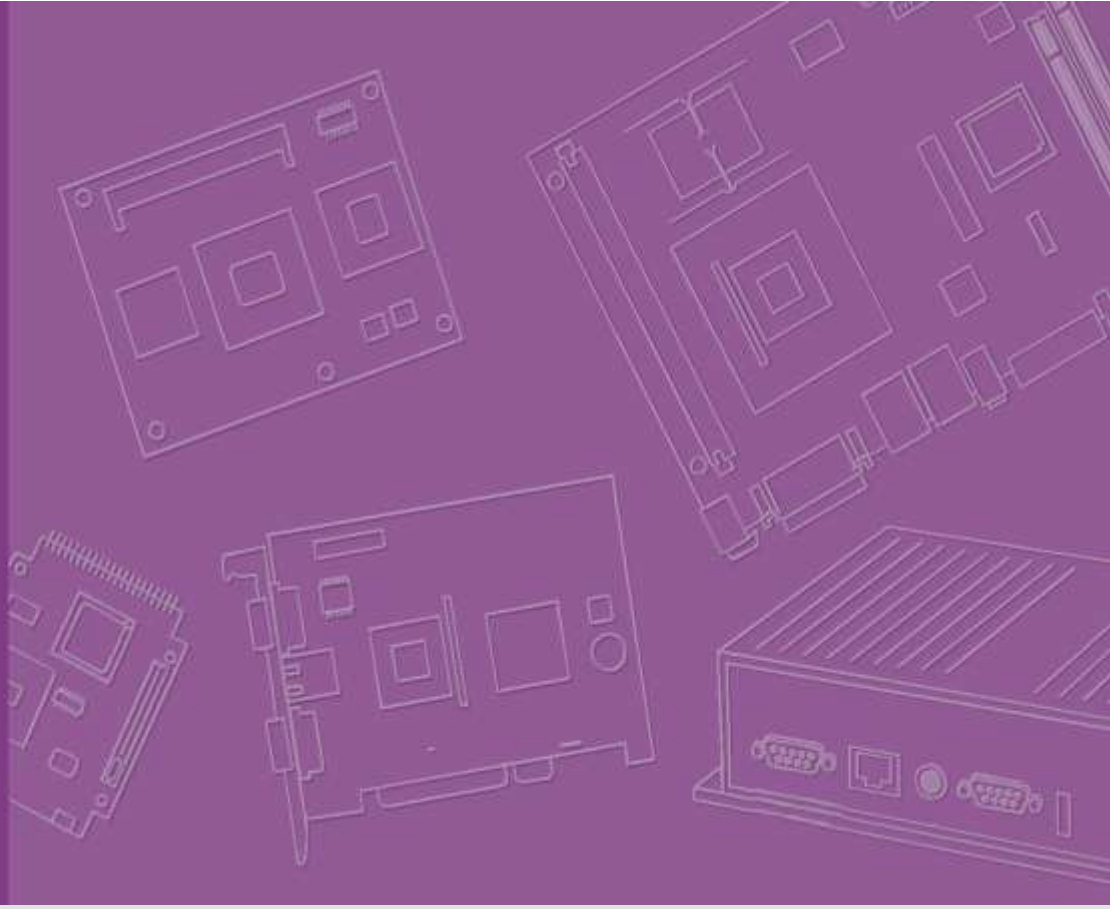


User Guide

Android

Board Support Package
For i.MX6 series

ADVANTECH
Enabling an Intelligent Planet

Table of Contents

Chapter 1

Getting Ready

1. Getting Ready

1.1 Prerequisites

All operations in this guide are based on Ubuntu 12.04 LTS 64bit only. First please install Ubuntu 12.04 LTS 64bit* with minimum 2GB memory.

