AW-CU427-USB

IoT Connectivity Evaluation Board for AWS IoT Core

Getting Started Guide

Rev. 0.2

Revision History

Version	Revision Date	Description	Initials	Approved
0.1	2021/01/14	Initial version	Steven Jian Jackson Boon Josh Lin	Chihhao Liao Patrick Lin
0.2	2021/10/28	Add introduction of “Over-the-Air Updates”	Josh Lin	Patrick Lin

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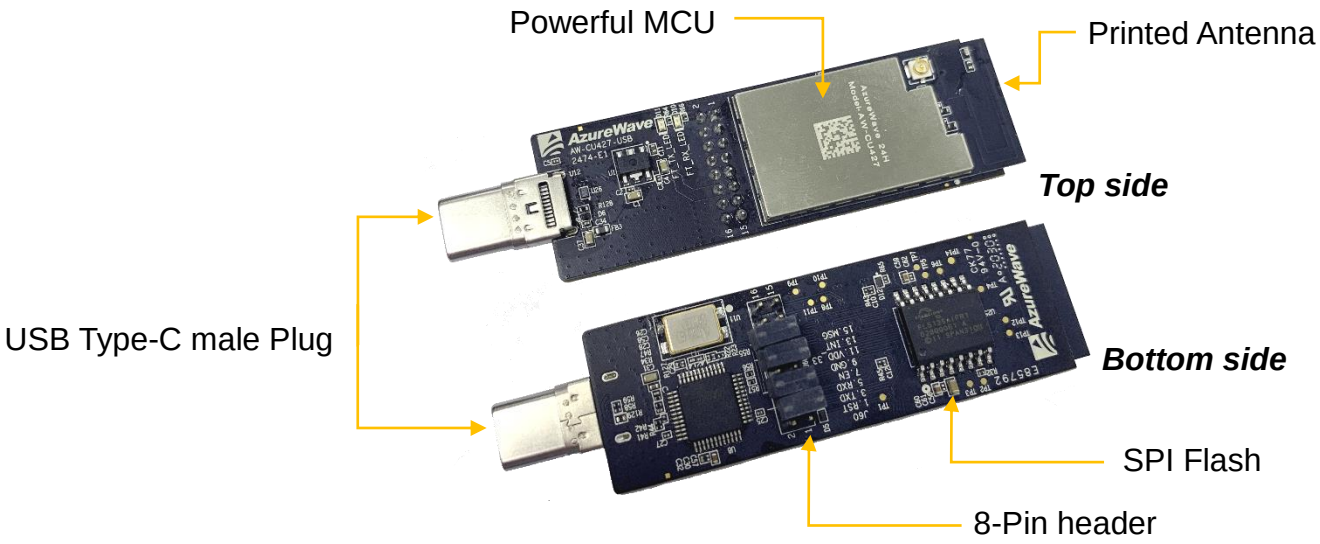
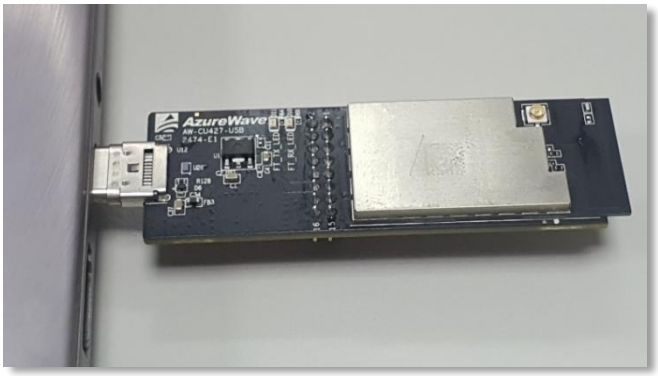
1. Overview of AW-CU427-USB



2. Hardware Setup

2.1 Components

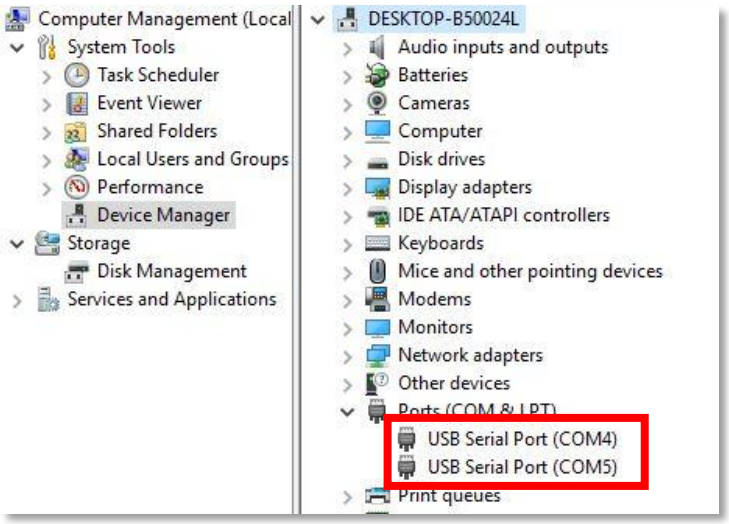
- Plug the AW-CU427-USB dongle into the USB type C port or through an USB type A male to USB type C female cable (not included in the box) if the computer does not have the USB type C port or it can not recognize the dongle



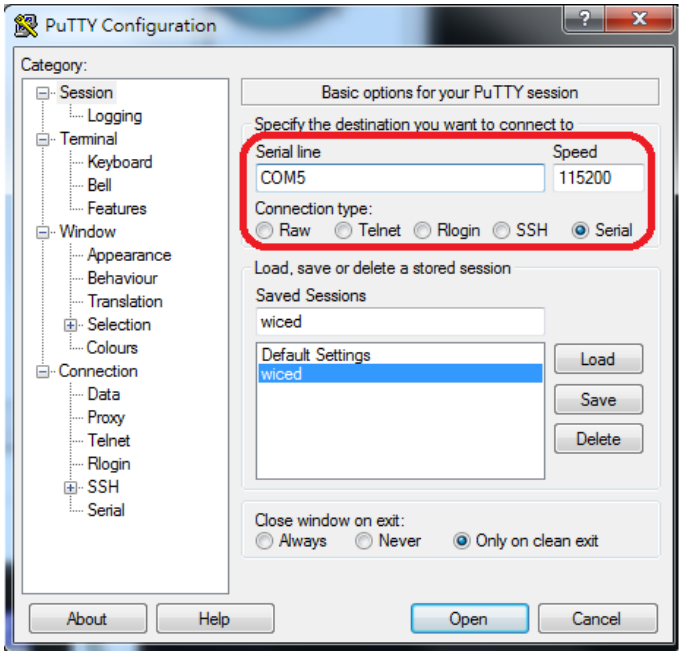
2.2 Identify the Hardware and Firmware

- The simple way to identify the hardware and firmware of AW-CU427 is under Windows. You also can identify it under Linux.

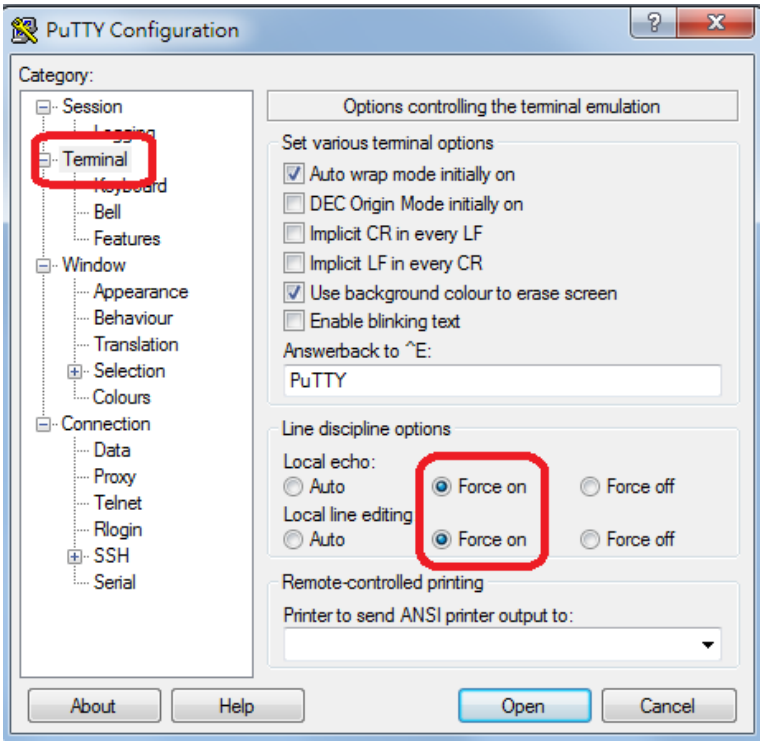
  Check if Device Manager can recognize AW-CU427-USB. If not, download FTDI Driver at https://www.ftdichip.com/Drivers/VCP.htm, then send the AT commands through the second FTDI com port



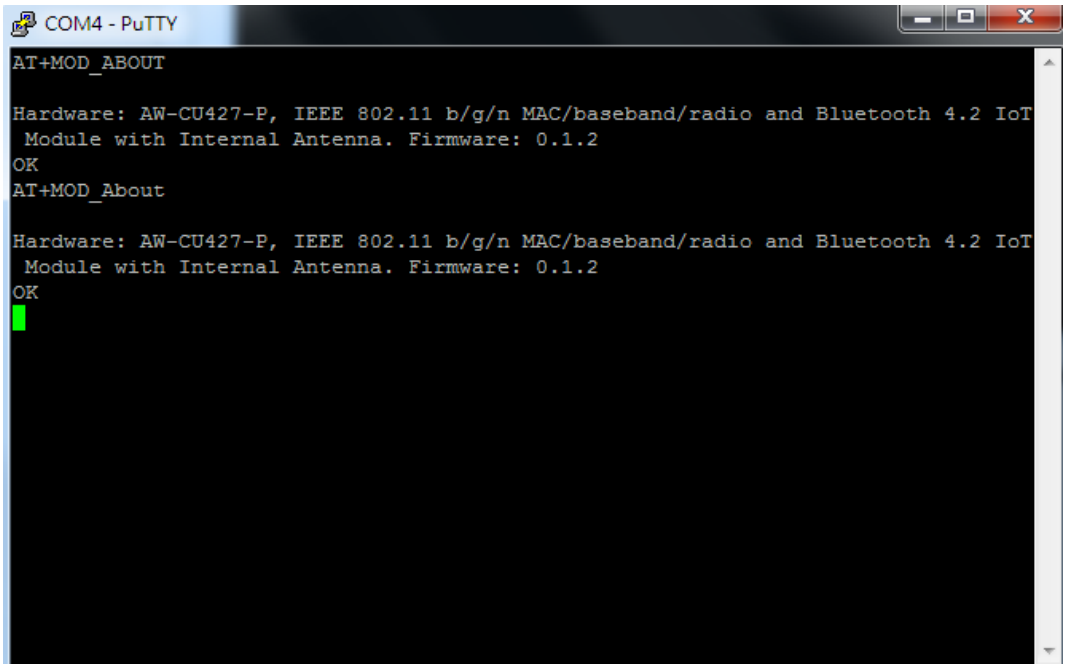
- Open a serial connection by using PuTTY or the similar terminal emulator



