INVENTEK SYSTEMS

Amazon AWS (MQTT) IoT Cloud Setup and Wi-Fi Connectivity App Note

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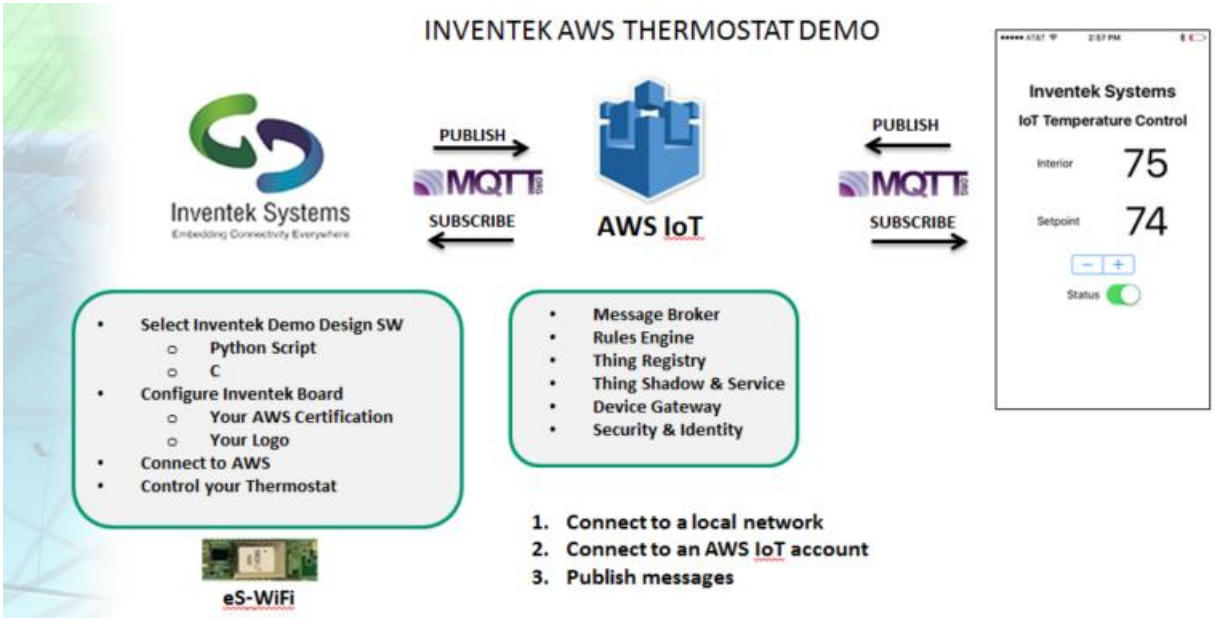
1 Scope

The Inventek eS-WiFi serial to Wi-Fi module family simplifies cloud connectivity by using the Inventek, IWIN AT Command Set to connect a device to the AWS IoT cloud. This document provides a detail description of how to:

1. Setup an AWS account
2. Modify the Inventek firmware to connect to your AWS account
3. Run either a “C: project or Python top connect to the AWS cloud
4. Control a thermistor and some push button



2 AWS IoT Description

The Amazon AWS IoT service enables secure, bidirectional communication between IoT devices, sometimes referred to as Internet-connected things or simply *things* (sensors, actuators, devices, applications, etc.), and the cloud over MQTT.

Things are authenticated using AWS IoT service-provided X.509 certificates. Once a certificate is provisioned and activated it can be installed on a thing. The thing will then use that certificate to send all requests to AWS MQTT. Authorization is controlled by JSON policy files that allow you to specify which resources a specific device (certificate) may access. Inventek’s eS-WiFi Demo program incorporates a firmware customization feature to program the required certificated on a device.

