WINC1500 Secure Wi-Fi Board
Set up Instruction

Contents

A. Introduction

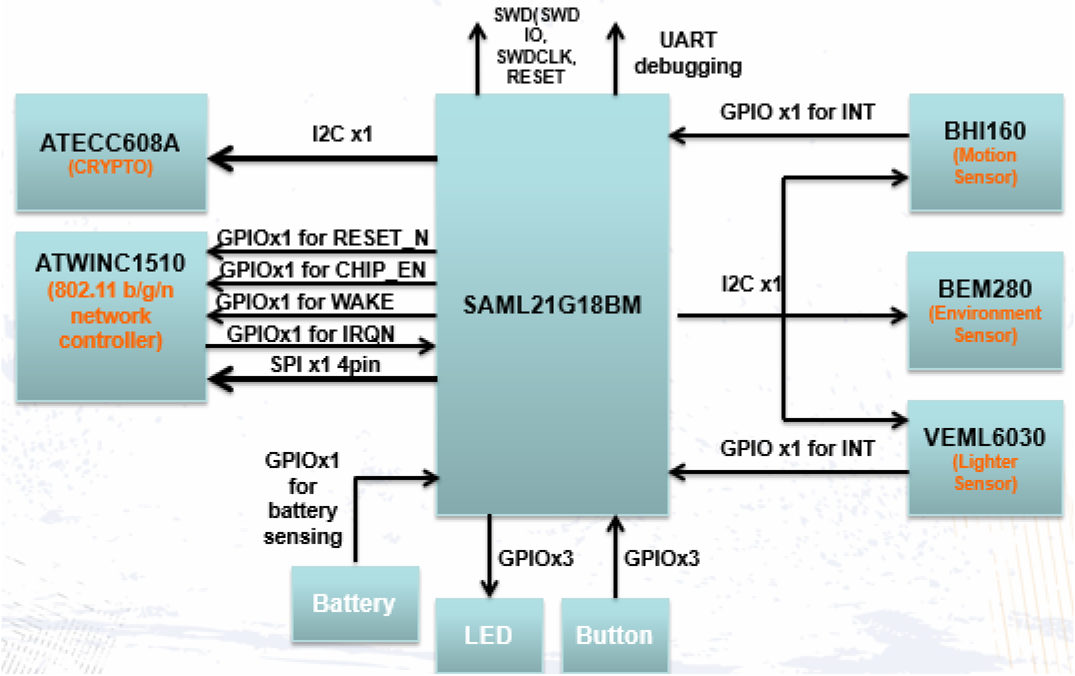
In this document, the set-up procedure of the WINC1500 Secure Wi-Fi Board working with Alexa is introduced. The WINC1500 Secure Wi-Fi Board is controlled by an SAML21G18B host MCU. It is equipped with a WINC15x0 IEEE 802.11 b/g/n network controller, an ATECC608A CryptoAuthentication™ device, an MCP73833 Li-Ion/Li-Po charge management controller, a MIC5317 High PSRR LDO, BME280 environment sensor, VEML6030 light sensor and BHI160 motion sensor. In this design, the board can connect Amazon Web Service (AWS) Cloud and report the sensor data to cloud. User can speak to Alexa-Enable device (e.g Echo Dot) to get the board's sensor data and control board's LED. As an IoT edge, this firmware provides the popular functions in a typical IoT scenario; Control, Monitor, Wi-Fi Connectivity and Security. Upon the completion of these instructions, the user will be able to speak to an Echo Dot to control the Secure Wi-Fi Board's I/O.

This board is for evaluation/demonstration purposes only.

Overview of Hardware

- Host MCU: ATSAML21G18B (ultra-low power microcontroller, 40KB RAM, 256KB program memory)
- Wi-Fi network controller: ATWINC1510 module
- Power: Rechargeable 2000mAh Lithium Battery or USB
- Crypto IC: ECC608
- User Interface: 3 Buttons, 1 RGB LED
- Program/ Debug Interface: SWD
- Sensor
    - Motion Sensor (BHI160)
        - Accelerometer
        - Gyro
- Light Sensor (VEML6030)
- Environment Sensor(BME280)
    - Temperature
    - Humidity
    - Pressure

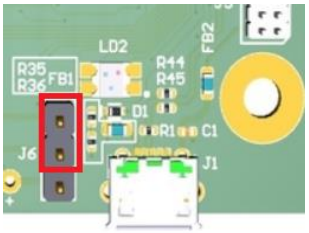
Block Diagram of WINC1500 Secure Wi-Fi Board



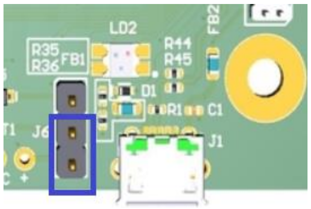
Power supply

The board can be powered up by USB power or **TR14500** lithium (3.7V) battery.
Jumper **J6** is used to select the power source.

