AWS IoT and Adafruit WICED Feather

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Guide Contents

Introduction

AWS IoT (http://adafru.it/pex), part of Amazon's ongoing attempt to corner all aspects of the 'cloud', is essentially a secure MQTT broker with a management console and some back-end logic behind it to make it easier and more flexible to work with than a vanilla broker like Mosquitto (http://adafru.it/pey).

One of the key aspects that makes AWS IoT stand out compared to other MQTT solutions is the security layer. In addition to validating the remote MQTT server with a certificate (similar to how HTTPS works), the individual sensor nodes are *also* verfied via a second device-side certificate. What this means is that there is a very high level of certainty that the device pushing the data out to the MQTT broker or subscribing to data from it is exclusively the device you think it is.

Unfortunately, this this also makes using AWS IoT more of a technical challenge, and there aren't a lot of embedded platforms out there that can jump through all of the technical hoops required to work with AWS IoT. Thankfully, with the WICED Feather (http://adafru.it/pez), we've got you covered!

This guide will walk you through configuring a new 'thing' with AWS IoT, and run you through the steps required to start securely communicating with Amazon's servers using a WICED Feather, including getting the two required certificates into a form the WICED Feather can use.

New to AWS? Don't worry about it, you should have everything you need here to get up and running in under an hour!

AWS IoT Setup

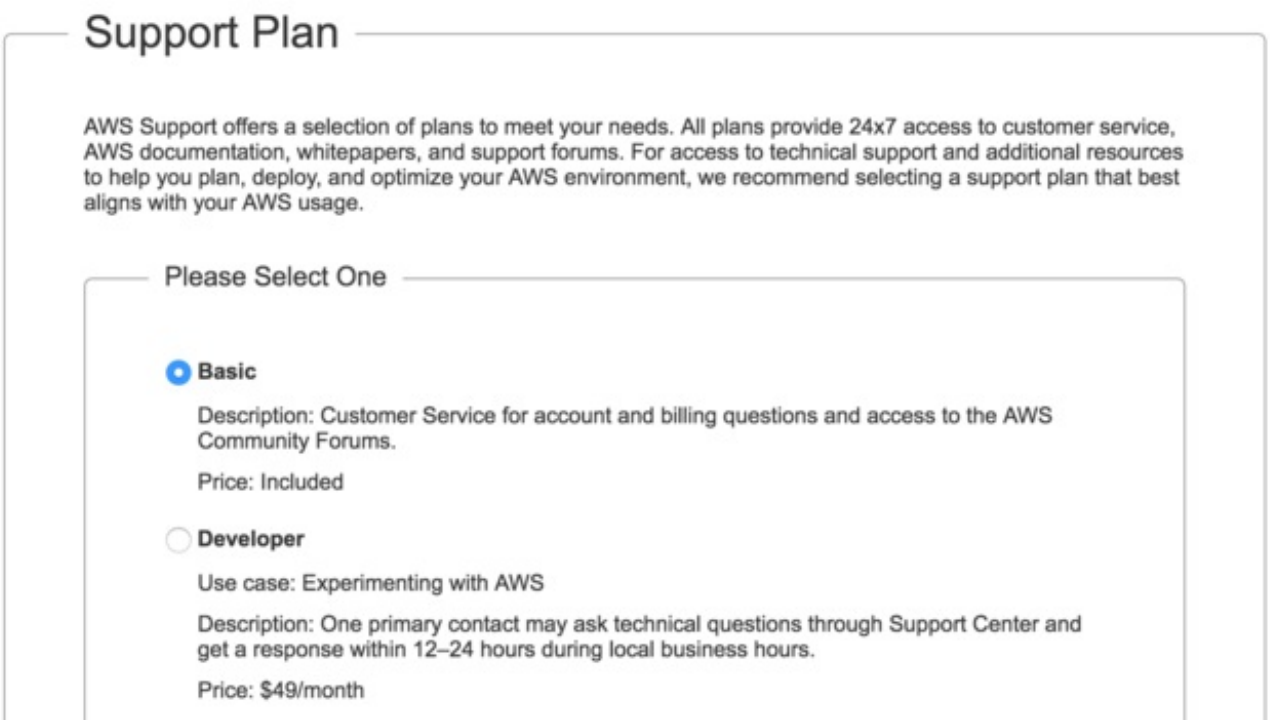
This page will guide you through the process of setting up a new 'thing' on AWS, and creating the required certificates to enable the WICED Feather to talk to the AWS IoT MQTT servers.

