



A113X1 Development Kit

User Guide

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Change History

Revision	Section	Change Description
0.1 (2017-11-20)	-	Initial draft
1.0 (2018-01-05)	-	First released revision
2.0 (2018-01-18)	2.2 Get Source Code	Rename for Source code tar package
3.0 (2018-01-18)	2.2 Get Source Code	Update website and Release SDK Buildroot-Openlinux-A113-20180131
4.0 (2018-02-06)	3.4.3 HelloWorld Test 3.4.2 Run AVS Demo	Update path for Helloworld, avs apk.
5.0 (2018-05-22)	2.2 Get Source Code	Note for DSP Concepts End User Evaluation License Agreement
6.0 (2018-08-29)	2.1 Configuration of Build Environment	Update website for reference
7.0 (2017-01-24)	3.1	Note for get latest solution for DSP Concepts

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1. Overview

A113X is an advanced application processor designed for smart audio and smart home applications. It integrates a powerful CPU subsystem, advanced multi-format audio processing unit, a secured runtime environment and all major peripherals for versatile smart home applications.

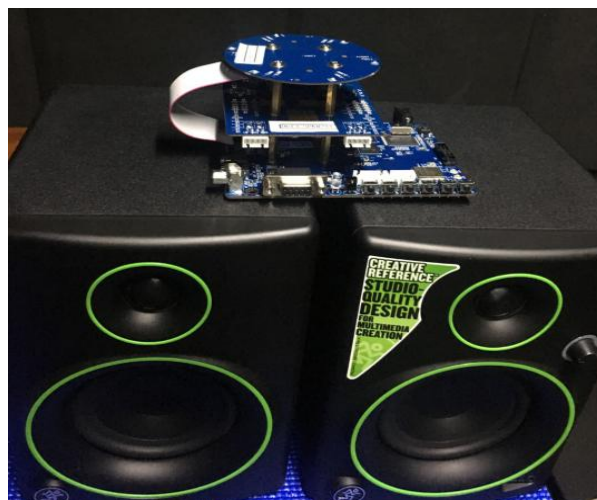
The basic features for Development Board :

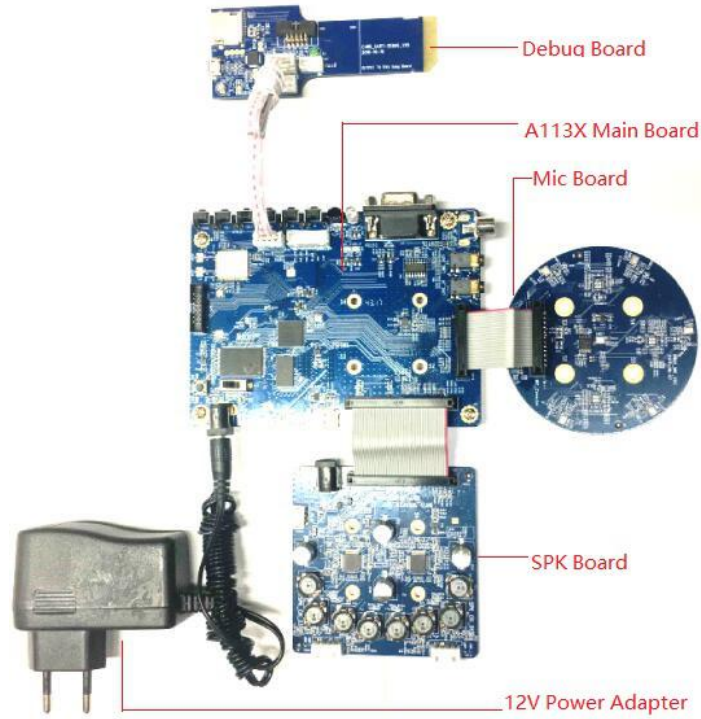
- 6 Digital Microphones in a Circular Array
- High-performance DSP algorithms for Acoustic Echo Cancellation, Beamforming, and Noise Reduction.