Short the jumper in red circle below for USB power



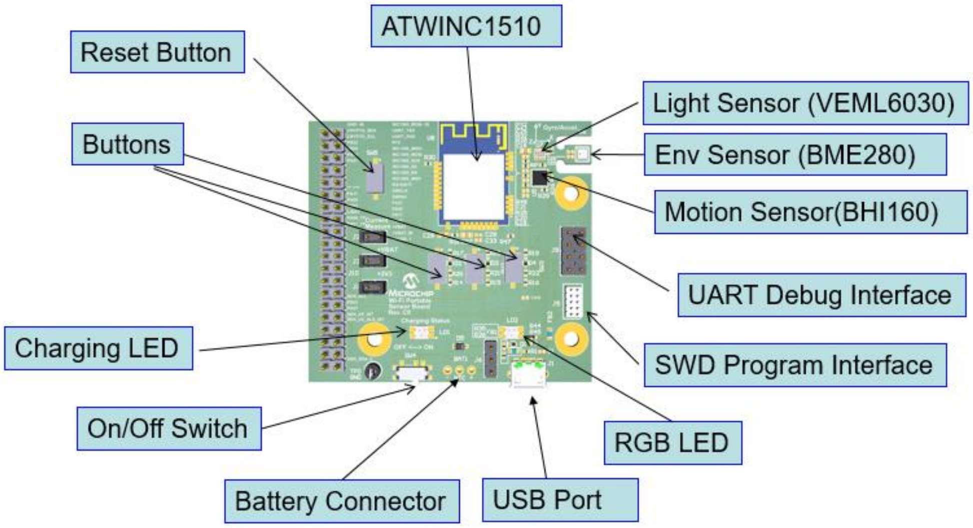
Short the jumper in blue circle below for lithium battery source. Lithium battery can be charged up by USB power. LD1 show the charging status.



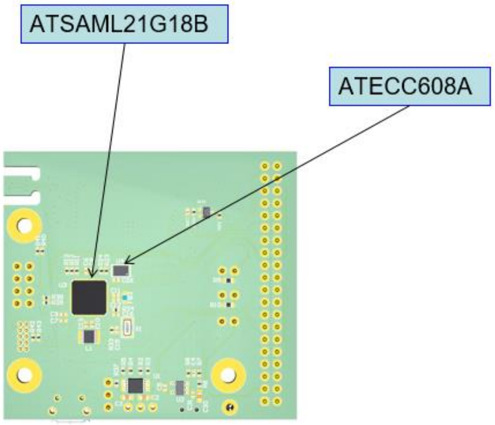
Charging Status	LD1 color
Standby	Red
Charge in Progress	Magenta
Charge Complete	Yellow

CAUTION: Overcharging is not recommended as the package does not include the rechargeable battery and the board does not undergo the overcharging test.

Top Side



Bottom Side



AWS Provision with ECC608

The board is provisioned to AWS IoT of Microchip account out of box. Unique Device Certificate and private key are generated and stored to ECC608 in each of the Secure Wi-Fi Board during factory manufacturing process. The CA certificate that used to sign device certificates is also registered to AWS IoT. When the board is configured to connect to an Access Point, it can connect to the AWS IoT Endpoint. A Lambda function running on AWS Cloud register the board to AWS IoT when the board connect to AWS IoT Endpoint in first time.

Prerequisite

It would be useful to research these items before using the Secure Wi-Fi Board, but not necessary for basic operation:

- AWS Service: AWS IoT, AWS Lambda, AWS Dynamodb, Amazon Cognito
- Alexa Skill

B. Software Installation

Java PC Application and Python Scripts

User need to use a Java PC application and python scripts to sign up a user account, register the board to their user account an provision the board to the network

Go to following URL to download the Java application and python scripts:

https://github.com/MicrochipTech/aws-iot-winc1500-secure-wifi-board/

User can download the whole project files (including the MCU firmware code and Java PC application source code) for reference in below link:

https://github.com/MicrochipTech/aws-iot-winc1500-secure-wifi-board-included-source-files

Java Runtime Environment (JRE)

Java SE Runtime Environment (JRE) 8 need to be installed to run the Java PC application. Go to following URL to find installer:

http://www.oracle.com/technetwork/java/javase/downloads/jre8-downloads-2133155.html

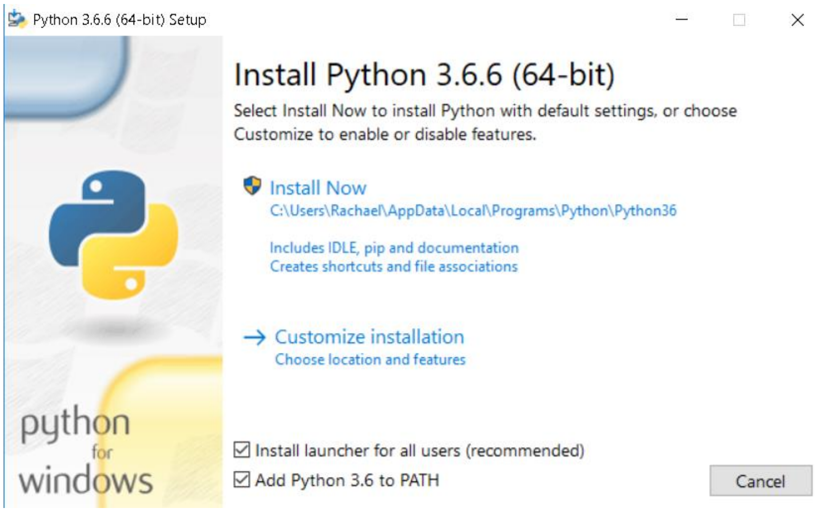
Python 3.6.x

User need to use python scripts to provision the Secure Wi-Fi Board to the network and provision the board to the user account. User can view the Python scripts to see the detailed steps involved. Go to following URL to find installer:

https://www.python.org/downloads/release/python-366/

(NOTE: Python 3.7.x is not yet supported)

When installing Python, check 'Add Python 3.6 to PATH'.



Install Python 3.6.6 (64-bit)

Select Install Now to install Python with default settings, or choose Customize to enable or disable features.