- To force the terminal show characters you type and send the command only after you hit the “Enter” key, set Local echo & Local line editing to “Force on”



- Type **AT+MOD_About** and hit “Enter” key to identify the dongle hardware and firmware



2.3 Antenna Installation Guide

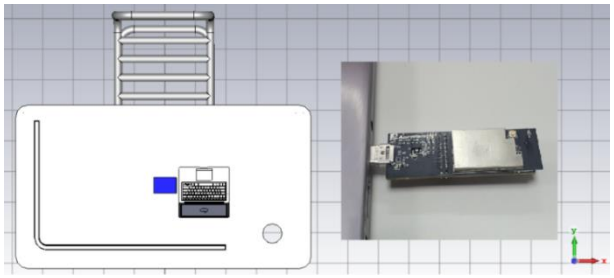
The AW-CU427-USB includes an integrated omnidirectional antenna. Hence, the dongle can be seen as an antenna.

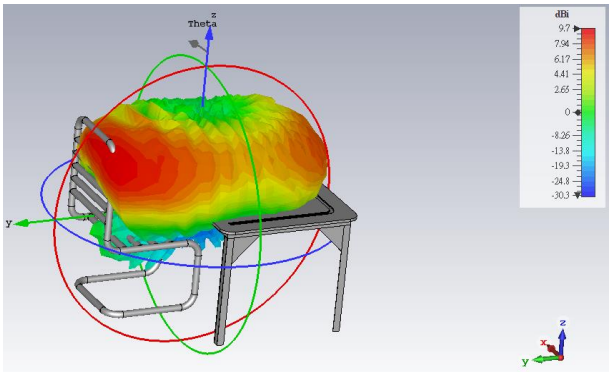
Objects close to the antenna (the dongle) become new sources for radiation from far field perspective. This can be a problem if those objects are electrically large. Recommended minimum clearance is 20mm for conductive materials and 10mm for non-conductive materials. Failing to meet the clearance requirements will detune the antenna and the radiation pattern may not be omnidirectional.

Use AT command **AT+WIFI_On** and **AT+WIFI_Scan** to check if the RSSI (Received Signal Strength Indication) is good (>-65dBm) or not. If not, adjust the setup until the RSSI >-65dBm.

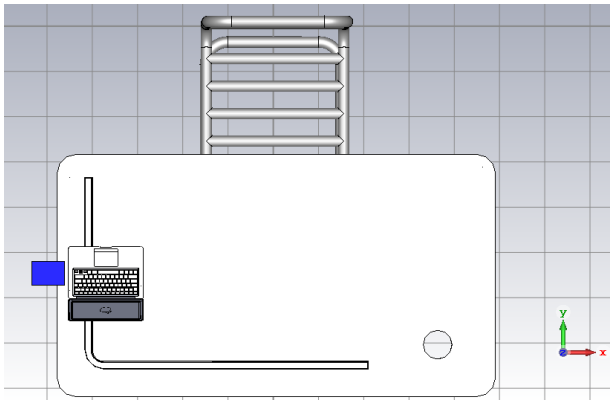
The examples below are antenna radiation patterns with different setups:

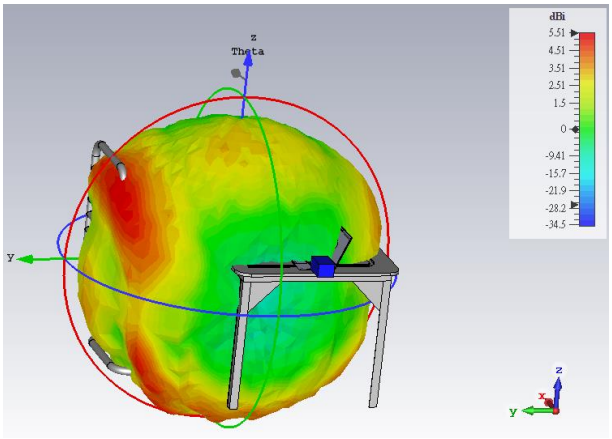
- Steel Desk & Chair + Horizontal Position



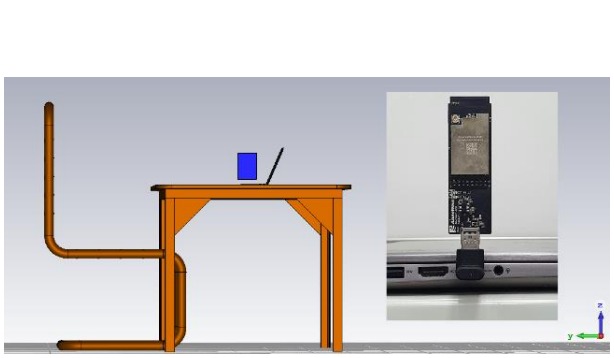


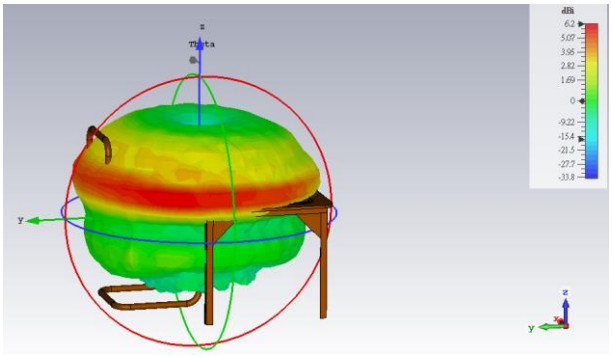
- Steel Desk & Chair + Horizontal Position + Close to Desk Edge



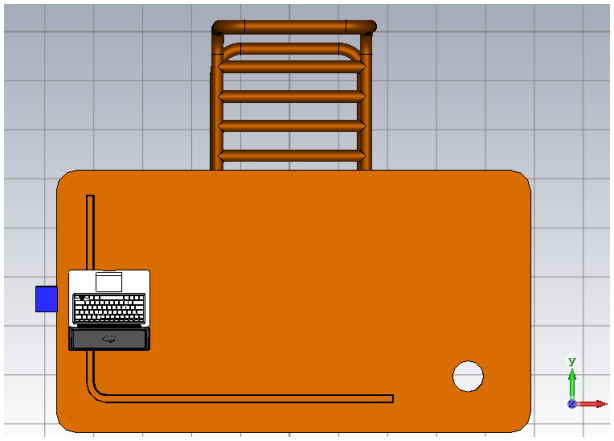


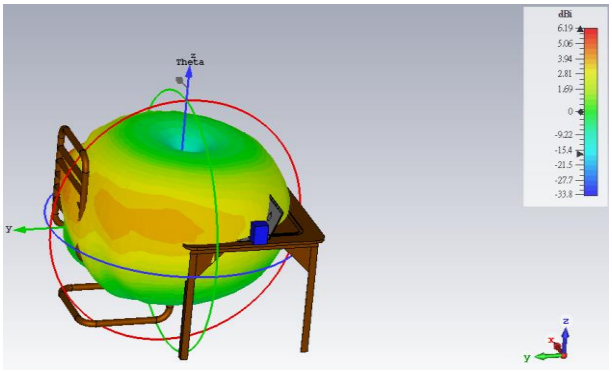
- Wood Desk & Chair + Vertical Position





- Wood Desk & Chair + Vertical Position + Close to Desk Edge





3. AWS Command Example

Please find the command details in **AWS CONNECTOR AT Command Set**.

Below are commands for the demo:

1. Turn on Wi-Fi module: **AT+WIFI_On**
2. Retrieve the Wi-Fi AP | Station Mode: **AT+WIFI_GetMode**
3. Perform a Wi-Fi network scan: **AT+WIFI_Scan**
4. Set and store the Wi-Fi AP information when AW-CU427-USB in Station Mode:

   AT+WIFI_SetAP=SSID,password,security type
   SSID: SSID of AP (case sensitive)
   password: password for AP (case sensitive)
   security type: OPEN | WEP | WPA | WPA2

5. Connect to the AP: **AT+WIFI_Connect**
6. Define and store Thing-specific configuration:

   AT+THING_Set=client ID,endpoint,client certificate,client private key
   client ID: Thing name(Client ID)
   endpoint: AWS IoT endpoint URL
   client certificate: Certificate for this Thing
   client private key: Private key for this Thing

7. Connect the client to MQTT broker: **AT+MQTT_Connect**
8. Subscribe to and save MQTT topic: **AT+MQTT_Subscribe**=<topic>,<qos>
9. Publish to MQTT topic:

   AT+MQTT_Publish=topic,message,qos
   topic: Topic to publish to
   message: Message to publish
   qos: 0 | 1

3.1 Getting Started with AWS IoT Core

Step 0**:** The below link is a documents of how to setup AWS IOT, you can refer to it for full AWS IOT knowledge.

https://docs.aws.amazon.com/iot/latest/developerguide/iot-gs.html

But, if you want to setup AzureWave AWS Connector, you would just refer to the following steps.

Step 1: Create AWS Account, Create an IAM user.

Please refer to the below link to setup AWS Account and IAM user.

https://docs.aws.amazon.com/iot/latest/developerguide/setting-up.html

If you have created an IAM user, please refer to the following setting to connect these two policies (AmazonFreeRTOSFullAccess, AWSIoTFullAccess) to your IAM.

https://docs.aws.amazon.com/freertos/latest/userguide/freertos-account-and-permissions.html

Step 2: Create a thing.

A thing represents a specific device or instance that can communicate with AWS IOT.