3 AWS IoT Setup

For complete information on getting started using the AWS IoT service, see: https://us-west-2.console.aws.amazon.com/iot/home.
Or
https://us-east-2.console.aws.amazon.com/iot/home

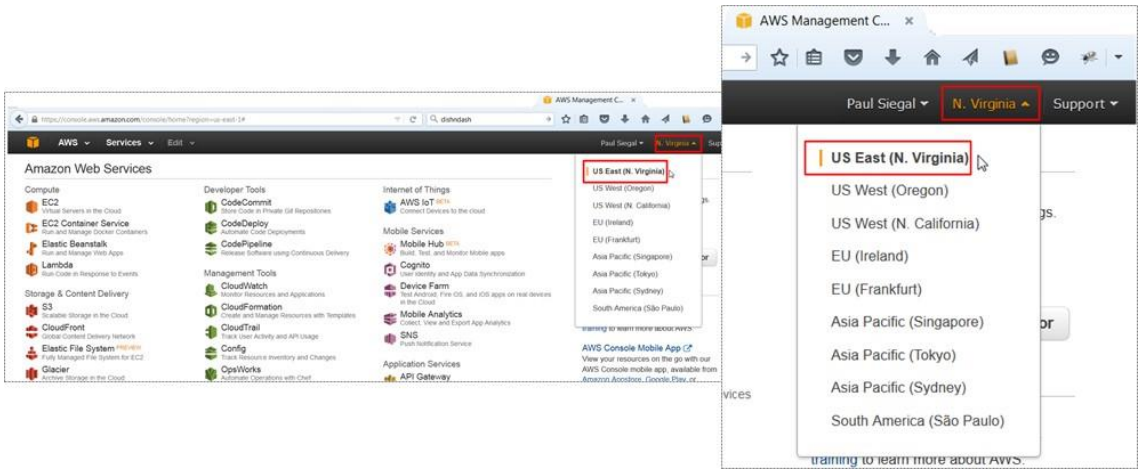
The following steps summarize what a user should do to get started using the AWS IoT service with a device:

1. Go to the AWS IoT service by clicking on or entering http://aws.amazon.com/iot/ in a browser.

2. Create an AWS account by clicking on **Get started with AWS IoT**

3. Sign in to the AWS Management Console by clicking on or navigating to https://aws.amazon.com/console/ and then clicking on **Sign in to the AWS Console**.

5. In the webpage that opens, select **US East (N. Virginia)** as the server region for management console use during the AWS IoT beta:



5. In the Internet of Things column, click **AWS IoT** **BETA** to start using the management console

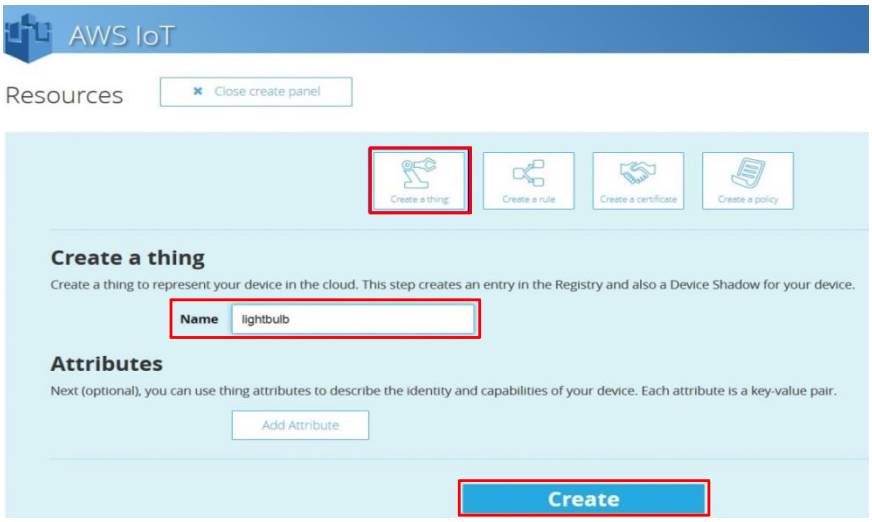
6. In the webpage that opens, click **Get started**:

7. In the AWS IoT management console webpage:

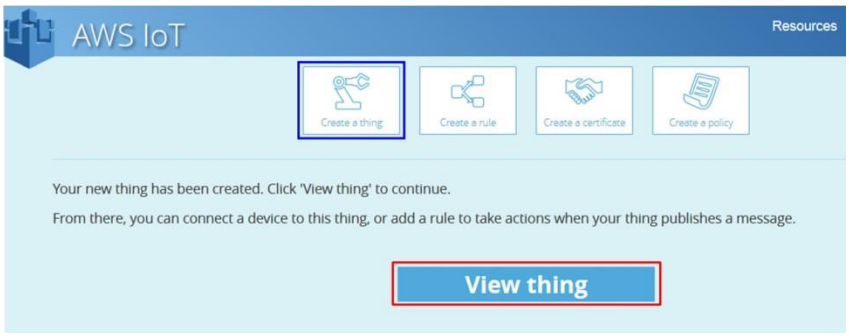
a. Click **Create a resource**.