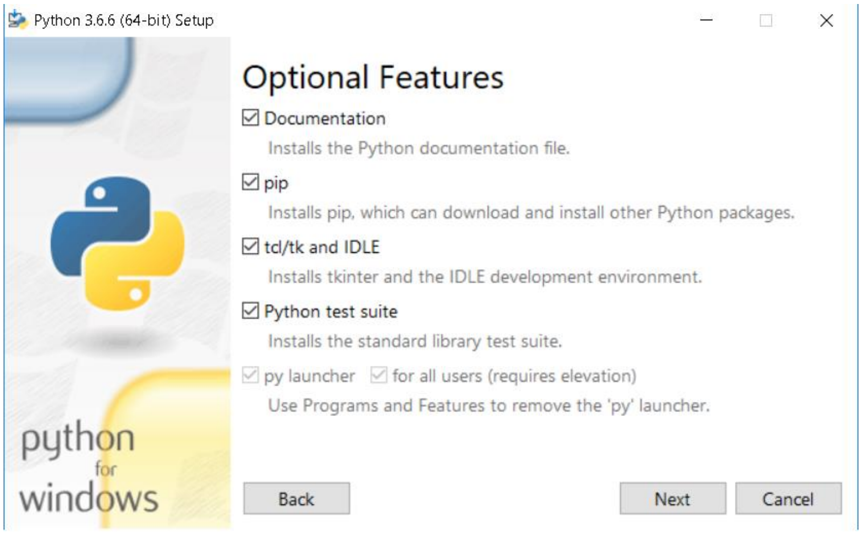
Install Now
C:\Users\Rachael\AppData\Local\Programs\Python\Python36

Includes IDLE, pip and documentation
Creates shortcuts and file associations

→ Customize installation
Choose location and features

☑ Install launcher for all users (recommended)
☑ Add Python 3.6 to PATH

Choose 'Customize Installation' and make sure everything is selected.



Optional Features

☑ Documentation
Installs the Python documentation file.

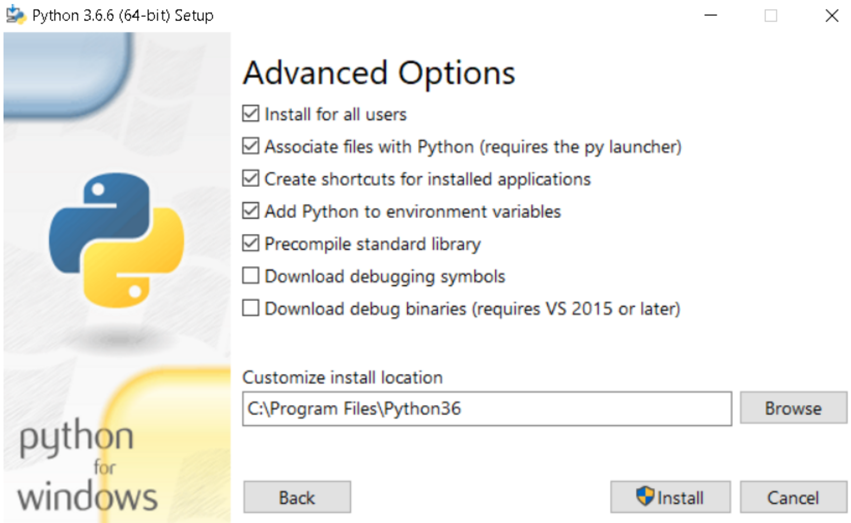
☑ pip
Installs pip, which can download and install other Python packages.

☑ tcl/tk and IDLE
Installs tkinter and the IDLE development environment.

☑ Python test suite
Installs the standard library test suite.

☑ py launcher ☑ for all users (requires elevation)
Use Programs and Features to remove the 'py' launcher.

Click **Next**, then select 'Install for all users' and 'Precompile standard library'.



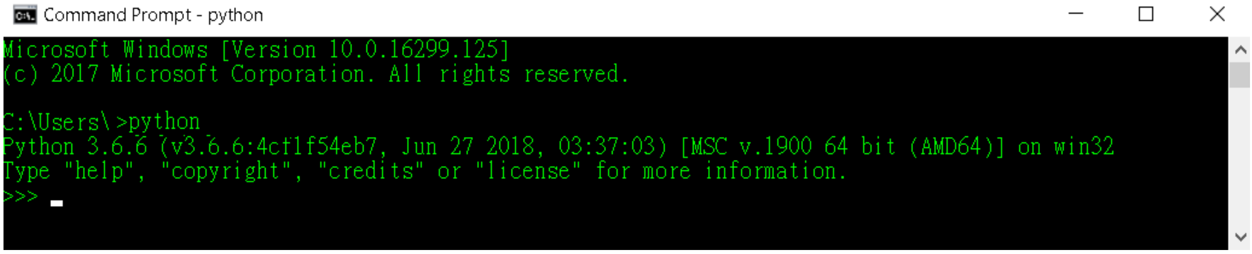
Advanced Options

☑ Install for all users
☑ Associate files with Python (requires the py launcher)
☑ Create shortcuts for installed applications
☑ Add Python to environment variables
☑ Precompile standard library
☐ Download debugging symbols
☐ Download debug binaries (requires VS 2015 or later)

Customize install location: C:\Program Files\Python36

Click **Install**

After install success, user needs to ensure the PC is using the correct Python version. This can be check by typing “python” Window command prompt



