MAVID-3M EVK

User Guide

Revision: 1.0

Libre Wireless Technologies Private Limited

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Table of Figures

1. Document Information

1.1. Abstract

This document explains the details of MAVID-3M Evaluation Kit (EVK) Setup, Firmware Upgrade procedures, network setup, and APP usage and GPIOs customization in MAVID-3M platform.

Libre Wireless, MAVID-3M is an ultra-low power device targeted for voice/AI, audio streaming and multi-protocol connectivity IoT hub and device applications.

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	Mar 24, 2021	Final Draft	Ranjith, Bhargav and Shahim
0.1	Feb 3, 2021	Initial Draft	Ranjith and Shahim

2. MAVID-3M Architecture

2.1. System Architecture

MAVID-3M system architecture is represented as shown in the below diagram:

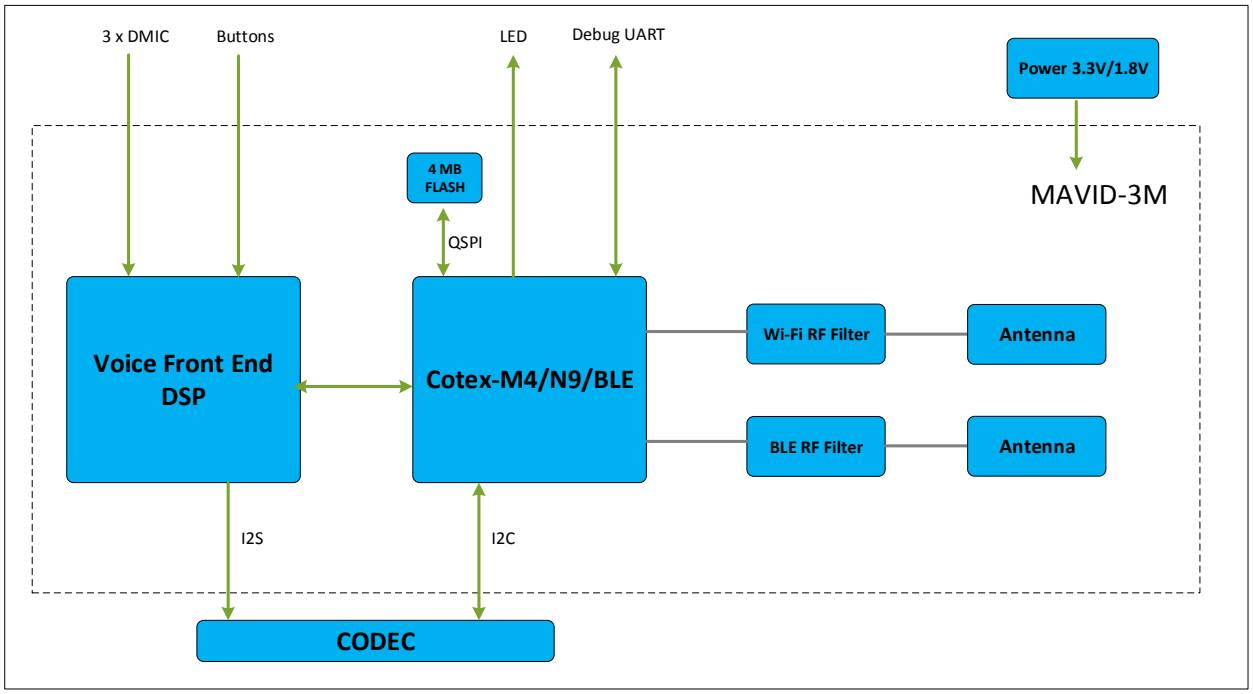

Figure 2.1-1: MAVID-3M Block Diagram

MAVID-3M has in-built:

- ARM Cortex M4 196 MHz
- Open SDK Voice/AI, IoT and Audio on Free RTOS Operating System
- 1x UART (currently used for debugging)
- 2x SPI (QSPI for Flash, SPI for Voice Front End)
- 1x I2C
- 1x I2S Serial audio interface
- 1x Analog port (12 bits ADC)
- Hi Resolution Audio (up to 192 kHz/24 bits) stereo supported

- LPCM, MP3, HE AAC decode capability
- Crypto Engine for AES 128, 192, 256. DES, 3DES, MD5, SHA 1, 224, 256, 384, 512, True Random number generator
- Two/three MIC Far Field voice. Noise reduction (Beam Forming) and AEC
- Internal 0.4MB/4.4MB SRAM
- External QSPI flash 4MB (XIP)
- 1x1, 802.11 b/g/n 2.4GHz WLAN
- BLE 5.0
- Wi-Fi/BLE coexistence
- Requires multiple voltage domains (3.3V and 1.8V)
- Supports 20MHz, 40MHz bandwidth in 2.4 GHz band
- Wi-Fi security WEP, WPA2 and WPS
- Dedicated high-performance 32-bit RISC CPU up to 160 MHz clock to run WLAN firmware
- Android and iOS Application for device on boarding and other functionalities
- Secure OTA Firmware Update
- Complete Low Power AVS “MIC to Cloud” Solution (Amazon AVS)
- IoT Stack for AWS or custom IoT Application, Device cloud for back end support

2.2. Software Architecture

MAVID-3M Software architecture is very flexible for the customer. Button and LED behavior can be easily configured by customer. With the help of Libre's MAVID-3M SDK, customer can write the IoT application to customize the sensor data, actions to be taken for actuators and communication with cloud. Libre also provides the ENV software to store the device configuration, login details in non-volatile memory. Customer can easily write and read the contents of ENV. MAVID-3M also supports the secure firmware update over the air.

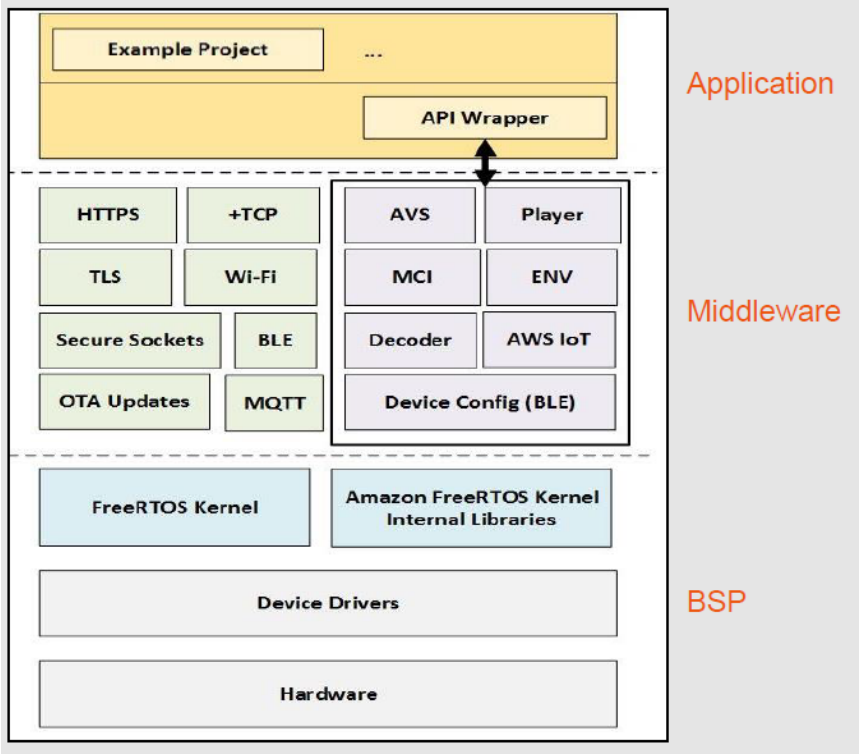

Figure 2.2-2: Block diagram for Libre MAVID-3M SDK

2.3. Security

MAVID-3M software also takes care of security at each stage of device operation.

- Secure Boot: MAVID-3M supports secure boot, where the BootROM code checks the authenticity and integrity of the application code before starting.
- Secure Firmware Update: MAVID-3M supports secure firmware update over air. The application binary is encrypted at the compile time and uploaded to OTA cloud. MAVID-3M starts updating the firmware once new version is found. Authenticity and integrity are checked before flashing new firmware to device.

