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AWS IoT Core - Quick Start Guide

Revision: 0.1

Libre Wireless Technologies Private Limited

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1. Document Information

1.1. Abstract

This user guide describes the content of the MAVID Package for AWS (Amazon Web Services) IoT (Internet of Things).

The Amazon Web Services Internet of Things service enables secure, bidirectional communication between IoT devices and the cloud over MQTT, HTTP and WebSockets.

1.2. Document Convention

Icon	Meaning	Description
	Note	Provides information good to know
	Caution	Indicates situation that might result in loss of data or hardware damage

1.3. Document Revision History

Revision	Date	Description of change	Author
1.0	Feb 25, 2020	Final Draft	Naga
0.1	Nov 21, 2019	Initial Draft	Ramya

2. Hardware and Software Environmental Setup

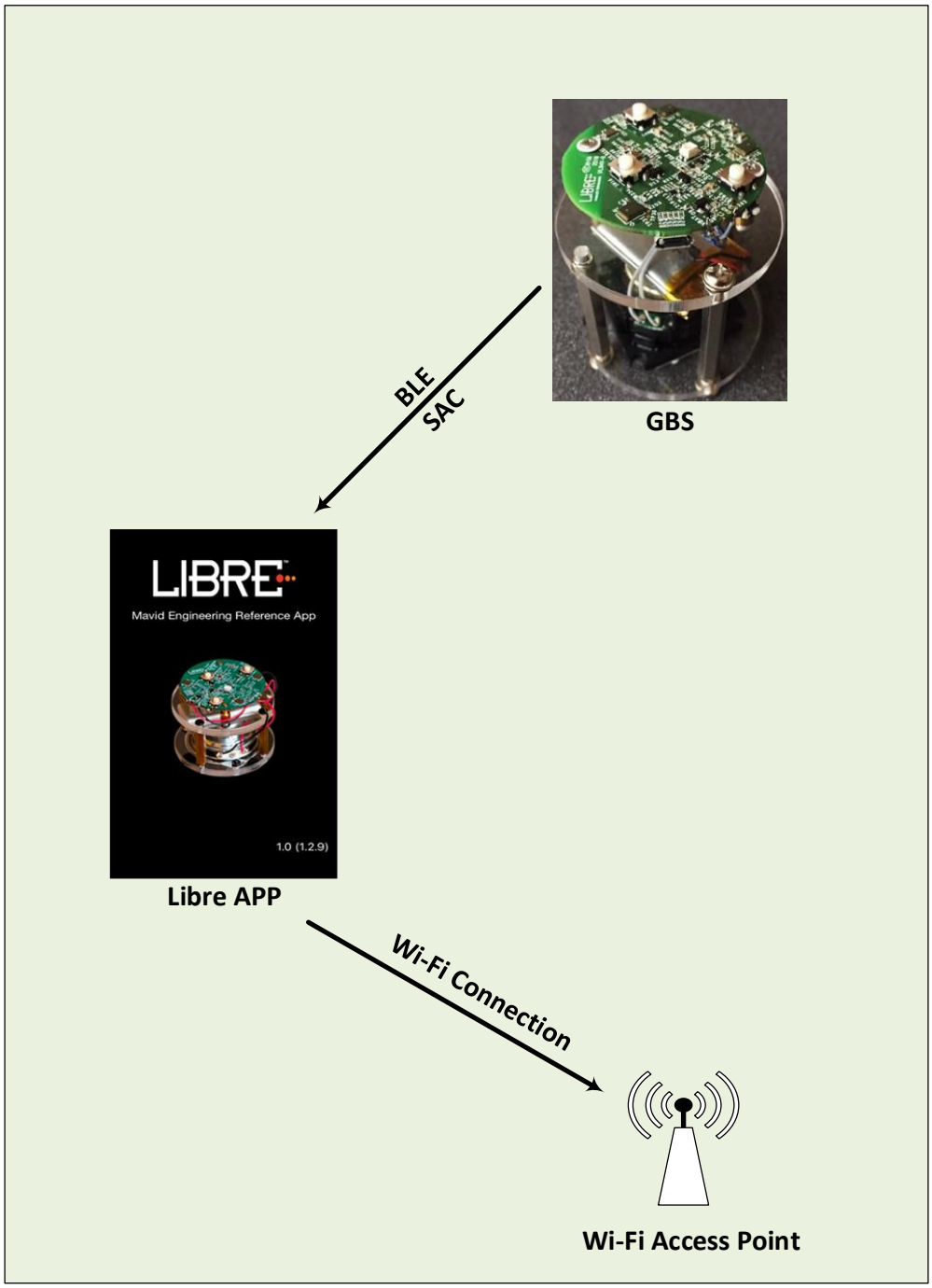

Figure 2-1: Hardware and Software Environmental Setup

3. MAVID Architecture

This section describes the software components of MAVID architecture.