1.1 Development Board Introduction

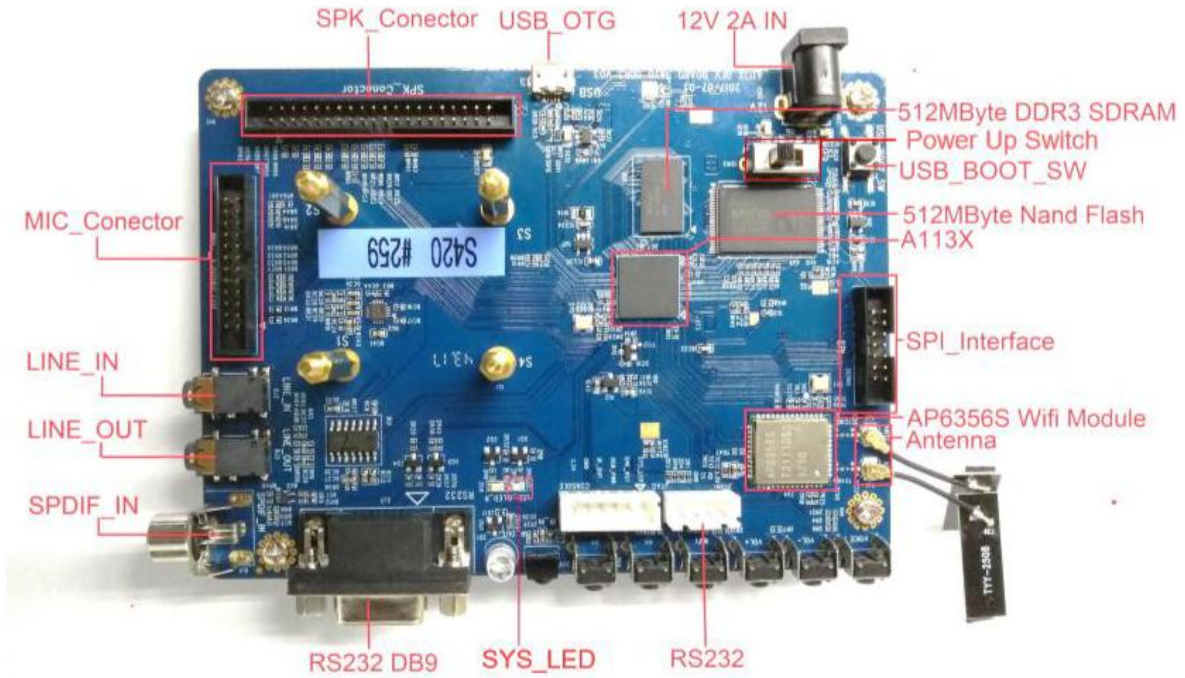
Table 1-1 Components of Development Board

