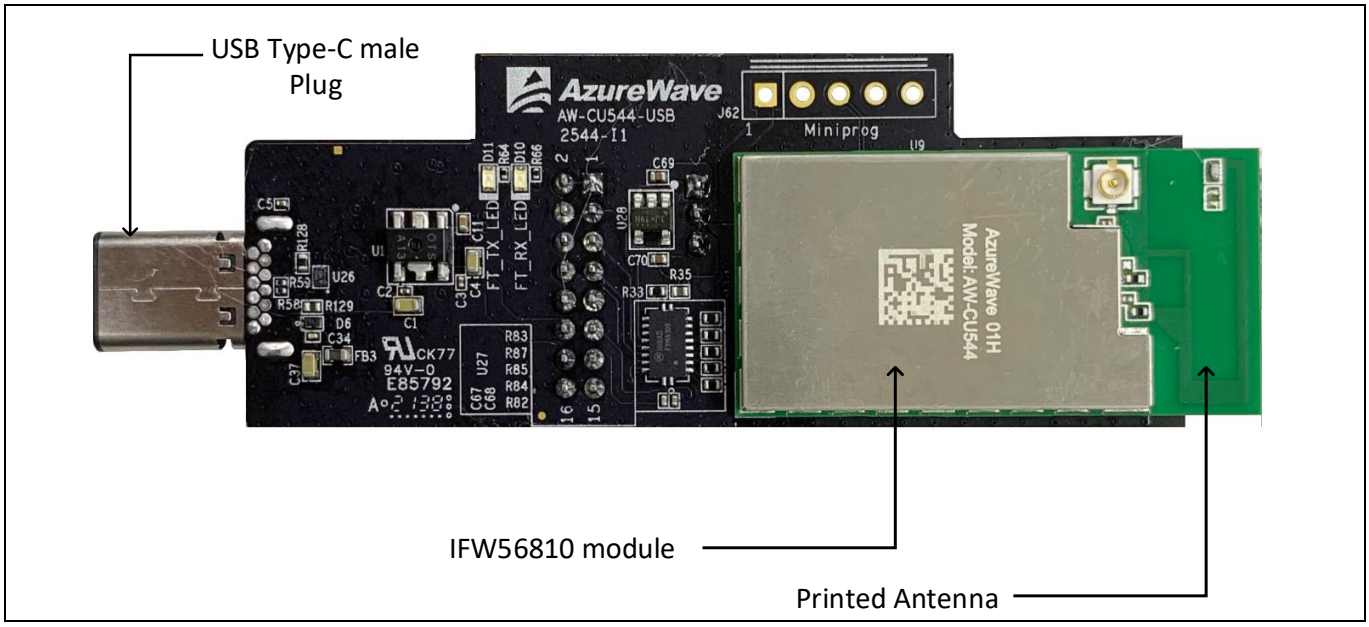


Figure 2 Top view

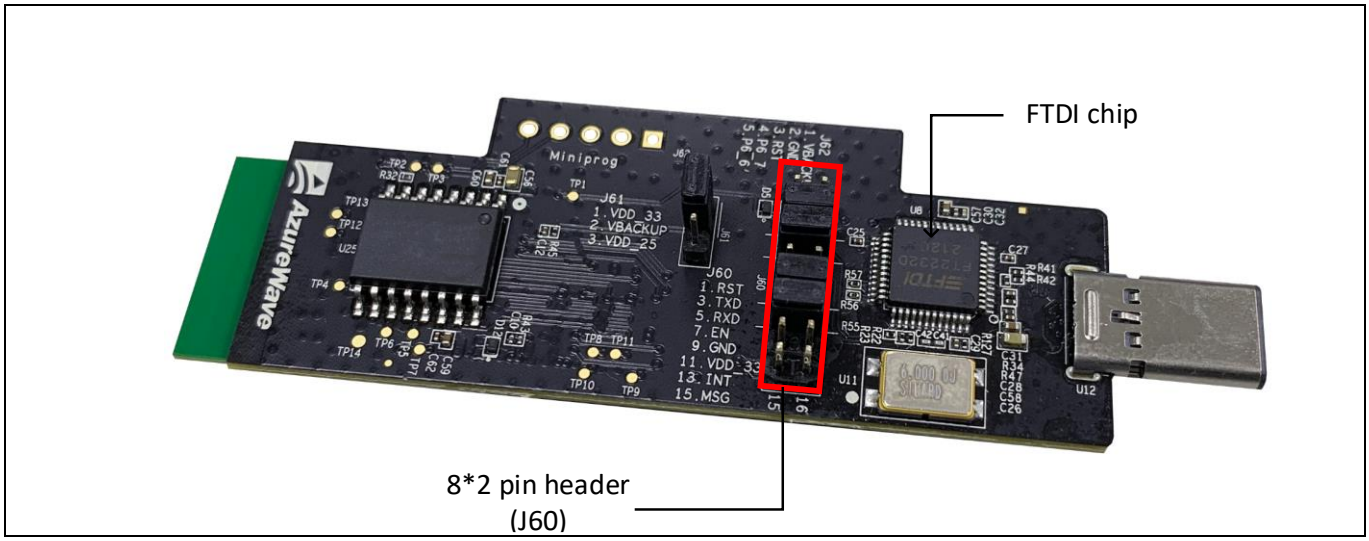


Figure 3 Bottom view

Ensure that pin 3 to pin 4, pin 5 to pin 6, pin 9 to pin 10, and pin 11 to pin 12 of header J60 are closed before connecting the USB dongle to the PC (see **Figure 3**). The PC can be used as a host for evaluation. AT commands can be sent through a serial terminal on the PC to the IFW956810 CCM kit.

4 Setting up a serial terminal on the PC

Note: The following instructions are only for a Windows PC.

The IFW956810 CCM evaluation kit should be recognized by the PC when connected to it. If the device is recognized, the COM ports will be available in the Device Manager.

If the device is not recognized, you need to install the FTDI USB-to-UART Bridge Virtual Communication Port drivers from this **link**.

4.1 Determine the COM port number

- In Windows, determine the COM port number from the Device Manager.

Note: Use the higher-number COM port among the enumerated COM ports to communicate with the kit.