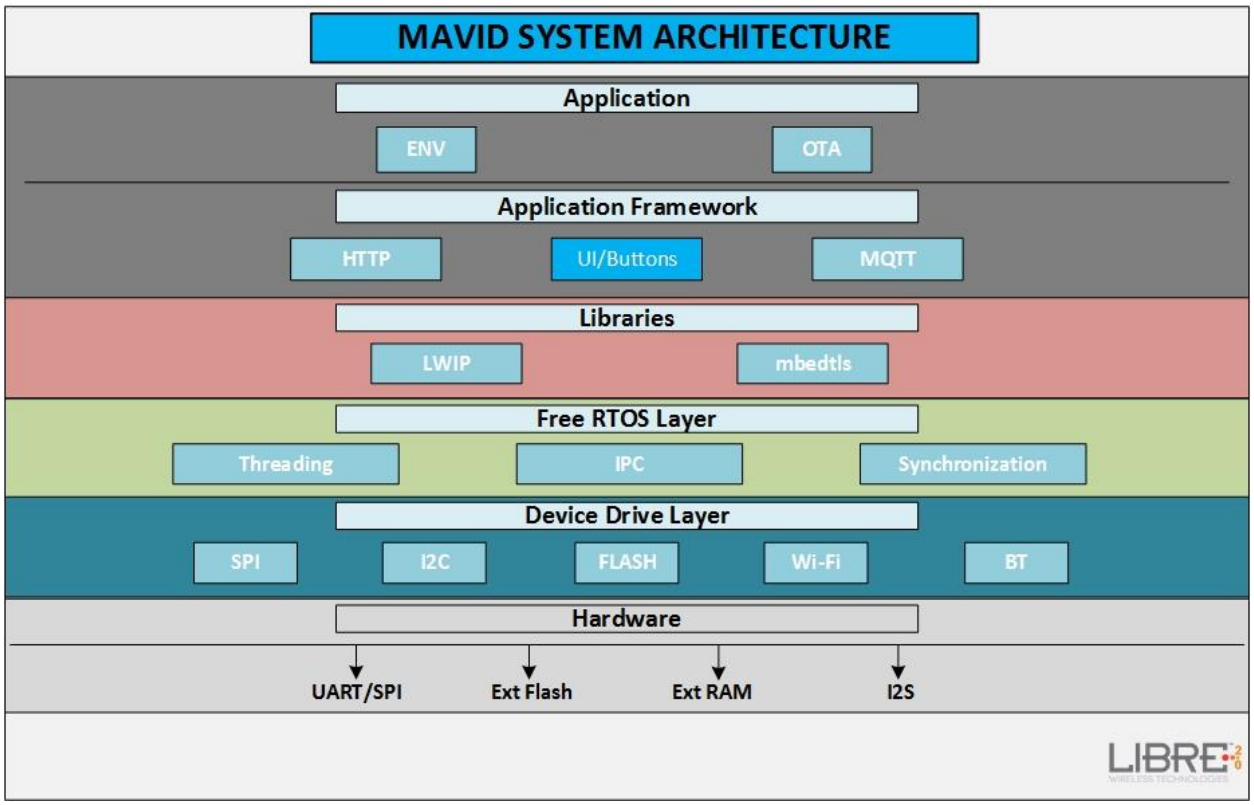

Figure 3-1: MAVID Architecture

- Application layer: This has all the user lever/application layer codes like BLE configuration, BT application, etc.
- ENV: Configuration parameter and user nonvolatile data
- OTA: Over the Air update
- MQTT: AWSIoT C SDK
- UI/Buttons: UI/UX related features
- LWIP: Wi-Fi application feature
- Mbedtls: Embedded TLS library
- Threading: Free RTOS threading

- IPC: Free RTOS Inter process communication
- Synchronization: Free RTOS thread synchronization
- HAL: BSP code of ST
- FLASH: Internal Flash driver
- BT/ Wi-Fi: BT and Wi-Fi Stack

4. MAVID GBS-Minitower Setup

MAVID is the world's smallest, thinnest, and lowest power Voice/AI Technology Solution.

MAVID device is shown below:

Figure 4-1: MAVID Device

4.1. Golf Ball Speaker (GBS) Minitower

Golf Ball Speaker (GBS)-Minitower is a MAVID device-based reference design, used for customer evaluation purpose.

The GBS-Minitower reference board and Setup is shown below:

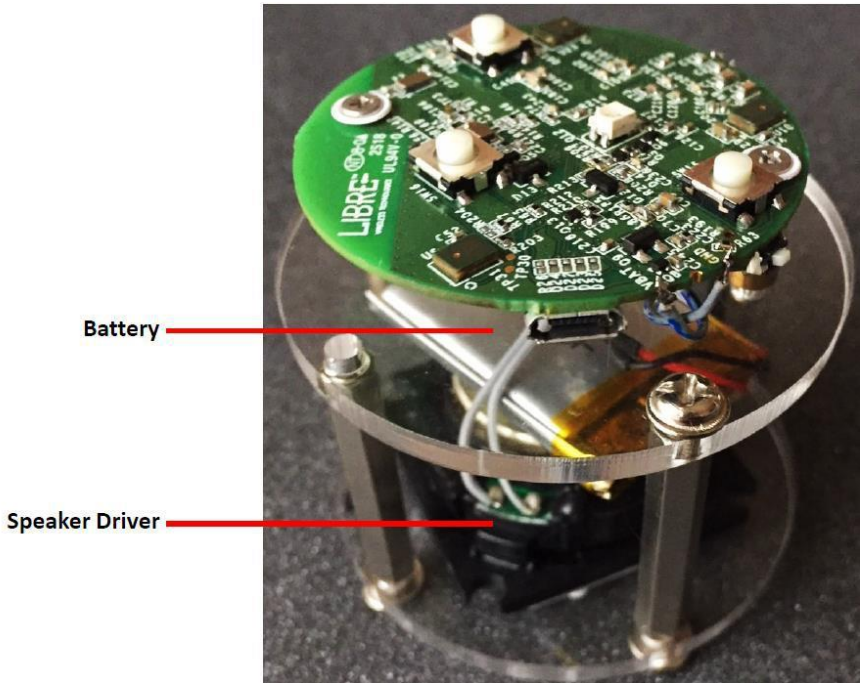

Figure 4.1-1: GBS-Minitower Side View

Figure 4.1-2: GBS-Minitower PCBA Top View

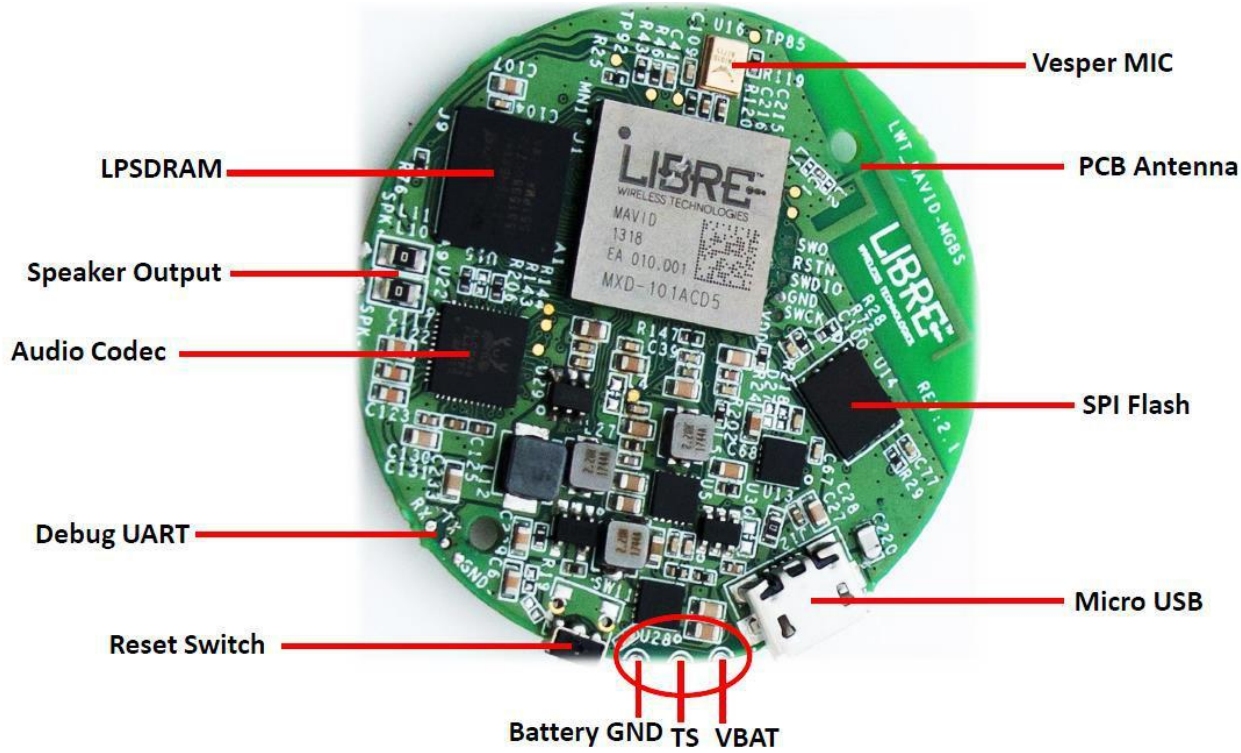

Figure 4.1-3: GBS-Minitower PCBA Bottom View

4.2. GBS Product UI

Switch#	Short press Functionality	Long press Functionality	MAVID MCU port	RTC GPIO	MAVID Pin#
SW14	-	SETUP	PI11	YES	P57
SW15	-	POWER ON/OFF	PA0	YES	P109
SW16	Play/Pause	BT pairing	PB4	NO	P84

- Simultaneous press of SW14 and SW15 results in Factory Default Reset (FDR) functionality.

  Note: SW16 button can be eliminated if there is no requirement of BT functionality.

Here are the supported features in Libre's current GBS Rev 2.1.

- Micro USB for charging battery
- Battery charging circuit
- 4 nos. of buttons
  - POWER ON-POWER OFF
  - Network setup
  - Play-pause/BT pairing
  - RESET button
  - SW14: Network setup (long press)
  - SW15: Power ON/POWER OFF (long press)
  - SW16: BT pair (long press) and short press for BT play/pause
  - SW11: Only reset (to reboot MAVID device)
- LPSDRAM + QSPI memory supported

- PCB antenna - but we would recommend going with external antenna. The reason is, with smaller size PCB with not much ground plane. We cannot expect good performance from the PCB antenna. We could get range of 65 meter. If the customer is ok with this performance, then they can retain the PCB antenna as it is.
- Test points added
    - JTAG programming
    - UART - debugging
    - D2/D4 - tuning
- BT pair mode - To put the device in BT pair mode, press and hold the button SW16 in GBS-Minitower speaker for 4 seconds. BT pair state is indicated by blinking blue.

4.3. UART debugging

Libre does run command line interpreter (CLI) over UART, it includes the following capabilities:

- Does have the boot up logs with appropriate initialization state of each module, that point out the errors or exception with details.
- Relevant runtime debugging information for every module, this will be looked up on to trace bugs.
- The Command Interpreter over UART provides custom AT commands such as,
    - Memory analysis - to monitor system memory
    - CPU utilization - to monitor CPU load
    - Modify Config parameters - to change the configuration parameters (NV-items) to change mode

4.4. LED Indication Status

State	LED Indication
Ready/Idle State	No indication
Firmware Update	Solid Magenta
Charger Connected	Red blink once
Bluetooth Pairing	Blue blinking
Bluetooth Connected/Paired	Blue - 2x blink
Booting up	White - blink
Wi-Fi setup mode	Multiple colors
Battery Low	Red continuous blinking

5. Network Setup

5.1. Triggering points for SAC

- Out of the box the device goes to SAC mode by default.
- Press and Hold SW14 Button for 4 seconds to enter SAC mode.