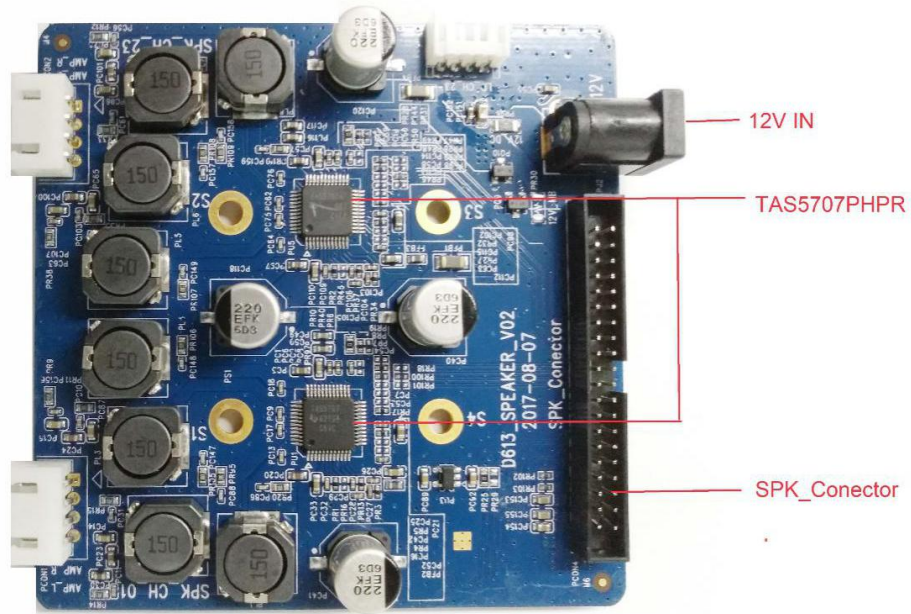
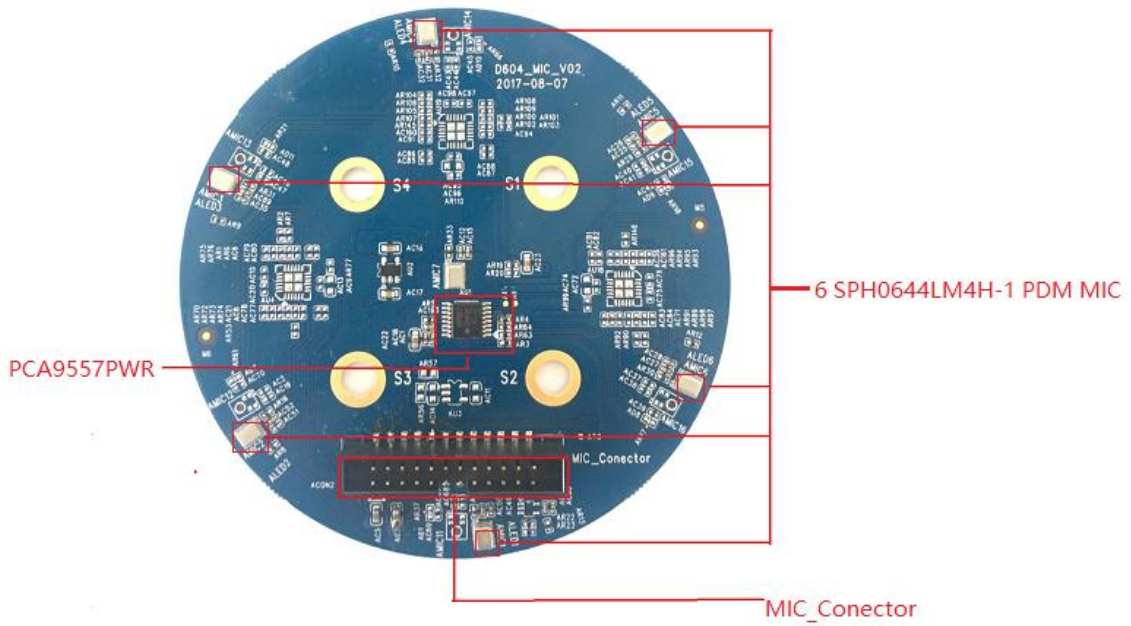
Component	Quantity	Note
A113X Main Board	1	-
Microphone Board	1	-
Speaker Board	2	Additional purchase. Eg: https://www.amazon.com/Mackie-CR4-Pair-Reference-Multimedia/dp/B00KVEIY4O/ref
Stereo Speaker	2	-
12V Power Adapter	1	-
UART Debug Board	1	Additional purchase, support the standard RS-232 protocol device. Eg: https://www.amazon.com/dp/B014PBYSER4/ref=psdc_464394_t3_B00M41OUYA





1.2 Interface Description





2. Development Environment

This section explains how to build the code and run it on the development kit.

2.1 Configuration of Build Environment

Buildroot is designed to run on Linux System. Please use the PC or build server which was installed with 64bit Ubuntu 12.04 or 14.04 or 16.04 version.

The reference configuration for Build Environment:

- Web site : : http://openlinux.amlogic.com/Docs/Common/How_to_build_compiled_server

2.2 Get Source Code

Developers can download the source code from Amlogic’s website :

Step 1. Navigate to <http://openlinux.amlogic.com/wiki/index.php/Arm/Buildroot/AVS-ref-kit>

Step 2. Scroll down the web page and click Download link, please download the latest version.

Step 3. Copy and paste the URL in Step 2, and enter the following as one line in a Linux terminal window:

```
wget -c
http://openlinux.amlogic.com:8000/download/ARM/filesystem/Linux_BSP/buildroot_openlinux
_kernel_4.9_yyyymmdd.tar.gz
```

Step 4. tar xvzf buildroot_openlinux_kernel_4.9_yyyymmdd.tar.gz

Note:

Source code includes binary code which was developed by DSP-Concepts company, Amlogic has been authorized to integrate this binary code into our Board Develop Kit. Licensee customers need to agree with “DSP Concepts End User Evaluation License Agreement” if they want to use this kit. Details of this agreement can be found on :

https://dspconcepts.com/sites/default/files/dsp_far-field_voice_ui_eval_with_sensory_pass-throughs_click-through.pdf