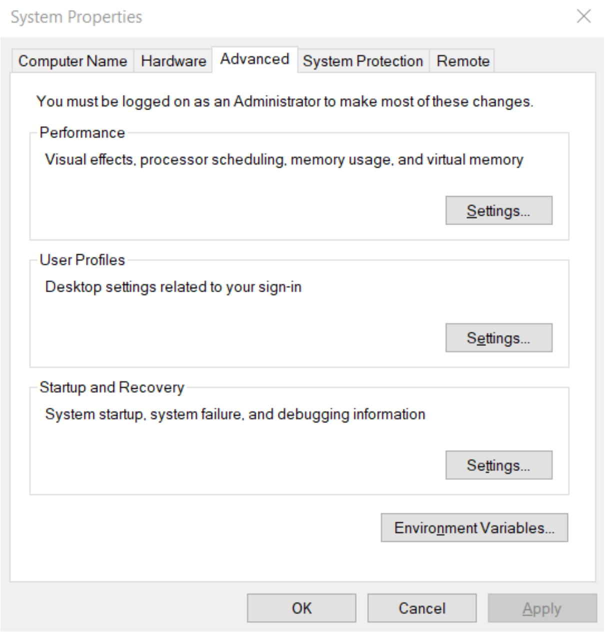
```
Microsoft Windows [Version 10.0.16299.125]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users\ >python
Python 3.6.6 (v3.6.6:4cf1f54eb7, Jun 27 2018, 03:37:03) [MSC v.1900 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

For Window PC, if the Python version is not correct, user can check only if only Python 3.6 is added the Environment Variable **Path.** Remove other python tools which are added to the Environment Variable **Path.**

To check the Environment Variable,

click the Window logo key -> type “System” and enter to it -> Advanced system settings -> select Advance Tab -> click Environment Variables -> check the **Path** User variables and **Path** System variables



You must be logged on as an Administrator to make most of these changes.

Performance

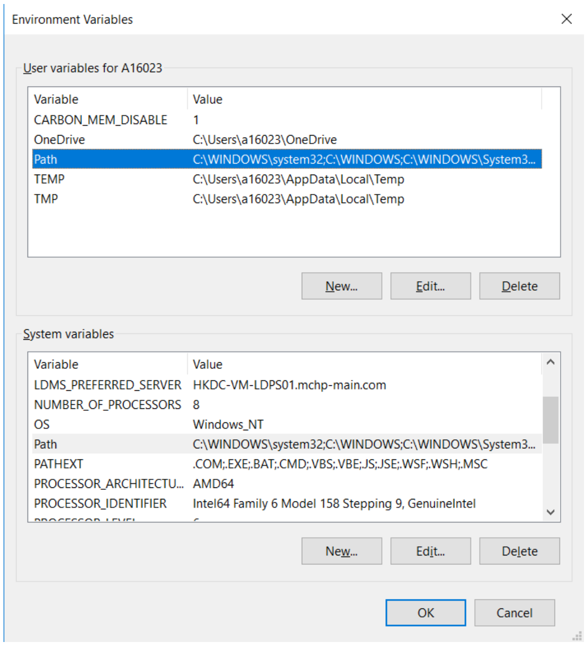
Visual effects, processor scheduling, memory usage, and virtual memory

User Profiles

Desktop settings related to your sign-in

Startup and Recovery

System startup, system failure, and debugging information



User variables for A16023

Variable	Value
CARBON_MEM_DISABLE	1
OneDrive	C:\Users\a16023\OneDrive
Path	C:\WINDOWS\system32;C:\WINDOWS;C:\WINDOWS\System3...
TEMP	C:\Users\a16023\AppData\Local\Temp
TMP	C:\Users\a16023\AppData\Local\Temp

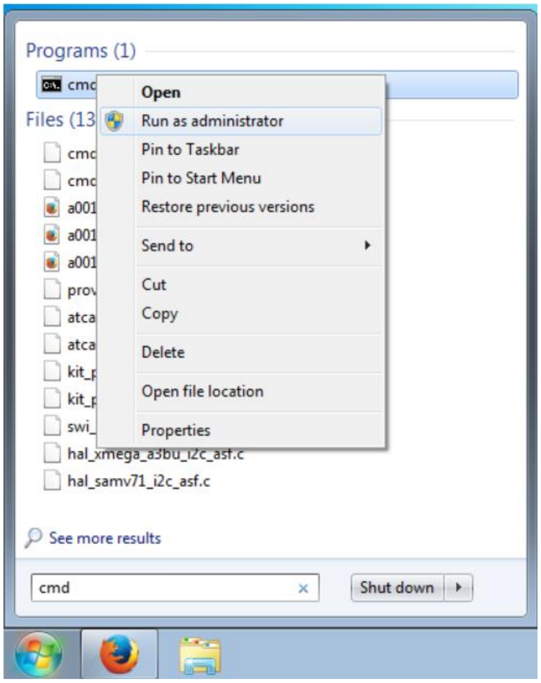
System variables

Variable	Value
LDMS_PREFERRED_SERVER	HKDC-VM-LDPS01.mchp-main.com
NUMBER_OF_PROCESSORS	8
OS	Windows_NT
Path	C:\WINDOWS\system32;C:\WINDOWS;C:\WINDOWS\System3...
PATHEXT	.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC
PROCESSOR_ARCHITECTU...	AMD64
PROCESSOR_IDENTIFIER	Intel64 Family 6 Model 158 Stepping 9, GenuineIntel

Python Packages

You will be using the Python package manager (pip) to install the required packages used in this guide.

Locate `requirements.txt` in the Project Software files you installed earlier.
Open the start menu (bottom left window) and search for 'cmd'
Right-click on 'Command Prompt (CMD)' and select 'Run as Administrator'



In command prompt, navigate to the directory and run the following command:

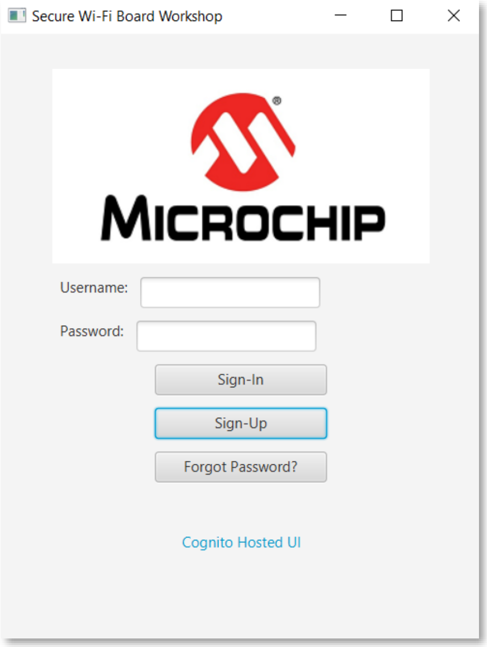
```
pip install –r requirements.txt
```

C. Create User Account and Configure the Board

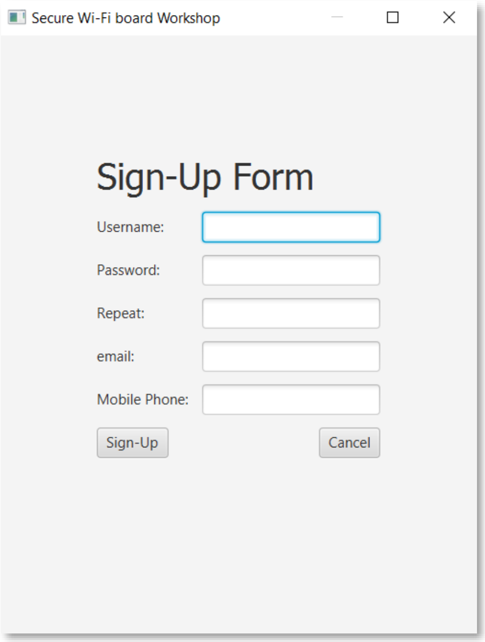
1. Open command prompt in Windows, navigate to the directory of the Java PC Application that downloaded from the previous section
2. Run the following command:

   ```
   Java -jar Secure-WiFi-Board-CognitoUI-1.0-jar-with-dependencies.jar
   ```

   Below screen is shown:

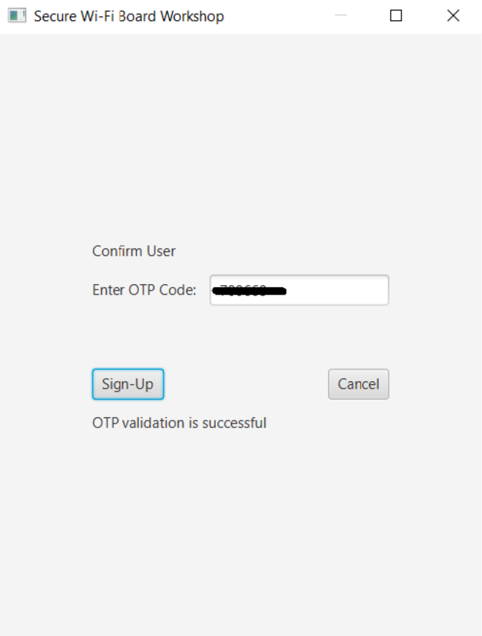


3. Before signing in, a new user will need to sign up an account by clicking the **Sign-Up** Button, UI show the Sign-Up Form as below



4. Fill in the User name, Password (8 characters min), email and phone number. Click **Sign Up** Button.
(Phone number must start with a plus (**+**) sign, followed immediately by the country code, for example, +14325551212.)

5. OTP code will be send to the email. Input the OTP in below UI.
"**OTP validation is successful**" is shown if the OTP code is correct



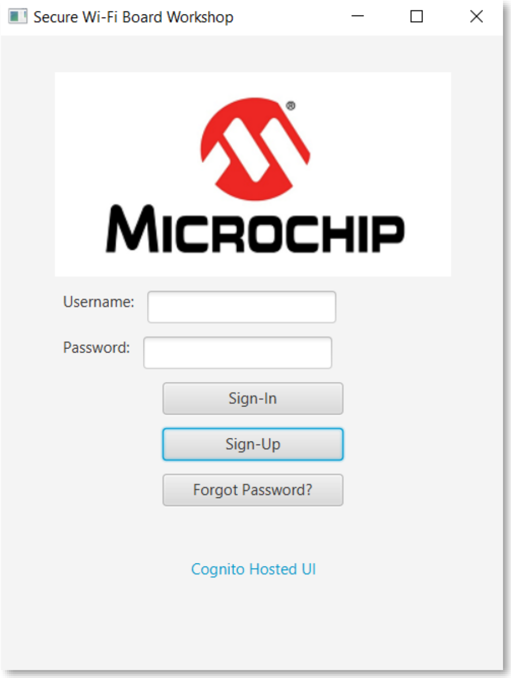
Confirm User

Enter OTP Code: [redacted]

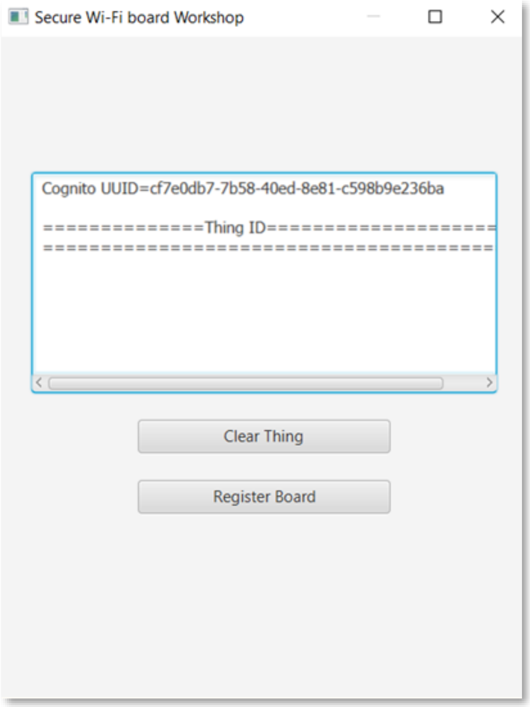
OTP validation is successful

6. After you have successfully signed up, click the close button (X) in the upper right corner

7. Input Username and Password, click **Sign-in** button to login account.



8. The application will now show the account UUID and the sensor board AWS IoT Thing ID that is registered to the account. Since you have only just signed up for the account, there should be not be any Thing IDs shown as no sensor board has been registered to the account yet.
   (In this stage, the application scans a table in AWS DynamoDB. As this is the first time you login, there is no Thing ID record in the DynamoDB table and the application do not show Thing ID in the window. After you register the board Thing ID by performing step 9 to 11, the board Thing ID will be stored in the table in AWS DynamoDB. The application will show the Thing ID in the window)



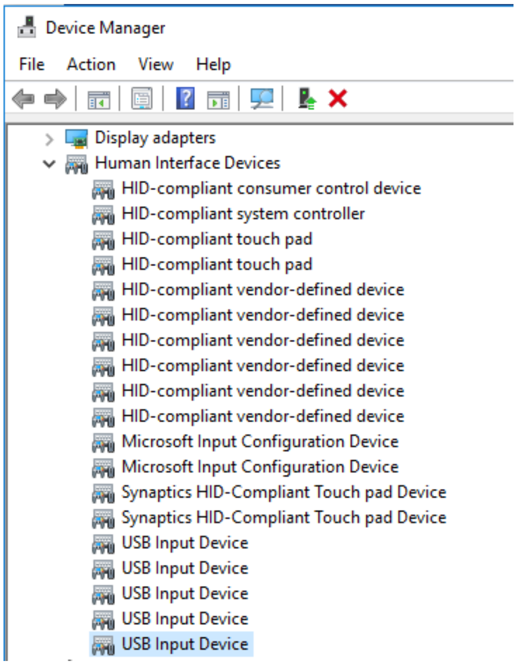
```
Cognito UUID=cf7e0db7-7b58-40ed-8e81-c598b9e236ba