*** ubuntu-12.04.1-desktop-amd64.iso**

1.1.1 To install required packages

Please login and perform the following commands:

```
sudo apt-get install ssh
sudo apt-get install ia32-libs libx11-dev:i386 libreadline6-dev:i386 \
   libgl1-mesa-glx:i386 zlib1g-dev:i386 uuid-dev:i386 liblzo2-dev:i386 \
   libncurses5-dev:i386
sudo apt-get install \
   bison build-essential ccache dpkg flex gcc g++ gettext intltool \
   libarchive-zip-perl libfreetype6-dev libdbus-glib-1-dev liborbit2-dev \
   libxml2-dev libx11-dev libgtk2.0-dev liblzo2-2 libtool m4 \
   patch rpm tcl uboot-mkimage uuid zlib1g zlib1g-dev \
   git gnupg flex bison gperf build-essential  zip \
   curl libc6-dev libncurses5-dev x11proto-core-dev libx11-dev:i386 \
   libreadline6-dev:i386 libgl1-mesa-glx:i386 libgl1-mesa-dev g++-multilib \
   mingw32 tofrodos python-markdown libxml2-utils xsltproc zlib1g-dev:i386 \
   gcc-4.6 g++-4.6 cpp-4.6 gcc-4.6-multilib uuid-dev liblzo2-dev \
   uboot-mkimage libarchive-zip-perl \
   wget git-core unzip texinfo gawk diffstat build-essential chrpath \
   sed cvs subversion coreutils texi2html \
   docbook-utils python-pysqlite2 help2man make gcc g++ \
   desktop-file-utils libgl1-mesa-dev libglu1-mesa-dev mercurial \
   autoconf automake groff curl lzop asciidoc xterm
sudo apt-get install libncurses5-dev:i386 liblzo2-dev:i386 uuid-dev:i386
sudo ln -s /usr/lib/i386-linux-gnu/mesa/libGL.so.1 /usr/lib/i386-linux-gnu/libGL.so
tar zcvf ~/usr_lib_i386-linux-gnu_for_Building_Android_KK.tar.gz \
     /usr/lib/i386-linux-gnu/{libuuid.a,libuuid.so,liblzo2.so,liblzo2.a}
sudo apt-get install uuid-dev liblzo2-dev
sudo tar zxvf ~/usr_lib_i386-linux-gnu_for_Building_Android_KK.tar.gz -C /
```

1.1.2 To install JDK

Please download "jdk-6u45-linux-x64.bin" manually, put it to directory ~/FILES/ and Perform the following commands:

```
cd /usr/lib
sudo ~/FILES/jdk-6u45-linux-x64.bin
sudo mkdir jvm
cd jvm
sudo mv ../jdk1.6.0_45 .
cd jdk1.6.0_45/
sudo update-alternatives --install /usr/bin/java    java    /usr/lib/jvm/jdk1.6.0_45/jre/bin/java    2
sudo update-alternatives --install /usr/bin/javac   javac   /usr/lib/jvm/jdk1.6.0_45/bin/javac   2
sudo update-alternatives --install /usr/bin/jar     jar     /usr/lib/jvm/jdk1.6.0_45/bin/jar     2
sudo update-alternatives --install /usr/bin/javap   javap   /usr/lib/jvm/jdk1.6.0_45/bin/javap   2
sudo update-alternatives --install /usr/bin/javadoc javadoc /usr/lib/jvm/jdk1.6.0_45/bin/javadoc 2
sudo update-alternatives --config javap
sudo update-alternatives --config javadoc
sudo update-alternatives --config java
sudo update-alternatives --config javac
sudo update-alternatives --config jar
cd ~/
```

1.2 Introducing BSP

The BSP contains cross toolchain, linux kernel source code, u-boot source code, Android root file system and some scripts. It is consist of three top folders: "android", "image", "scripts".