b. Click **Create a thing**, enter the name of the thing (for example, lightbulb) then click

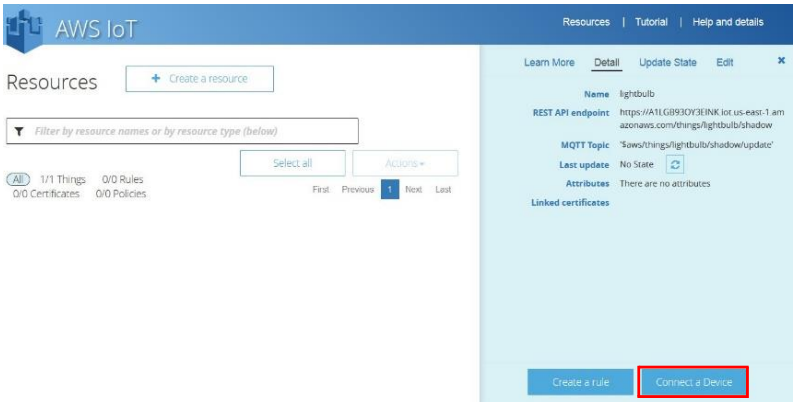
Create.



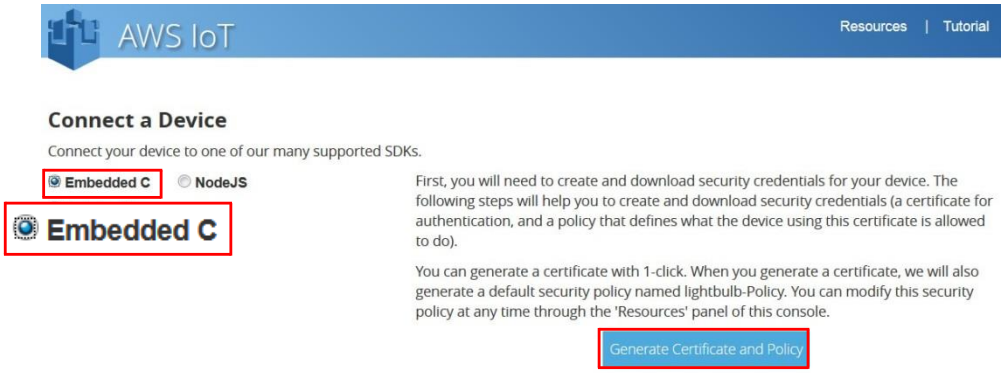
c. Click **View thing** in order to connect a device.



d. Click **Connect a Device**.



e. Click **Embedded C** as the supported SDK and then click **Generate Certificate and Policy**.



f. Sequentially click on the **Download Public Key**, **Download Private Key**, and **Download Certificate** links and for each click **Save File**, **OK**, navigate to the directory where the credentials should be stored, and then click **Save**. Also, Download the Root CA:

I. Download the Root CA cert here: https://www.symantec.com/content/en/us/enterprise/verisign/roots/VeriSign-Class%203-Public-Primary-Certification-Authority-G5.pem