Once device enters SAC, it broadcasts the SSID ***LSConfigure_<MacId>***

E.g.: LSConfigure_a00008

5.2. Procedure to configure network settings

Network settings can be configured through following methods:

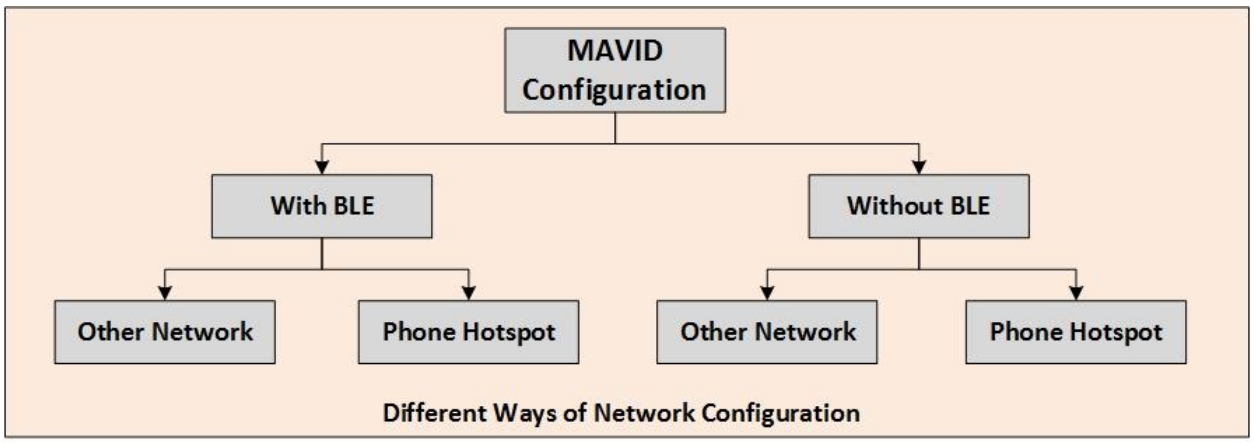

Figure 5.2-1: Different Ways of Network Configuration

Click the below hyperlinks to procced with required network settings:

- Configuring Network Settings with BLE for Phone Hotspot
- Configuring Network Settings with BLE for Other Network

5.3. Configuring Network Settings using BLE

The following section describes the steps involved in configuring network settings with BLE for both phone hotspot and other networks.

5.3.1. Configuring Network Settings with BLE for Phone Hotspot

Step 1. **Power-On** the Speaker.

Step 2. Press and Hold SW14 button for 4 seconds, LED will turn RED colour and then blinking with multiple colours.

Step 3. Switch on the Bluetooth connectivity of the phone.

Step 4. Launch the **MAVID App**.

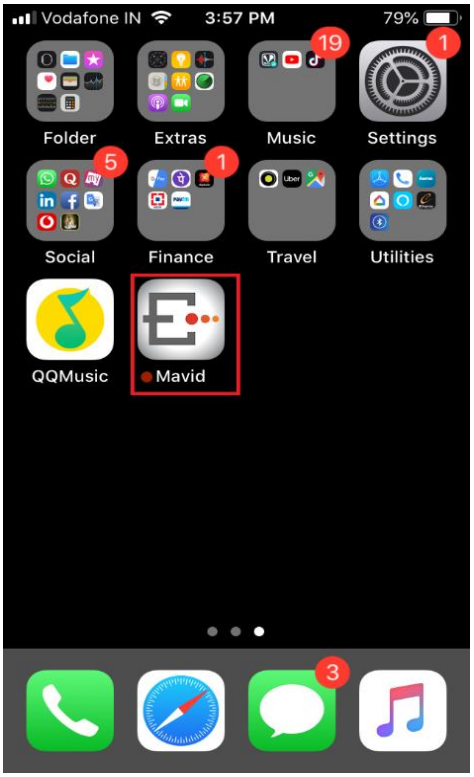

Figure 5.3.1-1: MAVID App icon

Step 5. The MAVID App opens with the following screen.

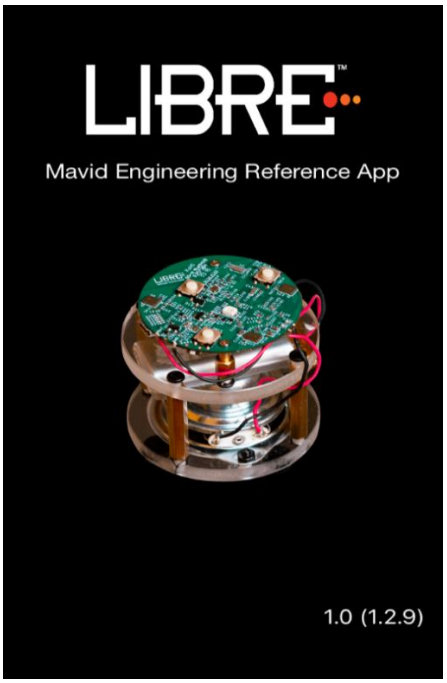

Figure 5.3.1-2: Launch Screen

Step 6. If there is no MAVID device configured, the home screen appears as below, click ***Configure***.

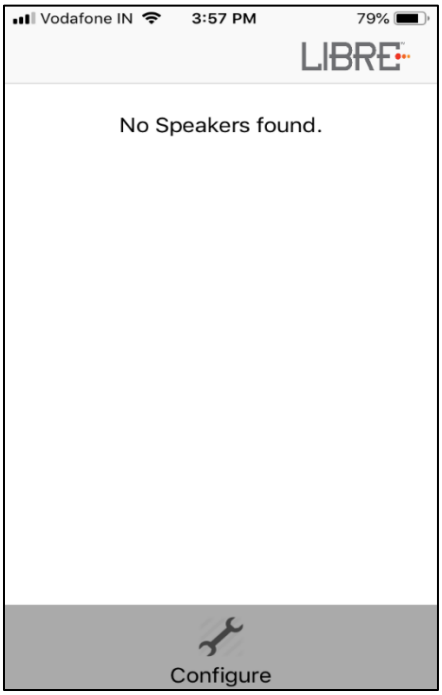

Figure 5.3.1-3: Configuration Screen 1

Step 7. Click ***Continue***.