==============Thing ID===================
========================================
```

Note: A thing is a representation of a specific device in AWS IoT. Thing ID is the name of the thing, which is unique for each device.

9. Connect the secure Wi-Fi board to PC with USB port

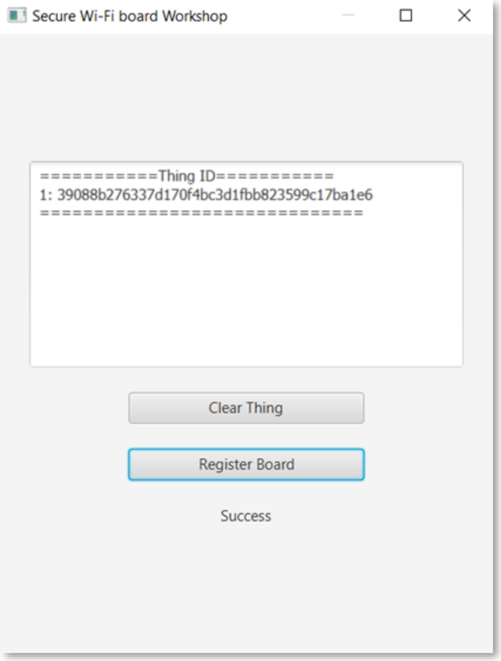
10. Power on the Secure Wi-Fi board, LD2 on the board blink in blue color and then blink in green color. Windows detect HID USB Input Device.



- Display adapters
- Human Interface Devices
  - HID-compliant consumer control device
  - HID-compliant system controller
  - HID-compliant touch pad
  - HID-compliant touch pad
  - HID-compliant vendor-defined device
  - HID-compliant vendor-defined device
  - HID-compliant vendor-defined device
  - HID-compliant vendor-defined device
  - HID-compliant vendor-defined device
  - HID-compliant vendor-defined device
  - Microsoft Input Configuration Device
  - Microsoft Input Configuration Device
  - Synaptics HID-Compliant Touch pad Device
  - Synaptics HID-Compliant Touch pad Device
  - USB Input Device
  - USB Input Device
  - USB Input Device
  - USB Input Device
  - USB Input Device

11. Click **Register Board** button
(PC GUI runs a python script in the background and communicates with the sensor board over USB to get the Thing ID)

12. The application shows registration success and the Secure Wi-Fi Board Thing ID is now displayed in the window