1.2.1 Overview

The description of some important folders as below:

android/

prebuilt/gcc/linux-x86/host/ : cross toolchain

bootable/bootloader/uboot-imx/ : u-boot source code

kernel_imx/ : linux kernel source code

device/

fsl/ : Android device related settings

fsl-proprietary/ : modules & firmware(e.g. WiFi, GPU)

hardware/imx/ : HAL (Hardware Abstraction Layer)

image/ : all built images located in

scripts/ : to simplify building process (Please refer to 1.4 & 1.5 for details)

1.2.2 Naming Rule

It is consist of the model name followed by "AB" plus version number, for example, 4410ABV2080 which "4410" stands for RSB-4410, "AB" is acronym of Android BSP, "V2080" stands for Version 2.080; other model names list below:

"3420" stands for ROM-3420
"5420" stands for ROM-5420
"7420" stands for ROM-7420
"DS31" stands for UBC-DS31
"U220" stands for UBC-220

1.3 Conventional Term

${BOARD} : target board name(e.g. rsb_4410, rom_3420, rom_5420, rom_7420, ubc_ds31, ubc_200)

${BSPHOME} : the directory that BSP tarball extacted to

${SD_DEVICE} : device name of SD card in Ubuntu (e.g. /dev/sdf)

${MMC_DEVICE} : device name of on-board eMMC in Android (e.g. /dev/block/mmcblk0)

debug console / serial console
serial terminal program (e.g. minicom, putty, teraterm ...) that serial port is configured to 115200 8N1

terminal console
terminal program (e.g. gnome-terminal, xfce4-terminal ...)

1.4 Build Instructions

1.4.1 To build everything

Perform one of the following commands in “terminal console”

a) engineer version (default option)

```
$ cd ${BSPHOME}/scripts
$ ./mk_android.sh ${BOARD}
```

b) user version

```
$ cd ${BSPHOME}/scripts
$ ./mk_android.sh ${BOARD} user
```

1.4.2 To build boot loader

Perform the following command in “terminal console”

```
$ cd ${BSPHOME}/scripts
$ ./mk_bootloader.sh ${BOARD}
```

1.4.3 To build boot image

Perform the following command in “terminal console”

```
$ cd ${BSPHOME}/scripts
$ ./mk_bootimg.sh ${BOARD}
```

1.4.4 To build recovery image

Perform the following command in terminal console

```
$ cd ${BSPHOME}/scripts
$ ./mk_recoveryimg.sh ${BOARD}
```

1.4.5 To build system image

Perform the following command in terminal console

```
$ cd ${BSPHOME}/scripts
$ ./mk_systemimg.sh ${BOARD}
```

1.4.6 To build OTA package

1) Perform the following command in terminal console

```
$ cd ${BSPHOME}/scripts
$ ./mk_otapackage.sh ${BOARD}
```

2) The OTA package, update.zip, is located in directory:

```
../android/out/target/product/${BOARD}
```

1.5 Boot up from SD card or eMMC

1.5.1 To create a bootable SD card

Perform the following command in terminal console

```
$ cd ${BSPHOME}/scripts
$ ./mksd-android.sh ${SD_DEVICE}
```

1.5.2 To transfer whole system to onboard eMMC

1) Boot up from SD card
2) Perform the following command in debug console

```
# cd /data/mkimage/scripts
# sh ./mksd-android.sh ${MMC_DEVICE}
```

3) Remove SD card, then target board can boot up from onboard eMMC.