Enable AWS Services for your Amazon Account

Before you can do anything, you will need to make sure that your Amazon account has billing enabled (even if you are using a free AWS plan!) and that your account is associated with a valid credit card.

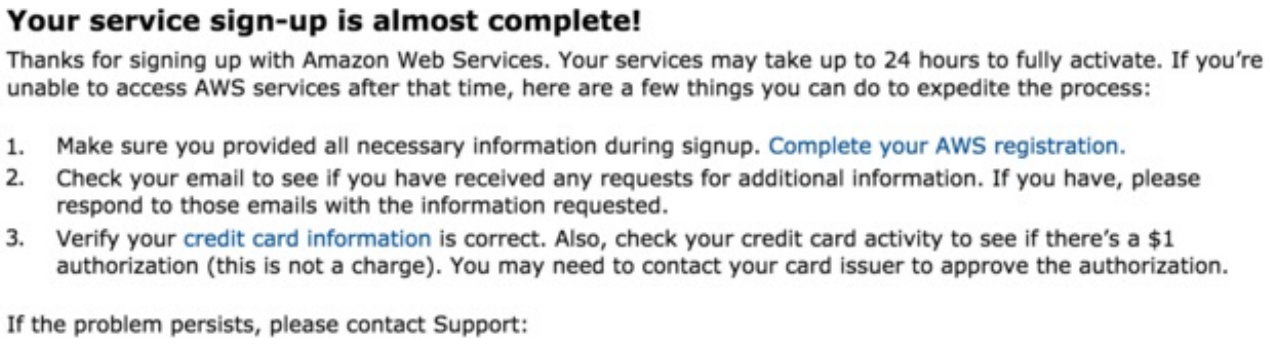
You will also need to verify your identity, which you can do by clicking on the following link: https://aws-portal.amazon.com/gp/aws/developer/registration/index.html (http://adafru.it/peA)

This will call the phone you associated with your account, and you will supply a PIN number, and you will then be able to select the AWS support plan that you wish to use:



If you don't have a valid credit card associated with your account and if you haven't verified your account, you will get the following error whenever you try to use AWS IoT via the AWS Console:

There may be a delay of up to 24 hours for the account activation to take effect. You can test the account status by clicking a related link like https://console.aws.amazon.com/lambda/home (http://adafru.it/peB) which will show you the following screen if your account activation is still in progress:



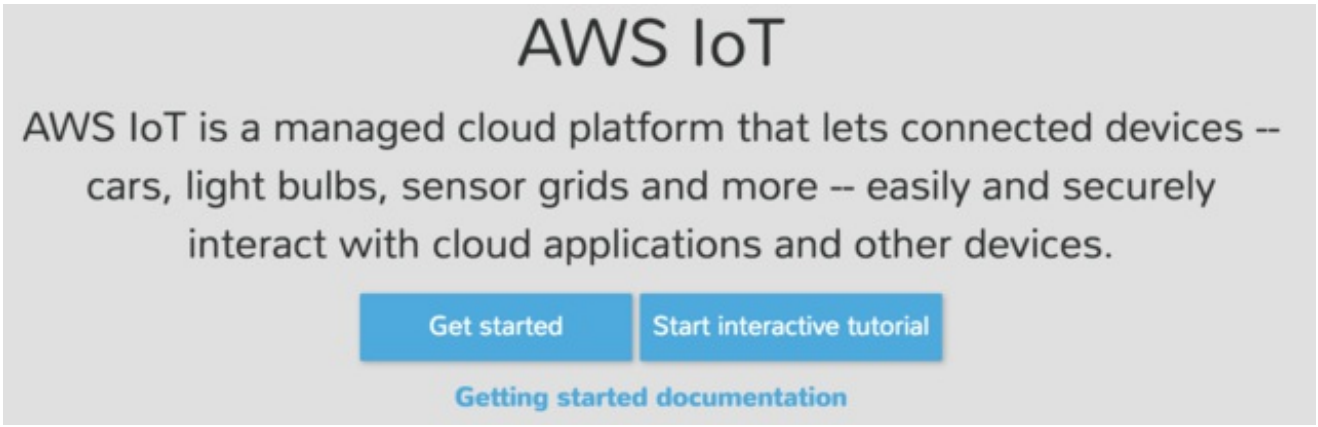
If your billing information is up to date, but the error message persists when trying to create a 'thing' (later in this tutorial) you can try resubscribing to AWS services with the following link: https://portal.aws.amazon.com/billing/signup?type=resubscribe#/ (http://adafru.it/peC)