Please refer to the following link to create a thing.

https://docs.aws.amazon.com/iot/latest/developerguide/create-aws-thing.html

Step 3: Register a device

This step will create certificate and private key. You can use certificate, private key, thing name and endpoint as **AT+THING_Set** command parameter. After this command executing, the four parameter will be provision to our connector. After provisioning, you can connect to AWS IOT with MQTT or SHADOW operation.

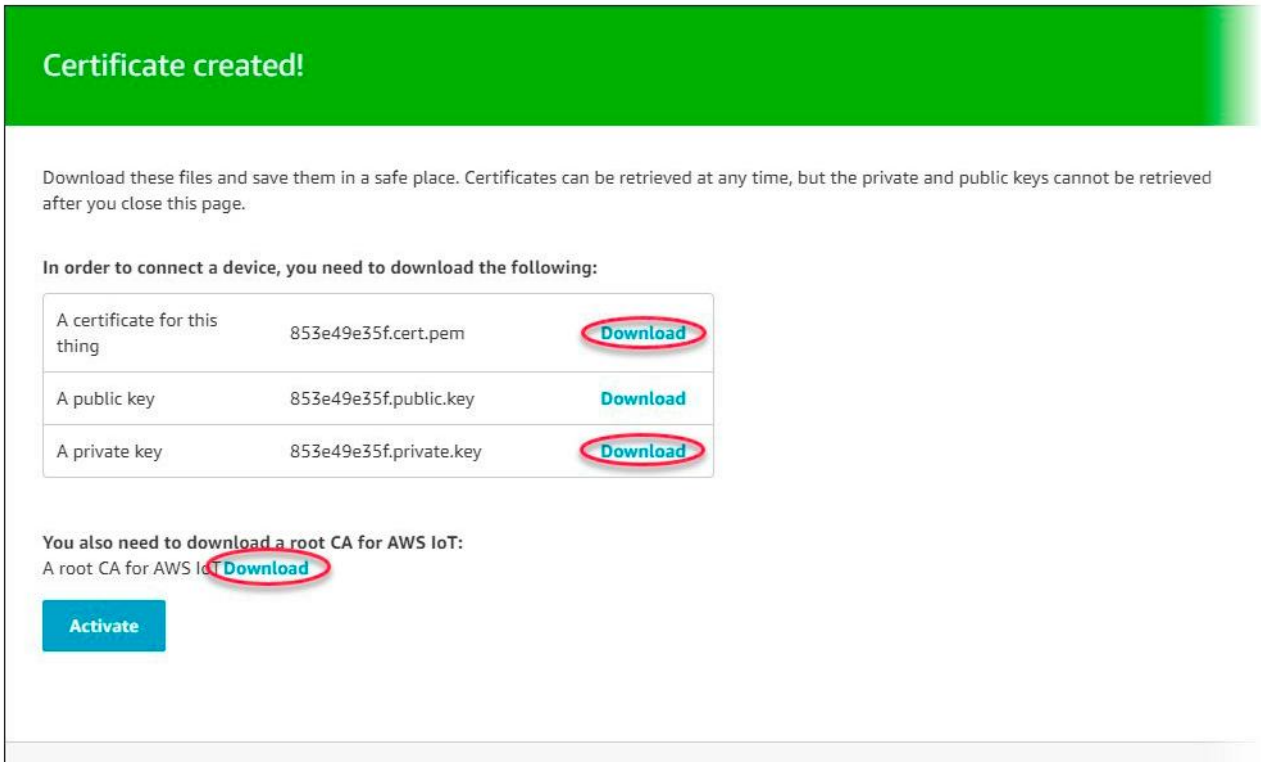
Please refer to the steps at the following link.

https://docs.aws.amazon.com/iot/latest/developerguide/register-device.html

After finishing the steps, please notice the following two actions:

- Download certificate and private key

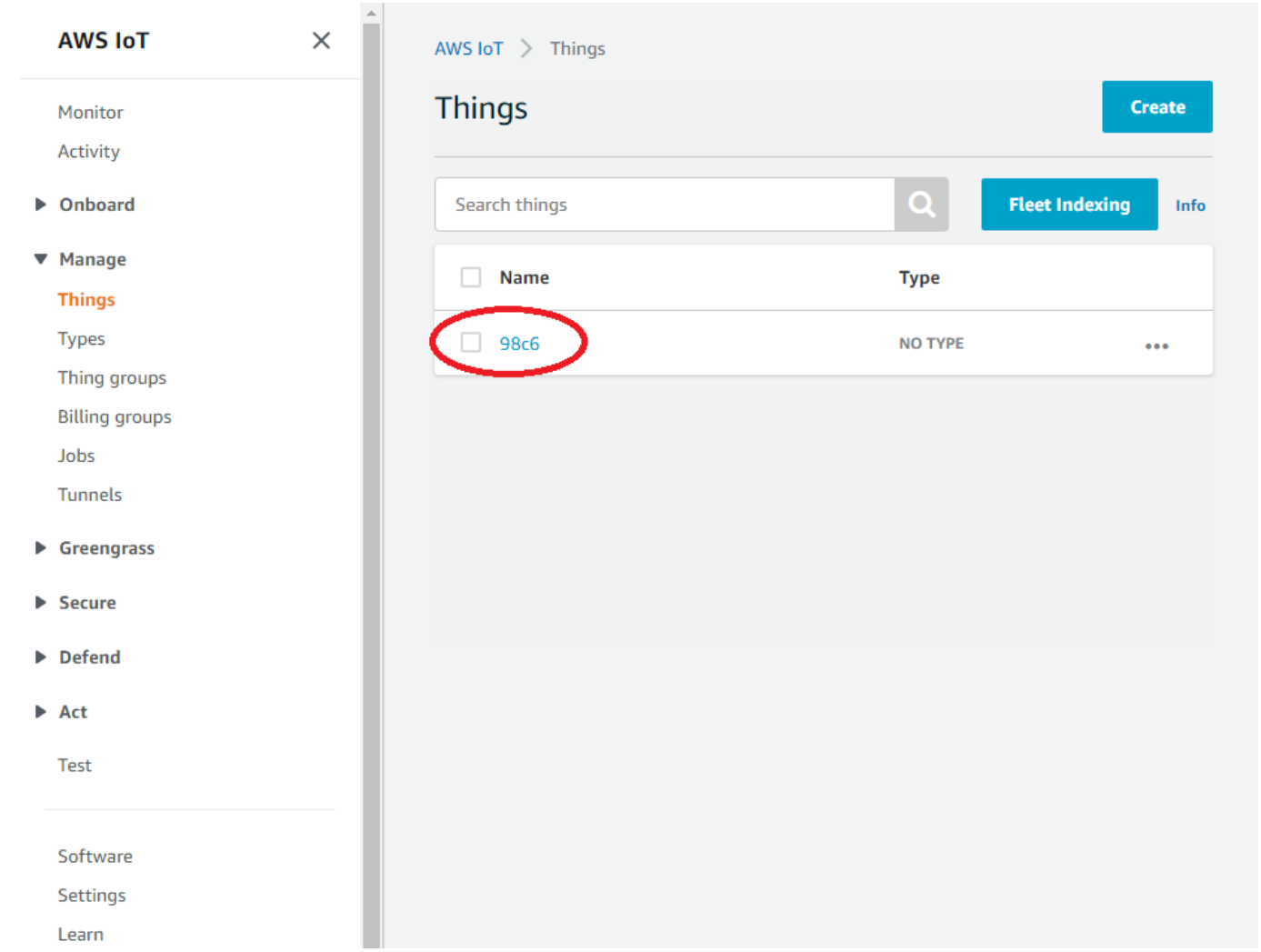
In Create and activate a device certificate chapter, please download and keep the certificate and private key. Because they will be used when sending the **AT+THING_Set** command.

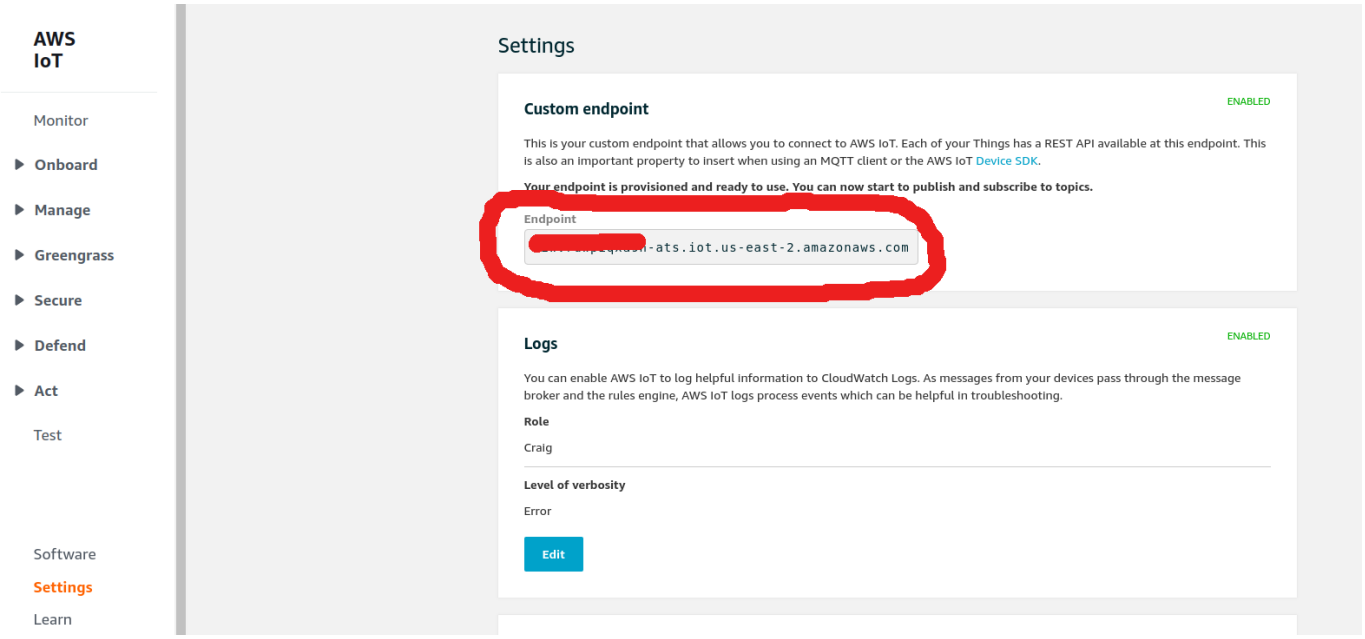


- Thing Name and Endpoint

These two data will also be used for **AT+THING_Set** command.