2.4. 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

3. MAVID-3M EVK Setup

MAVID-3M comes with an extensive software SDK features for Voice/AI, Audio and Multi-protocol IoT control applications. These include system level control and data transfer and bridging features as well as core networking connectivity and OTA features.

3.1. MAVID-3M EVK

EVK is a MAVID-3M device-based reference design, used for customer evaluation purpose:

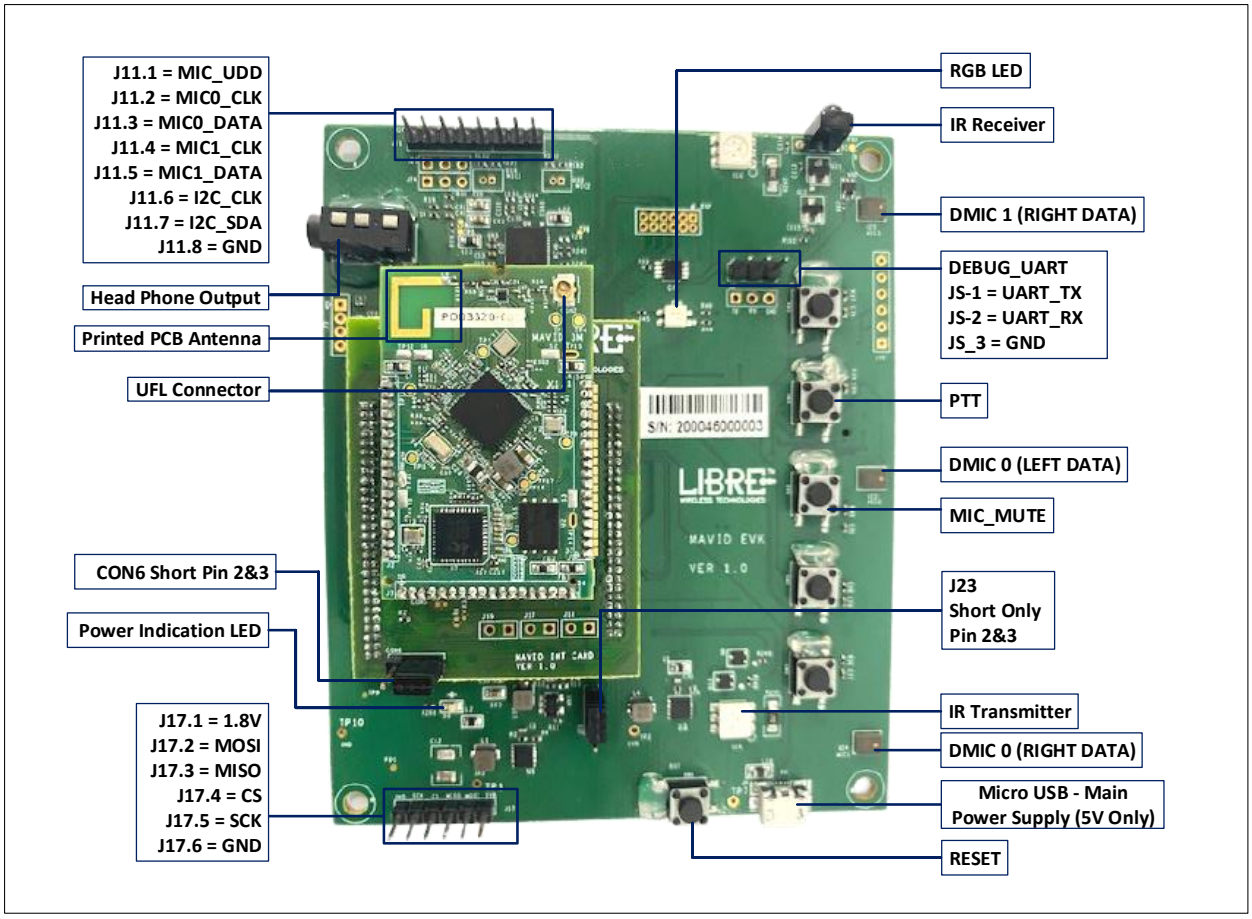

Figure 3.1-1: MAVID-3M EVK

3.2. EVK Product UI

The MAVID-3M EVK board has the following switches and defined functionality as given below:

Switch#	Short press Functionality	Long press Functionality	MAVID_3M PORT
SW3	PTT	SETUP	PORTB_FS
SW4	MUTE	Power OFF/Reboot	PORTB_CLK
SW5	Vol+	NA	PORTB_DI
SW6	Vol-	NA	PORTB_DO
SW7	Play/Pause	NA	NA

- Apart from these buttons, there is a button SW9 known as RESET button. It will reset the board
- MAVID-3M EVK supports 3 digital MICs or 2 analog MICs
- For audio output Jack is provided, which can be listened through speakers with in-built amplifier or earphone
- New introductions in MAVID-3M are IR transmitter and IR receiver
- UART at J5 are used to program firmware and debug purpose

3.3. LED Indication Status

The MAVID-3M EVK board has the following System LEDs along with AVS LEDs as mentioned below:

3.3.1. System LED

State	LED Indication
Ready/Idle State	No Indication
Listening	Cyan
Thinking	Cyan and Blue - Alternating
Speaking	Cyan and Blue - Pulsing
Notification Arrives	Yellow - Burst
Notification Queued	Yellow - Slow Pulse
Microphones Mute	Red solid
Firmware Update	Solid Magenta
Booting up	White - blink
Wi-Fi Connected & Alexa not Connected	Green blinking
Wi-Fi setup mode	Multiple colours

4. Network Setup

4.1 Triggering points

- Out of the box the device goes to set up mode by default.
- Press and hold SW3 button for 4 seconds to enter set up mode.

4.2 Procedure to configure network settings

This section displays the procedures to configure the network in both Android and iOS.

4.2.1. Procedure to configure network using BLE setting through Android App

Step 1. **Power on** the Speaker.

Step 2. Press and hold SW3 button for 4 seconds LED will turn ***red*** colour and then blinks with multiple colours.

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

Step 4. Launch the **MAVID-3M App**:

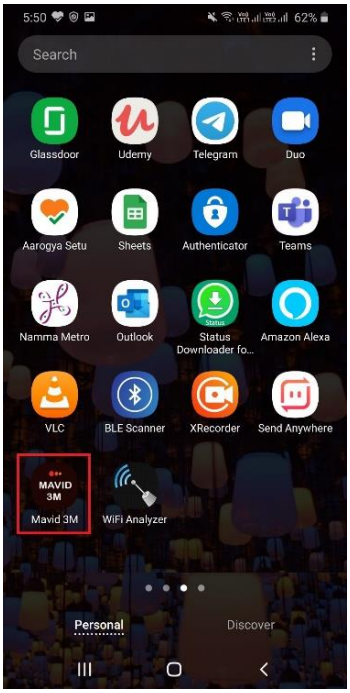

Figure 4.2.1-1: MAVID-3M App

Step 5. The MAVID-3M App opens with the following screen:

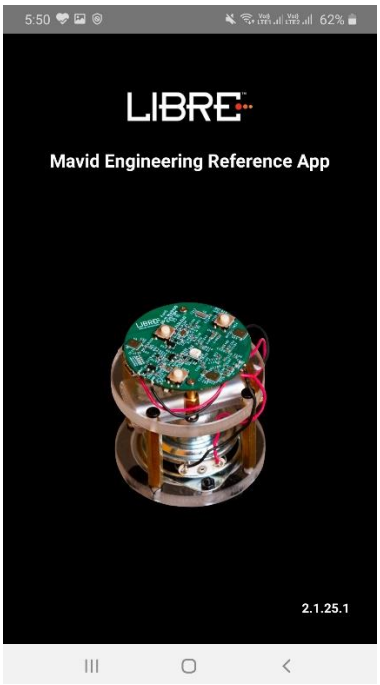

Figure 4.2.1-2: Launch Screen

Step 6. If there is no MAVID-3M device configured, the home screen appears as below and click ***Setup New Speaker***:

Figure 4.2.1-3: Configuration Screen 1

Step 7. Click the device to be set up from the list:

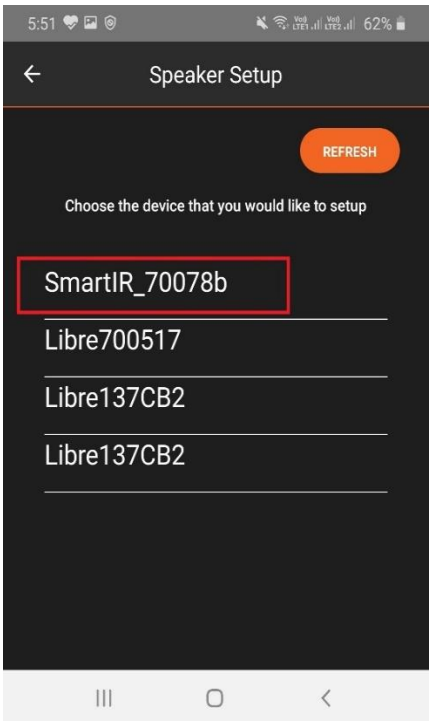

Figure 4.2.1-4: Configuration Screen 2

Step 8. If you would like to setup speaker to another network, Click ***No*** and connect to other network:

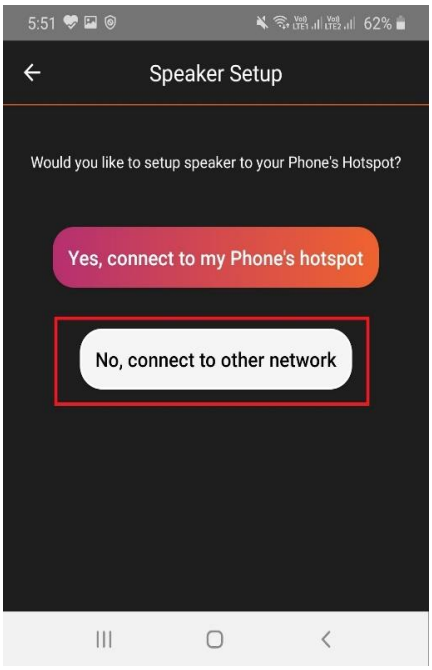

Figure 4.2.1-5: Configuration Screen 3

Step 9. Select the required Wi-Fi from the drop-down list and enter the password and click ***Next***:

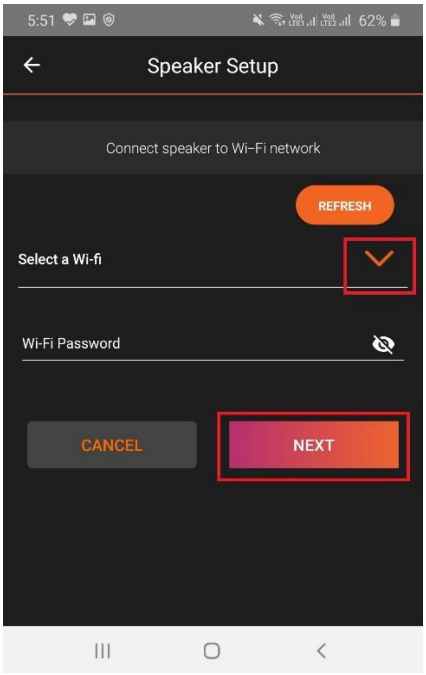

Figure 4.2.1-6: Configuration Screen 4

Step 10. Click ***Login with Amazon***:

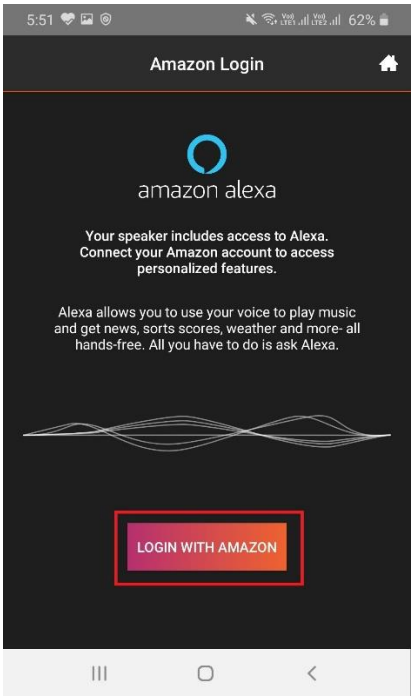

Figure 4.2.1-7: Amazon Login Screen 1

Step 11. Sign into Amazon with Valid Login Credentials:

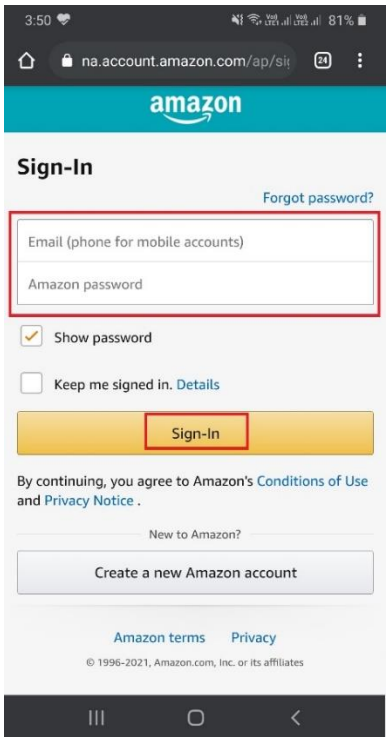

Figure 4.2.1-8: Amazon Login Screen 2

Step 12. After successful sign in, the below screen appears:

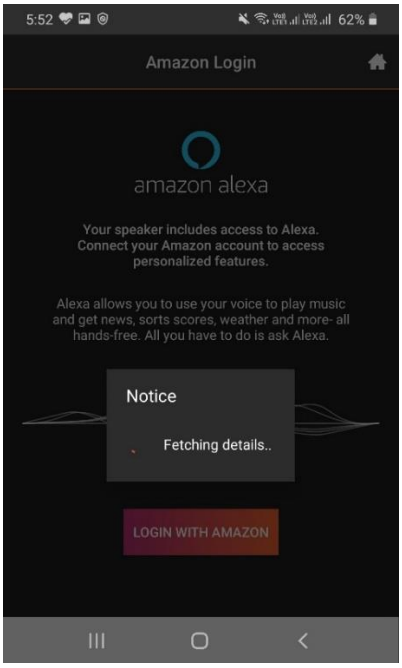

Figure 4.2.1-9: Amazon Login Screen 3

Step 13. After successful login, the following screen would appear:

Figure 4.2.1-10: Amazon Screen

Step 14. To sign out from the Amazon Alexa App, click on ***Sign out***.

4.2.2. Procedure to configure network using SoftAP setting through Android App

Step 1. Make sure mobile Bluetooth is turned OFF.

Step 2. If there is no MAVID-3M device configured, click on ***Setup New Speaker***:

Figure 4.2.2-1: Configuration Screen 1

Step 3. Click on ***Other Setup Option***:

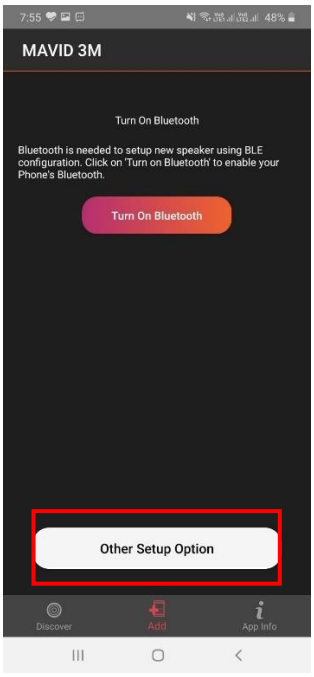

Figure 4.2.2-2: SoftAP Configuration screen 1

Step 4. Click on ***Wi-Fi SETTINGS***:

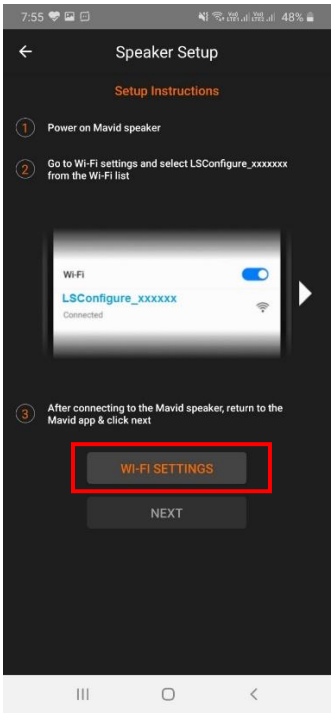

Figure 4.2.2-3: SoftAP Configuration screen 2

Step 5. Select your Wi-Fi from the list:

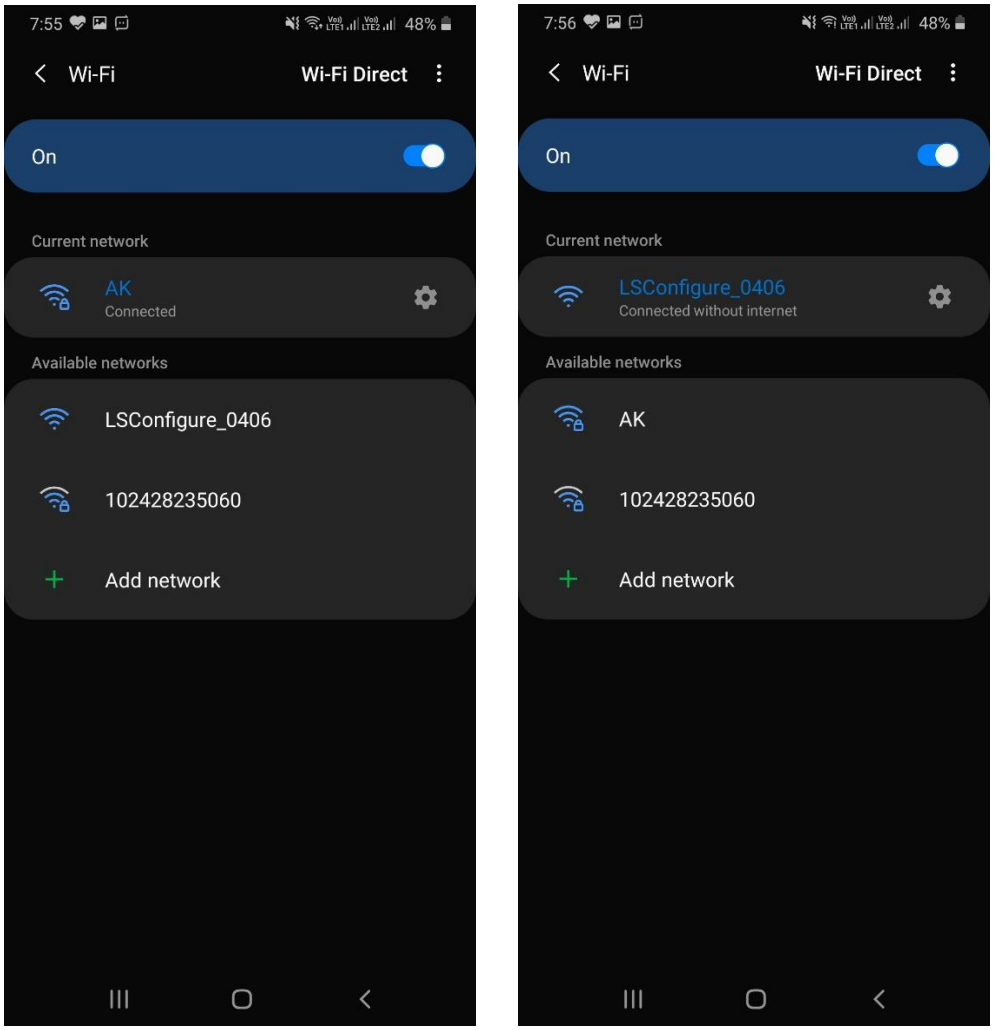

Figure 4.2.2-4: SoftAP Configuration screen 3

Step 6. Either connect to your phone hotspot or other network:

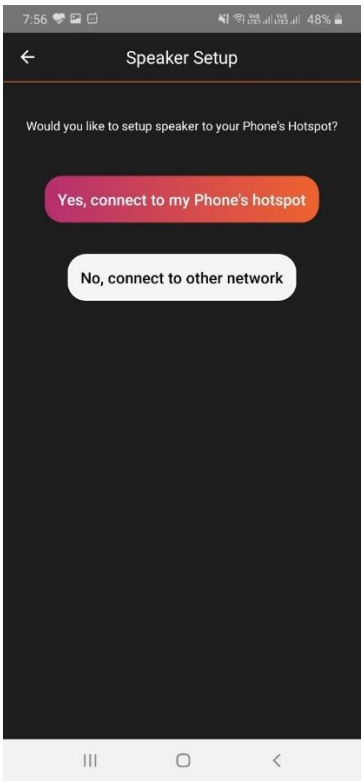

Figure 4.2.2-5: SoftAP Configuration screen 4

Step 7. Enter the credentials and click ***Next***:

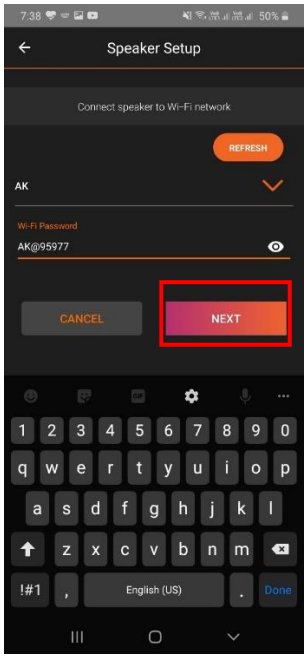

Figure 4.2.2-6: SoftAP Configuration screen 5

Step 8. Click ***OK***:

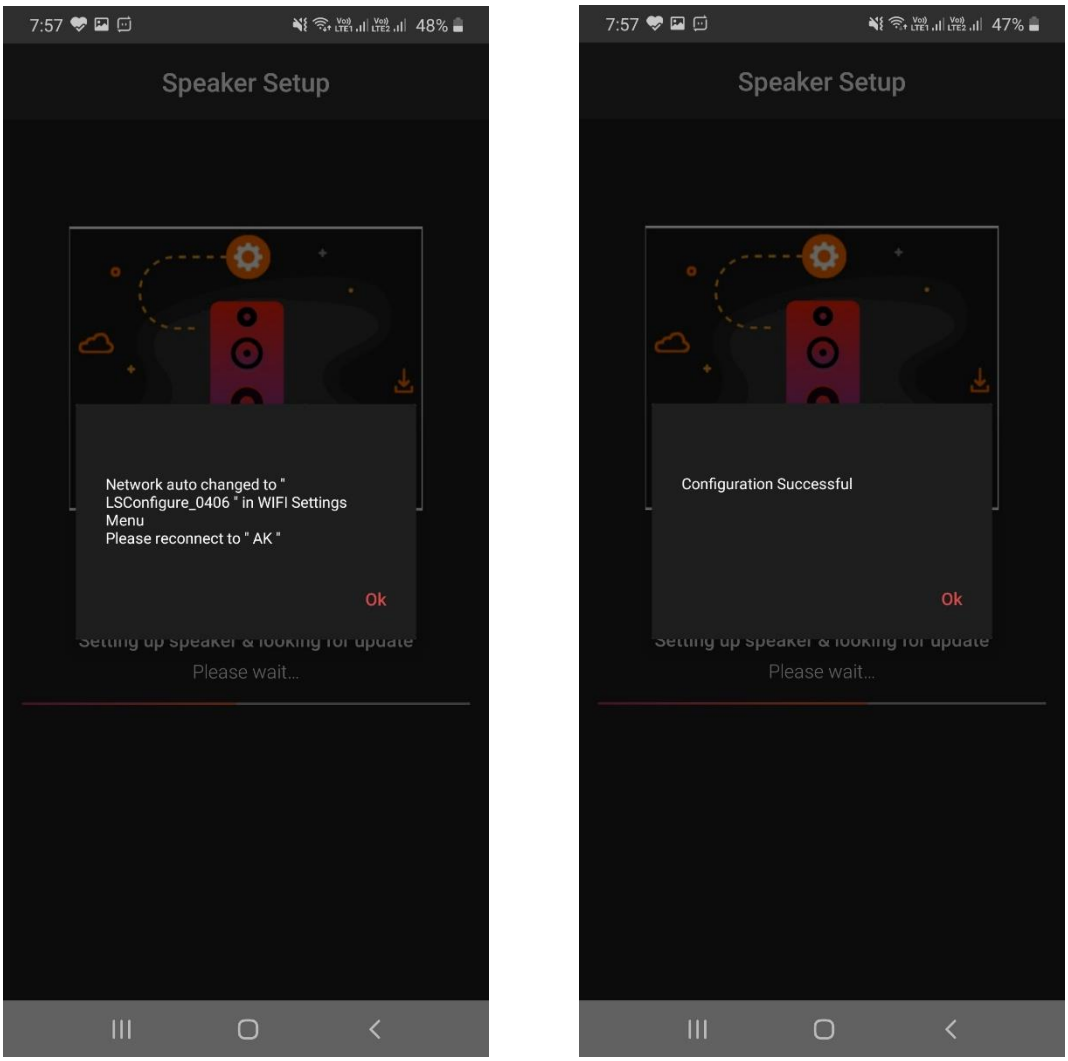

Figure 4.2.2-7: SoftAP Configuration screen 6

Step 9. Click on ***Login with Amazon***:

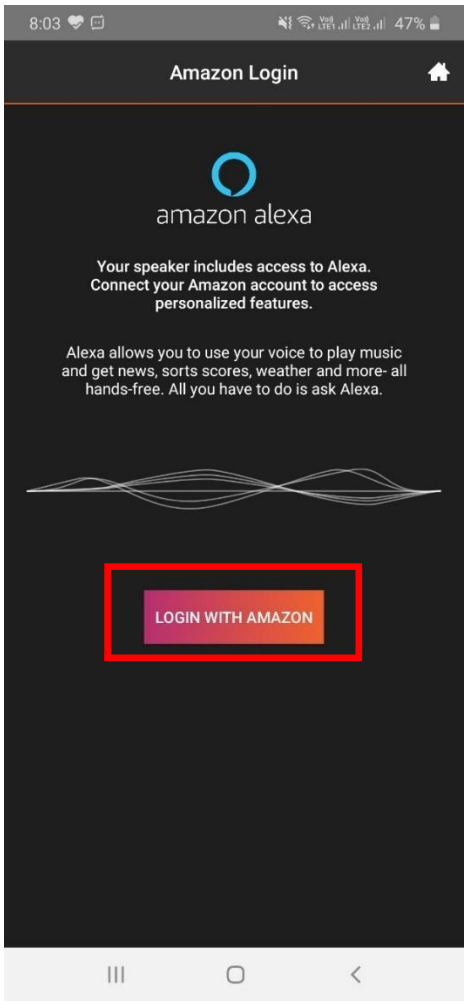

Figure 4.2.2-8: Login with Amazon screen

Step 10. Enter your Amazon credentials:

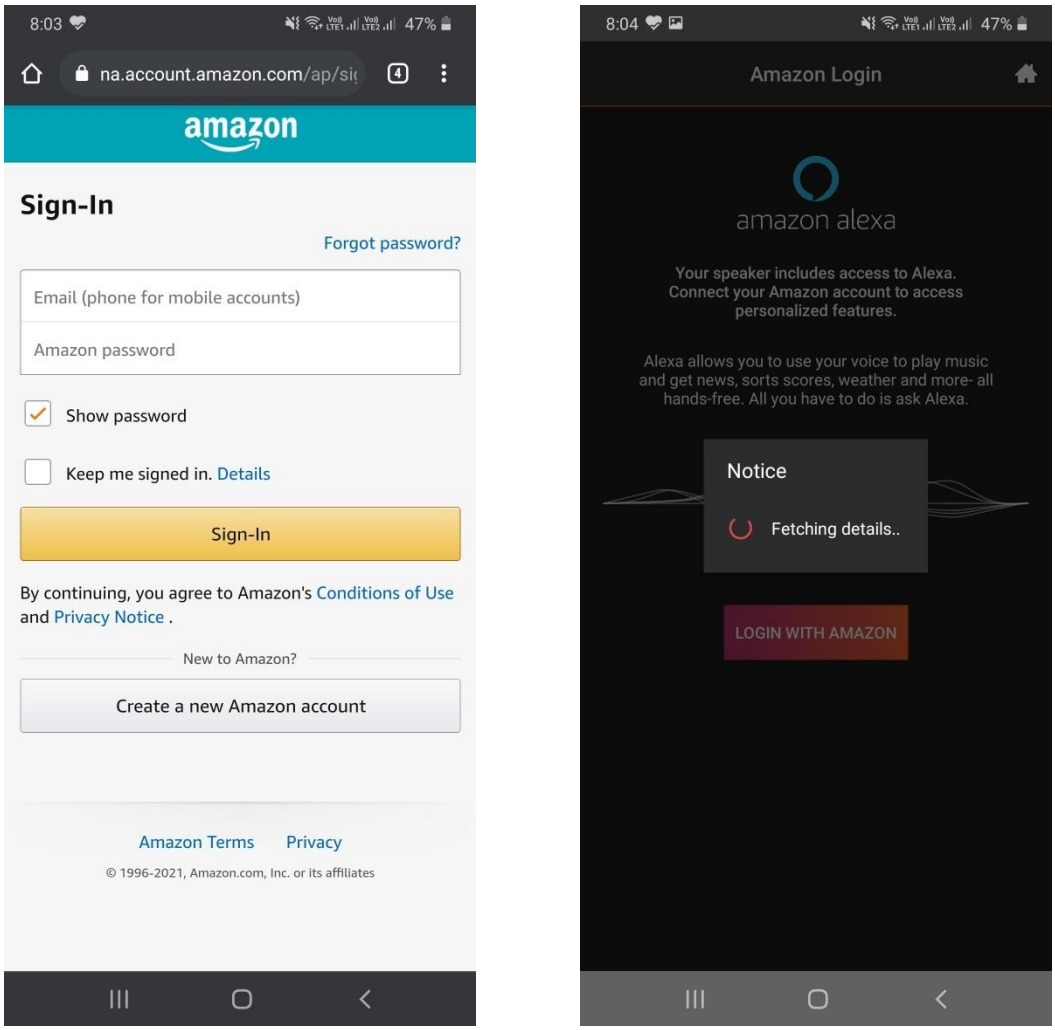

Figure 4.2.2-9: Amazon Credentials screen

Step 11. Alexa is successfully configured. Click ***Change Language*** if you want to change your language preference:

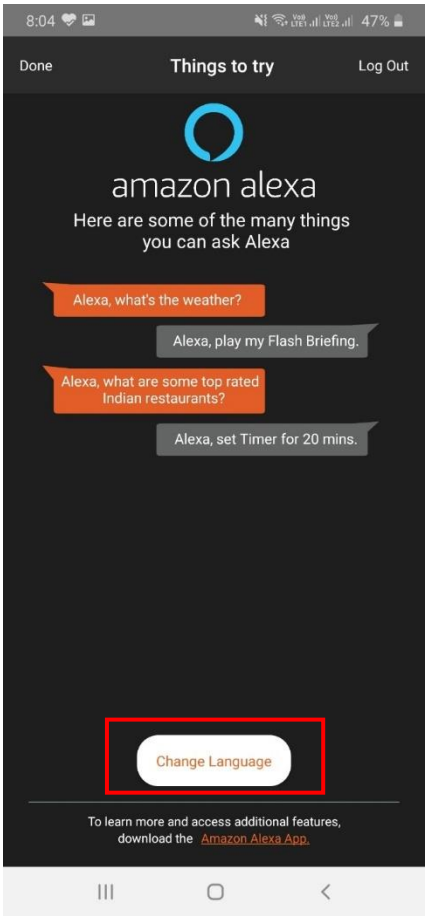

Figure 4.2.2-10: Change Language screen

4.2.3. Procedure to configure network using BLE setting through iOS App

Step 1. **Power on** the Speaker.

Step 2. Press and hold SW3 button for 4 seconds LED will turn ***red*** colour and then blinks with multiple colours.