Figure 5.3.1-4: Configuration Screen 2

Step 8. MAVID App will look for setup speaker through Bluetooth.

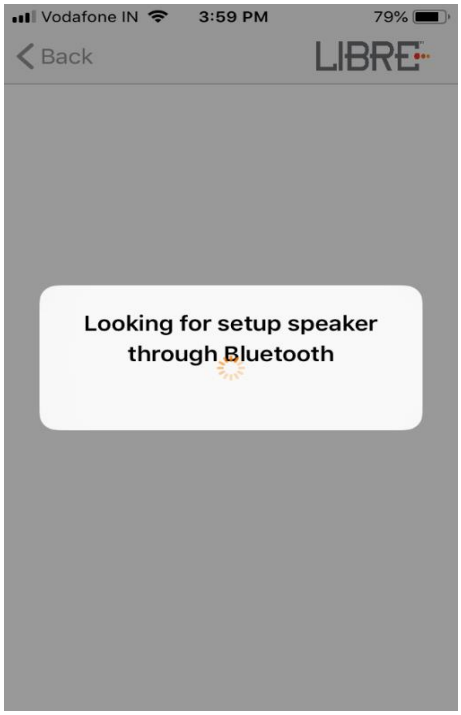

Figure 5.3.1-5: BLE Configuration Screen 1

Step 9. Choose the device that you would like to setup.

Figure 5.3.1-6: BLE Configuration Screen 2

Step 10. The device will start getting connected to the speaker.

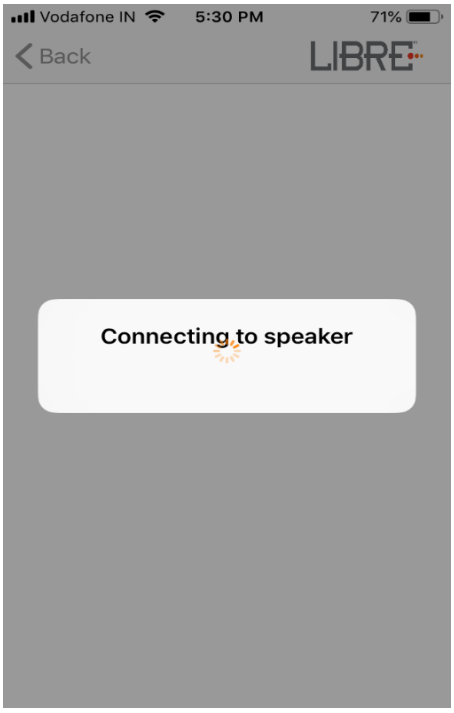

Figure 5.3.1-7: BLE Configuration Screen 3

Step 11. If you would like to setup speaker to your Phone's Hotspot, Click ***Yes*.**

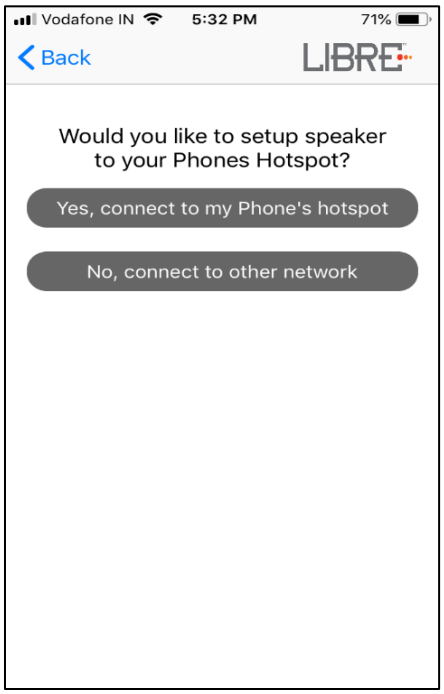

Figure 5.3.1-8: BLE Configuration Screen 4

Step 12. Enter the Phone's Hotspot Password and click ***Continue***.

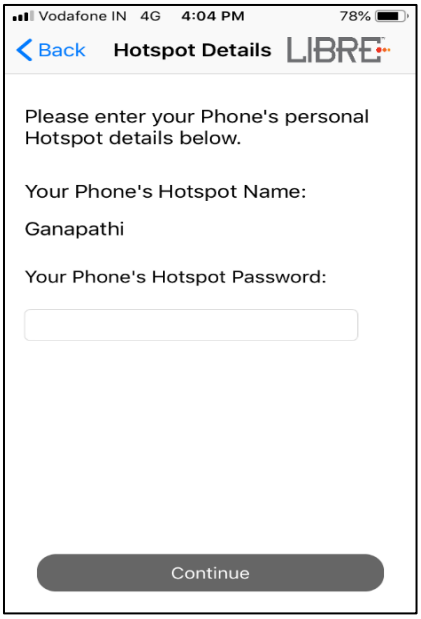

Figure 5.3.1-9: BLE Hotspot Screen 1

Note: Make sure your mobile hotspot is ***switched on.***

Step 13. Click ***Proceed*** to continue.

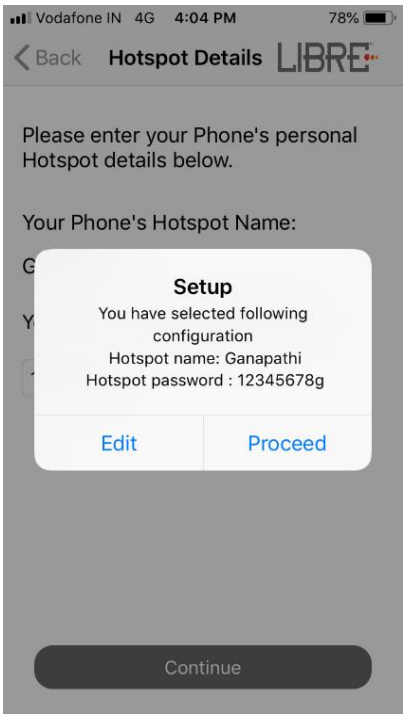

Figure 5.3.1-10: BLE Hotspot Screen 2

Step 14. The process of sending hotspot credentials to speaker takes place.