```
===========Thing ID============
1: 39088b276337d170f4bc3d1fbb823599c17ba1e6
=============================
```

Success

D. Network Provision

To set the Secure Wi-Fi board to connect to the Access Point, user can connect the secure Wi-Fi board to PC with USB port, and run below python scripts:

```
python kit_set_wifi.py --ssid wifi-name --password wifi-password
```

Where wifi-name = SSID and wifi-password = PASSWORD of your Wi-Fi access point.

Access Point need to operate in WPA2 personal security mode

When the network provisioning is done, LD2 on the board blinks red. The board needs to be rebooted for the new Wi-Fi settings to take effect.

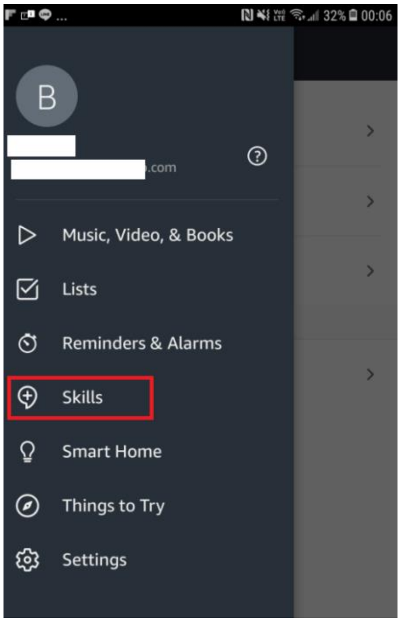
E. Set up Alexa on Amazon Echo Dot

1. Install Alexa mobile APP.
   Android devices:
   https://play.google.com/store/apps/details?id=com.amazon.dee.app&hl=zh_HK
   IOS devices:
   https://itunes.apple.com/us/app/amazon-alexa/id944011620?mt=8

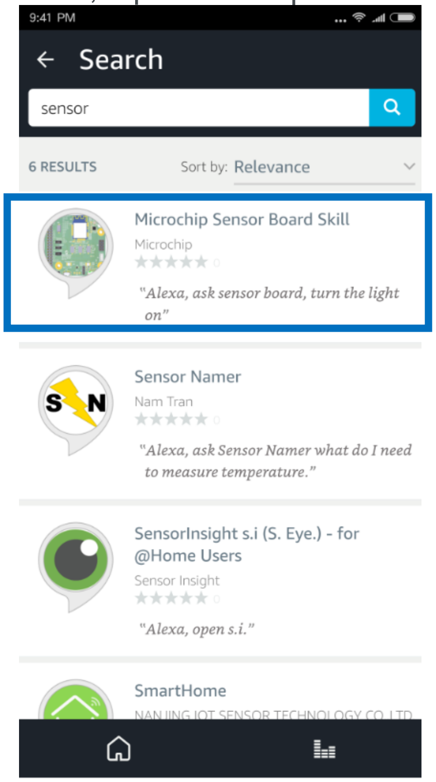
2. Create an Alexa account and sign in the Alexa mobile APP
3. Refer below link to set up Echo Dot:
   https://www.amazon.com/gp/help/customer/display.html?nodeId=201994280

F. Enable Skill

1. Launch Alexa mobile APP, Tap ”≡” in the upper left hand cornet
2. Select **Skills**



3. Type “sensor” in the search bar, tap “Microchip Sensor Skill”



9:41 PM

← Search

sensor

6 RESULTS Sort by: Relevance

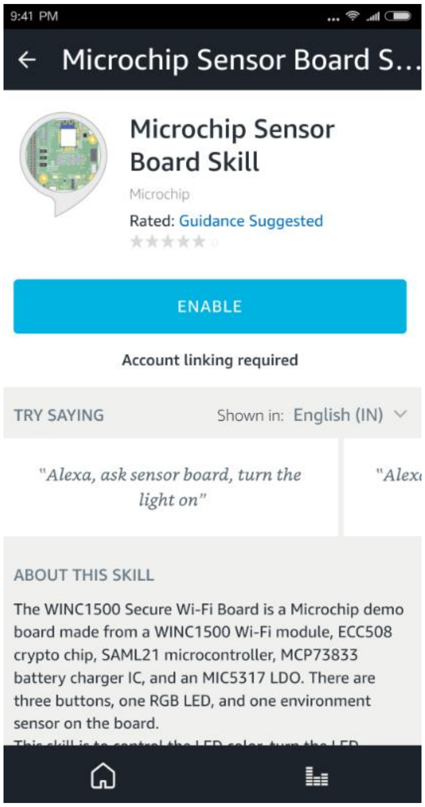
Microchip Sensor Board Skill
Microchip
★★★★★ 0
“Alexa, ask sensor board, turn the light on”

Sensor Namer
Nam Tran
★★★★★ 0
“Alexa, ask Sensor Namer what do I need to measure temperature.”

SensorInsight s.i (S. Eye.) - for @Home Users
Sensor Insight
★★★★★ 0
“Alexa, open s.i.”

SmartHome
NANJING IOT SENSOR TECHNOLOGY CO.,LTD

4. Tap **ENABLE**



9:41 PM

← Microchip Sensor Board S...

Microchip Sensor Board Skill
Microchip
Rated: Guidance Suggested
★★★★★ 0

ENABLE

Account linking required

TRY SAYING Shown in: English (IN)

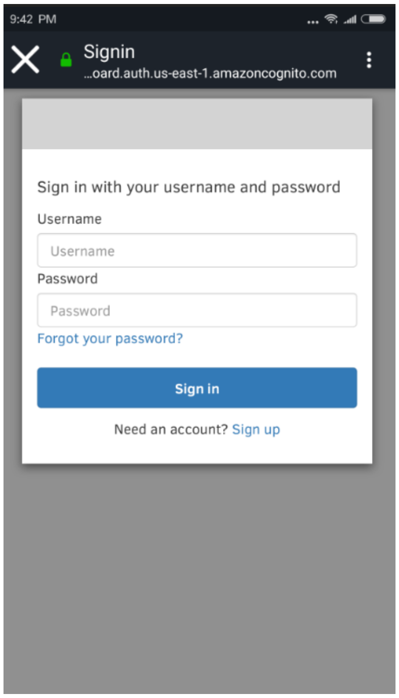
“Alexa, ask sensor board, turn the light on”

“Alexa

ABOUT THIS SKILL

The WINC1500 Secure Wi-Fi Board is a Microchip demo board made from a WINC1500 Wi-Fi module, ECC508 crypto chip, SAML21 microcontroller, MCP73833 battery charger IC, and an MIC5317 LDO. There are three buttons, one RGB LED, and one environment sensor on the board.
This skill is to control the LED color, turn the LED

5. Input Secure Wi-Fi Board user account **Username** and **Password** that created in Section C. Tap **Sign in**



9:42 PM

Signin
...oard.auth.us-east-1.amazoncognito.com

Sign in with your username and password

Username

Username

Password

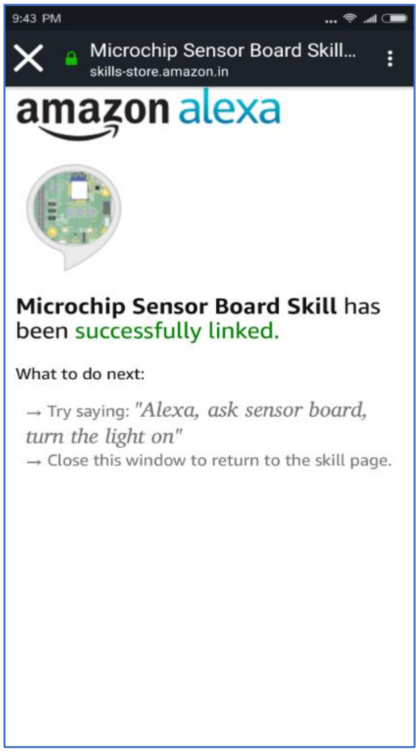
Password

Forgot your password?

Sign in

Need an account? Sign up

6. The App will now show that the Microchip Sensor Skill has been successfully linked



9:43 PM

Microchip Sensor Board Skill...
skills-store.amazon.in

amazon alexa

Microchip Sensor Board Skill has been successfully linked.

What to do next:

→ Try saying: *"Alexa, ask sensor board, turn the light on"*
→ Close this window to return to the skill page.

G. Control and Monitor the Secure Wi-Fi Board Using Voice Commands with Your Echo Dot