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

Step 4. Launch the **MAVID-3M App**:

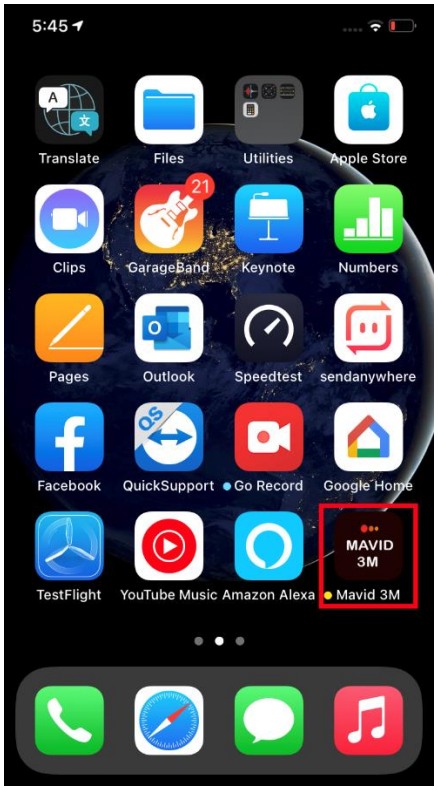

Figure 4.2.3-1: MAVID-3M App

Step 5. The MAVID-3M App opens with the following screen:

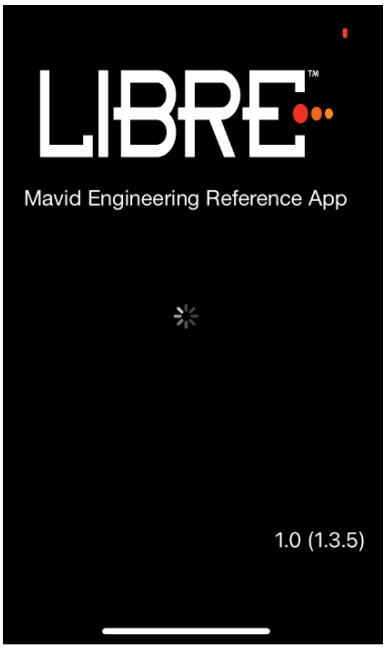

Figure 4.2.3-2: Launch Screen

Step 6. If there is no MAVID-3M device configured, the home screen appears as below and click ***Add***:

Figure 4.2.3-3: Configuration Screen 1

Step 7. Click the device that is to be set up from the list:

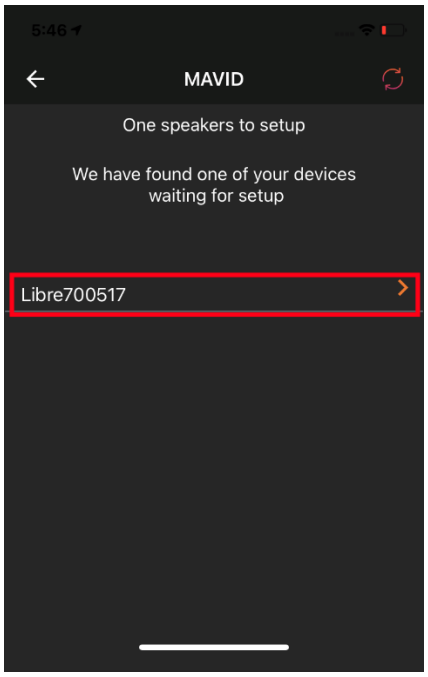

Figure 4.2.3-4: Configuration Screen 2

Step 8. Select the network type, click ***Wi-Fi:***

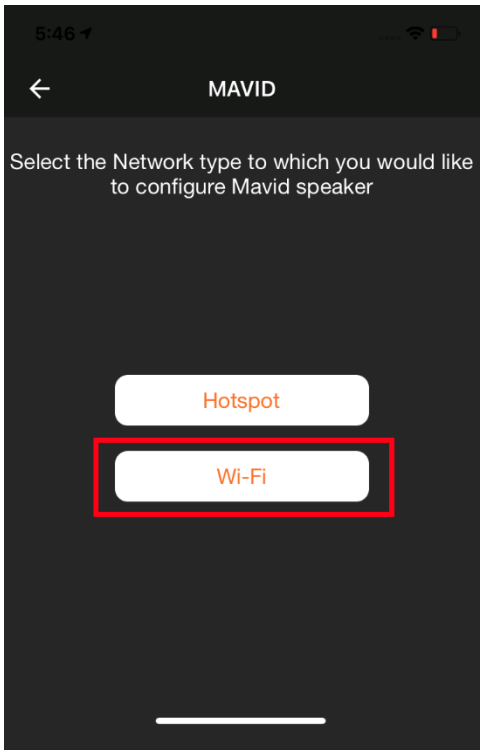

Figure 4.2.3-5: Configuration Screen 3

Step 9. Select the Wi-Fi from the drop-down list and enter the password and click ***Next***:

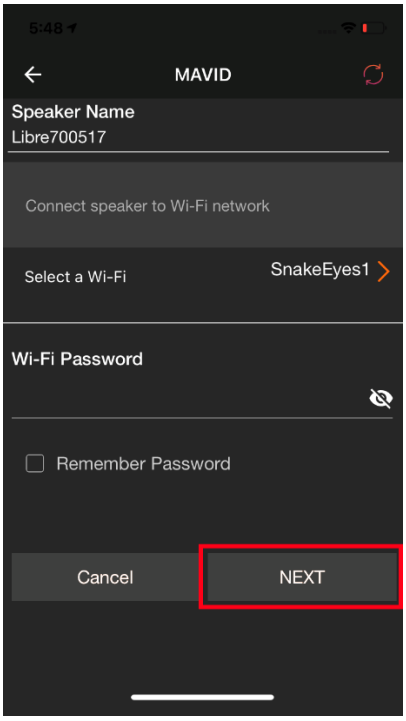

Figure 4.2.3-6: Configuration Screen 4

Step 10. Speaker setup is in progress:

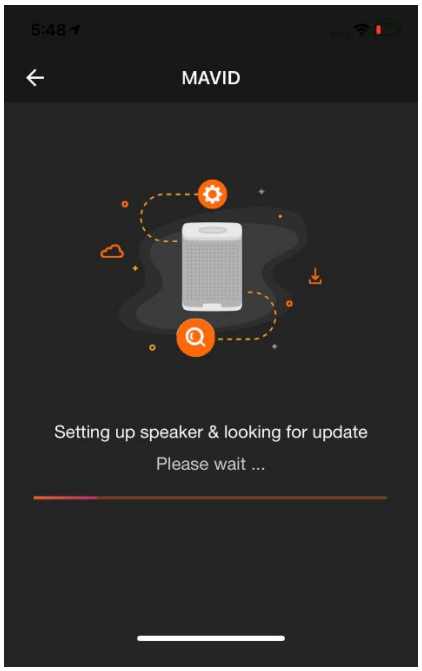

Figure 4.2.3-7: Configuration Screen 5

Step 11. Click ***Login with Amazon***:

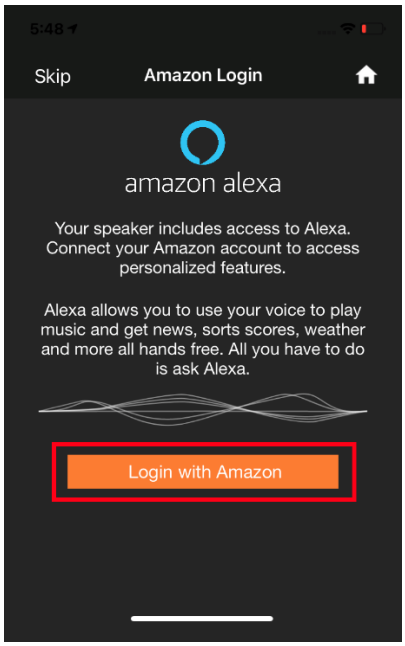

Figure 4.2.3-8: Amazon Login Screen 1

Step 12. Sign into Amazon with Valid Login Credentials:

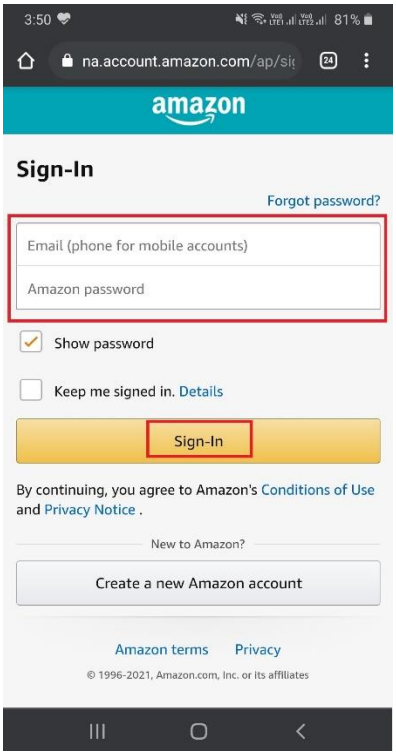

Figure 4.2.3-9: Amazon Login Screen 2

Step 13. Click ***Allow***:

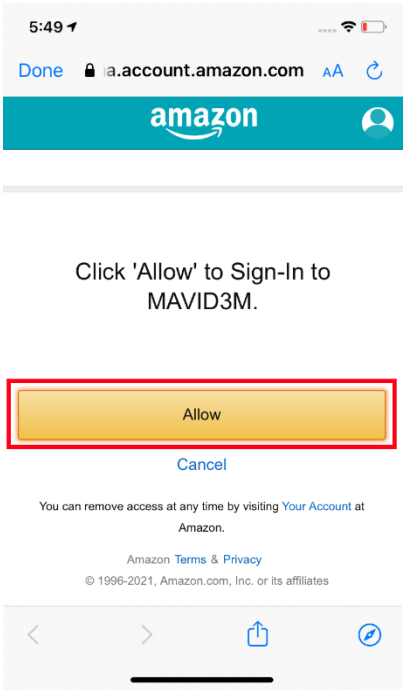

Figure 4.2.3-10: Amazon Login Screen 3

Step 14. After successful sign in, the below screen appears:

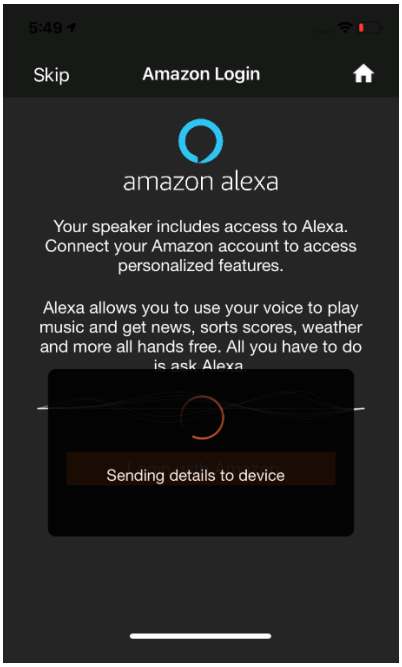

Figure 4.2.3-11: Amazon Login Screen 4

Step 15. After successful login, the following screen would appear:

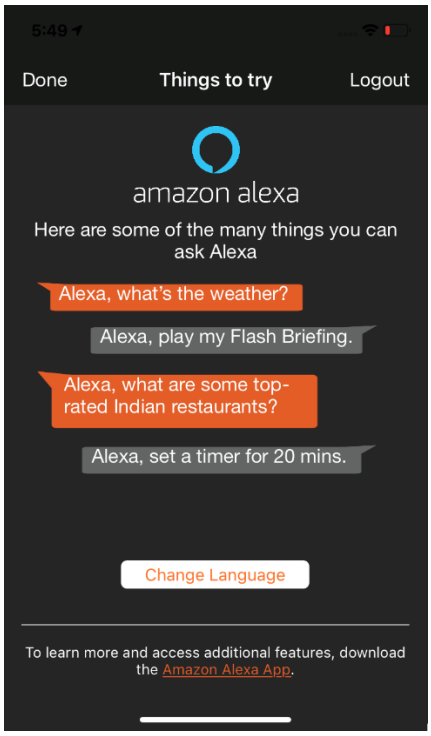

Figure 4.2.3-12: Amazon Screen

Step 16. To sign out from the Amazon Alexa App, click on ***Sign out***.

4.2.4. Procedure to configure network using SoftAP setting through iOS App

Step 1. Make sure mobile Bluetooth is turned OFF.

Step 2. If there is no MAVID-3M device configured, click on ***Setup New Speaker***:

Figure 4.2.4-1: Configuration Screen 1

Step 3. Click ***Other Option***:

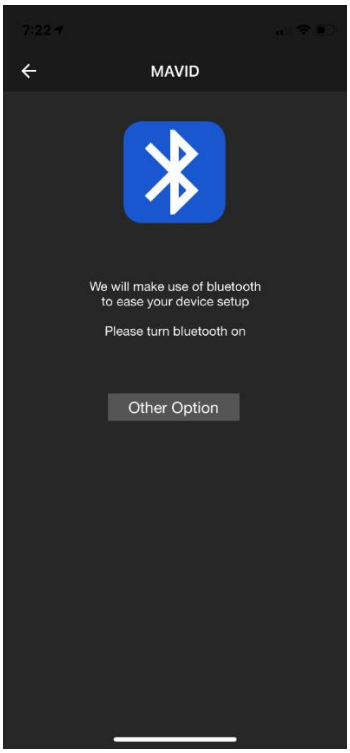

Figure 4.2.4-2: SoftAP Configuration screen 1

Step 4. Click on ***WIFI Settings***:

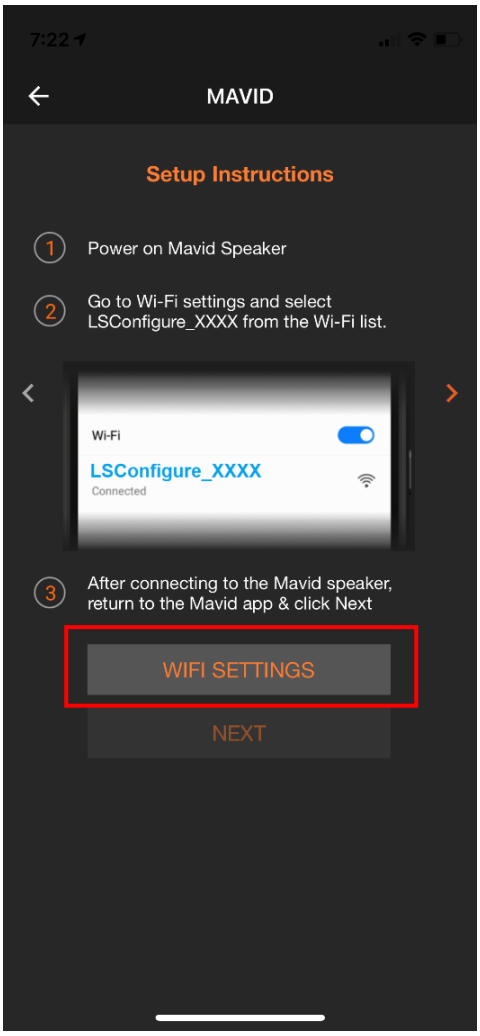

Figure 4.2.4-3: SoftAP Configuration screen 2

Step 5. Select your Wi-Fi device from the list:

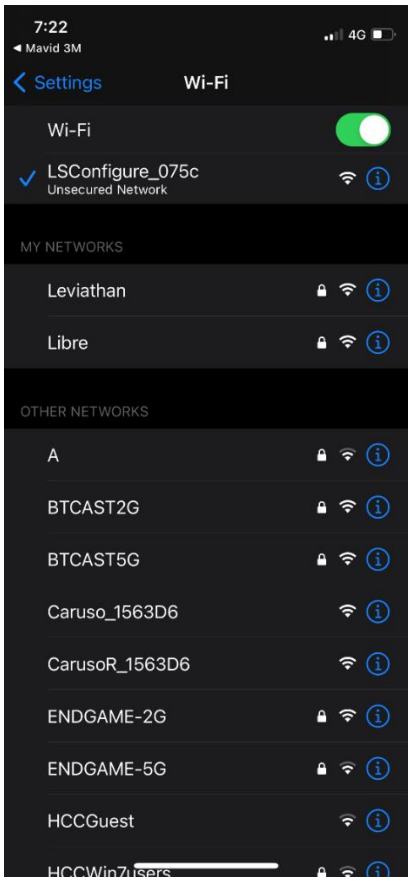

Figure 4.2.4-4: SoftAP Configuration screen 3

Step 6. Click ***Next***:

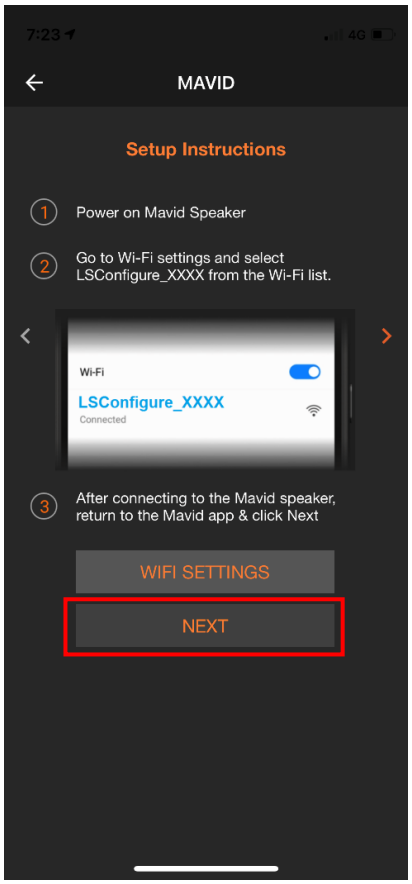

Figure 4.2.4-5: SoftAP Configuration screen 4

Step 7. Click ***Wi-Fi***:

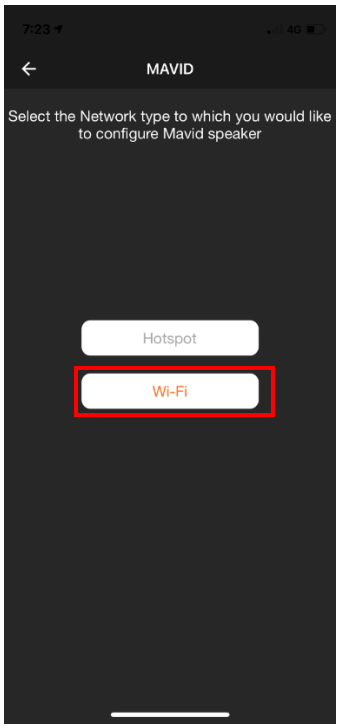

Figure 4.2.4-6: SoftAP Configuration screen 5

Step 8. Enter the credentials and click ***Next***:

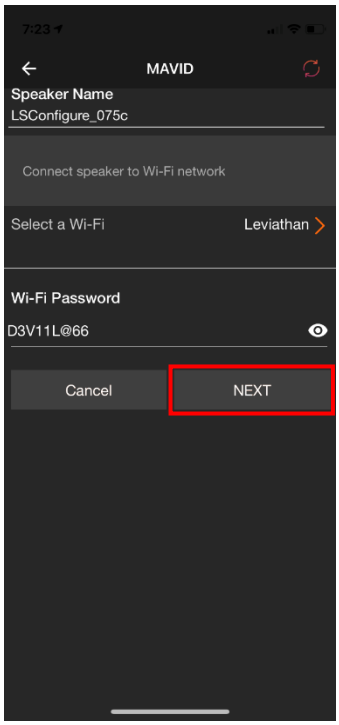

Figure 4.2.4-7: SoftAP Configuration screen 6

Step 9. The speaker is setup successfully:

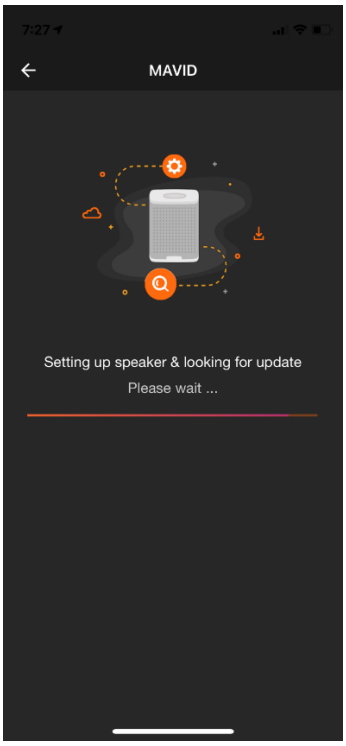

Figure 4.2.4-8: SoftAP Configuration screen 7

Step 10. Click ***Login with Amazon***:

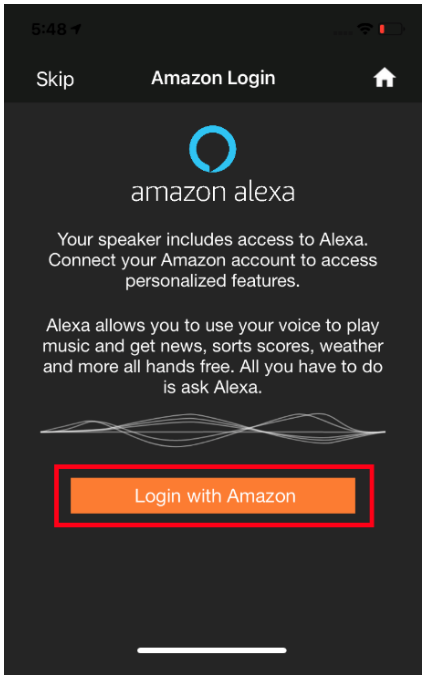

Figure 4.2.4-9: Amazon Login Screen 1

Step 11. Sign into Amazon with Valid Login Credentials:

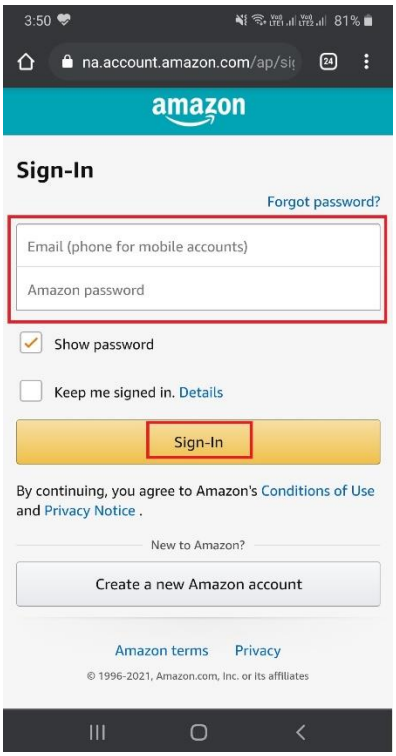

Figure 4.2.4-10: Amazon Login Screen 2

Step 12. Click ***Allow***:

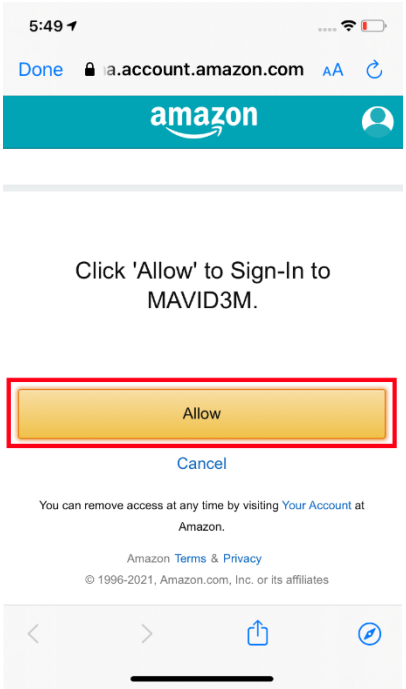

Figure 4.2.4-11: Amazon Login Screen 3

Step 13. After successful sign in, the below screen appears:

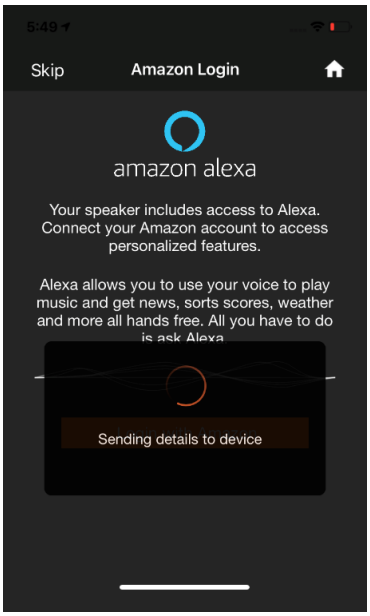

Figure 4.2.4-12: Amazon Login Screen 4

Step 14. After successful login, the following screen would appear:

Figure 4.2.4-13: Amazon Screen

To sign out from the Amazon Alexa App, click on ***Sign out***.