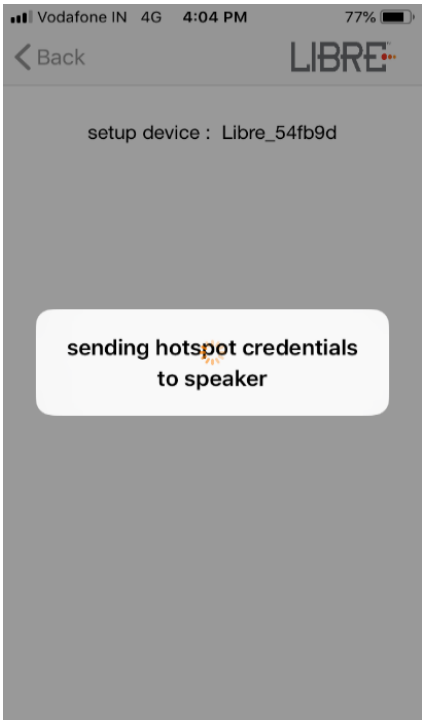

Figure 5.3.1-11: BLE Hotspot Screen 3

Step 15. New screen will be displayed, click ***Yes*** if you would like to Login to Alexa.

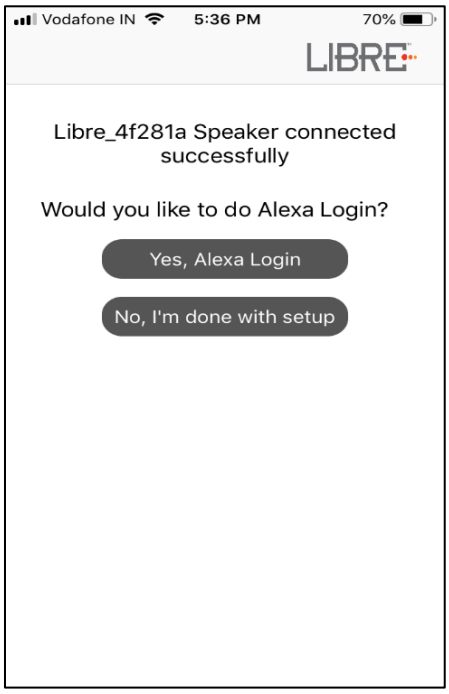

Figure 5.3.1-12: BLE Setup Success Screen

5.3.2. Configuring Network Settings with BLE for Phone Hotspot

Step 1. **Power-On** the Speaker.

Step 2. Press and Hold SW14 button for 4 seconds, LED will turn RED colour and then blinking with multiple colours.

Step 3. Switch on the Bluetooth connectivity of the phone.

Step 4. Launch the **MAVID App**.

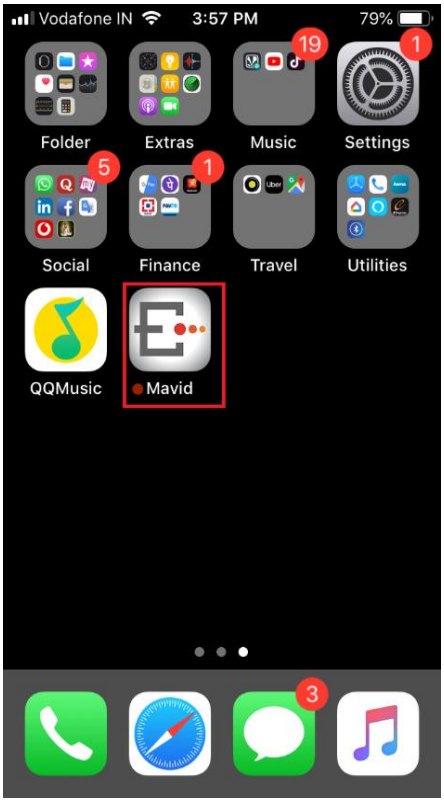

Figure 5.3.2-1: MAVID App icon

Step 5. The MAVID App opens with the following screen.

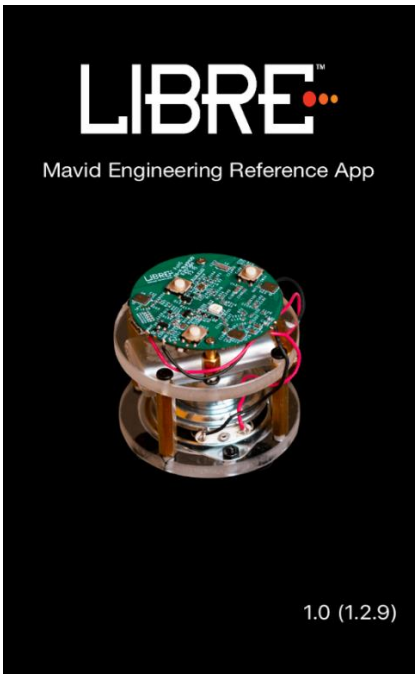

Figure 5.3.2-2: Launch Screen

Step 6. If there is no MAVID device configured, the home screen appears as below, click ***Configure***.