You can find out thing name in Manage > Things submenu, and endpoint in settings of AWS IOT Console at console.aws.amazon/iot.





3.2 Publish and Monitor MQTT message on the cloud

Step 0: Make sure the AP under test is connected to the internet using other Wi-Fi enabled devices. Assume the SSID, password and security type of the AP is MySSID, MyPassword, wpa2.

Step 1: Connect the AW-CU427-USB to the system (refer to 2. Hardware Setup) and turn off the wireless devices near the AW-CU427-USB (except for the device under test). Turn on the Wi-Fi module of the AW-CU427-USB using **AT+WIFI_On**

Step 2: Check if AW-CU427-USB is in station mode using **AT+WIFI_GetMode**

Step 3: Set and store information of the AP using **AT+WIFI_SetAP= MySSID,MyPassword,wpa2**

> **AT+WIFI_SetAP**=**SSID**,**password,security type**
> **SSID**: SSID of AP (case sensitive)
> **password**: password for AP (case sensitive)
> **security type**: OPEN | WEP | WPA | WPA2

Step 4: Connect to the AP: **AT+WIFI_Connect**

Step 5**:** Define and store Thing-specific configuration using **AT+THING_Set** command

> **AT+THING_Set=client ID,endpoint,client certificate,client private key**
> **client ID:** Thing name(Client ID)
> **endpoint:** AWS IoT endpoint URL
> **client certificate:** Certificate for this Thing (downloaded in 3.1 step 3)
> **client private key:** Private key for this Thing (downloaded in 3.1 step 3)

You should create command as format below:

AT+THING_Set=98c6, a3qjEXAMPLEffp-ats.iot.us-east-1.amazonaws.com, -----BEGIN CERTIFICATE-----\n…base64 data…\n-----END CERTIFICATE-----\n, -----BEGIN RSA PRIVATE KEY-----\n…base64 data…\n-----END RSA PRIVATE KEY-----\n

> Note: a3qjEXAMPLEffp is just an example endpoint, your endpoint URL should replace it. Please follow the instructions to find the endpoint.

- Navigate to the AWS IoT console
- Choose Settings in the navigation pane
- The endpoint can be found under Custom endpoint

Step 6: Connect the client to MQTT broker: **AT+MQTT_Connect**.

Step 7: Subscribe to and save MQTT topic using **AT+MQTT_Subscribe=iotdemo/1,0**

Step 8: Publish to MQTT topic using **AT+MQTT_Publish=iotdemo/1, hello, 0**

AT+MQTT_Publish=topic,message,qos
topic: Topic to publish to
message: Message to publish
qos: 0 | 1

Step 9: Use the MQTT client in the AWS IoT console to monitor the messages that device sends to the AWS Cloud.

Sign in to the AWS IoT console.

https://console.aws.amazon.com/iotv2/

In the navigation pane, choose **Test** to open the MQTT client.

In **Subscription topic**, enter **iotdemo/#**, and then choose **Subscribe to topic**.

You should see the message send from device as like below.

3.3 Over-the-Air Updates

This section descripts how to setup OTA on AWS server side and how to create an OTA job for our AWS connector to update firmware.

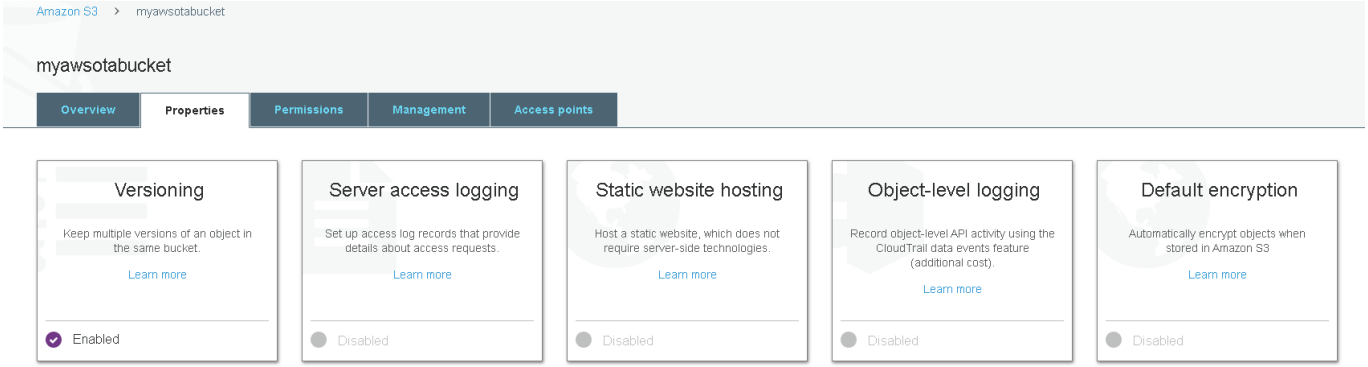
The first three steps descript what requirements of OTA on AWS server side you have to setup. The last step descripts how to create an OTA job.

Create S3 bucket to store update.

AWS S3 is an object storage service and we will put update firmware in it.

Please reference https://docs.aws.amazon.com/freertos/latest/userguide/dg-ota-bucket.html

Note: Please make sure you have enable versioning on you S3 bucket setting.

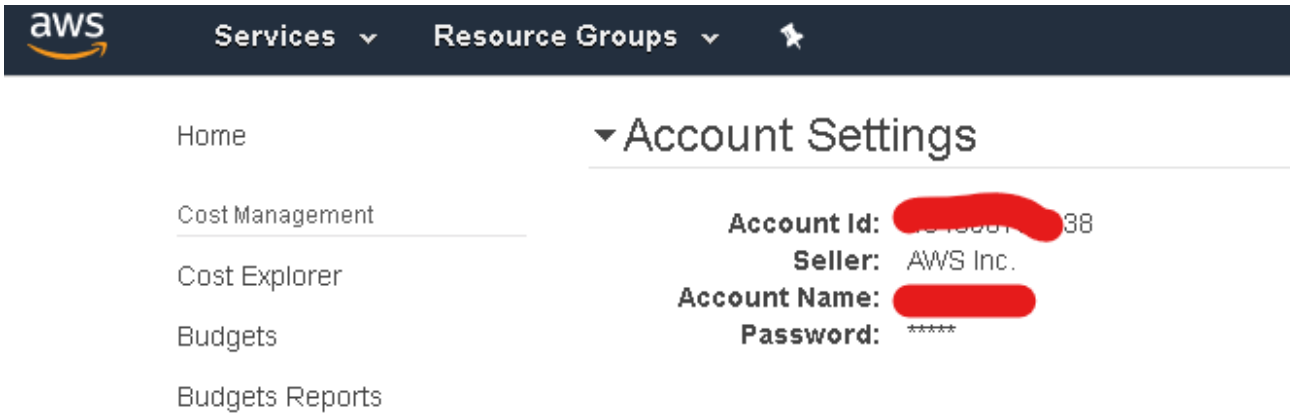


Create Service Role and Policy.

This section will descript how to setup Role and Policy to have right to access AWS S3 storage.

- Service Role
  Please reference
  https://docs.aws.amazon.com/freertos/latest/userguide/create-service-role.html

  If you want to find out your Account id, please enter the following link.
  https://console.aws.amazon.com/billing/home?#/account



- User Policy
  Please reference
  https://docs.aws.amazon.com/freertos/latest/userguide/create-ota-user-policy.html

Create code-signing certificate

Because there are several configures in this topic, please use the following link to complete code-signing certificate.

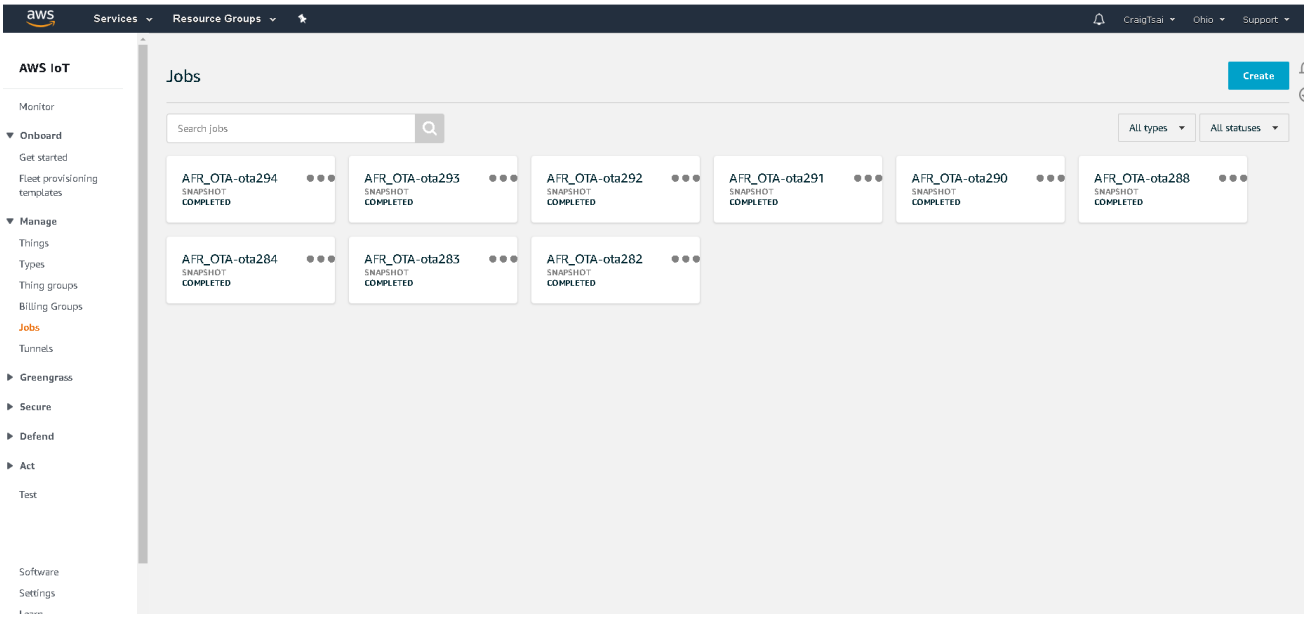
https://docs.aws.amazon.com/freertos/latest/userguide/ota-code-sign-cert-win.html

AWS CLI and openssl are necessary softwares to complete this task.