Login to AWS IoT Admin

The first thing to do once you have a verified account is to login to theAWS Console (http://adafru.it/peD). If you don't already have an account you can create one, or login with your existing details

From the AWS Console home page, find the **AWS IoT** icon shown below and click on it:

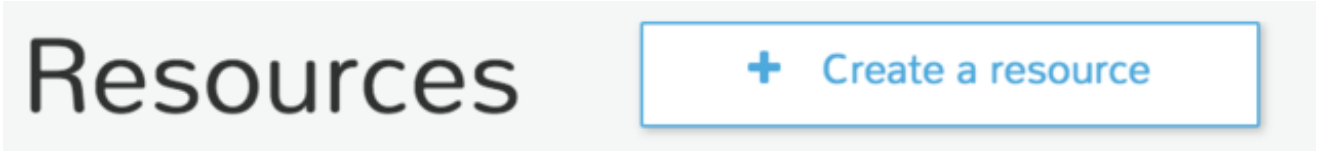
Click the **Get Started** button on the AWS IoT homepage:



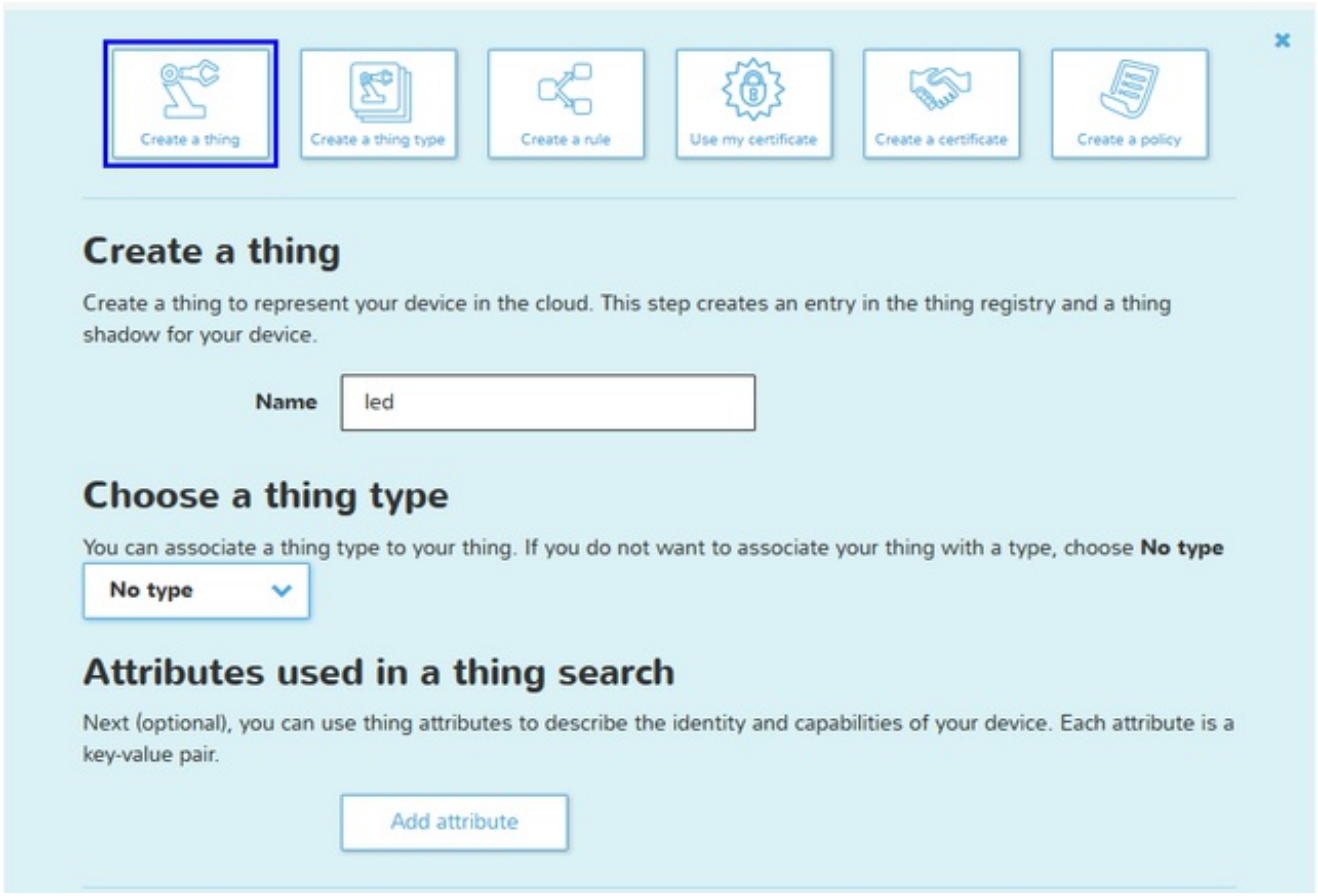
Create a Thing

Before you can work with AWS IoT you will need to 'Create a Thing', which is done via the wizard shown below:

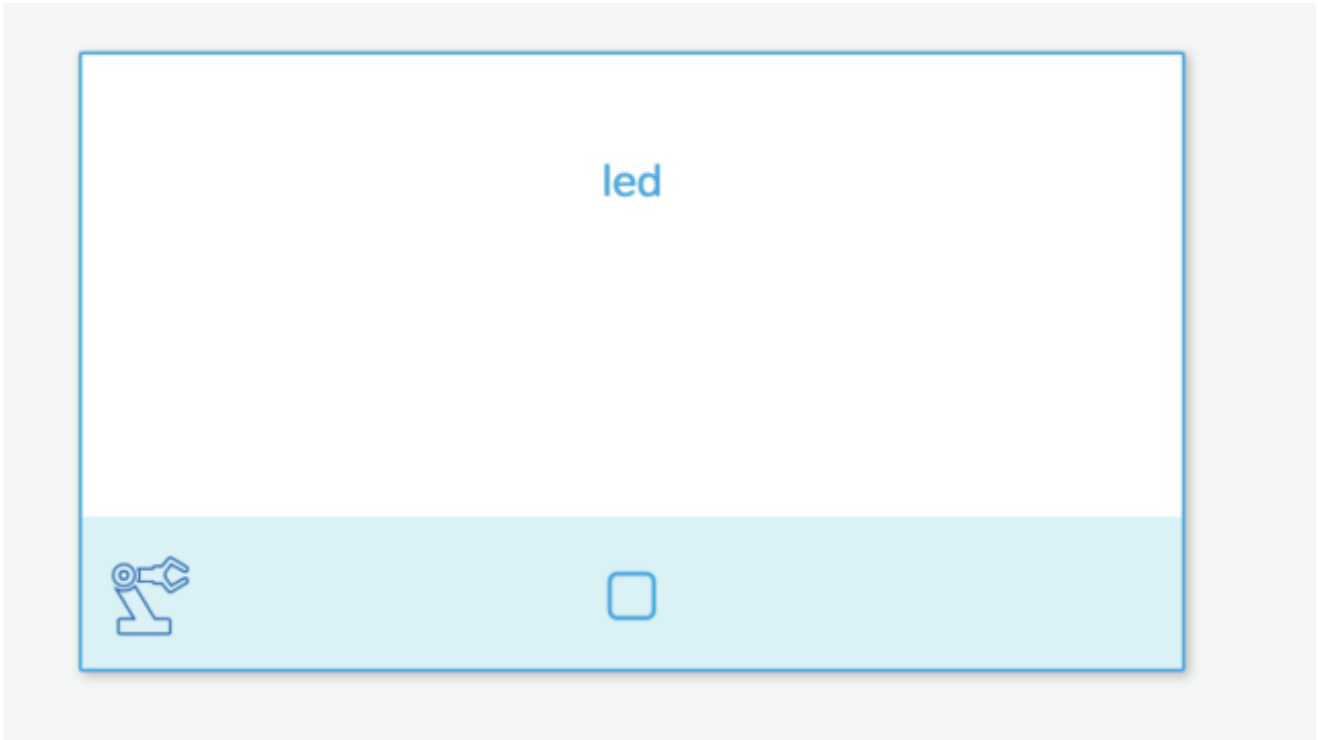
If you didn't use the **Get Started** button and don't see the wizard above, you can find it by clicking on the **Resources** link in the top-right hand corner, and then clicking the**Create a resource** button shown below:



Name the thing **led** (no attributes or type) and click the **create** button:

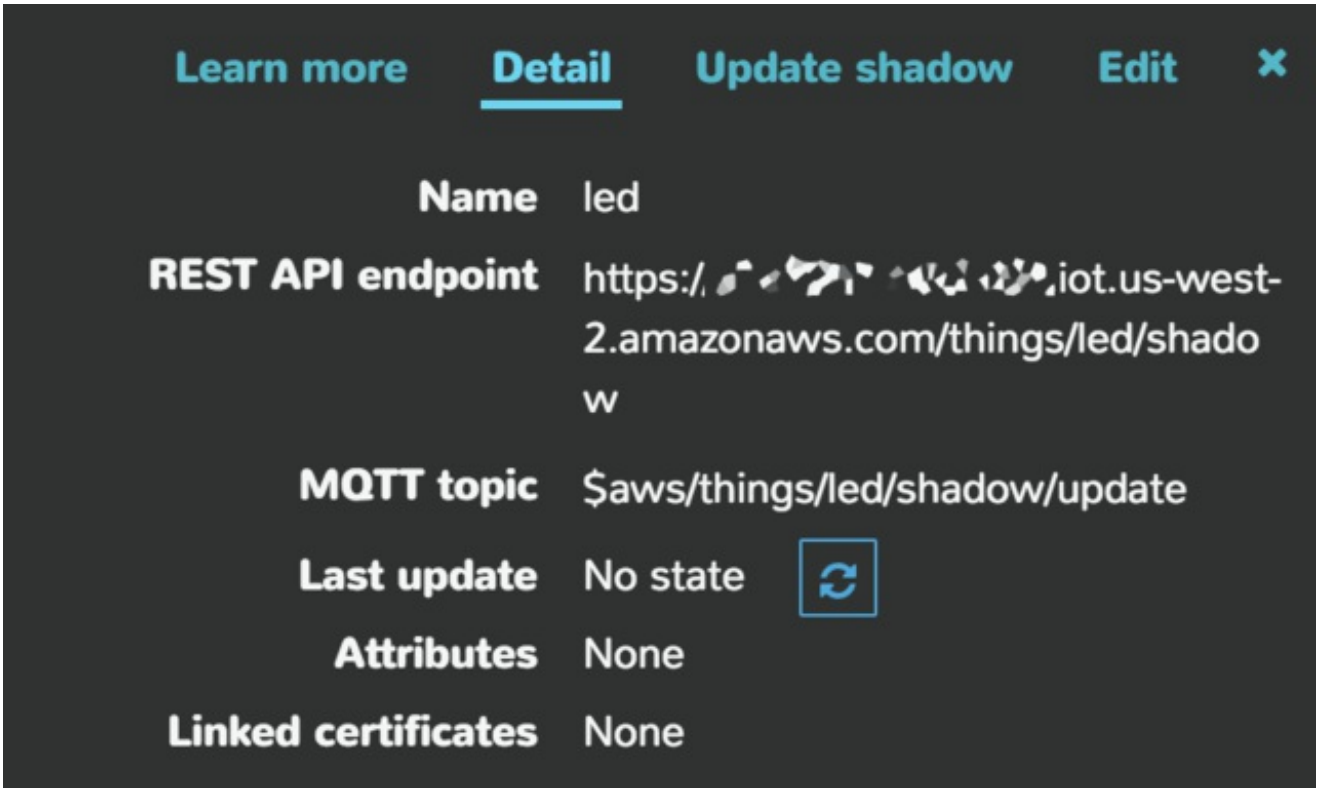


You should see a small box with your new 'thing' in the bottom left-hand side of the screen:



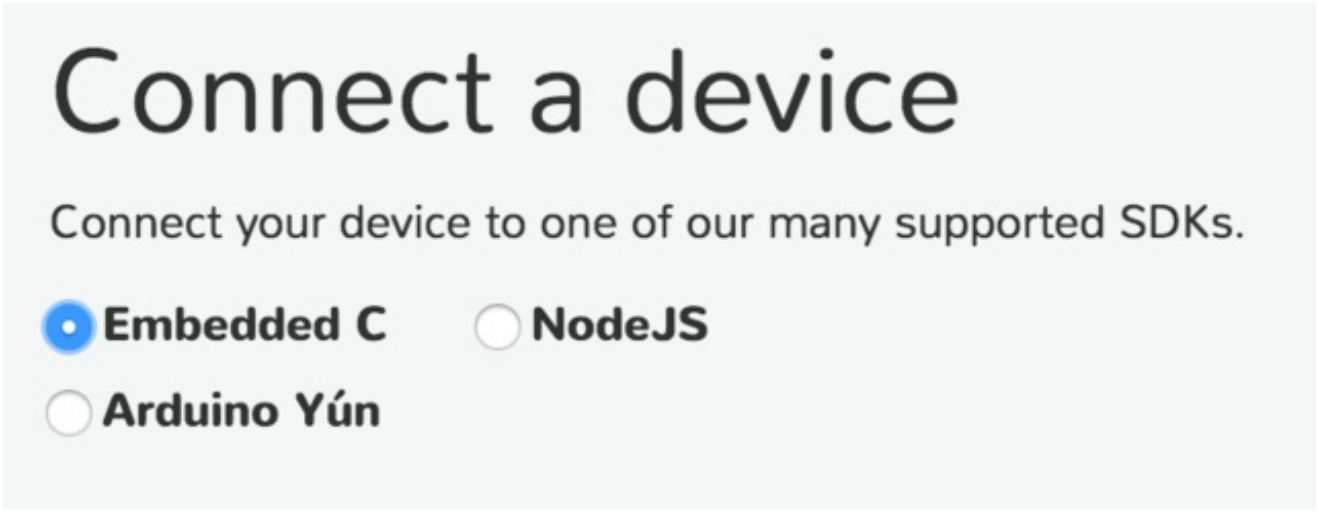
Click the **View Thing** button to see the details for your new 'led' thing on the right-hand