II. Save it with the .pem file extension

4 eS-WiFi Module Setup

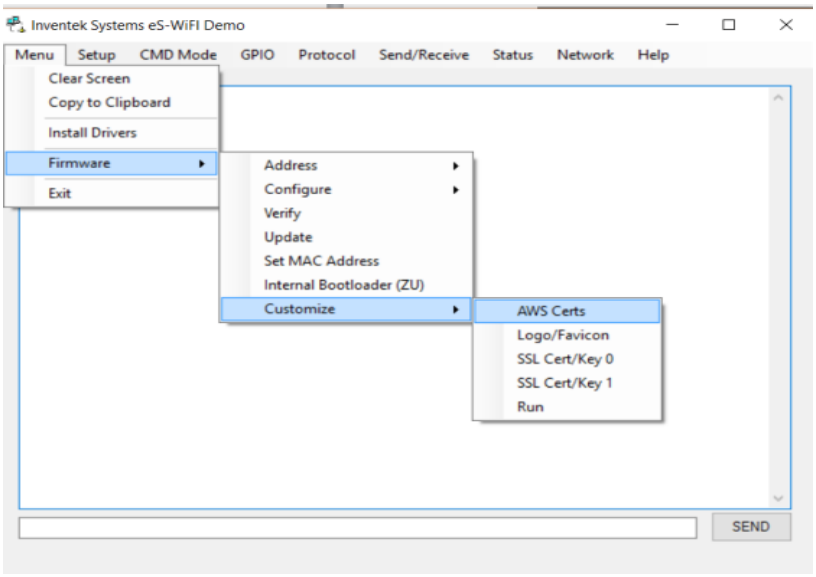
After you have completed your AWS account setup, you need to modify the Inventek firmware to add your particular AWS account credentials. You need the following files that you can download from the Inventek website:

1. es-Wifi Demo Program (PC program)
2. ISM43362 Firmware image 3.5.02 or later

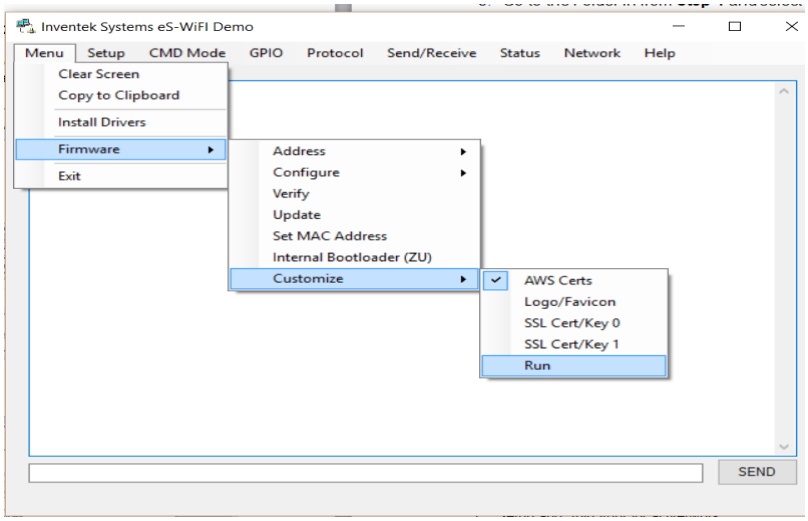
4.1 Creating the AWS eS-WiFi Firmware Image for <u>your</u> account

2. Create a folder on your PC with the following files:
   I. **ISM43362_M3G_L44_C3.5.2.0.bin (beta)**
   II. **RootCA. pem**
   III. **AWS-Certificate.crt**
   IV. **AWS-Private.pem.key** (Downloaded in **Step F** above)

3. Open the **eS-WiFi Demo** Program to create the Image. Select
   I. AWS Certs



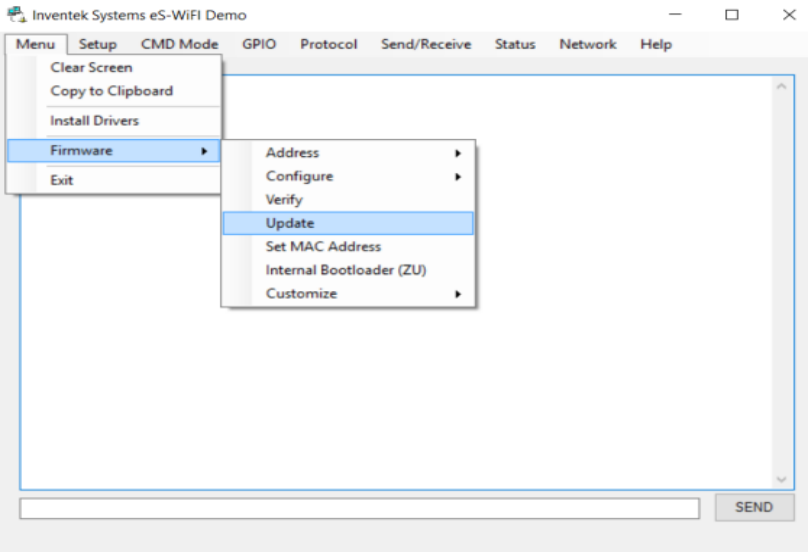
4. Then Selects **Menu → Firmware → Customize → AWS Certs → Run**