2.3 Compile the System

Excute the following command.

```
$ cd /<your-buildroot-repo dir>/
$ source runCompile.sh
```

The script “runCompile.sh” will run the Compile automatically.

```
amlogic_source/a113$ source runCompile.sh
#####++++#####
#####
# show how to use the runCompile Script: #
```



```
# 1. source runCompile.sh // bulid all #
# 2. source runCompile.sh uboot/kernel/openssh // bulid single module #
# Note: the default config is [8. mesonaxg_s420_32_release], you can #
# change the different Project value According to the project setting #
#####
#####
```

After build completed, Output file: output/mesonaxg_s420_release/images/aml_upgrade_package.img

Note:
Do not use make -jN here as Buildroot does not support top-level parallel make. This does not mean that Buildroot does not support parallel compilation, but just that it will handle this inside the Buildroot compilation system.
Source code includes binary code which was developed by DSP-Concepts company, Amlogic has been authorized to integrate this binary code into our Board Develop Kit. Licensee customers need to agree with “DSP Concepts End User Evaluation License Agreement ” if they want to use this kit. Details of this agreement can be found on:
https://dspconcepts.com/sites/default/files/dsp_far-field_voice_ui_eval_with_sensory_pass-throughs_click-through.pdf

3. Developer's Initial Test

3.1 Get the Latest Firmware(Image) for Burning

In order to perform an initial test, developers can download a pre-built binary directly from the following website and download `aml_upgrade_package_XXXXXXX.img` .

<http://openlinux.amlogic.com:8000/download/A113/Image>

Note : If the user wants to obtain the newest Voice UI solution from DSP Concepts, please contact DSP Concepts directly at: info@dspconcepts.com

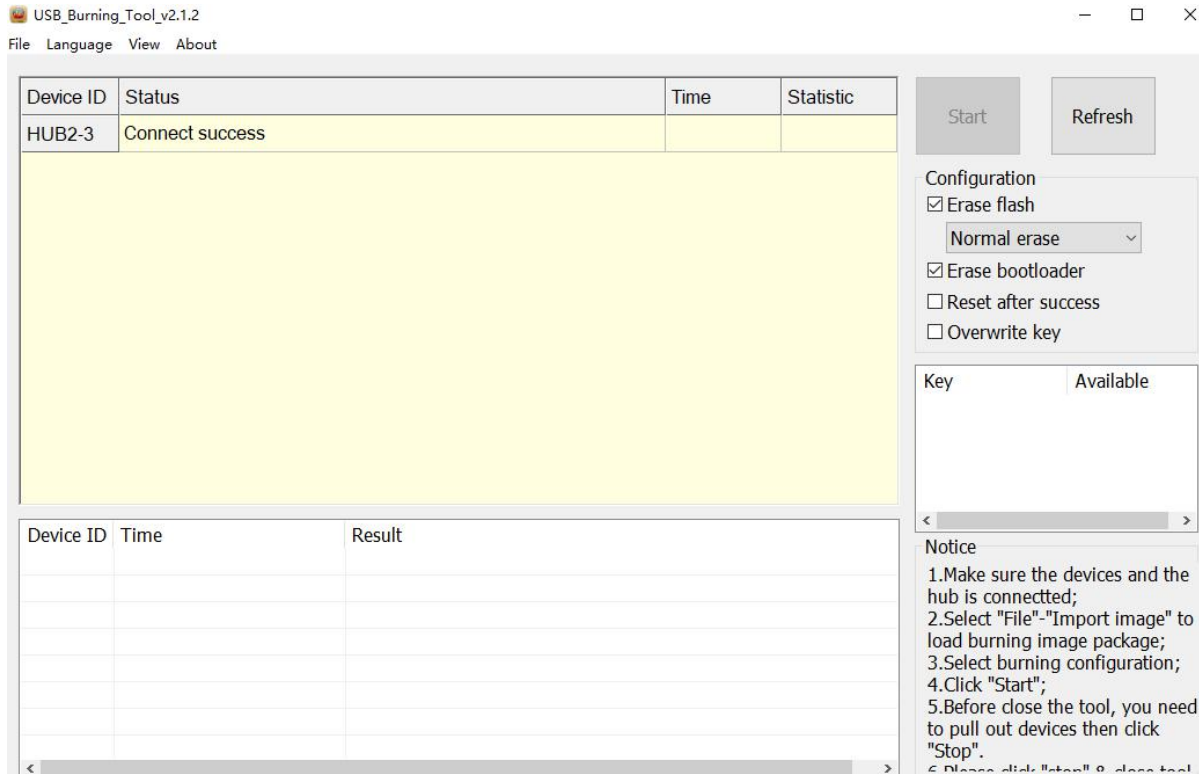
3.2 Upgrade firmware

Developers need to download the follow tools for Upgrade the firmware:

- Step 1.** Navigate to <http://openlinux.amlogic.com:8000/download/A113/Tool>, and click on windows, then download `USB_Burning_Tool_v2.1.3.zip` and unzip it which used for Windows host.
- Step 2.** Navigate to <http://openlinux.amlogic.com:8000/download/A113/Tool>, and click on windows, then download `flash-tool-v4.7` which used for Ubuntu host.

3.2.1 Upgrade from Windows Host

- Step 1.** Upgrade with `USB_Burning_Tool` which version is 2.1.2 or above, and install it on windows PC . Supported for win7,win8,and win 10.
- Step 2.** Copy `aml_upgrade_package.img` to your PC.
- Step 3.** Connect the USB cable between PC and board , it will install device driver automatically when power on the development board, or you can Install it manual with driver as follow site: \"Directory for install `USB_Burning_Tool`\"`USB_Burning_Tool\WorldCup_Device\InstallDriver`
- Step 4.** If your want to download your new firmware to the board, you should follow these steps:
 - a)Keep holding down the button \"`USB_BOOT_SW`\"
 - b)Connect the USB cable between PC and development board, then the message \"Connect success\" shows via `USB_Burning_Tool`, and stop to press button \"`USB_BOOT_SW`\" after Connect success.



c) If you can use UART debug tool, you can enter UBOOT command line mode by execute “Ctrl + C” immediately when power on system, input “update”, then enter USB burning mode.

```
axg_s420_v1#<INTERRUPT>
axg_s420_v1#update
InUsbBurn
```

- Step 5.** Import the firmware form “File ->Import Image”.
- Step 6.** After import Image completed, start to download.
- Step 7.** Show “100% Burning successfully ”after downloaded successfully.

3.2.2 Upgrade from Ubuntu Host

Note:

“flash-tool-v4.7 ” is a tool for Amlogic platforms witch used in linux to upgrade.

Step 1. Install the driver in Ubuntu PC .

a) Add the Ubuntu user to access worldcup device without root authority. in the path /etc/udev/rules.d, create a '70-persistent-usb.rules' and edit like this:

```
SUBSYSTEMS=="usb",ATTRS{idVendor}=="1b8e",ATTRS{idProduct}=="c003",OWNER="yourUserName",MODE="0666",SYMLINK+="worldcup"
```

b) Enter usb burning mode.

c) Install the libusb driver. In your Ubuntu pc, use 'lsusb' to see whether the Ubuntu is already installed the libusb library.

1. If you see device like this: 'ID 1b8e:c003 Amlogic. Inc.', Now your PC already can use the 'update' tool.
2. If you fail to see Amlogic worldcup device string '1b8e:c003...', you can install it using command 'sudo apt-get install libusb-dev'.
3. Check driver if it has been correctly installed.

Step 2. Make sure plug-out and plugin the usb cable to let worldcup usb device probed by Ubuntu:

- a) Use 'lsusb' to see if Amlogic device '1b8e:c003...' recognized.
- b) In Ubuntu 12.04, a device called '/dev/worldcup' as described in you udev rules

Step 3. Connect the board to your linux pc with a usb cable, set board to USB mode, if you have installed properly the update binary tool, your linux machine should detect a new usb device called /dev/worldcup

Step 4. Execute the following command: `$ flash-tool.sh --img=/path/to/aml_upgrade_package.img --parts=all --wipe --soc=axg`

Note:

If you want to get more detail information, please reference DOC ““Amlogic Update USB Tool User Guide” and README for flash-tool-v4.7.

3.3 Boot Up System

Connect development board with a 12V power adapt and switch on, The System Led will display green after power on success.