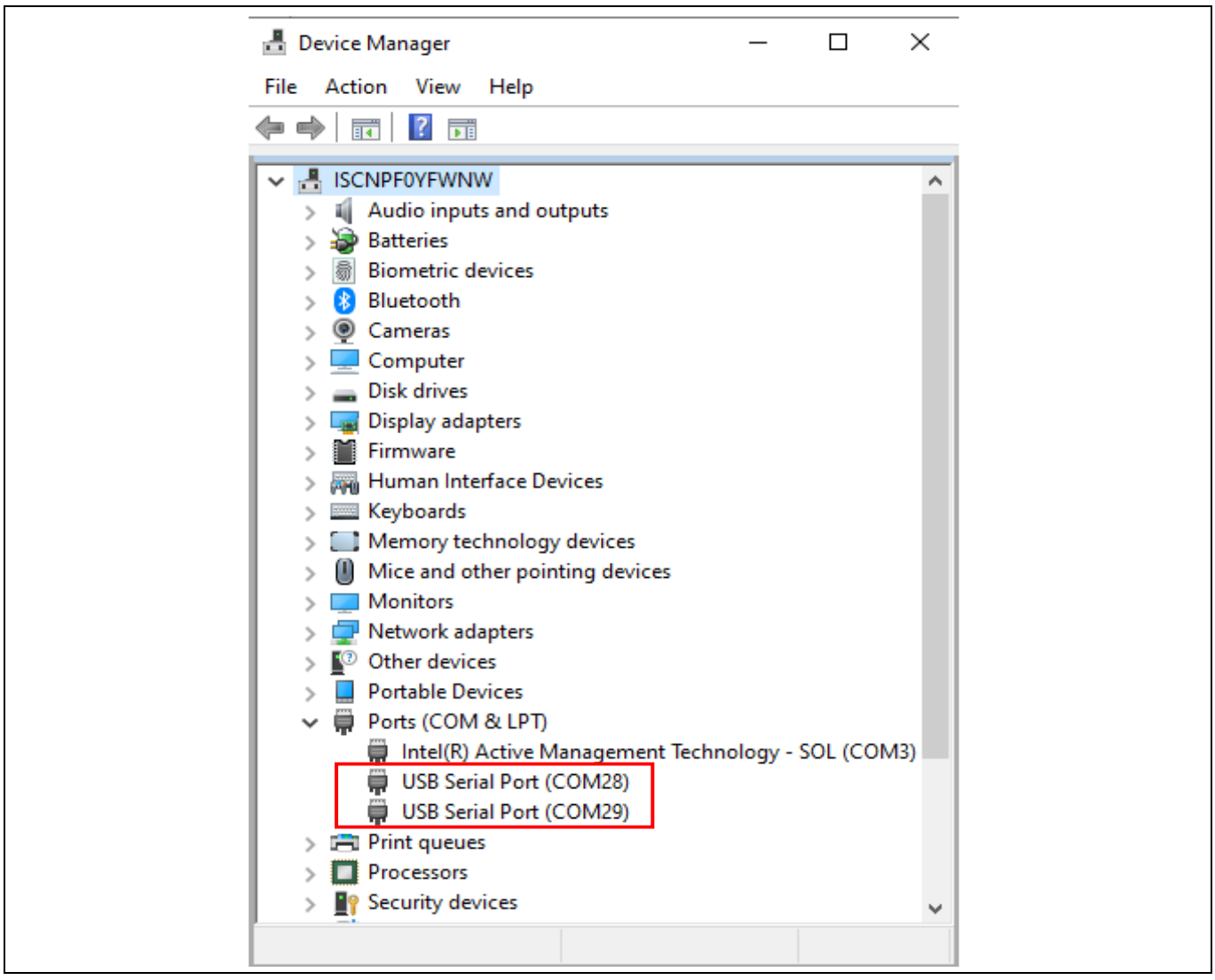
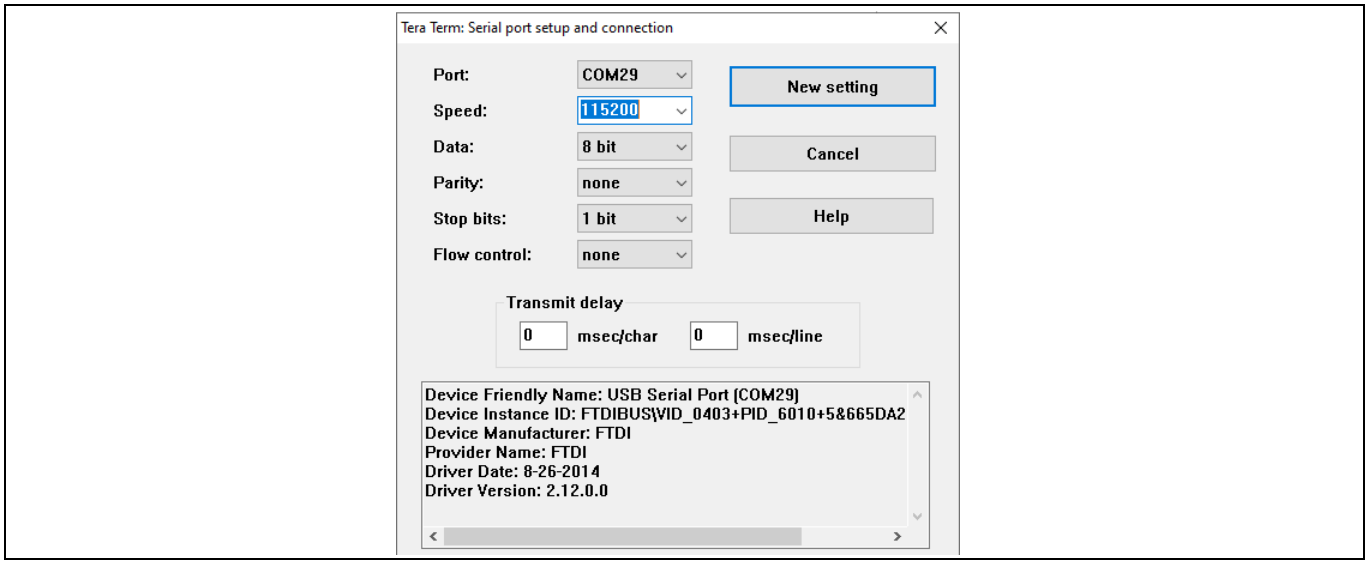


Figure 4 COM port

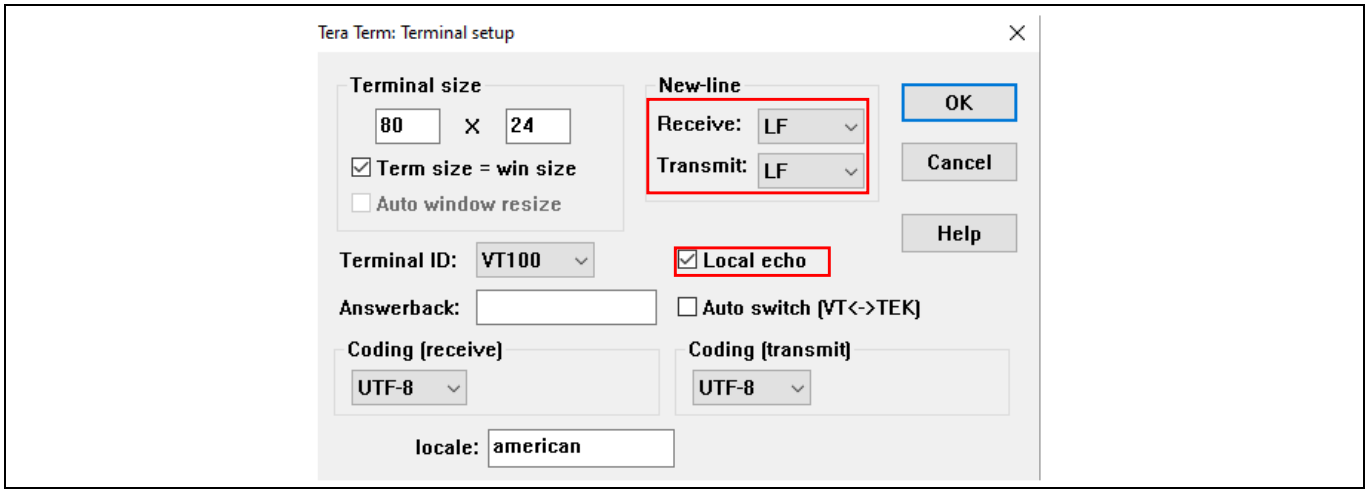
4.2 Serial terminal settings

Note: Tera Term is not available for Linux/macOS but there are some alternatives like PuTTY, which have the same functionality as Tera Term, and are both free and Open Source.

1. Open a terminal such as Tera Term.
2. Choose the higher of the COM port numbers for the IFW956810 CCM evaluation kit.
3. Select **Set Up** > **Serial port.**
4. Select the settings as follows:



5. Select **Set Up** > **Terminal**.
6. Do the following:
   - Set **End of Line** as **Line Feed**.
   - Enable **Local Echo** to view the commands that you type on the terminal.



Once you open the serial terminal, type `AT+CONF? About` in the serial terminal.
You should see a response "`OK Infineon - IFW56810`".

5 Quick evaluation of the CCM device

The IFW956810 CCM evaluation kit comes with a quick evaluation flow that lets you test your device right out of the box without creating an AWS account. The following steps will enable you to connect the kit to the internet through Wi-Fi and send random data points to the AWS staging account.

Note: 1. *If you don't want to do a quick evaluation of the CCM device, jump to Section **6**.*

2. *The AWS Staging account provides users who do not have an AWS account to quickly evaluate the kit.*

3. *To connect programmatically to an AWS service like the AWS IoT core, use an endpoint. An endpoint is the entry point URL for an AWS web service. All CCM devices come with a preconfigured Endpoint of AWS staging account for evaluating the Quick Connect flow.*

4. *Quick Connect is meant for evaluation purposes only.*

5.1 Connect the kit to the PC

Connect the IFW956810 Single-band Wi-Fi 4 Cloud Connectivity Manager evaluation kit to the PC using either the Type-C connector or Type-A male to Type-C female cable.

Figure 5 Connect the USB dongle to the PC

5.2 Steps for Quick Connect evaluation.

Note: *To perform a Quick Connect evaluation, it is essential to close the serial terminal application that may have been opened on the enumerated COM port for the CCM Evaluation kit.*

1. Download the following Quick Connect package and extract *Infineon-qc-utility.zip.*

https://quickconnectexpresslinkutility.s3.us-west-2.amazonaws.com/infineon/QuickConnect_infineon_v1.0.zip

2. Extract the utility package inside the **Infineon-qc-utility** folder with respect to your OS.

QuickConnect_infineon_v1.0_linux.x64.tar.gz	05-09-2022 01:18	GZ File	26,392 KB
QuickConnect_infineon_v1.0_macos.x64.tar.gz	05-09-2022 01:18	GZ File	17,015 KB
QuickConnect_infineon_v1.0_windows.x64 (1)...	05-09-2022 01:18	Compressed (zipped)...	17,231 KB

3. Connect the IFW956810 single-band Wi-Fi 4 Cloud Connectivity Manager evaluation kit to the PC using either the Type-C connector or Type-A male to Type-C female cable and determine the serial port.