side of the admin console:

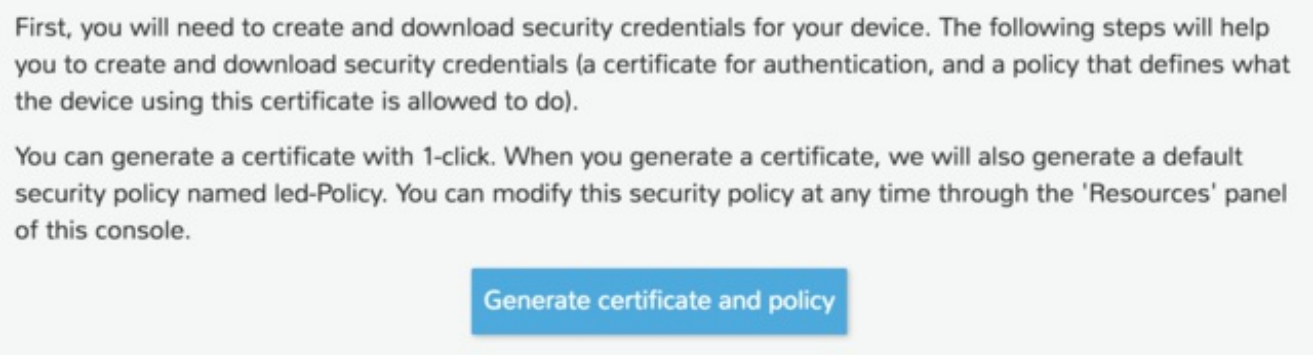


Connect a Device

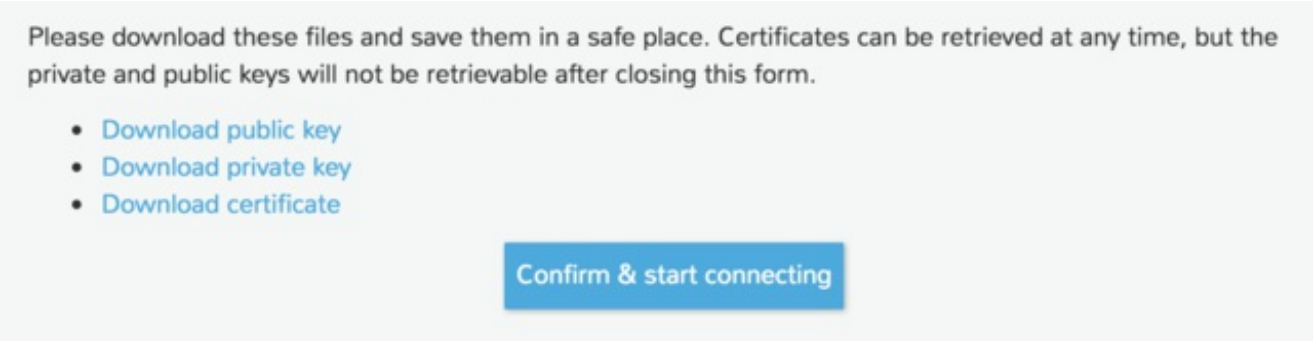
With the thing opened up on the side panel, click the**Connect a Device** button in the bottom right-hand corner, and select the **Embedded C** option:



Then click the **Generate certificate and policy** button that appears on the right-hand side:



Download the **Private Key** and **Certificate** to a folder, since you will need to place these files in the same location as your WICED Arduino sketch later on:



Click the **Confirm & start connecting** button to continue.