3.4 Run AVS Demo

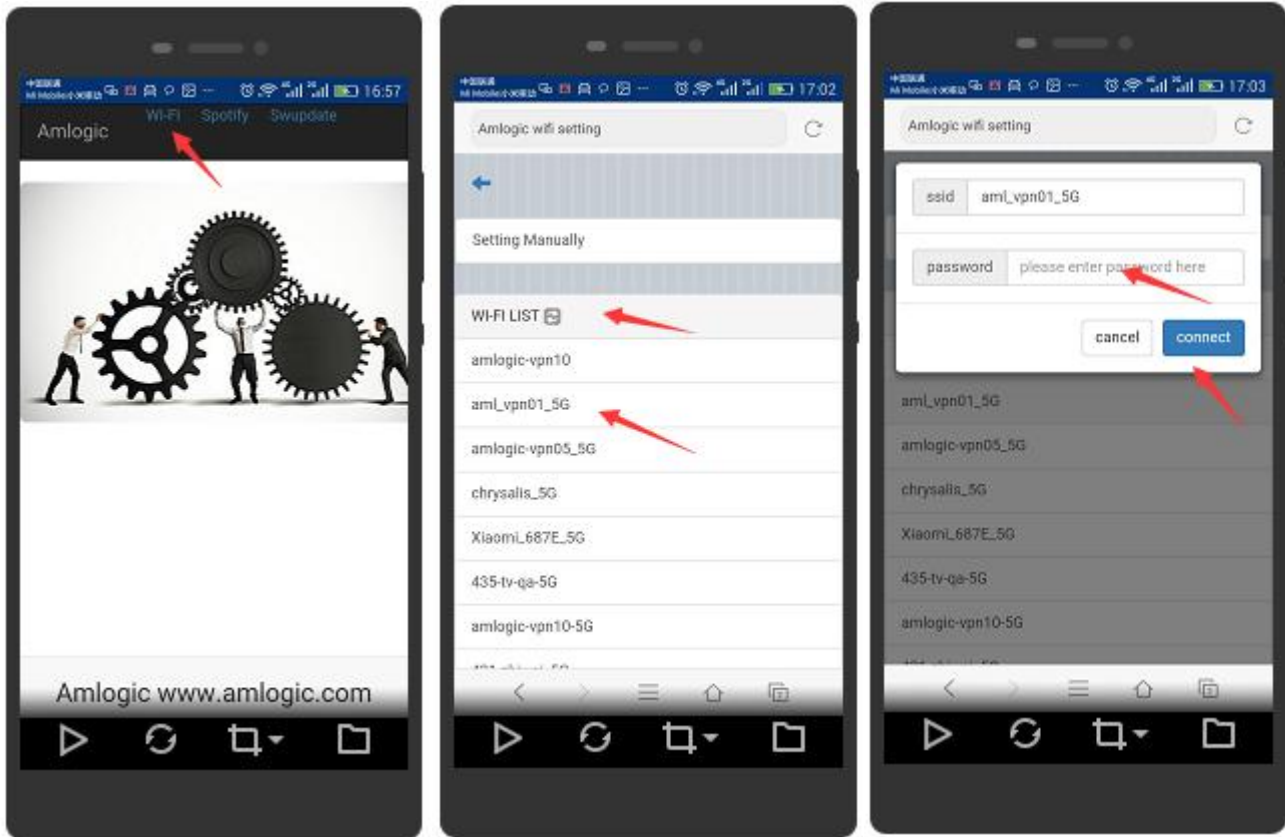
3.4.1 Setup Wifi

After the device is upgraded, WiFi will auto enter AP mode. You can use web to send SSID and Password to device, it will connect to WiFi AP.

Step 1. Open WLAN on your phone or your tablet PC, you can find AP which name is “amlogic-audio-xxxxx”, please to connect it, password is “12345678”.

Step 2. Open web app to setup WiFi, please input the URL : 192.168.2.1 ,and then click search button, you will find the following picture.

Step 3. Scanning nearby wifi ssid, clicks on “WIFI-LIST”, set password and connect it.