4. Fill the details in the `config.txt` file to have the correct serial port, as well as Wi-Fi SSID and password.

5. Execute the executable in the Quick Connect package.

Note: Run the Start_Quick_Connect.exe in the case of Windows OS.

Note: In the case of Linux and mac, go inside the extracted folder, open the terminal, and enter the following commands

chmod +x Start_Quick_Connect (for giving Executable permission)

./ Start_Quick_Connect

5. The workflow prompts you to open the visualizer in your browser. You can either select **Yes** or copy and paste this link into the browser. After a few seconds, you will see random values being published from the IFW956810 CCM evaluation kit on the visualizer.

Figure 6 Random values displayed in visualizer from IFW956810 CCM evaluation kit

Note: Visualizer is a GUI that displays random data points getting published to the AWS staging account as a graph.

6 Getting started with using an AWS account

Connect the IFW956810 single-band Wi-Fi 4 Cloud Connectivity Manager evaluation kit to the PC as mentioned in Section **5.1**.

Steps in sections **6.1** to **7.2** are required only for the first time you connect. The IFW56810-00 module will remember its configuration and will be ready to connect to your AWS account automatically.

6.1 Creating your AWS account and permissions

Follow the instructions in the Amazon documentation (**Set up your AWS Account**) to create your account and get started:

1. Sign up for an AWS account or log in to your existing account.
2. Open the AWS IoT console.

7 Register the kit to your AWS development account

For registering your CCM kit to your AWS development account, you can select one of these two methods:

- **Infineon CIRRENT Cloud flow**
- **AWS flow**

Note: The process of registering a single module to the AWS IoT Cloud is simpler with the AWS flow, whereas the Infineon CIRRENT Cloud flow is more appropriate for registering a batch of modules (one batch of CCM modules comes with a single QR Code) to the AWS IoT Cloud.

While transitioning from the Infineon CIRRENT Cloud flow to the AWS flow, or vice versa, input the command "AT+FACTORY_RESET" into the serial terminal.

7.1.1 Infineon CIRRENT Cloud flow

The CIRRENT Cloud flow uses the Cloud ID solution to simplify the process of registering and connecting the kit to your AWS developer account. This method eliminates several manual steps that need to be performed in the AWS flow. Learn more about this Cloud ID solution **here**.

At a high level, the CIRRENT Cloud flow performs the following functions to connect the kit to your AWS developer account:

1. Binds your kit to your CIRRENT account.
2. Provisions the AWS resources for the kit on your AWS account.
   The resources include the Thing (cloud representation of your physical device), device certificate (associates the device certificate from the CIRRENT Cloud to your Thing), and policies (creates and associates AWS IoT Thing access policies to your Thing)
3. Enables the kit to connect to your AWS account.
   The endpoint of your AWS development account is required for the kit to connect to your AWS account.
   The CIRRENT Cloud pulls the AWS endpoint required from your AWS account and automatically pushes it to the kit. This enables the kit to connect to your AWS development account.

The CIRRENT Cloud flow is very close to the production flow and demonstrates the ease of securely connecting your products to the product cloud. The CIRRENT Cloud is preloaded with the device certificate of all IFW56810-00 modules, thus offloading the effort of managing device certificates from product manufacturers.

Figure 7 illustrates how to interact with the AWS developer account using the CIRRENT Cloud flow. Each of these steps are elaborated in the following sections.

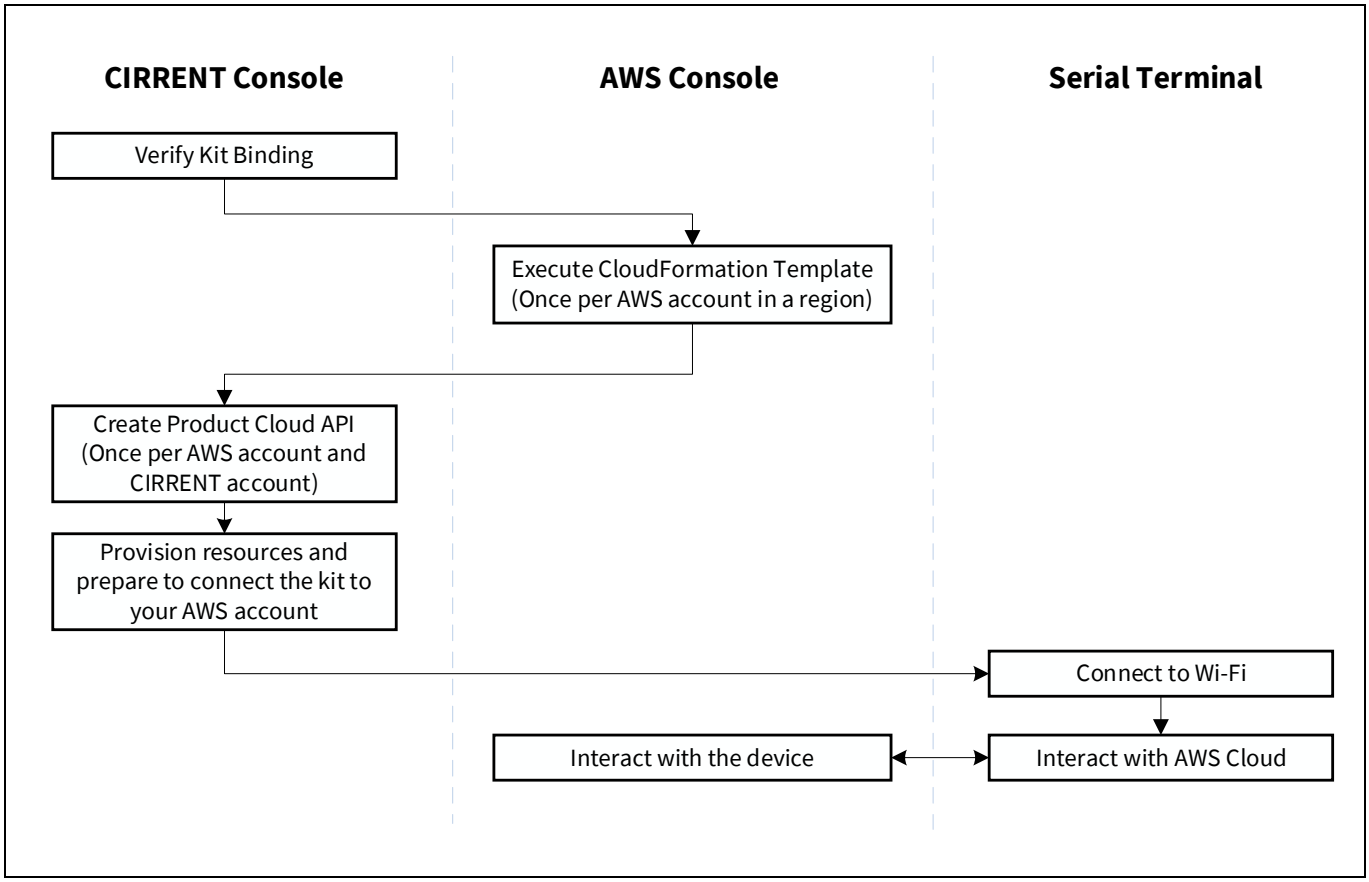


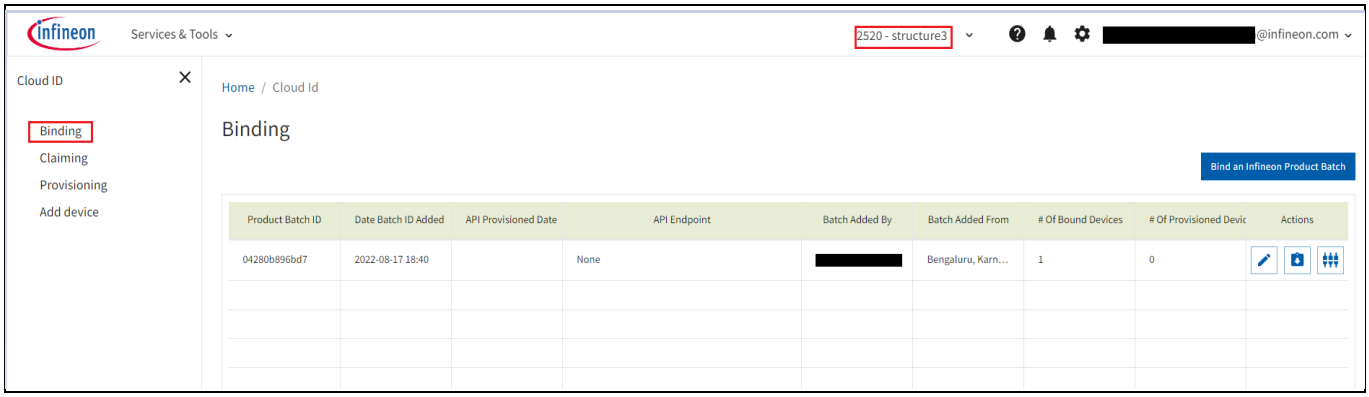
Figure 7 AWS Developer interacting using CIRRENT Cloud Flow

7.1.1.1 Verify the binding of your device to your CIRRENT account

Your kit is already bound to your CIRRENT account when you registered your kit through the quick start guide provided along with the kit. If you landed on this page without following the quick start guide, see the document provided along with your kit.