5. Go to the Folder in from **Step 1** and select the files in the following order:
   I. **Firmware**
   II. **Root CA**
   III. **Certificate**
   IV. **Private Key**

6. The eS-WiFi demo program will automatically create a new firmware image that you can use to re-flash your evaluation board.

   I. Plug your evb into the PC USB port. (see user manual if you have not already installed the FTDi drivers)
   II. Select **Menu → Firmware → Update** to program the new firmware Image
   III. Point to the newly created *.bin in your AWS folder
   IV. Your module is now updated with your firmware that is setup to connect to your AWS account



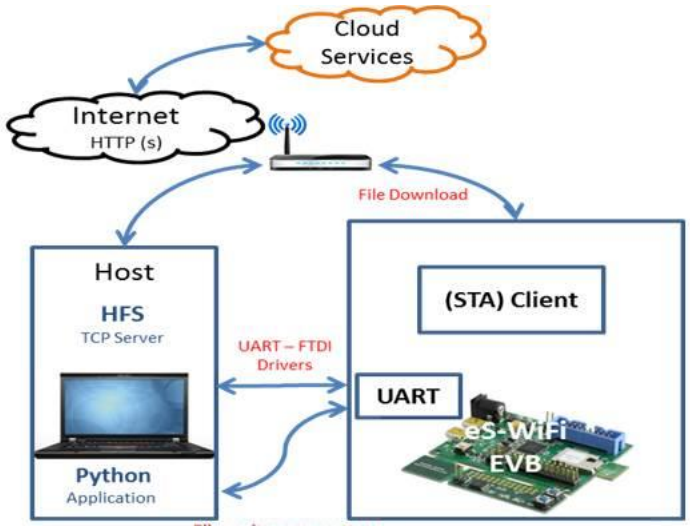
4.2 Python Script to Connect to AWS using IWIN AT Commands

Now that you have an AWS account and the eS-WiFi module has been updated with your account credentials, this section shows you how to connect to the AWS cloud using either a Python Script or “C” code”.

5 Python Script

Visit Inventek Systems website (www.inventeksys.com) to download the latest python script for AWS IoT connectivity.