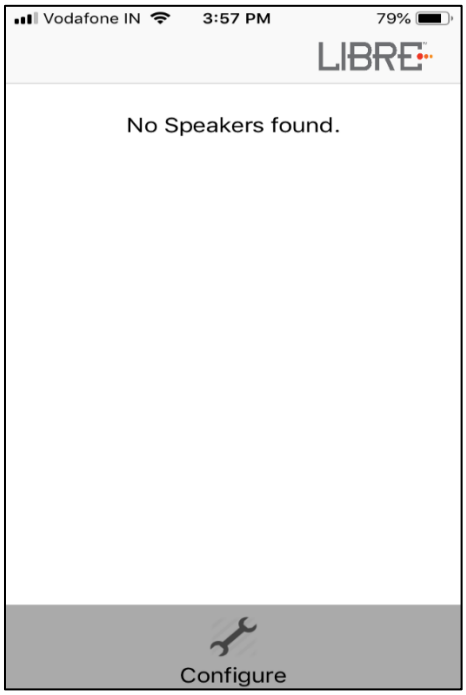

Figure 5.3.2-3: Configuration Screen 1

Step 7. Click ***Continue***.

Figure 5.3.2-4: Configuration Screen 2

Step 8. MAVID App will look for setup speaker through Bluetooth.

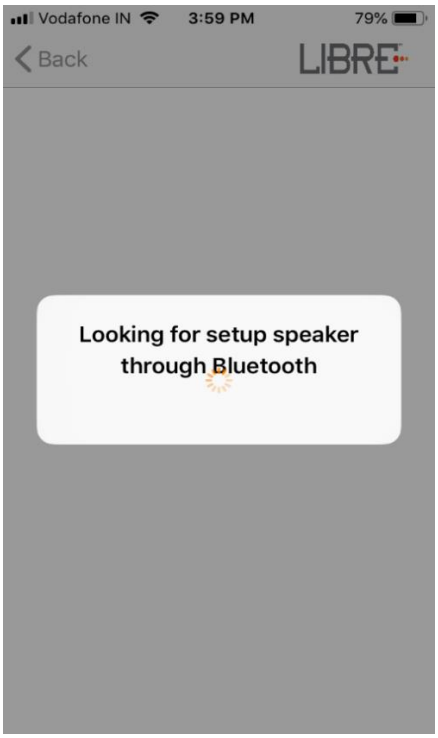

Figure 5.3.2-5: BLE Configuration Screen 1

Step 9. If you would like to setup speaker to other networks, Click ***No*** and connect to other network.

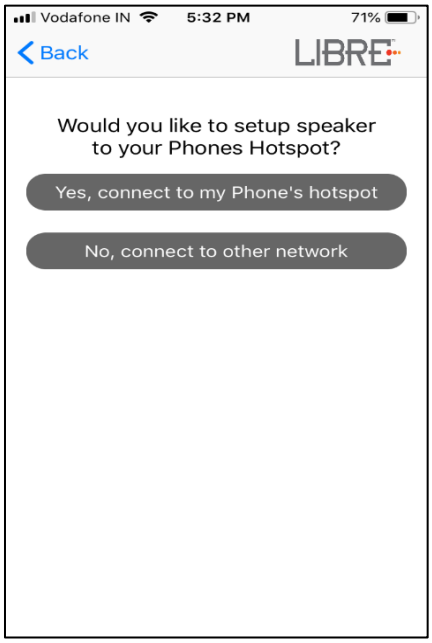

Figure 5.3.2-6: BLE Configuration Screen 2

Step 10. Select the SSID from the drop-down list and enter the password and click ***Connect***.

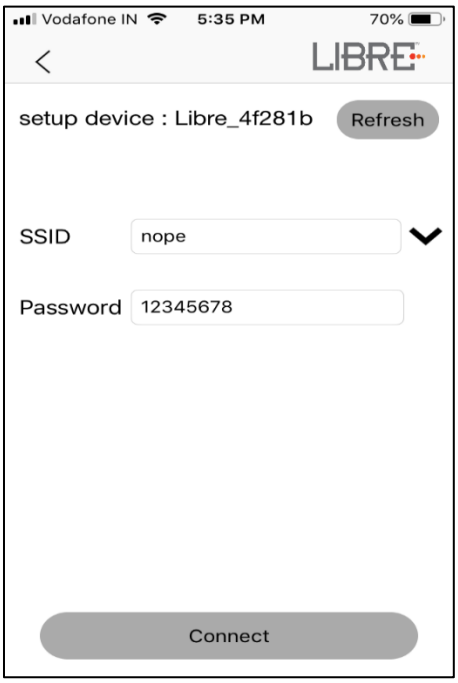

Figure 5.3.2-7: BLE Other Network Setup Screen 1

Step 11. The device will be connected.

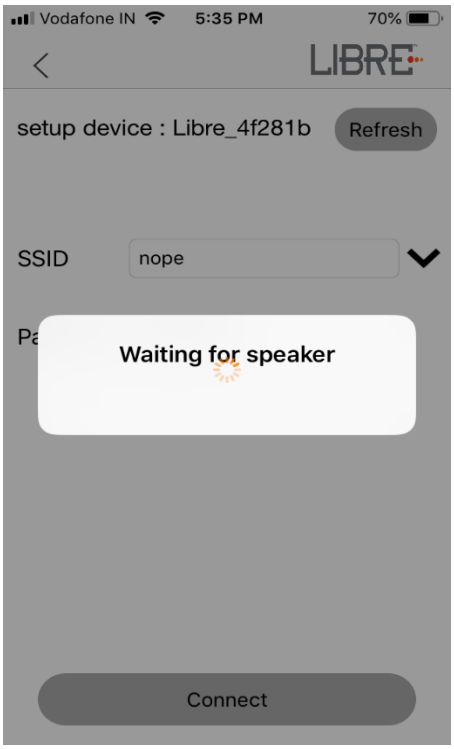

Figure 5.3.2-8: BLE Other Network Setup Screen 2

Step 12. New screen will be displayed, click ***Yes*** if you would like to Login to Alexa.