Store the Thing Connection Details

At this point, you should see some C pre-processor macros that contains the information necessary for the WICED Feather to connect to the AWS IoT servers. Copy these values, and store them somewhere in a text file since they will need to be added to the AWS Arduino Sketch we'll edit in a moment:

Note: You only need the first four entries in the code snippet below

```
// Get from console
// =================================================
#define AWS_IOT_MQTT_HOST              '[redacted].iot.us-west-2.amazonaws.com"
#define AWS_IOT_MQTT_PORT              8883
#define AWS_IOT_MQTT_CLIENT_ID         "led"
#define AWS_IOT_MY_THING_NAME          "led"
#define AWS_IOT_ROOT_CA_FILENAME      "root-CA.crt"
#define AWS_IOT_CERTIFICATE_FILENAME   "[redacted]-certificate.pem.crt"
#define AWS_IOT_PRIVATE_KEY_FILENAME   "[redacted] -private.pem.key"
// =================================================
```

Arduino Sketch Setup

AWS IoT uses MQTT, which is already well supported by the WICED Feather, but it has some additional requirements around security with the need for a certificate on the sensor node side (the WICED Feather) to validate that the device AWS IoT is talking to is indeed the right device.

To address some of the specifities of talking to AWS, the WICED Feather includes a sample AWS sketch in the **MQTT/aws** folder in examples. You should have this available on your system, but for convenience sake you can also browse the latest code online in github using the link below:

Show AWS Example Sketch on Github
http://adafru.it/peE

Convert Certificate with pycert

To validate the WICED Feather, we need to convert the certificates downloaded in the previous page of this tutorial into a format the WICED SDK understands. You can do this with the pycert tool (http://adafru.it/peF) we provide as part of the WICED Feather BSP.

Place the ***certificate.pem.crt** and ***private.pem.key** files in the sketch folder, and run the pycert tools as follows (you may need to adjust the '..' path to points to tools/pycert in the WICED Feather BSP):

```
python ../../../tools/pycert/pycert.py convert -c local_cert -l LOCAL_CERT_LEN **********-certificate.pem.crt
```

This should create a **certificates.h** file in the sketch folder containing the certificate data in 'local_cert':

```
Loaded certificate **********-certificate.pem.crt
Wrote certificates.h
```

You can now reference certificates.h in your sketch (it is already included in the code), which takes care of one of the two certificates we need to deal with for AWS.

Add the Private Key to the Sketch

Newt we need to add the private key to our demo sketch. The file downloaded is already in

a binary format, so it doesn't need to be run through the pycert conversion tool, but you do need to copy the contents of the certificate into the sketch and perform a bit of manual labour to make it work.

Copy the contents of the ***private.pem.key** file to the browser, and paste them into your sketch in the **aws_private_key** array that is already defined:

```
const char aws_private_key[] =
"-----BEGIN RSA PRIVATE KEY-----\n"
"Your Key line 1 with\n"
"Quote each of your key's lines like this example\n"
"-----END RSA PRIVATE KEY-----";
```

You will need to place quotes before and after each line, and also add an '\n' newline character after each line! You'll end up with something like this:

```
const char aws_private_key[] =
"-----BEGIN RSA PRIVATE KEY-----\n"
"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx\n"
"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx\n"
"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx\n"
"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx\n"
"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx\n"
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"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx\n"
"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx\n"
"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx\n"
"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx\n"
"-----END RSA PRIVATE KEY-----";
```

Add the AWS IoT MQTT Details

Finally you need to add the MQTT Server details for the AWS server, which will mean

replacing these four values with the data generated in the previous page of this tutorial:

```
// ================================================
#define AWS_IOT_MQTT_HOST             "**********.iot.us-west-2.amazonaws.com"
#define AWS_IOT_MQTT_PORT             8883
#define AWS_IOT_MQTT_CLIENT_ID        "led"
#define AWS_IOT_MY_THING_NAME         "led"
// ================================================
```

Add AP Connection Details

At this point you simply need to add your connection details, and you should be able to flash the sketch to your WICED Feather and open the Serial Monitor to see the connection status:

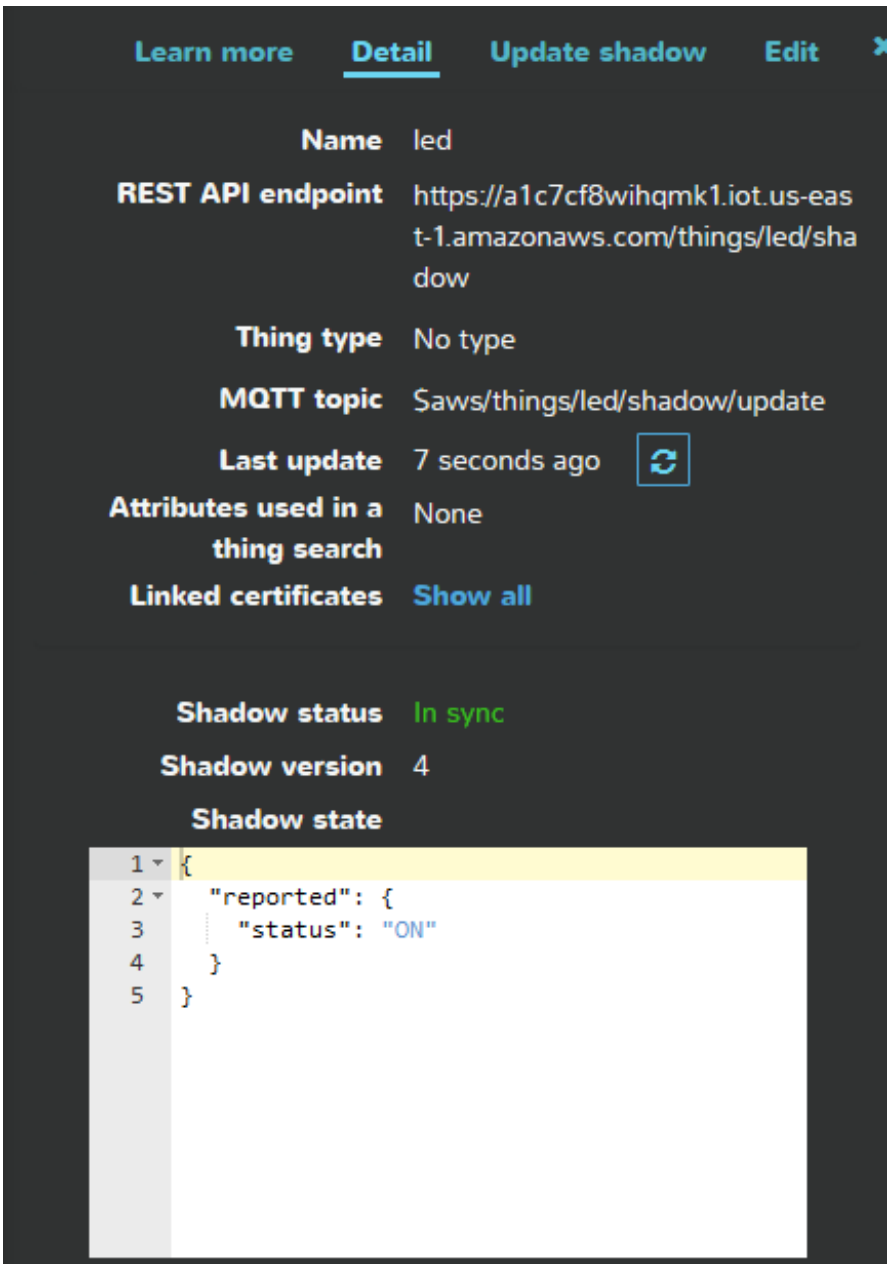
Note: Make sure you are using the latest version of FeatherLib and the Arduino WICED BSP before running this code. You will need at least FeatherLib 0.5.5 for it to run.

```
AWS IOT Example

Bootloader  : 1.0.0
WICED SDK   : 3.5.2
FeatherLib  : 0.5.5
Arduino API : 0.5.6

Please wait while connecting to: 'CLARAWIFI' ... Connected!

SSID        : CLARAWIFI (-78 dBm)
Encryption  : WPA2_AES
MAC Address : FF:FF:FF:FF:FF:FF
Local IP    : 10.0.1.10
Gateway     : 10.0.1.1
Subnet Mask : 255.255.255.0

Connecting to **********.iot.us-west-2.amazonaws.com port 8883 ... OK
Subscribing to $aws/things/led/shadow/update ... OK
Enter '0' or '1' to update feed:
```

Entering either 1 or 0 into the Serial Monitor input should turn the LED on the WICED Feather on or off via AWS IoT. There will be a few seconds lag, of course, while the data makes a round trip and before the MQTT event is capture by the WICED Feather:

```
Enter '0' or '1' to update feed: 1
Enter '0' or '1' to update feed:

Enter '0' or '1' to update feed: 0
Enter '0' or '1' to update feed:
```

Enter '0' or '1' to update feed:



That's it! At this point, you can start looking at the example sketch we used above to see how you can modify it to fit your needs, but you've done all the heavy lifting to get AWS IoT working, and securely connecting your WICED Feather to Amazon's servers!

Doing something neat with AWS IoT? Make sure to let us know in the forums!