1. IWIN AT Command Python example Script
2. Portable Python

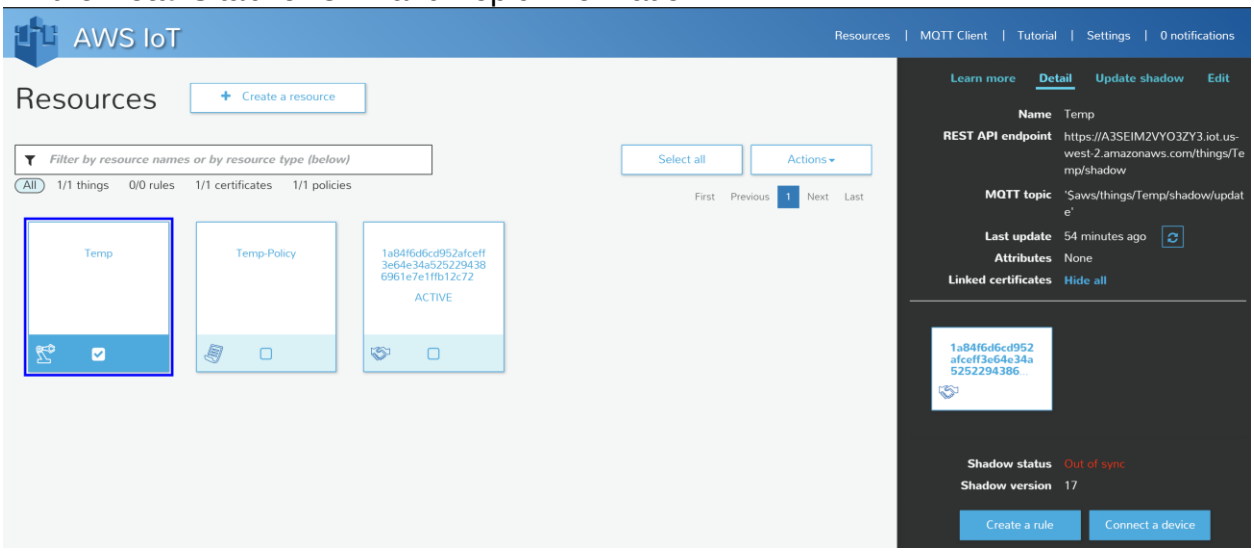


Locate the following section of the code in the Python script and make the changes to configure your network and AWS certificates:

```
 #Setup--------------------------------------------------------------------
#Network Configuration Method
useSoftAP = 0           #Join using, 0 = Cx commands, 1 = A0 (SoftAP)

   #Local Network Setup
SSID = "ssid"              #SSID of AP
PSWD = "password"          #Password of AP
SEC="4"                 #Security type of AP: 0-Open, 1-WEP, 2-WPA, 3-WPA2-AES, 4-WPA2-Mixed
DHCP="1"                #Get IP address for DHCP, 0-No, 1-Yes

   #Socket/Protocol Setup
SOCKET = "0"               #Select Socket 0-3
PROTOCOL="4"               #TCP=0, UDP=1, UDP-Lite=2 TCP-SSL=3(Hercules doesn't support), 4-MQTT

   #MQTT Setup
PBTOPIC="$aws/things/<Thing_name>/shadow/update"  #Publish topic
SBTOPIC="$aws/things/<Thing_name>/shadow/update/accepted"  #Subscribe topic
MQTTMODE = "2"             #Mode 0-None, 1-User Name/Password, 2-Certificates(AWS IoT)

   #TCP Keep-Alive
TTI = 3000              #Time-To-Idle (ms)

   #AWS IoT
deviceID = "<AWS_ID>"                     #AWS Device Id
remoteURL = deviceID + ".iot.us-east-1.amazonaws.com"   #AWS Location URL

   #Client Mode
useDNS = 1
remoteIP = "192.168.1.48"     #Remote Server IP address (use 192.168.10.100 with AD Direct Mode)
remotePort = "8883"         #Remote TCP port
#---------------------------------------------------------------------------
```

1. Locate the “Local Network Setup”
    a. Change “ssid” to the name of your Access Point
    b. Change “password” to the password of your Access Point
2. Locate the “MQTT Setup”
    a. In the PBTOPIC change “<Thing_name>” to the name of your thing
    b. In the SBTTOPIC change “<Thing_name>” to the name of your thing
3. Locate the “AWS IoT”
    a. Change “<AWS_ID>” to your AWS device ID
    b. Change the URL location to match the location of where you created your thing
    ex.“.iot.us-east-1.amazonaws.com” to “.iot.us-west-1.amazonaws.com”
4. Locate the “Client Mode”
    a. Check the remote Port matches the port for your thing

Note: On the AWS IoT Webpage, Click on the desired *thing* (i.e. Temp), Then Click the **Details** tab for URL and Topic Information.



6 Verify MQTT Subscribe and Publish

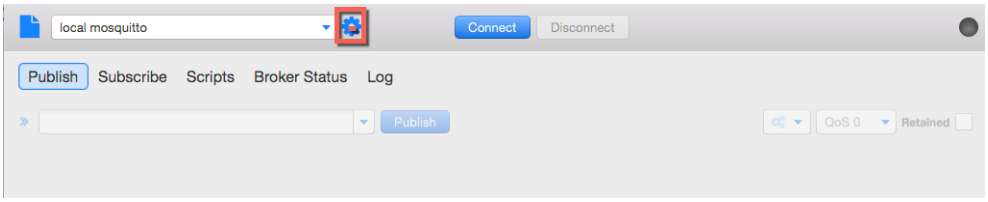
The steps in this section show you how to verify you can use your certificate to communicate with AWS IoT over MQTT. You will use an MQTT client to subscribe and publish to an MQTT topic.