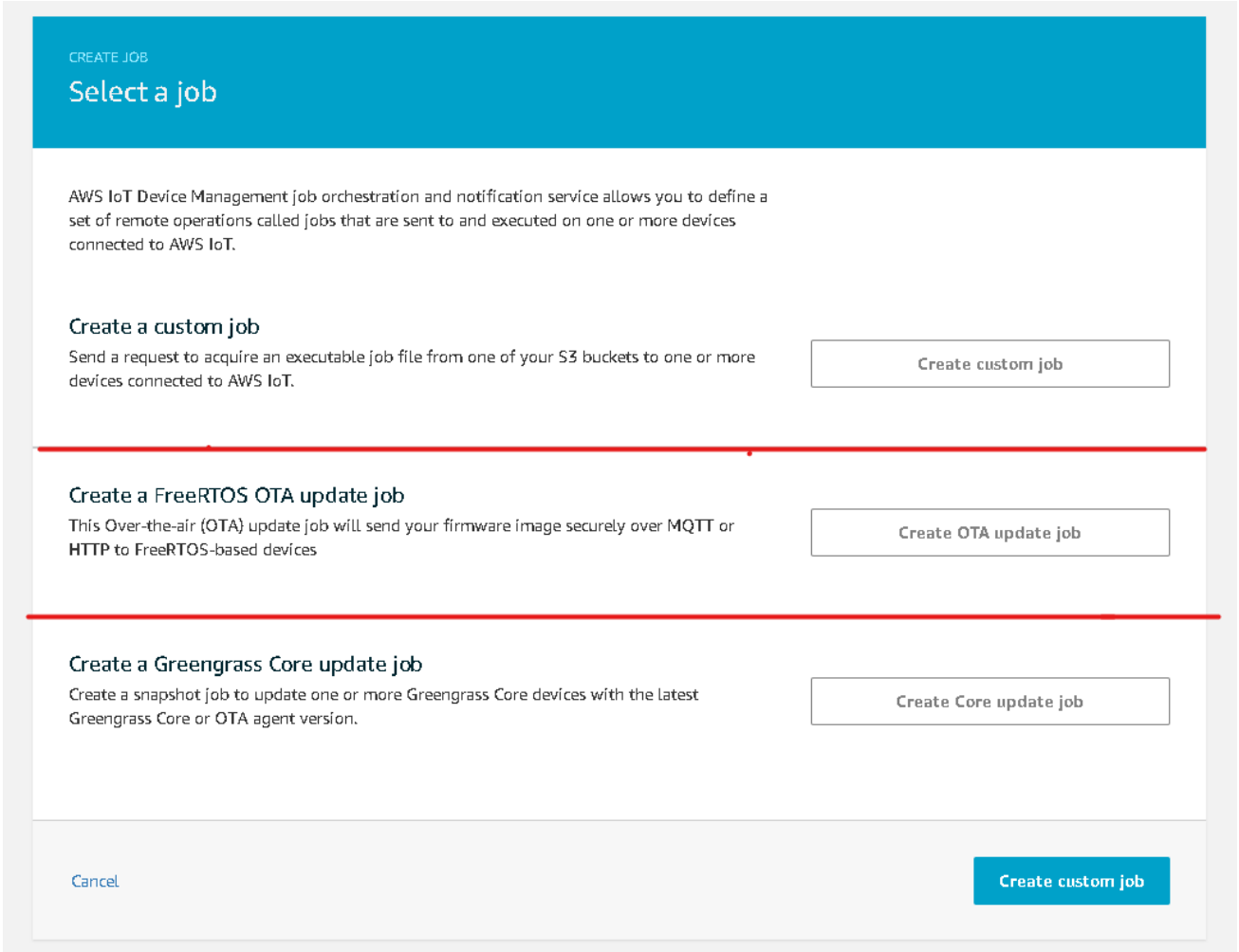
Create OTA update Job

After all prepared procedure finished, you can create an OTA update job on this thing name and use AT+MOD_OTA command to trigger OTA update procedure.

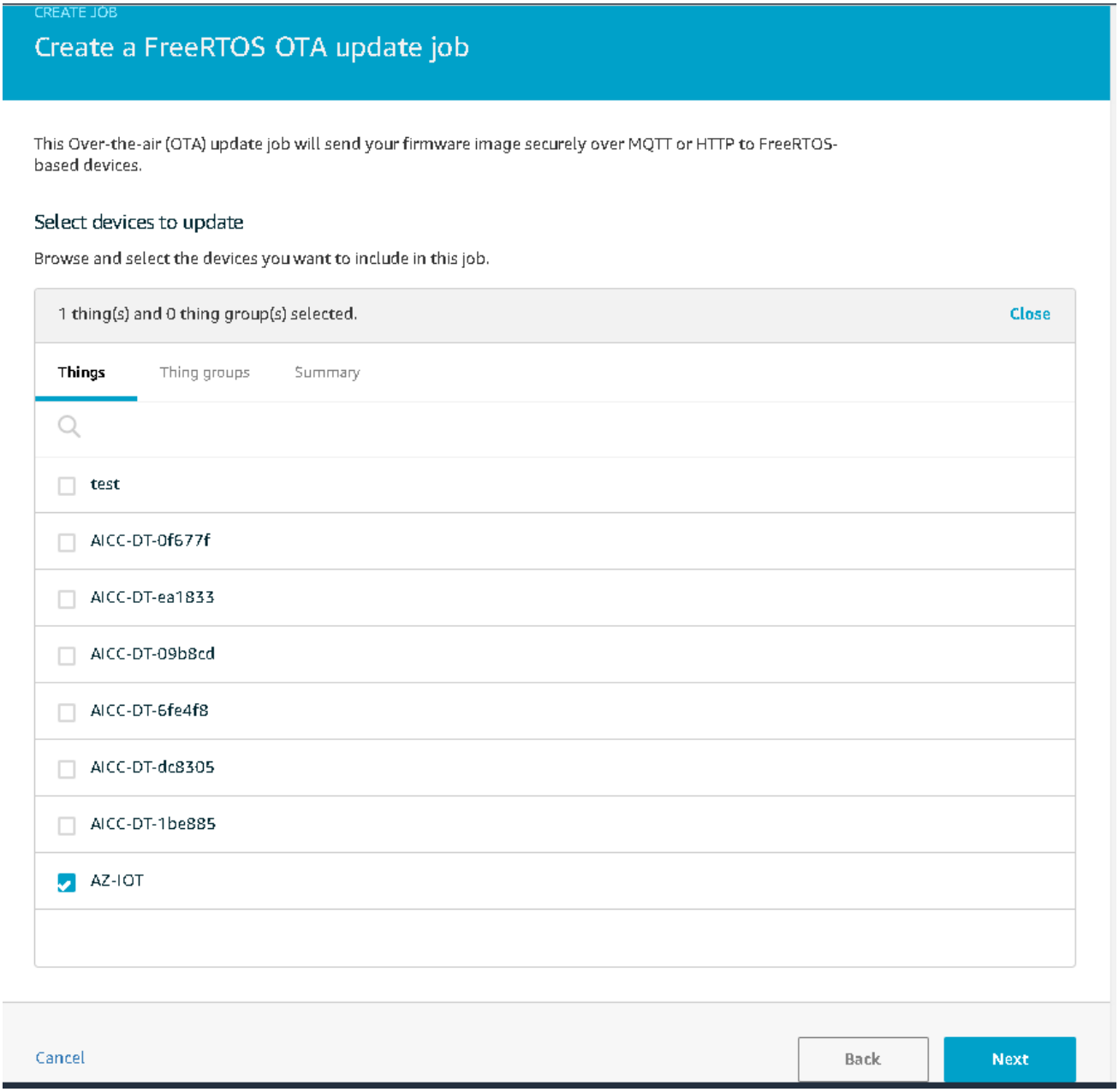
1. Create OTA Job
   Please enter AWS IOT console, choose Manager, and press Jobs and then press Create button.



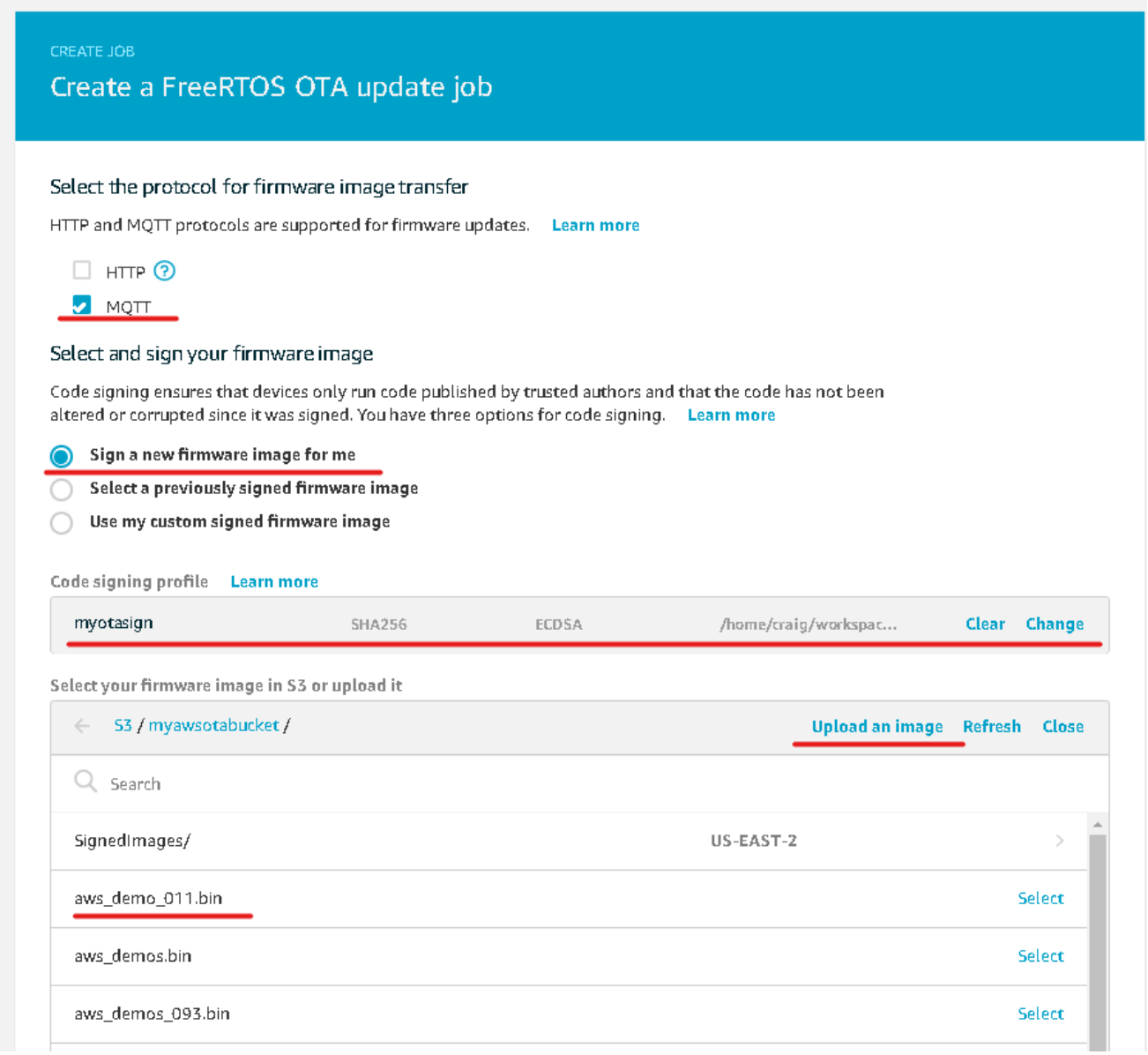
2. Please choice a FreeRTOS OTA update job and press "**create OTA update job**"