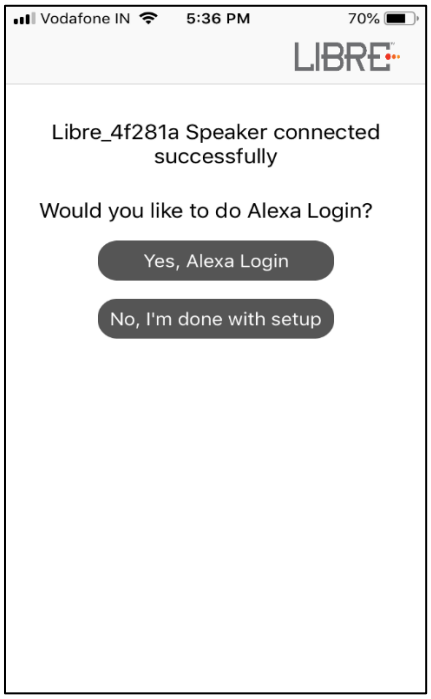

Figure 5.3.2-9: BLE Setup Success Screen

6. AWS IoT Documentation

Amazon Web Services (AWS) provide on-demand computing resources and services in the cloud. AWS IoT Core is the main service used in the scope of the application examples presented in this document.

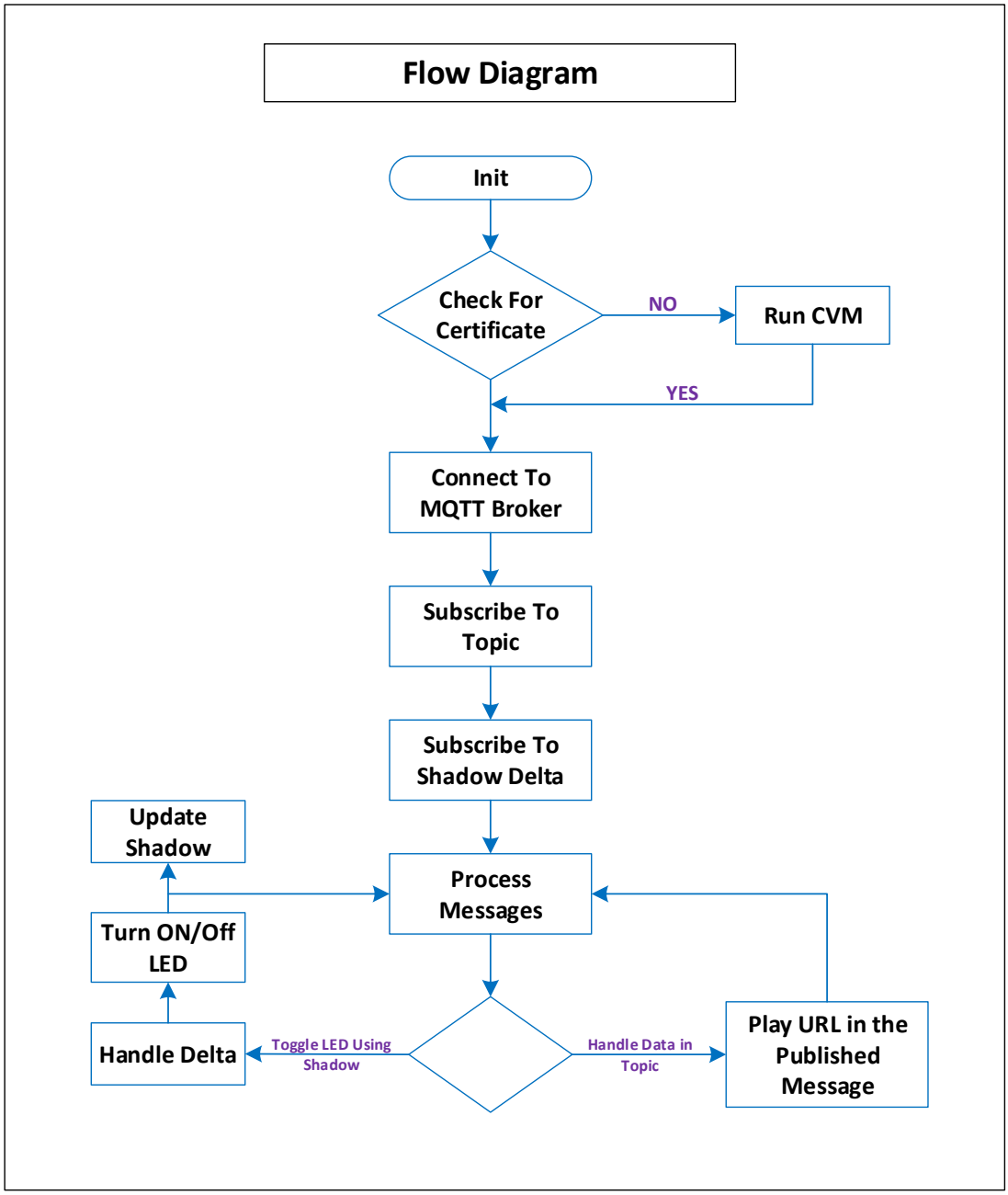

Figure 6-1: Flow Diagram

6.1. AWS Security Credential Creation

6.1.1. Certificate Generation (CVM) and Policy Assignment

On Init, device will check ENV for certificates. If the certificates are present, it will go ahead and connect to the MQTT broker. Else it will follow the certificate generation process. On registering yourself for the use of Libre's AWSIoT core, you will be assigned a set of credentials that are required to run CVM. These credentials should then be written to the ENV and the library will take care of generating the certificates. Libre follows best security practices for certificate and thing creation and policy assignment in line with Amazon guidelines.