This guide assumes you are using MQTT.fx, an MQTT client written in Java based on Eclipse Paho. You can install it from Download MQTT.fx here:

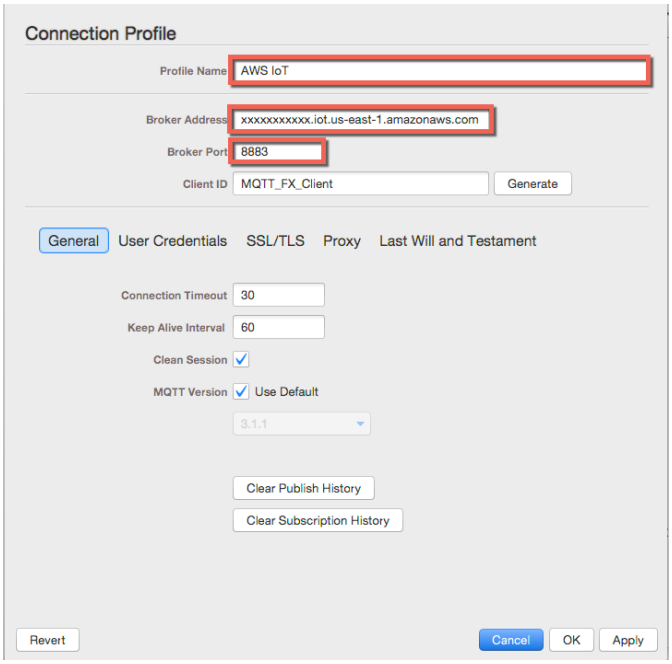
http://mqttfx.jfx4ee.org/index.php/download

6.1 Configure MQTT.fx

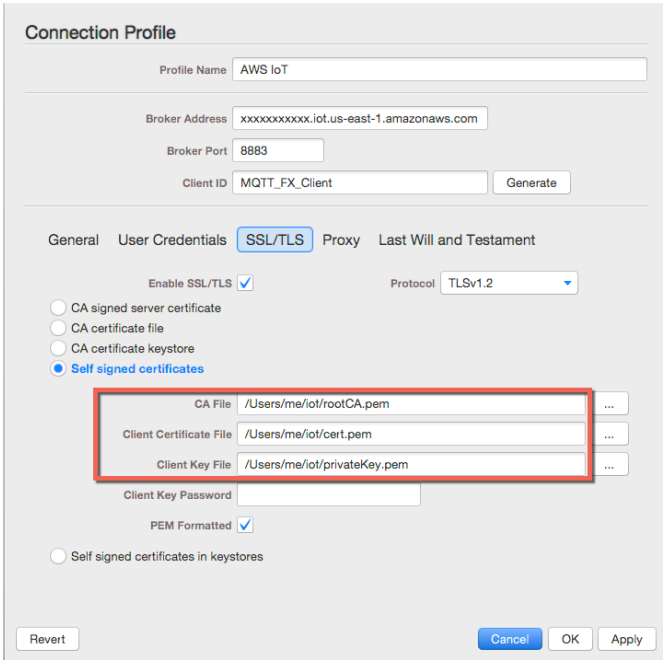
To configure MQTT.fx, open the app and choose the gear icon at the top of the page.



Type a profile name. In **Broker Address**, type your account-specific AWS IoT endpoint URL. Use the describe-endpoint CLI command to find your account-specific AWS IoT endpoint URL. In **Broker Port**, type 8883, as shown here:



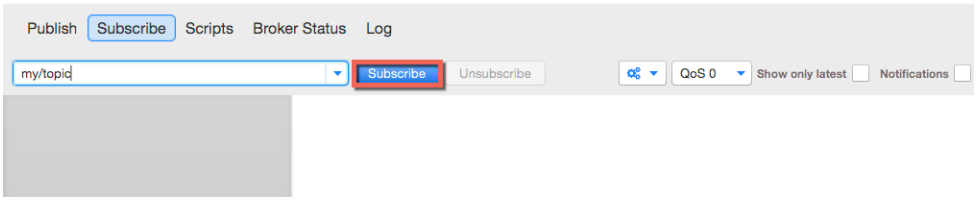
Choose the **SSL/TLS** button to view the **SSL/TLS settings** page. Type the paths to your private key, certificate, and root CA certificate as shown here:



Choose the OK to save your settings, and then choose Connect to connect to AWS IoT.