Do the following to verify the kit binding:

1. Log in to your CIRRENT account at **https://osts.infineon.com/login** and choose your sub-account to which you binded your kit while following Quick start guide.
2. On the home page, select **CIRRENT Cloud ID**, and you will be redirected to the binding page.
3. Check your sub account number as follows:



4. Locate your device listed on the page.

Binding of the device to the CIRRENT account is required to provision the devices to the AWS developer account using Cloud ID.

7.1.1.2 Execute the CloudFormation template

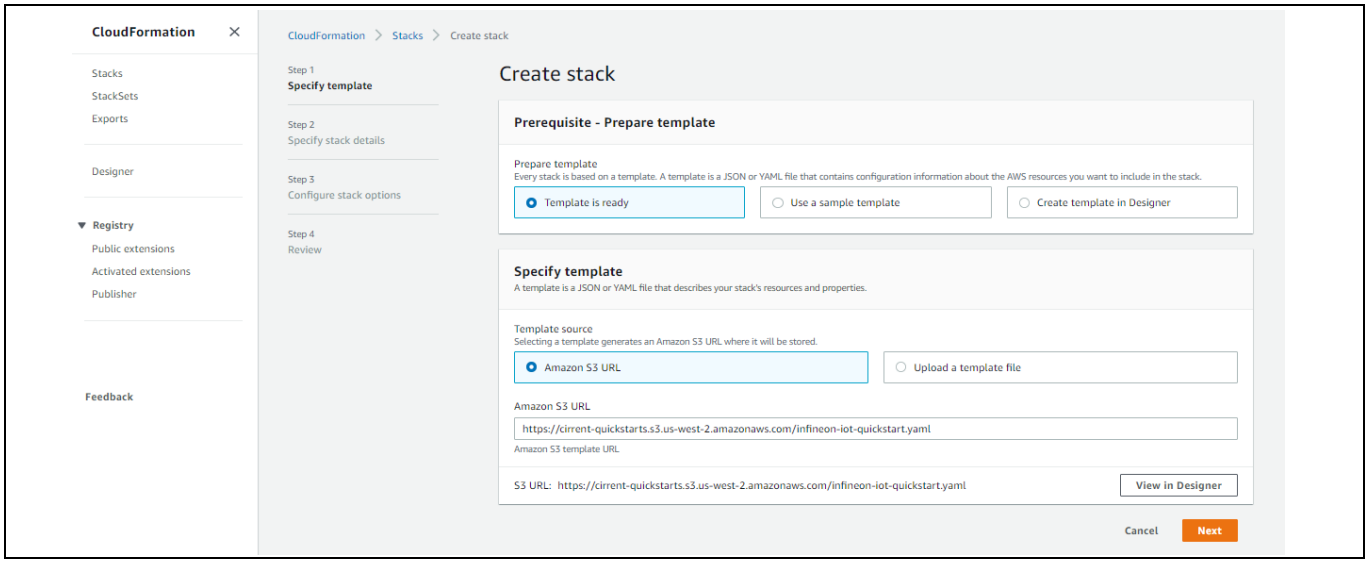
CloudFormation is an AWS service that helps in setting up the required resources in AWS through a template (JSON or YAML file). Executing a CloudFormation template creates a stack in the AWS CloudFormation service. A stack is a collection of AWS resources.

The template for creating AWS resources required for connecting the IFW956810 evaluation kit to the AWS IoT Core is already created by Infineon and stored in Amazon S3 storage. The stack created by this template provides some outputs that can be used to establish a channel of back-end cloud communication between your CIRRENT account and your AWS account.

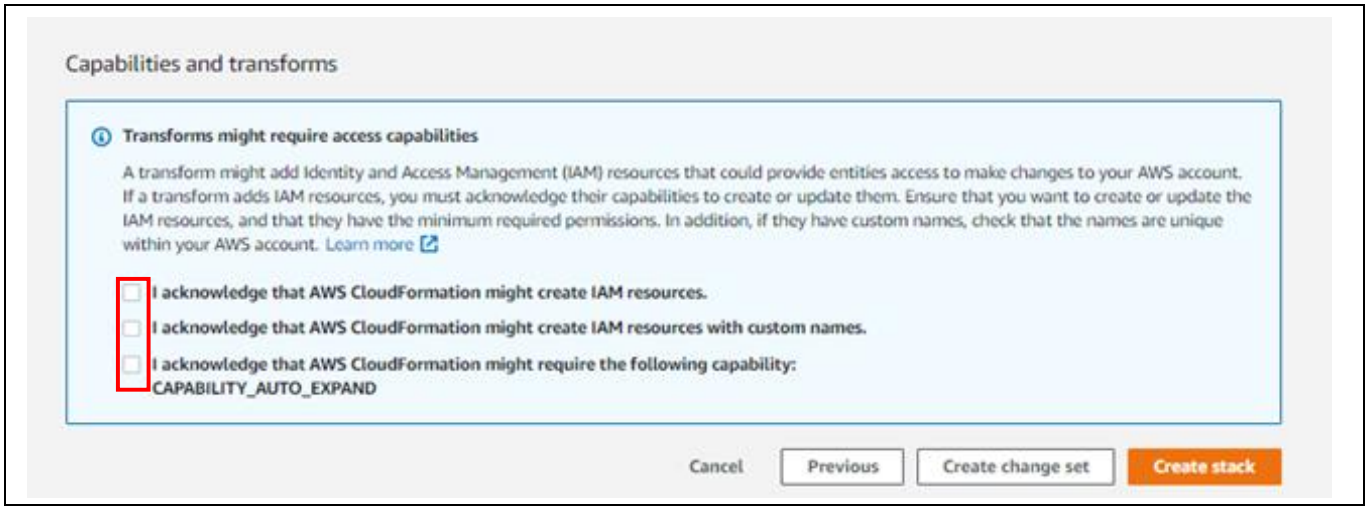
You need to execute the CloudFormation template only once per AWS account in a region. The same stack can be reused to provision multiple kits to the AWS account in that region.

Do the following to execute the Infineon-provided CloudFormation template:

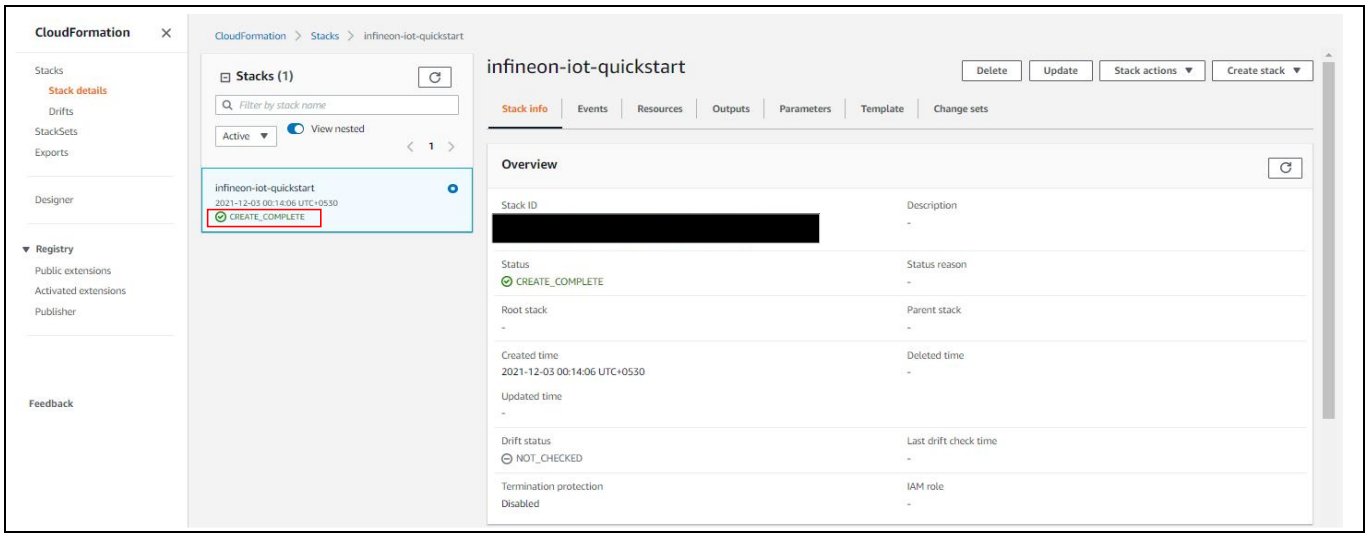
1. Click on the following link to execute the CloudFormation template. By default, the link uses the **us-west-1** region.
   https://us-west-1.console.aws.amazon.com/cloudformation/home?region=us-west-1#/stacks/create/template?stackName=infineon-iot-quickstart&templateURL=https://cirrent-quickstarts.s3.us-west-2.amazonaws.com/infineon-iot-quickstart.yaml
   You can change the region in which you want to execute this template by changing the `region=us-west-1` in this link to your required region. See the **Choosing a Region** section of the AWS documentation.
2. On the **Create Stack** page in the AWS CloudFormation service with the Infineon CloudFormation template preloaded, click **Next**.



3. On the Step 2 page, retain all parameters at their default values, and click **Next**.
4. On the Step 3 page, retain all parameters at their default values, and click **Next**.
5. Select the boxes to provide permissions to access the resources required by the CloudFormation template.



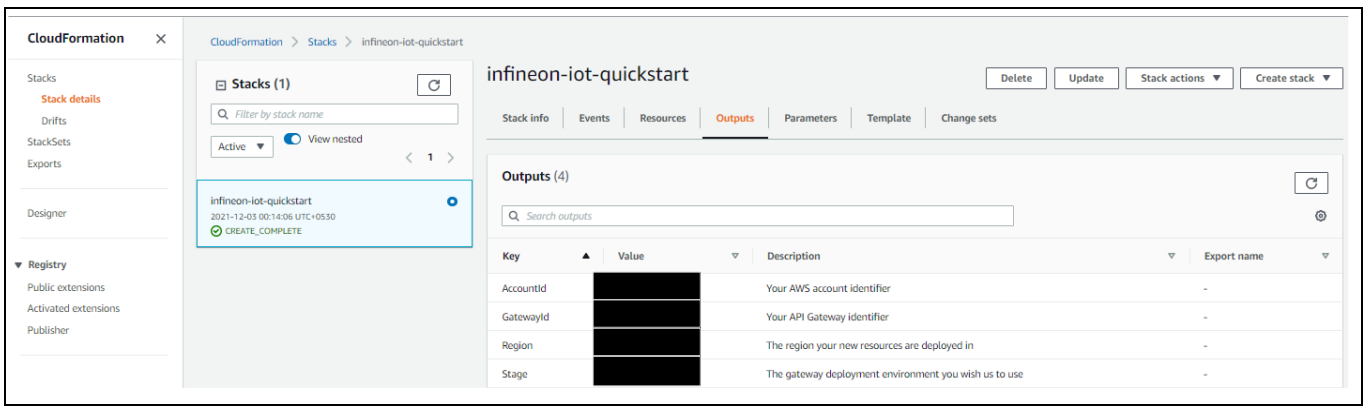
6. Click **Create stack**.
7. Wait for up to five minutes for the stack creation to complete.



This stack creates an infrastructure to enable provisioning the required resources for the IFW56810-00 device through the CIRRENT Cloud.

8. Click **Outputs**.

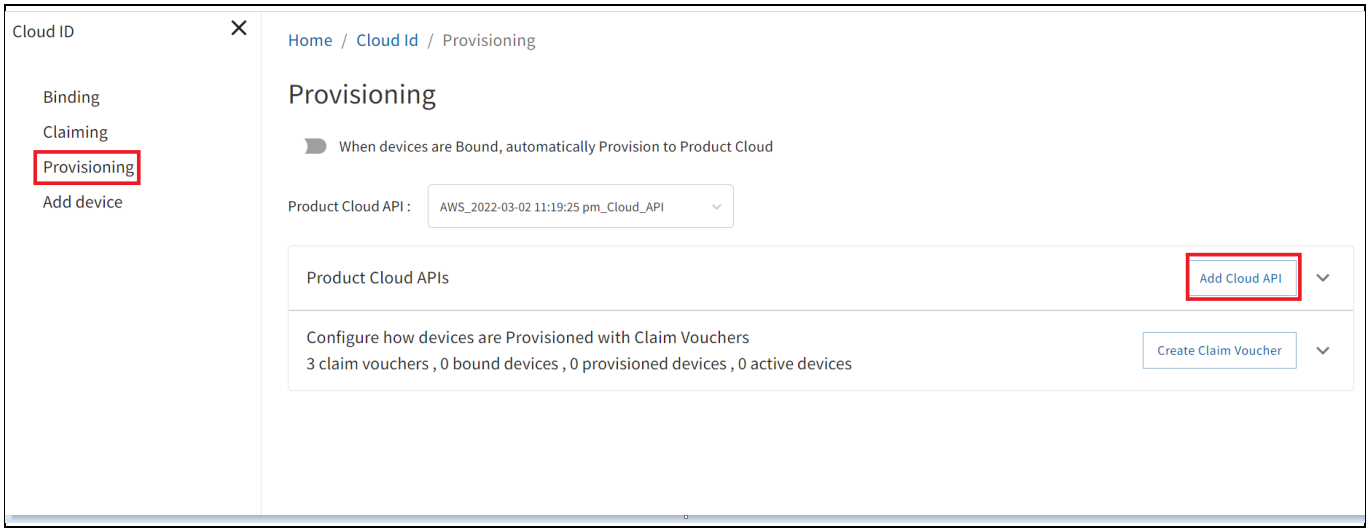
The output of the stack that you created is shown on this page. You must enter these details in the CIRRENT Console in Step **3** of Section **7.1.1.3**.



7.1.1.3 Create Product Cloud API

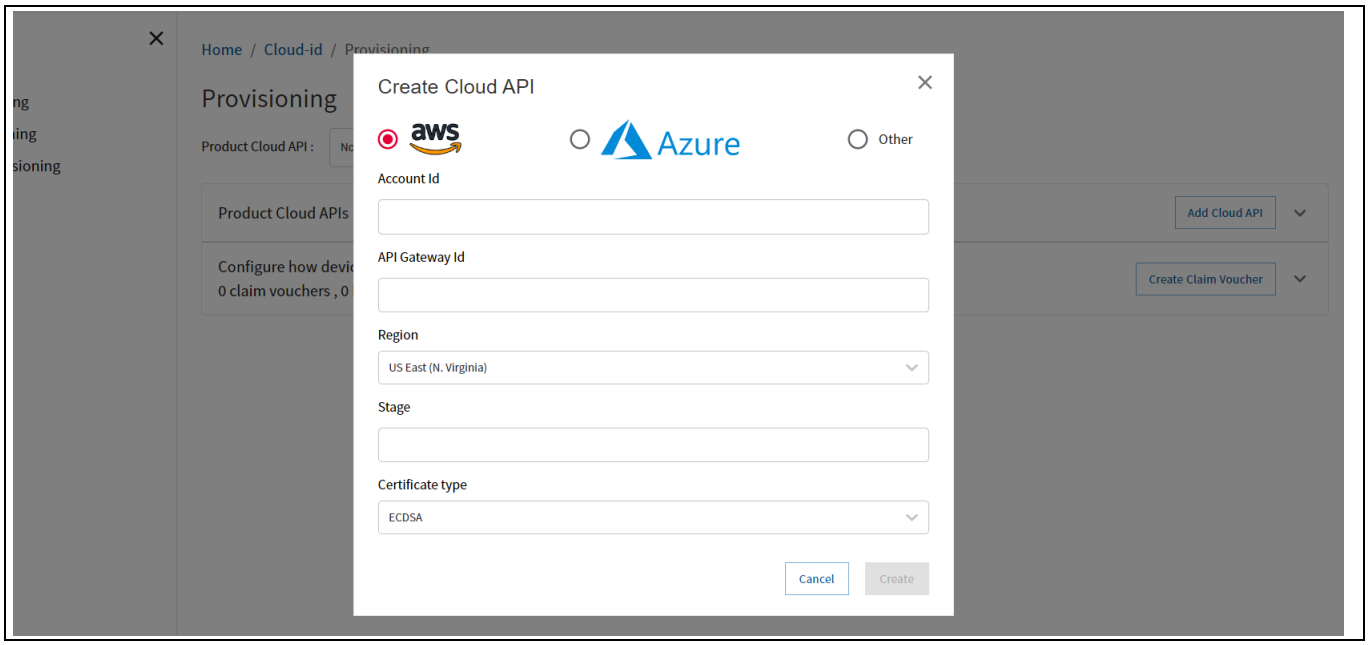
Product Cloud API is a software interface that allows the CIRRENT Cloud to communicate with your AWS developer account. To achieve this, Product Cloud API requires certain AWS developer account details including the AWS Gateway ID obtained as part of the AWS CloudFormation template output. This API must be executed once per CIRRENT account. The same API can be used to provision multiple kits from your CIRRENT account to your AWS account.