NOTE: You only need to say “Alexa” to prefix opening the sensor board. This opens a session and you don’t need to prefix the command with “Alexa” after you’ve opened the session.

User: Alexa, open sensor board

Echo Dot: Welcome to Microchip Sensor Board Skill. This skill is used to control and get the sensor data from WINC1500 Secure Wi-Fi Board showed in Microchip Master workshop

User: What is the temperature?

Echo Dot: The temperature is 93.70 degrees Fahrenheit, please provide other command.

User: What are the button status?

Echo Dot: The button states are, button1 is up, button2 is up, button3 is up, please provide other command.

User: Turn the light Blue

Echo Dot: The Sensor board light is blue (LD2 on the board turn to blue color), please provide other command.

User: Set Port A 17

Echo Dot: PORT A 17 will be set, please provide other command (PortA 17 on the board is set to high)

User: Clear Port A 17

Echo Dot: PORT A 17 will be clear, please provide other command (PortA 17 on the board is set to low)

User: Stop

Echo Dot: Thank you for using Microchip Sensor board demo. Have a nice day!

Voice Command List

Voice Command	Function
What is the temperature / humidity?	Get the temperature / humidity from board sensor
What are the button states?	Get the button status on the board
What is the light state?	Get the LED2 on/ off state
What is the light color?	Get the LED2 color
Turn the light on/ off	Set the LED2 on/ off
Turn the light blue/ green/ red/ yellow/ white	Set the LED2 to different color
Set Port A 17/ 20/ 21 Set Port B 22/ 23	Assert the Port A 17/ 20 or 21 GPIO to high Assert the Port B 22/ 23 to high
Clear Port A 17/ 20/ 21 Clear Port B 22/ 23	Assert the Port A 17/ 20 or 21 GPIO to low Assert the Port B 22/ 23 to low

H. Revision History

Doc. Rev.	Date	Comments
0	7/24 /2018	Initial version
0.1	7/30/2018	- Update phone number format when sign up acct - Add a content - Add power support option
0.2	8/2/2018	-Minor edits- JR, - Add AWS Provision with ECC608 information - Modify the Alexa conversation example in Section G
0.3	8/6/2018	-Add information of battery changing
0.4	8/10/2018	-Update the skill icon screen capture
0.5	8/15/2018	-Add regulation notice
0.6	8/29/2018	-update github link to download materials

Regulatory Notice:

The unit is a development/evaluation tool which is designed to be used for research and development in a laboratory environment. The unit is not intended to be a finished appliance, nor is it intended for incorporation into finished appliances that are made commercially available as single functional units to end users.

SIMPLIFIED EU DECLARATION OF CONFORMITY

Hereby, Microchip Technology Inc. declares that the radio equipment type DM100100/ WINC1500 Secure Wi-Fi Board is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity, for this product, is available at:

www.microchip.com

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CONSEQUENTIAL DAMAGES, LOST PROFITS OR LOST DATA, COST OF PROCUREMENT OF

SUBSTITUTE GOODS, TECHNOLOGY, SERVICES, OR ANY CLAIMS BY THIRD PARTIES (INCLUDING BUT NOT LIMITED TO ANY DEFENSE THEREOF), OR OTHER SIMILAR COSTS.