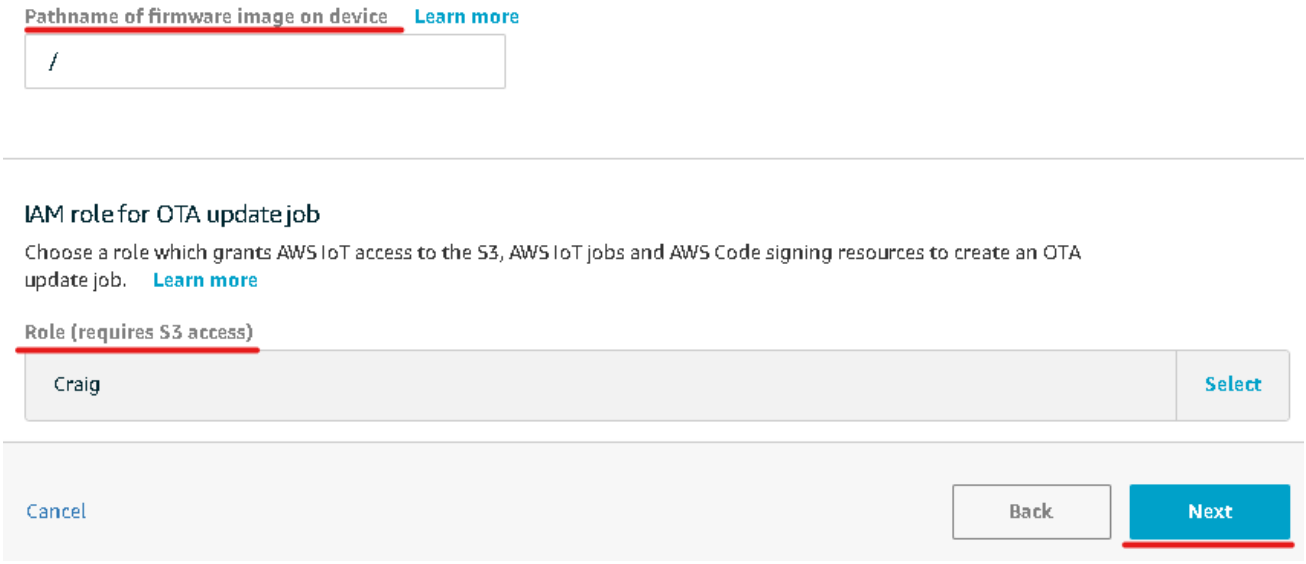
3. Select a Things to create OTA job and then press NEXT



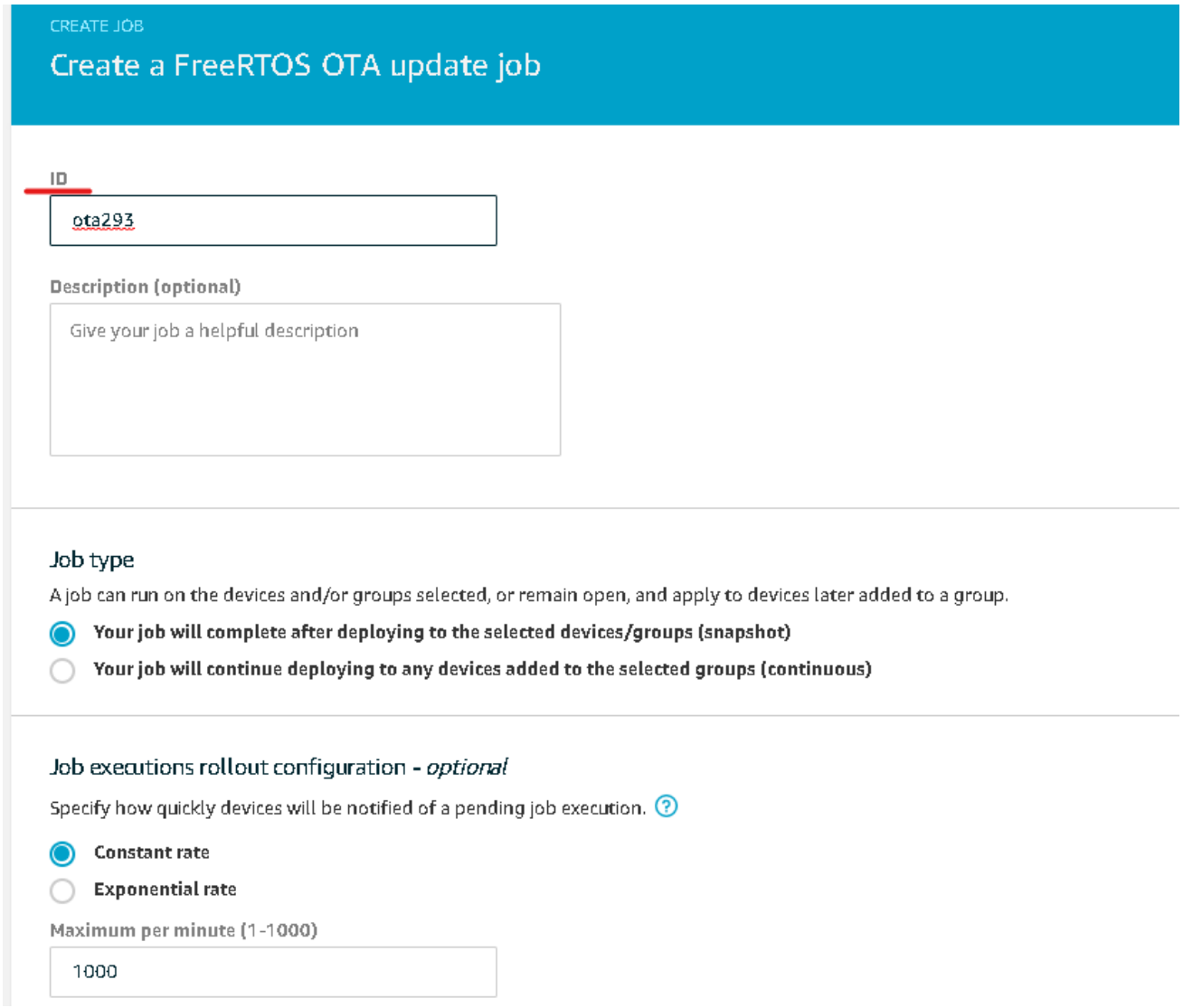
4. On next page, please only select **MQTT** to be update protocol and select **Sign a new firmware for me**. Then choose the **code signing profile** we create on previous chapter. After that, you can select a exist firmware or upload a new image from local.



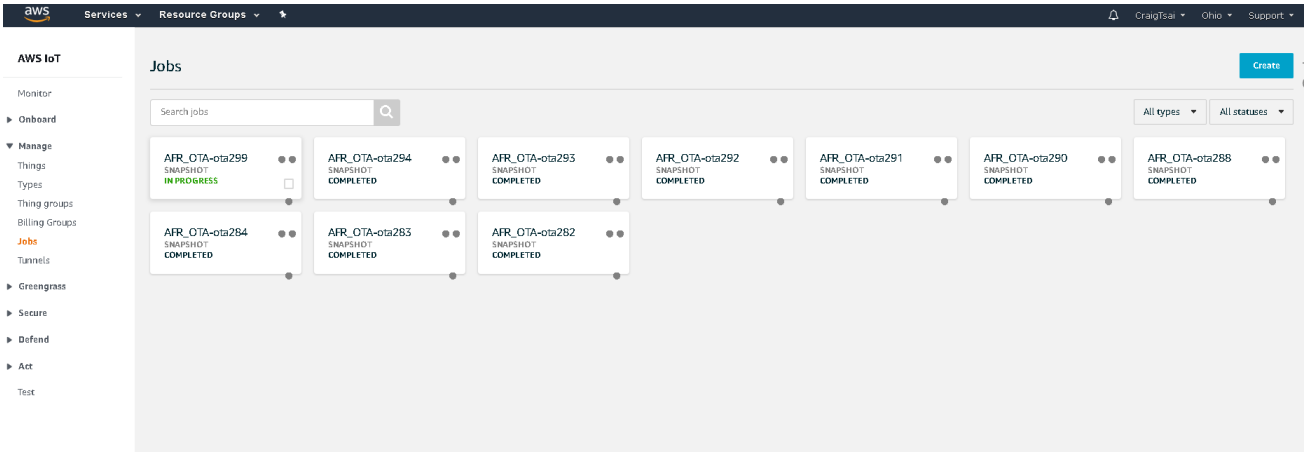
Then, please enter slash in **Pathname of firmware image on device** and choose the **Role** we create on previous chapter. Then press NEXT button.



5. Entering a **unique ID** in ID field. You can't use the same ID you created before. Other fields just keep default setting and press Create button.