1. Click the menu button on the top left of the screen and select the **Provisioning** menu.
2. On the Provisioning tab, click **Add Cloud API**.



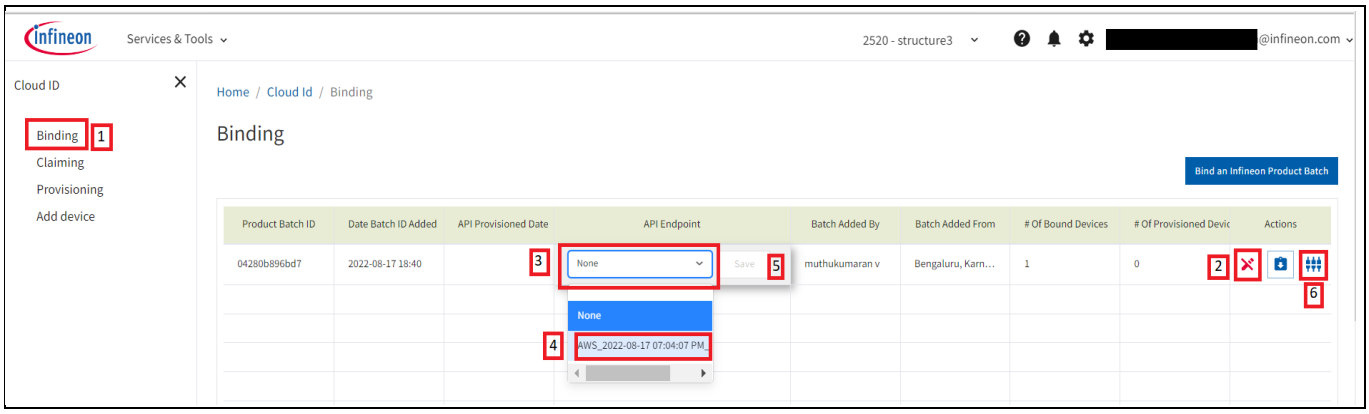
3. When prompted, enter your AWS account parameters.

   Copy the `AccountId`, `GatewayId`, `Region`, and `Stage` values from your AWS Console obtained in Step **8** of Section **7.1.1.2** and enter them in the **Create Cloud API** pop-up on the CIRRENT Console, and then click **Create**.



7.1.1.4 Provision and prepare to connect the kit to your AWS account

1. Click the menu button onthe top left of the screen and select the **Binding** menu.



2. Click **Edit**.
3. Click the drop-down list in the **API Endpoint** column.
4. Choose the Product Cloud API created in Section **7.1.1.3**.
5. Click **Save**.
6. Click **Provision now**.

   This performs two functions:

   a) Creates the Thing for your device in the AWS Console and attaches the related policy and device certificate.

   b) Pulls the AWS endpoint required by the device to connect to your AWS account and pushes it to the device.

   When the kit is connected to the Wi-Fi network, it will pull this endpoint from the CIRRENT Cloud and connect to the AWS Cloud automatically.

7. Jump to Section **7.2** to connect your kit to Wi-Fi.

Note: *To connect one more kit using the CIRRENT Cloud flow, skip section **7.1.1.2** if you are using the same AWS account and section **7.1.1.3** if you are using the same CIRRENT Cloud account. Follow only section **7.1.1.3** and Section **7.1.1.4**.*

7.1.2 AWS flow

The following steps will help you register your kit to the AWS account. Skip the following section if you already registered your kit using the Infineon CIRRENT Cloud flow.

7.1.2.1 Configure the AWS Thing

1. Open the **AWS IoT Console**.
2. From the left pane, select **Manage**, and then select **Things**.
3. Click **Create Things**.
4. On the **Create things** page, select **Create single thing**, and then click **Next**.
5. In the terminal application, type the following command:

```
AT+CONF? ThingName
```

6. Copy the returned string (a sequence of alphanumeric characters) from the terminal.
7. On the console, on the **Specify thing properties** page, paste the copied string from the terminal into the **Thing name** field under **Thing properties**.
8. Leave other fields at their default values, and then click **Next**.

7.1.2.2 Configure device certificate

7.1.2.2.1 Prepare device certificate

1. In the terminal application, type the following command:

   ```
   AT+CONF? Certificate pem
   ```

   You will receive the device certificate in PEM format as part of the response.

2. Copy the returned string (a longer sequence of alphanumeric symbols), and save it into a text file on your host machine as "ThingName.cert.pem".

   Replace "ThingName" with the name of the Thing obtained in Section **7.1.2.1**.

7.1.2.2.2 Attach device certificate to the Thing

1. On the **Configure device certificate** page in the AWS Console, select **Use my certificate**, and then choose **CA is not registered with AWS IoT**.
2. Under Certificate, select **Choose file**.
3. Double-click the *ThingName.cert.pem* file created in in Section **7.1.2.2.1**.
4. Under Certificate Status, select **Active**.
5. Click **Next**.

7.1.2.3 Attach policies to certificate

1. Click **Create** to create a policy. This opens a new tab.
2. Enter the policy name (e.g., "IoTDevPolicy") and click **Advanced mode**.
3. Copy the following section into the console:

   ```
   { "Version": "2012-10-17", "Statement": [ { "Effect": "Allow", "Action":
   "*", "Resource": "*" } ] }
   ```

Note: *The examples in this document are intended only for development environments. All devices in your end product must have credentials with privileges that authorize only intended actions on specific resources. The specific permission policies can vary for your use case. Identify the permission policies that best meet your business and security requirements.*

4. Click **Create**.

7.1.2.4 Configure endpoint

1. In the AWS IoT Console, choose **Settings**, and then copy your account endpoint string under **Device data endpoint**.
2. Type the following AT command in the serial terminal to configure the endpoint:

   ```
   AT+CONF Endpoint= endpoint copied in step 1.
   ```

   The above step replaces the configured default endpoint used for evaluating the quick connect flow .

7.2 Connect the kit to Wi-Fi

You can either follow Section **7.2.1** or Section Error! Reference source not found. to connect the IFW956810 C CM evaluation kit to Wi-Fi.

A Wi-Fi onboarding mechanism is required for IoT products that do not have a display to enter Wi-Fi SSID and password. Use one of the following methods to connect the IFW956810 CCM evaluation kit to Wi-Fi.

Note: Connect the kit only to a 2.4-GHz Wi-Fi network.

7.2.1 Using AT commands

AT commands provide a simple method of Wi-Fi onboarding in a development environment.

Type the following commands in sequence in the terminal application:

```
AT+CONF SSID=<your router ssid>
AT+CONF Passphrase=<your router passphrase>
```

Note: Your local router's SSID and passphrase are stored securely inside the IFW56810-00 CCM module. While the SSID can be retrieved later (i.e., for debugging purposes), any attempt to retrieve the passphrase will return an error.

7.2.2 Using CIRRENT Wi-Fi onboarding app

The CIRRENT Cloud solution from Infineon provides an effective Wi-Fi onboarding service through the CIRRENT Wi-Fi onboarding app for any IoT product. The IFW956810 CCM evaluation kit supports onboarding through either Bluetooth® LE or SoftAP.

1. Download and install the CIRRENT Wi-Fi onboarding app from **Google Play Store for Android** or **iOS App Store for iOS on your mobile phone**. Scan the following QR code relevant to your mobile device:

Android iOS

2. Type the following command in the serial terminal on the PC:

   ```
   AT+CONFMODE
   ```

   You should receive the "OK CONFMODE Enabled" response from the module.
3. Open the CIRRENT Wi-Fi onboarding app.
   You can skip the sign in to perform Wi-Fi onboarding.
4. From the menu, select **Configuration** and then choose either **BLE** or **Soft AP** onboarding.
5. Follow the onscreen instructions and enter the Wi-Fi router's SSID and password.