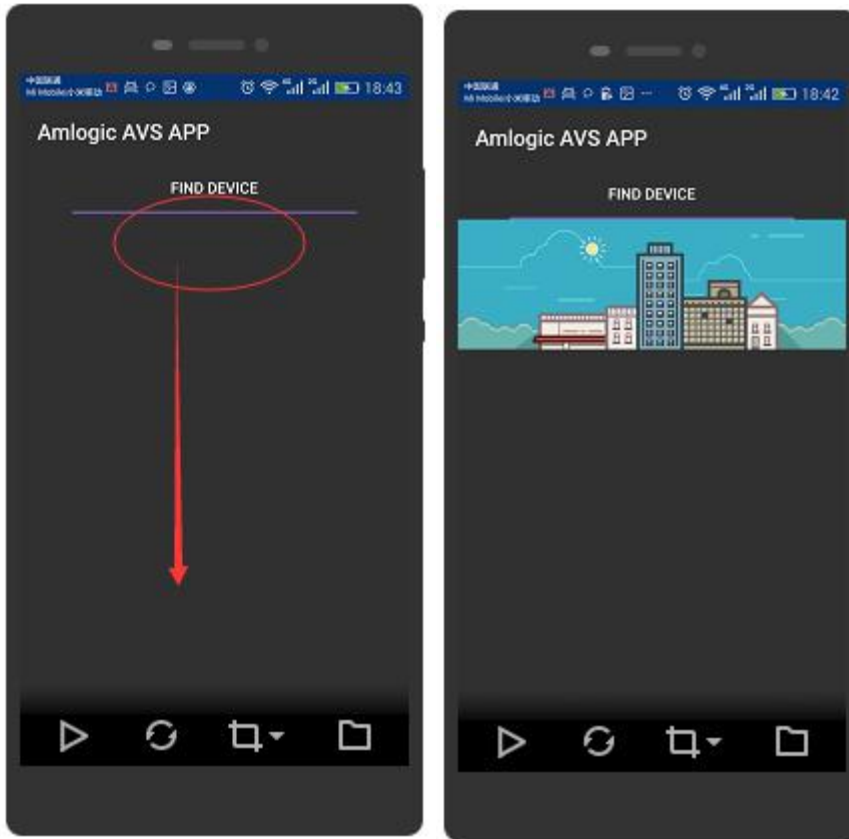


3.4.2 Run AVS Demo

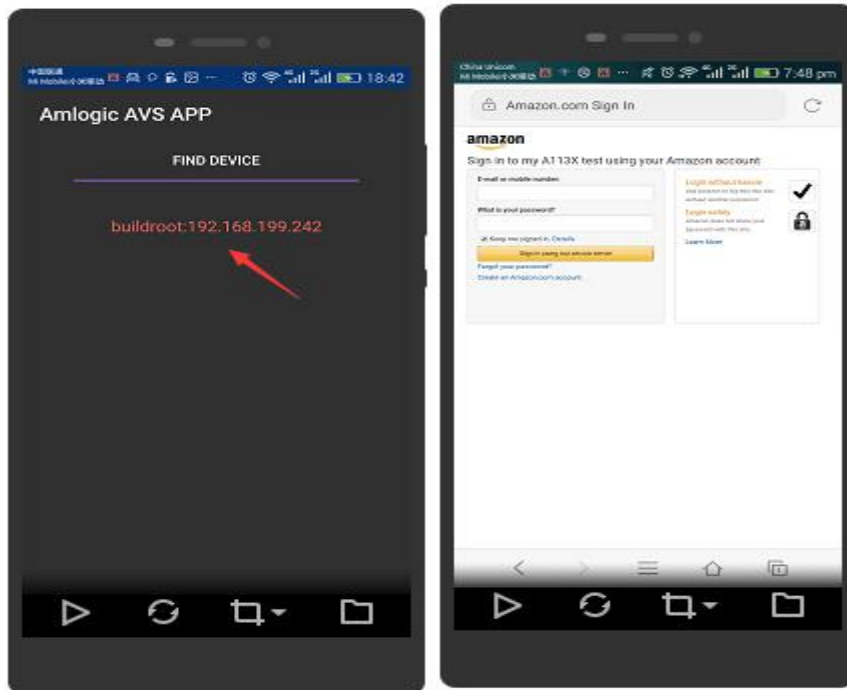
Step 1. Create your amazon account and device. More detail can refer to the document “*Amlogic Openlinux Release Notes*”.

Step 2. Install “Amlogic avs apk” on your android device, and set the development board in the same LAN with android device. <your-buildroot-repo dir>\multimedia\avs\setup_app\avs_token_app-0.3.1.apk, or download: <http://openlinux.amlogic.com:8000/download/A113/Tool>.