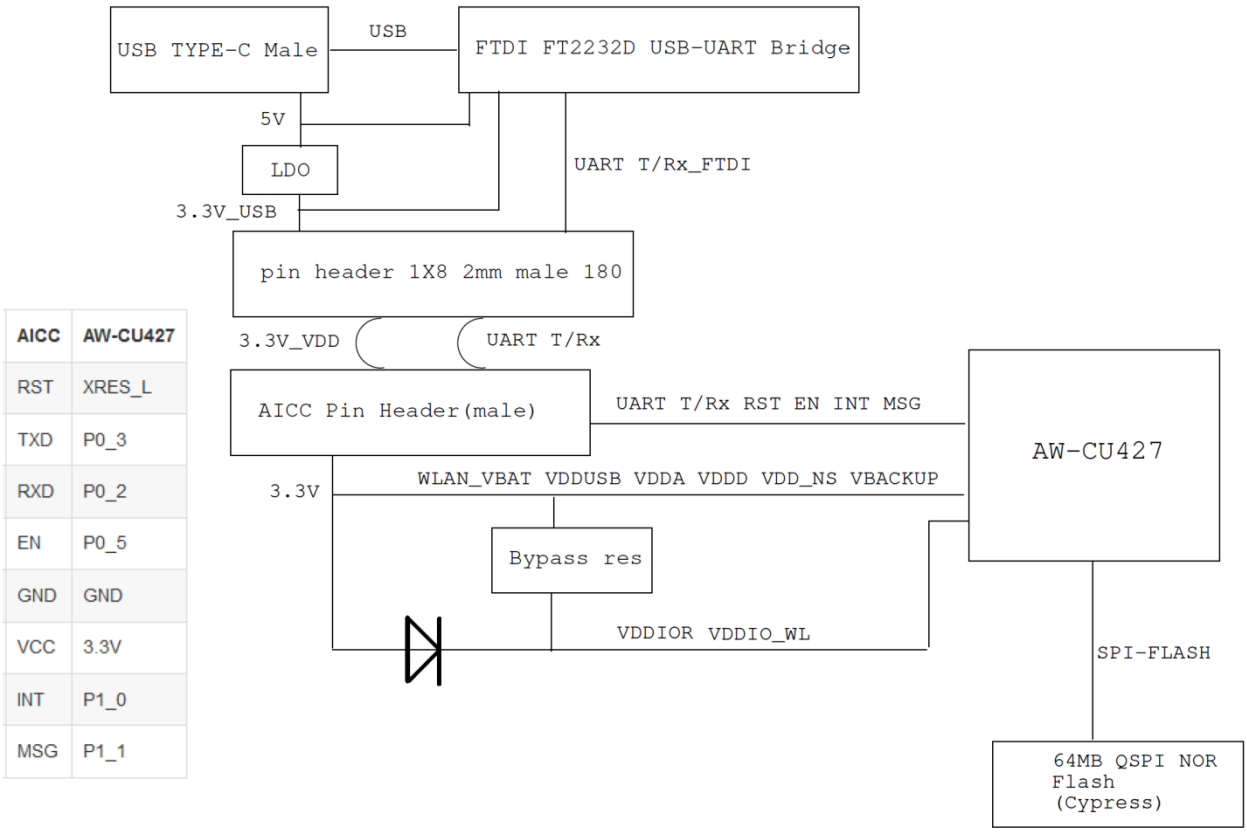


6. Finally, you can see a job to be created on Jobs page. If you don't see it, please press f5 to refresh the webpage. The Job will be in IN PROGRESS status.



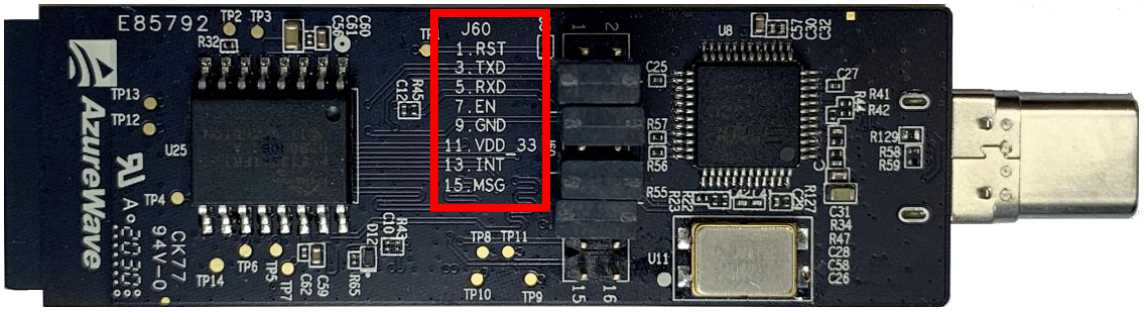
4. Block Diagram and Schematic

4.1 Block Diagram for AW-CU427-USB



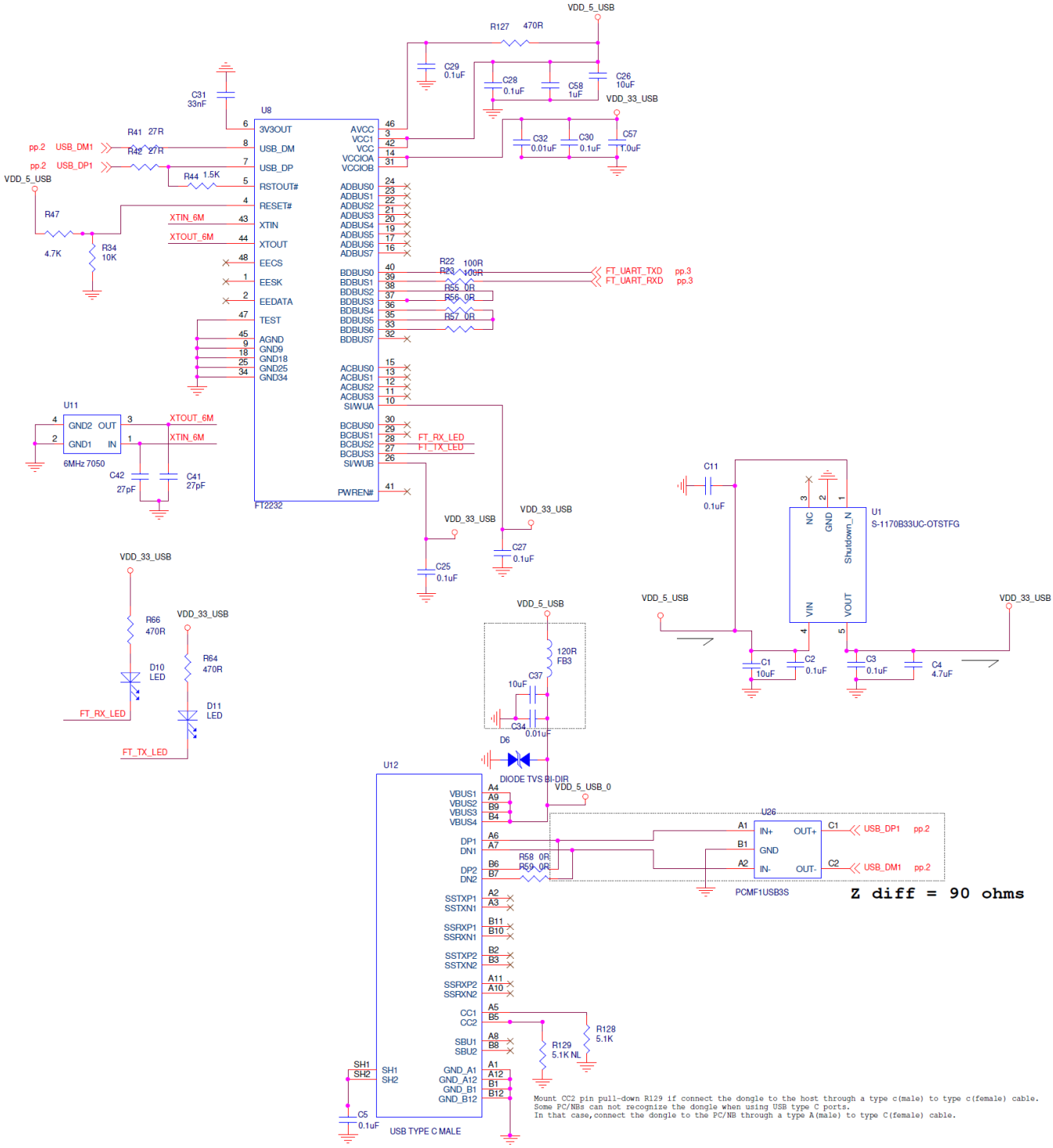
AICC	AW-CU427
RST	XRES_L
TXD	P0_3
RXD	P0_2
EN	P0_5
GND	GND
VCC	3.3V
INT	P1_0
MSG	P1_1