7.3 Connect and interact with the AWS Cloud

Use the MQTT client in the AWS IoT Console to monitor the communication between your evaluation kit and the AWS Cloud.

1. Navigate to the AWS IoT Console (**https://console.aws.amazon.com/iot/**).
2. In the navigation pane, select **Test** and then click **MQTT Test Client**.
3. Navigate to the additional configuration and select Display payloads as strings (these are more accurate) under the MQTT payload display.
4. In **Subscribe to a topic** panel, enter `#`, and then click **Subscribe**.

7.3.1 Connect to the AWS IoT Core

CIRRENT Cloud flow

Enter the following AT commands in the serial terminal

```
AT+CONNECT
```

After a few seconds, you will receive the message “OK 1 CONNECTED”. The above command allows your device to connect to the default configured endpoint used for quick evaluation flow over your configured SSID.

```
AT+CLOUD_SYNC
```

Wait for a minute or two while the device pulls the endpoint from the CIRRENT Cloud and connects to the AWS IoT Core.

Note: The above AT command will replace default endpoint used for quick evaluation flow with your AWS account endpoint and automatically switches the connection to the new endpoint

You can verify the endpoint present in the device using the following AT command “AT+CONF? Endpoint”

AWS flow

Enter the following command in the serial terminal to establish a secure connection to the AWS IoT Core if you followed AWS flow

```
AT+CONNECT
```

After a few seconds, the device will connect to the AWS IoT Core and you will receive the message

```
“OK 1 CONNECTED”.
```

8 AT commands to send and receive data

Wait for a response from the IFW956810 CCM evaluation kit in the serial terminal after entering each AT command.

8.1 Publish to a topic

Enter the following commands in sequence in the serial terminal:

```
AT+CONF Topic1=/MyPubTopic
AT+SEND1 hello world
```

The **Hello world** message gets dispayed on the AWS IoT console.

8.2 Subscribe to a topic

1. Enter the following commands in sequence in the serial terminal:

   ```
   AT+CONF Topic2=/MySubTopic
   AT+SUBSCRIBE2
   ```

2. Do the following on the AWS IoT Console:
   a) Select the MQTT test client and type /`MySubTopic` in the **Topic filter** and press **Subscribe** .
   b) Then go to **Publish to a topic** tab and type /`MySubTopic` in the **Topic name** field. Keep the “Hello from the AWS IoT Console” message.
   c) Click **Publish**.
3. On your serial terminal, enter the following command:

   ```
   AT+GET2
   ```

   You will receive the message “OK Hello from the AWS IoT Console”.

Note: The IFW56810-00 CCM module is capable of queuing 32 MQTT messages from AWS IoT core.

9 Low-power modes

9.1 Prerequisites

Before trying the low-power modes, ensure that the IFW56810-00 CCM module is not connected to Wi-Fi. To disconnect the device. enter the following command in the serial terminal:

```
AT+DISCONNECT
```

9.2 System sleep mode

To put the IFW56810-00 CCM module to System Sleep mode for a particular duration, enter the following command:

```
AT+SLEEP <Sleep time in seconds>
```

For example, AT+SLEEP 10 puts the device in Sleep mode for 10 seconds.

Enter the following command to put the device in System Sleep mode indefinitely till it receives an external interrupt:

```
AT+SLEEP
```

In System Sleep mode the device stays in Sleep state until it receives any external interrupt.

External interrupt can be triggered through sending any AT command or using device reset (using RST pin) or triggering the WAKE (INT) pin.

9.3 Deep Sleep mode

Enter the following command to put the device in Deep Sleep mode:

```
AT+SLEEP1.
```

In Deep Sleep mode, the device stays in Deep Sleep state until the device is reset (using the RST pin) or wake pin is triggered.

Note: The RST pin is pulled up by a 4.7-kΩ resistor internally; deasserting the pin will reset the module.

The Wake pin can be triggered by a falling edge (HIGH to LOW). By default, the Wake pin is in high-impedence state.

10 Performing firmware over-the-air update

10.1 Prerequisites

Get the signed updated firmware image from the following link **https://github.com/Infineon/ccm-ota-image-update**

Create an OTA update role in your AWS account using the steps outlined **here**.

10.2 Create a firmware update job in AWS IoT

1. Open **AWS IoT Console**.
2. Click **Manage**, and then under **Remote actions** click **Jobs**.
3. Click **Create job.**
4. Select **Create FreeRTOS OTA Update Job**, and then click **Next**.
5. Provide a job name which is unique within your AWS account. Optionally, provide a description, and then click **Next**.
6. From the **Devices to update** drop-down list, choose the Thing name with which the IFW56810-00 CCM module is registered in the account.
7. Select **MQTT** as the transfer protocol, and deselect **HTTP** if selected.
8. Select **Use my custom signed file.**
9. On the form that appears, enter the details from the **Prerequisites** section. Do the following:
   - In the **signature** field, provide the base64-encoded signature for the image.
   - From the **Original hashing algorithm** drop-down list, select the hashing algorithm provided by Infineon.
   - From the **Original encryption algorithm** drop-down list, select the encryption algorithm provided by Infineon.
   - In the **Path name of code signing certificate on device**, field, enter `NA`.
10. Select **Upload a new file**.
11. Click **Choose file** and upload the image received from Infineon.
12. Do one of the following:
    - Click **Create S3 bucket** to create a new bucket for the new uploaded image.
    - Click **Browse S3** to select an existing bucket in your account.
13. Under **Path Name of file on device**, enter `NA` if the image is not targeted as an executable file within a filesystem.
14. From the **File type** drop-down list, select a value “101” to signify that it is an IFW56810-00 CCM firmware update, and not a host firmware update.
15. Choose the OTA update role created above from the **Role** drop-down list under the **IAM role** section, and then click **Next**.
16. Click **Create Job**.

If successful, the job will be listed with the status as “in progress”.

10.3 Monitor and apply the new firmware update for the IFW56810-00 module

The IFW56810-00 CCM module polls for firmware update jobs, receives and validates a job, and then enters a state waiting for the update to be accepted. The host application receives an OTA event indicating that a new firmware image is available for the IFW56810-00 CCM module.

The host application or the user can perform the following sequence by entering appropriate commands in the serial terminal:

1. Check the image version running on the CCM Module before doing OTA using the following AT command:
   `AT+CONF? Version`
2. Query the state of the job:
   `AT+OTA?`
   You will receive a response “OK 1”
3. Accept the new firmware update:
   `AT+OTA ACCEPT`
   The IFW56810-00 CCM module starts downloading the firmware update from the cloud.
4. Query the state of the job:
   `AT+OTA?`
   Downloading the image takes a few minutes to complete. During the OTA image download, this command returns “OK 3”. You will receive an OTA event when the download is completed the image signature is verified.
5. Check whether the OTA image is received:
   `AT+OTA?`
   You will receive the response “OK 4”.
6. Apply the new image received through OTA:
   `AT+OTA APPLY`
   The IFW56810-00 CCM module now reboots and boots up with the new image.
7. To confirm whether the new image has been updated, use the following AT command to check the image version:
   `AT+CONF? Version`
8. Connect back to the AWS IoT:
   `AT+CONNECT`
   The IFW56810-00 CCM module should now connect to AWS IoT, complete the self-test and mark the image as valid. This prevents further rollback to the old image.

You can check the job status by going back to the AWS IoT Console. You should see the job status as completed.

11 Performing host firmware over-the-air update

The IFW56810-00 CCM module supports host firmware over-the-air updates. To do so, follow these steps.

Skip the prerequisites if you already have the OTA update role in your AWS account.