Step 3. Run “Amlogic avs apk”, hold down the screen and slide down to discovery the IP for development board.



Step 4. Click on IP “buildroot 192.168.199.242”, login to Amazon site with your account.



Step 5. It will update AlexaClientSDKConfig.json by “Amlogic avs apk” and show “Reflash token was succeeded” message, then you need to reboot development board for running AVS demo automatically.

Step 6. Speaking to development board, then it will connect Amazon server, and reply.

3.4.3 HelloWorld Test

Step 1. Create your helloworld project under the <your-buildroot-repo dir>/buildroot/package/ : Developers can download reference project from:

<http://openlinux.amlogic.com:8000/download/A113/DOC/helloworld>

```
buildroot/package/helloworld$ ls
Config.in helloworld.mk src
buildroot/package/helloworld/src$ ls
helloworld.c Makefile
```

Step 2. Build project.

```
$ <your-buildroot-repo dir>: make helloworld
```

Step 3. Run binary file.

```
# mount /dev/sdb1 /mnt
# cp /mnt/helloworld /usr/bin/
# chmod 755 /usr/bin/helloworld
# helloworld
Hello World
argv[0]=helloworld
```


4. Debug Tool

4.1 UART Debug Tool

Install the CP210x USB to UART Bridge VCP Driver on the Windows PC/laptop:

- Step 1.** Navigate to <https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>.
- Step 2.** Click 'Download VCP' (corresponding to your Windows OS version; no need for Serial Enumeration).
- Step 3.** Unzip the VCP zip file into a folder.
- Step 4.** Navigate to the folder with Windows Explorer and right-mouse click it to install it with administrator privilege.
- Step 5.** Follow the steps in the installation program to completion.
- Step 6.** Connect the Micro USB to serial debug board & opposite end to Windows PC USB port.
- Step 7.** Bring up Windows Device Manager & expand Ports. Note the COM# for 'Silicon Labs P210x USB to UART Bridge'.
- Step 8.** Install Putty for Windows.
- Step 9.** Start Putty, click Serial, enter COM# (replace with number viewed in step 4), 115200 for the baud rate, & click Open.
- Step 10.** Plug the 12V plug into the A113X main board power jack and the adapter into an electric outlet.
- Step 11.** Slide the tall black power-up switch immediately behind the power inlet on the A113x main board to power up the board.
- Step 12.** Observe that the boot up output appears in the Putty terminal window.

4.2 Usage of ADB and Telnet

ADB tool

Connect the USB cable between PC and board, and execute the command on CMD as below:

```
Microsoft Windows [版本 10.0.15063]
(c) 2017 Microsoft Corporation。保留所有权利。

C:\Users\yuegui.he>
C:\Users\yuegui.he>
C:\Users\yuegui.he>
C:\Users\yuegui.he>E:\amlogic_study\adb\adb.exe shell
* daemon not running. starting it now *
* daemon started successfully *
/ # _
```

Telnet

Set the development board in the same LAN with PC.

Execute the command: telnet IP address. Eg : telnet 192.168.199.117

```
amlogic@amlogic-Latitude-E5420:~$ telnet 192.168.199.117
Trying 192.168.199.117...
Connected to 192.168.199.117.
Escape character is '^]'.

buildroot login: root
#
# pwd
/root
# cd /
# ls
bin      dev      init     lib32    linuxrc  mnt      proc     run      share    tmp      var
data     etc      lib      libexec  media    opt      root     sbin     sys      usr
```

5. Microphone Configuration and Tuning

5.1 Default Microphone Configuration

By default, 6 digital microphones are enabled on the MIC-array board.

5.2 Options for Additional Microphone Daughter Cards

Six-microphone Circular array is the standard configuration for the development kit

Optional microphone configurations: two-microphone array (linear) and four-microphone array (triangle).

A script can be used to adjust the number of enabled Microphones:

```
# switch_mics_num.sh 2  
# switch_mics_num.sh 4
```

6. Support And Additional Documentation

6.1 Contact Information

Contact Amlogic sales to get additional documents that require an NDA such as a Quick Reference Manual and reference schematic/layout.

Technical support : avs_support@amlogic.com

6.2 Documents and Support

Developers can download some documents, tools, image from Amlogic's openlinux web site :

<http://openlinux.amlogic.com:8000/download/A113>