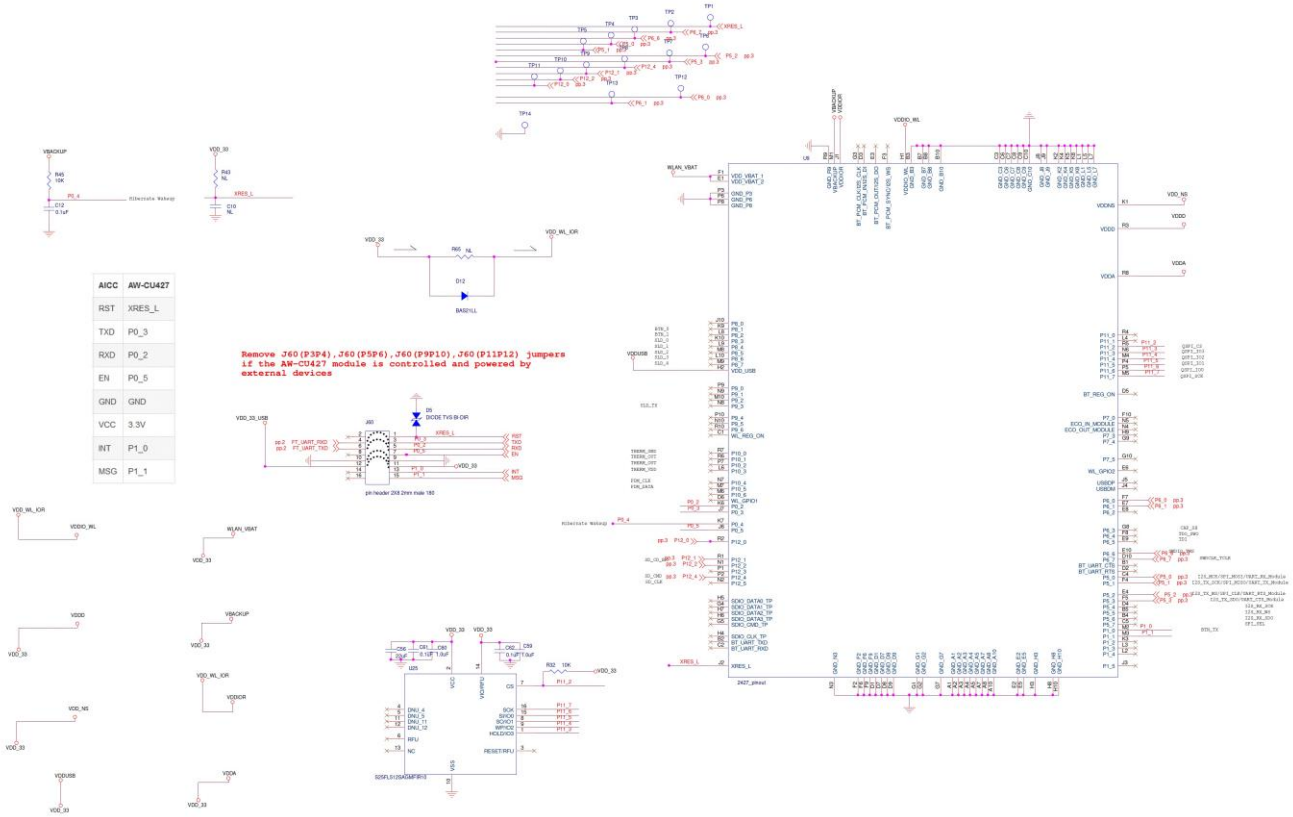
Pin Name (J60) is also shown on the bottom of PCBA



4.2 Schematics for AW-CU427-USB

FTDI Bridge （USB to UART/JTAG)





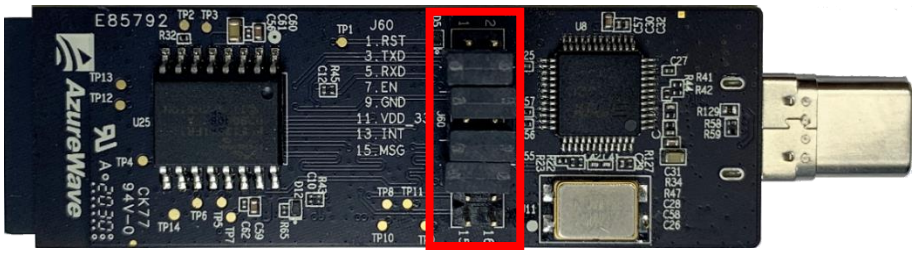
5. Additional Information

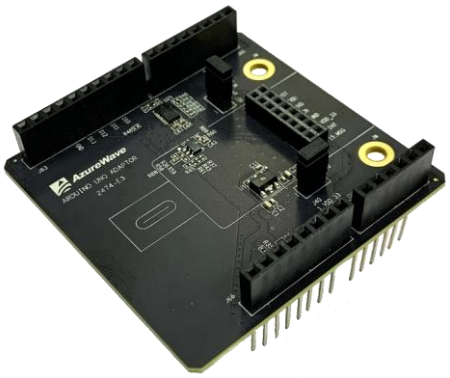
The AW-CU427-USB is designed for **Engineering Evaluation Purpose** Only as opposed to an end product. Thus, it may not comply with directives such as WEEE, CE and FCC. The dongle is not completely enclosed with a shielding case. User must take whatever measures to prevent ESD and minimize interference generated by the dongle. **For preventing any damage on this dongle, please plug it into USB female port horizontally**.

Appendix

AW-CU427-USB work with Arduino Uno

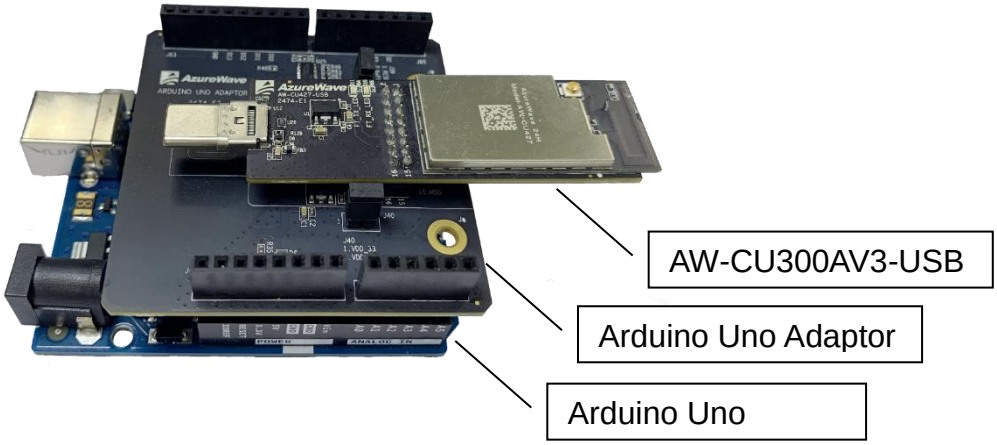
- Remove all the jumpers (2mm pitch) on the dongle before mating it with the Arduino Uno through the ARDUINO UNO ADAPTOR. **The digital logic level & power supply input of the dongle are 3.3V**. DO NOT directly connect the dongle to the Arduino Uno.



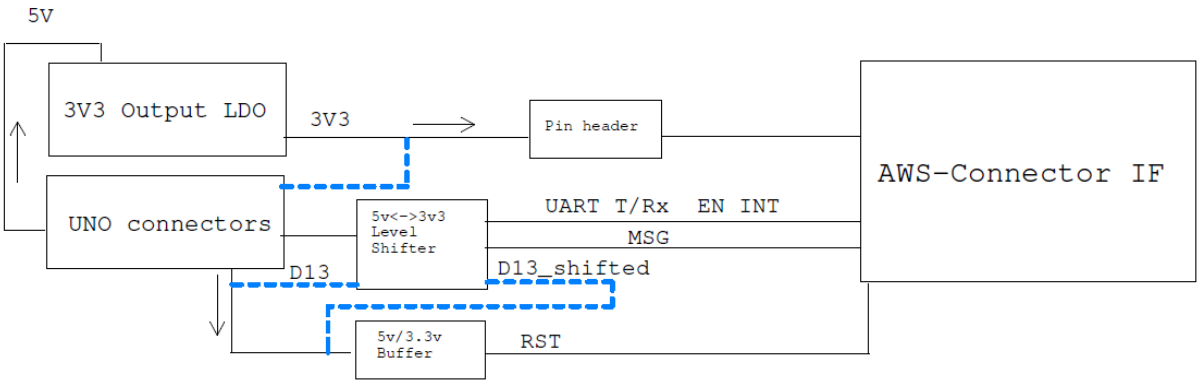


ARDUINO UNO ADAPTOR

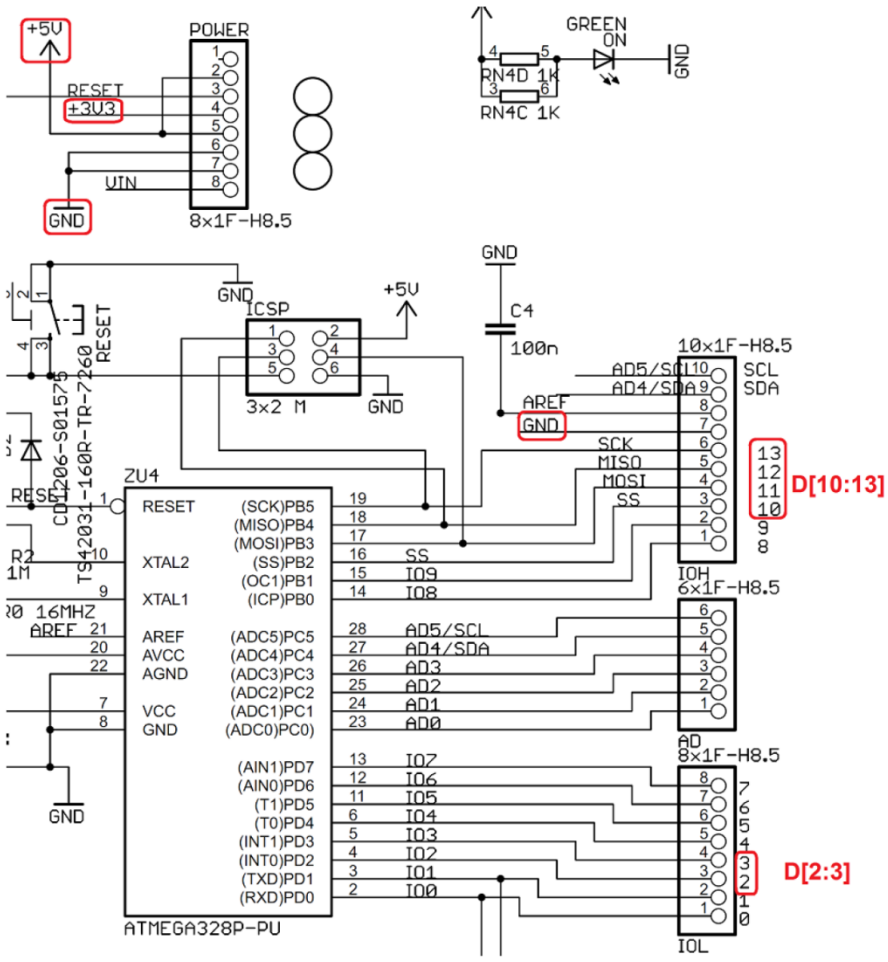
- AW-CU427-USB connected to Arduino Uno through the ARDUINO UNO ADAPTOR



- Block Diagram for Arduino Uno Adaptor



- Schematics for Arduino Uno Adaptor



ArduinoUNO	AICC
D13	RST
D12	TXD
D11	RXD
D10	EN
GND	GND
5V	VCC
D2	INT
D3	MSG

ArduinoUNO	AICC
D13	RST
D12	TXD
D11	RXD
D10	EN
GND	GND
5V	VCC
D2	INT
D3	MSG