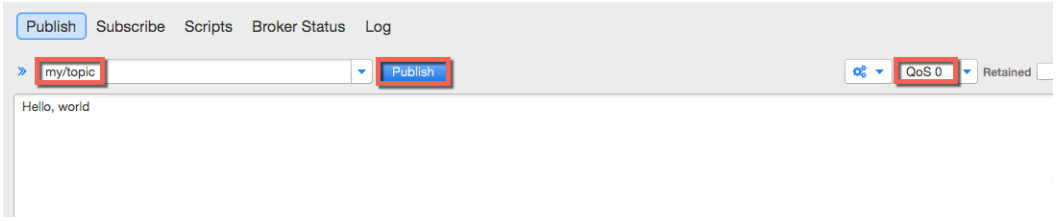
6.2 Subscribe to an MQTT Topic

Choose **Subscribe** and the **Subscribe** page will be displayed. Type **my/topic** in the text box, from the drop-down list, select **QoS 0**, and then choose Subscribe.

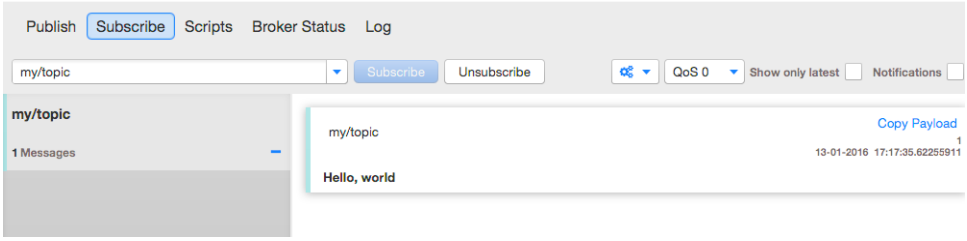


6.3 Publish to an MQTT Topic

Choose the **Publish** link and the publish page will be displayed. Type **my/topic** in the text box, and then type some text in the message area. From the drop-down box, choose **QoS 0**, and then choose Publish.



Choose **Subscribe** to display the **Subscribe** page. You should see the message has been received.



7 Back-up

8 IWIN AT Commands can be used to connect to AWS

8.1 Connect to AWS IoT using IWIN AT Commands

Use the eS-WiFi Demo or another terminal program to send IWIN AT Command. Connect to the WICED USB Serial Port, and use the following Terminal configuration:

- Baud Rate: 115200
- Parity: None
- Data Width: 8
- Stop Bits: 1

1. Setup and Join your local Network

AT Command	**Description**
C1=SSID	Sets SSID
C2=Password	Sets Password
C3=x	Sets network security type: 0-Open, 1-WEP, 2-WPA, 3-WPA2-AES, 4-WPA2-Mixed
C4=x	Get IP address from DHCP: 0-No, 1-Yes
C0	Joins a networks Based on the information from C1-C4

2. Socket and Protocol Setup

AT Command	**Description**
P0=x	Selects Socket: 0-3
P1=4	Selects protocol (MQTT for AWS IoT): 0-TCP, 1-UDP, 2-UDP-Lite, 3-TCP-SSL, 4-MQTT-AWS

3. MQTT Setup

AT Command	**Description**

PM=0,$aws/things/<ThingNAME>/shadow/update	Publish Topic
PM=1,$aws/things/<ThingNAME>/shadow/update/accepted	Subscribe Topic
PM=2,X	MQTT Mode (for AWS use PM=2,2) 0-None, 1-User Name/Password, 2-Certificates

4. Connect to AWS IoT

AT Command	**Description**
D0=DEVICEURL or IP ADDR	Sets device URL (see figure below)
P6=1	Sets Client mode and connects to AWS IoT

9 C Code example

Contact Inventek for the source code.

10 Revision Control

Document : ISM43341-M4G-L44	Wi-Fi module
External Release	DOC-DS-20023

Date	Author	Revision	Comment
3/3/2016	KMT	1.0	Preliminary
3/17/2016	KMT	1.1	Update MQTT.fx and Python Script

11 Contact Information

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