11.1 Prerequisites

Create an OTA update role in your AWS account using the steps outlined **here**

11.2 Create a firmware update job in AWS IoT

1. Open **AWS IoT Console**.
2. Click **Manage**, and then under **Remote actions** click **Jobs**.
3. Click **Create job.**
4. Select **Create FreeRTOS OTA Update Job**, and then click **Next**.
5. Provide a job name which is unique within your AWS account. Optionally, provide a description, and then click **Next**.
6. From the **Devices to update** drop-down list, choose the Thing name with which the IFW56810-00 CCM module is registered in the account.
7. Select **MQTT** as the transfer protocol, and deselect **HTTP** if selected.
8. Select **Use my custom signed file.**
9. On the form that appears:
   - In the **signature** field, provide the base64-encoded signature for the image. If the image is not signed, enter `NA`.
   - From the **Original hashing algorithm** drop-down list, select the hashing algorithm. If not used, leave it as is.
   - From the **Original encryption algorithm** drop-down list, select the encryption algorithm. If not used, leave it as is.
   - In the **Path name of code signing certificate on device** field, enter `NA`.
10. Select **Upload a new file**.
11. Click **Choose file** and upload the image.
12. Do one of the following:
    - Click **Create S3 bucket** to create a new bucket for the new uploaded image.
    - Click **Browse S3** to select an existing bucket in your account.
13. Under **Path Name of file on device**, enter `NA` if the image is not targeted as an executable file within a filesystem.
14. From the **File type** drop-down list, select a value “202” to signify that it is an IFW56810-00 CCM host firmware update.
15. Choose the OTA update role created above from the **Role** drop-down list under the **IAM role** section, and then click **Next**.
16. Click **Create Job**.

11.3 Monitor and load the firmware update to the host

The host application or the user can perform the following sequence by entering appropriate commands in the serial terminal:

1.Query the state of the job:

```
AT+OTA?
```

You will receive a response “OK 2”

2. Accept the new firmware update:

```
AT+OTA ACCEPT
```

The IFW56810-00 CCM module starts downloading the firmware update from the cloud

3. Query the state of the job:

```
AT+OTA?
```

Downloading the image takes a few minutes to complete. During the HOTA image download, this command returns “OK 3”. Once the image is downloaded this command will return “OK 5”

4. Host can send the following command to the IFW56810-00 CCM module to receive the image

AT+OTA READ <read size>

This command will respond with “OK {count} {data} {checksum}”

The byte count is expressed in hex (from 1 to 6 digits), each byte is then presented as a pair of hex digits (no spaces) for a total of count*2 characters followed by a checksum (4 hex digits).
The reading pointer is advanced by *count* bytes.

Note: The IFW56810-00 CCM module can read up to 2 KB at once. If the size of the host image is greater than 2 KB, the host needs to perform multiple AT+OTA READ commands with a specified read size.

12 Troubleshooting

12.1 Two COM ports enumerated when the kit is connected

The IFW956810 CCM evaluation kit has a **FT2232H chip** capable of supporting USB to dual-channel UART (USB serial converter A and USB serial converter B). Only USB serial converter B is configured in the kit for USB-to-UART conversion. Therefore, use the higher-number COM port among the enumerated COM ports to communicate with the kit.

12.2 Errors when commands are entered

For example:

```
AT+SUBCRIBE2
ERR3 COMMAND NOT FOUND
```

1. Make sure that you have typed the command correctly.
2. Note the error codes and refer to the **AWS IoT ExpressLink Programmer's Guide** for details of the error code and to determine the cause.

12.3 Change the Wi-Fi network connected

1. Execute AT+DISCONNECT on the serial terminal to disconnect from the current Wi-Fi network.
2. See Section **7.2** to configure the required Wi-Fi credentials.

12.4 Onboarding does not work with the CIRRENT app

Check if `CONFMODE` was enabled using the `AT+CONFMODE` command.

12.5 ERR14 2 UNABLE TO CONNECT [Wi-Fi Connection failed] error for the AT+CONNECT command

The `AT+CONNECT` command first connects to Wi-Fi, if not already connected, and then connects to the AWS IoT Core.

1. Check the Wi-Fi connection.
2. Check the entered Wi-Fi credentials.
3. Type the following command to verify whether the kit connects to Wi-Fi:

   ```
   AT+DIAG PING 8.8.8.8
   ```

   If the connection is successful, the device will respond with “OK Received ping response in <ping latency ms>”.

12.6 ERR14 5 UNABLE TO CONNECT MQTT device authentication failure error for the AT+CONNECT command

The `AT+CONNECT` command first connects to Wi-Fi if not already connected and then connects to the AWS IoT Core.

1. Check Your AWS endpoint.
2. Check the device certificate uploaded to the AWS IoT Core and the device certificate present in the CCM device.

12.7 Steps to follow if CIRRENT flow is not working

12.7.1 Check if a Thing is present in the AWS IoT console for your device

1. Run the following command in the serial terminal to get the ThingName of your device.

   ```
   AT+CONF? ThingName
   ```

2. Open the **AWS IoT Console**.
3. From the left pane, select **Manage**, and then select **Things**.
4. Note the **Name** of the Thing.

The ThingName shown on the serial terminal and the AWS IoT Console must be the same.

12.7.2 Check for a job in the CIRRENT Console

This job should be used for sending the endpoint to your device. Do the following:

1. In the CIRRENT Console, go to **Services & Tools > Device Managment**.
2. Click the **Jobs** tab present on the left of the screen.
3. Check the following columns for the new job created:
   - Action: ccm_config
   - Action Details: Endpoint should be the same as your AWS account endpoint.
     In the AWS IoT Console, choose **Settings**, check the endpoint under **Device data endpoint**.
   - Created Time: This should be the current time when you clicked **Provision now** in the CIRRENT Console.
   - Status: Active
   - Device IDs: Note the value in the **Device ID** field.

12.7.3 Check the pending state of the job

Do the following if a new job is available for your device.

1. Go to **Services & Tools > Device Managment** in the CIRRENT Console.
2. Click the **Jobs** tab present on the left of the screen, and do the following:
   - Type the device ID noted in the previous section in the **Device ID** text box as **Infineon_device ID**.
   - Under the Pending Jobs section, verify that the Job ID, Action, and Action Details are the same as shown in Step **2** in Section **12.7.2**.
     After sending the AT command AT+CLOUD_SYNC

     the job will move from the “Pending Jobs” section to the jobs list with the following: **Result** column as **success** and **Status** column as **Completed**.

   If execution of any of the above steps did not match the expectation as mentioned, check the Product Cloud API details and repeat the steps in Section **7.1.1.3**.

12.8 Other supported AT commands

Initiates ping to a given IPv4 address from CCM module

`AT+DIAG PING X.X.X.X` X.X.X.X - IPv4 address

Enable the logs with the following AT command

```
AT+DIAG LOG 5
```

Disable the logs with following AT commands

```
AT+DIAG LOG 0
```

Initiates a SCAN of nearby Wi-Fi access points with a timeout of X seconds from the CCM module

```
AT+DIAG SCAN X
```

Disconnects the device (if connected) and resets its internal state. Non-persistent configuration parameters are reinitialized, all subscriptions are terminated, and the message queue is emptied.

```
AT+RESET
```

Performs a full factory reset of the ExpressLink module, including re-initializing all non-persistent configuration parameters and selected persistent parameters, and empties the message queue.

```
AT+FACTORY_RESET
```

For details regarding which configuration parameters are persistent or non-persistent, refer to the following link:

https://docs.aws.amazon.com/iotexpresslink/latest/programmersguide/elpg-configuration-dictionary.html#elpg-table3

13 References

For connecting the CCM IFW956810 evaluation kit to the MCU, refer to the following link:

https://community.infineon.com/t5/Knowledge-Base-Articles/How-to-connect-the-AIROC-IFW956810-CCM-evaluation-kit-to-the-MCU-development/ta-p/369154

Refer to the following links for code examples using CCM and CY8CKIT-062s2-43012 as the host microcontroller

https://github.com/Infineon/mtb-example-ccm-mqtt-publish-capsense-slider
https://github.com/Infineon/mtb-example-ccm-mqtt-ota-subscribe
https://github.com/Infineon/mtb-example-ccm-mqtt-helloworld

Refer to the following link for AWS ExpressLink spec.

https://docs.aws.amazon.com/iot-expresslink/latest/programmersguide/expresslink-pg.pdf

Refer to the following links for the videos explaining the different sections of the GSG:

<links will be updated>

Revision history

Document revision	Date	Description of changes
**	2021-11-29	Initial release
*A	2021-12-24	Added **Infineon CIRRENT Cloud flow** to register the kit to the AWS account
*B	2022-09-22	Added the following sections to showcase new features of CCM: **Quick evaluation of the CCM device** **Low-power modes** **Performing host firmware over-the-air update** Updated the following sections as per new Infineon Cirrent Cloud ID GUI and latest CCM firmware: **Register the kit to your AWS development account** **AT commands to send and receive data** Added **References.** Updated the following sections to improve readability: **Kit contents** **Troubleshooting**
*C	2023-05-03	Updated the following sections to improve the readability: **7 Register the kit to your AWS development account** **12 Troubleshooting** Changed the module name from IFW56810 to IFW56810-00.

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