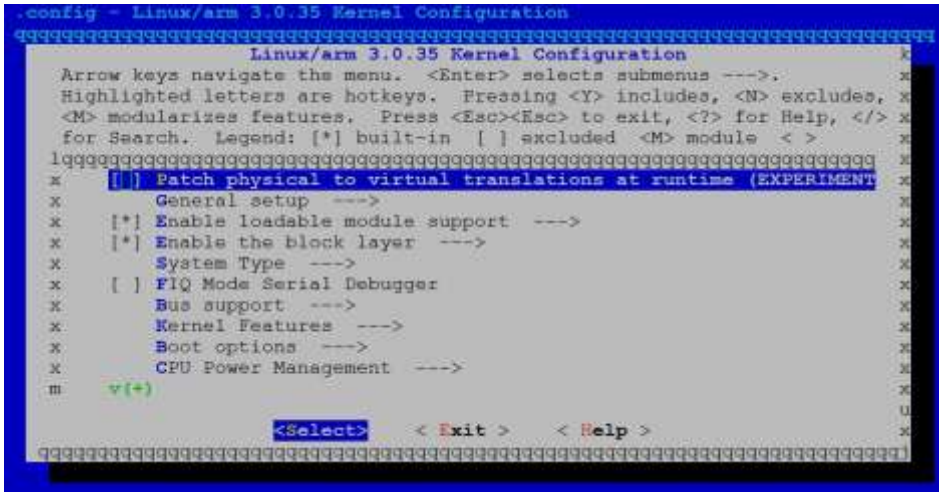
1.6 Customization

1.6.1 To configure Linux kernel

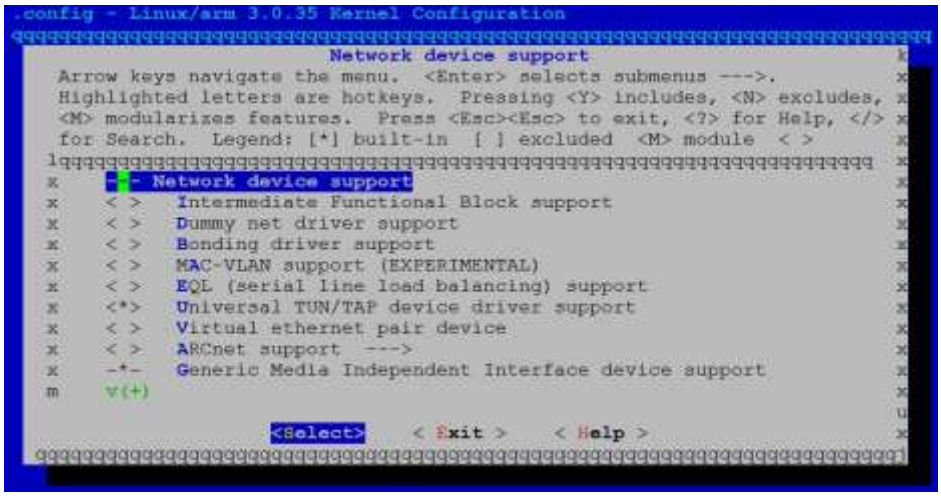
1) Perform the following command in terminal console

```
$ cd ${BSPHOME}/android/kernel_imx; make ARCH=arm menuconfig
```

2) Linux Kernel Configuration shows up as below:



3) By menu, **Device Drivers** / **Network device support**, to select device(s) that want to build in linux kernel.



4) Refer to 1.4.1 to build everything.

1.6.2 To change Logo

1) Prepare new logo with 24bpp PNG format
2) Replace old logo with new logo of which filename lists below:

```
${BSPHOME}/android/frameworks/base/core/res/assets/images/android-logo-mask.png
```

3) Refer to 2.4 to update system

1.6.3 To integrate with App source code

1) Put whole package into below directory:

   ${BSPHOME}/android/packages/apps/PROJECT_DIR_HERE

2) Create a file, Android.mk, that looks like below at project directory.

```
LOCAL_PATH:= $(call my-dir)
include $(CLEAR_VARS)

LOCAL_MODULE_TAGS := optional

LOCAL_SRC_FILES := $(call all-java-files-under, src)

LOCAL_PACKAGE_NAME := PROJECT_NAME_HERE
LOCAL_CERTIFICATE := platform

include $(BUILD_PACKAGE)

# Use the folloing include to make our test apk.
include $(call all-makefiles-under,$(LOCAL_PATH))
```

3) Edit the following file:

   ${BSPHOME}/android/device/fsl/imx6/${BOARD}.mk

   to insert correct project name:

```
# [Advantech] UART demo & library
PRODUCT_PACKAGES += \
        PROJECT_NAME_HERE                    \
        librxtxSerial                        \
        SerialJni
```

1.6.4 To integrate with prebuilt package (APK)

1) Put “prebuilt apk file” to the following directory:

   ${BSPHOME}/android/device/fsl/${BOARD}

2) Edit the following file:

   ${BSPHOME}/android/device/fsl/imx6/${BOARD}.mk

   to comment out the following red # lines:

```
#define check-product-copy-files
#$(if $(filter %.apk, $(1)),$(error \
    Prebuilt apk found in PRODUCT_COPY_FILES: $(1), use
BUILD_PREBUILT instead!))
#endef
```

3) Edit the following file:

${BSPHOME}**/android/device/fsl/imx6/**${BOARD}.mk

to insert correct project name:

```
PRODUCT_COPY_FILES += \
    device/fsl/${BOARD}/required_hardware.xml:system/etc/permissions/required_hardware.xml \
    device/fsl/${BOARD}/init.rc:root/init.freescale.rc \
    device/fsl/${BOARD}/vold.fstab:system/etc/vold.fstab \
    device/fsl/${BOARD}/gpsreset.sh:system/etc/gpsreset.sh \
    device/fsl/${BOARD}/audio_policy.conf:system/etc/audio_policy.conf \
    device/fsl/${BOARD}/audio_effects.conf:system/vendor/etc/audio_effects.conf \
    device/fsl/${BOARD}/PREBUILT.apk:system/app/PREBUILT.apk
```

Chapter 2

Software Functionality

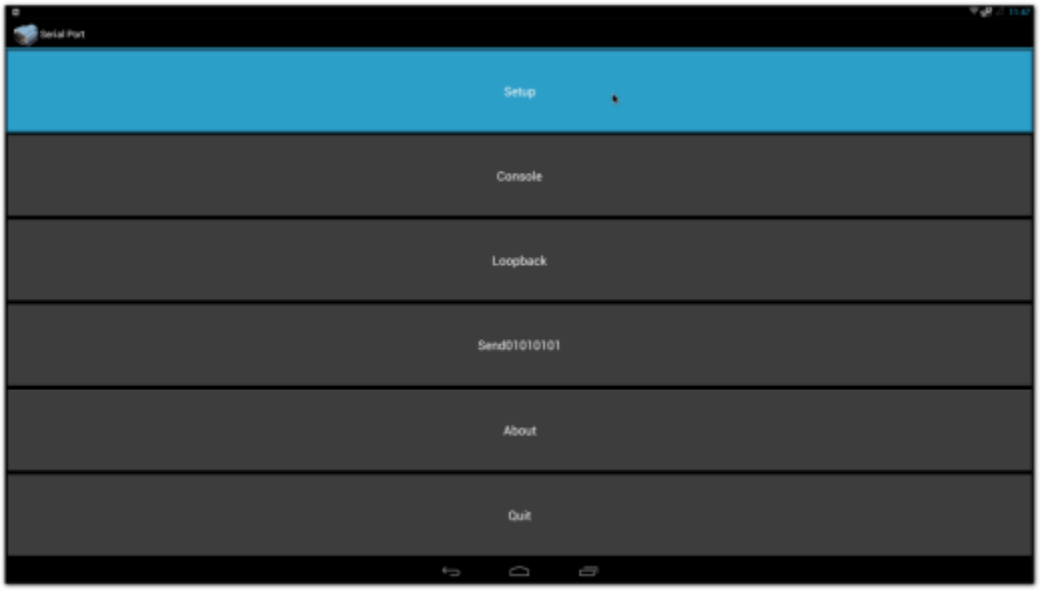
2. Software Functionality

2.1 Serial Port Test

2.1.1 Serial Port Setup

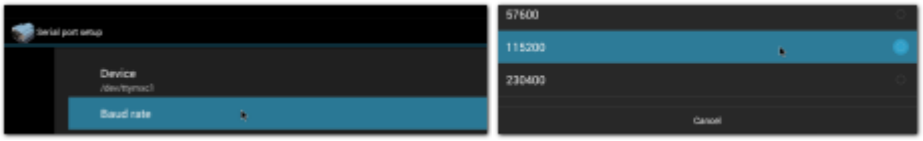
1) Click **Serial Port**

2) Click **Setup**



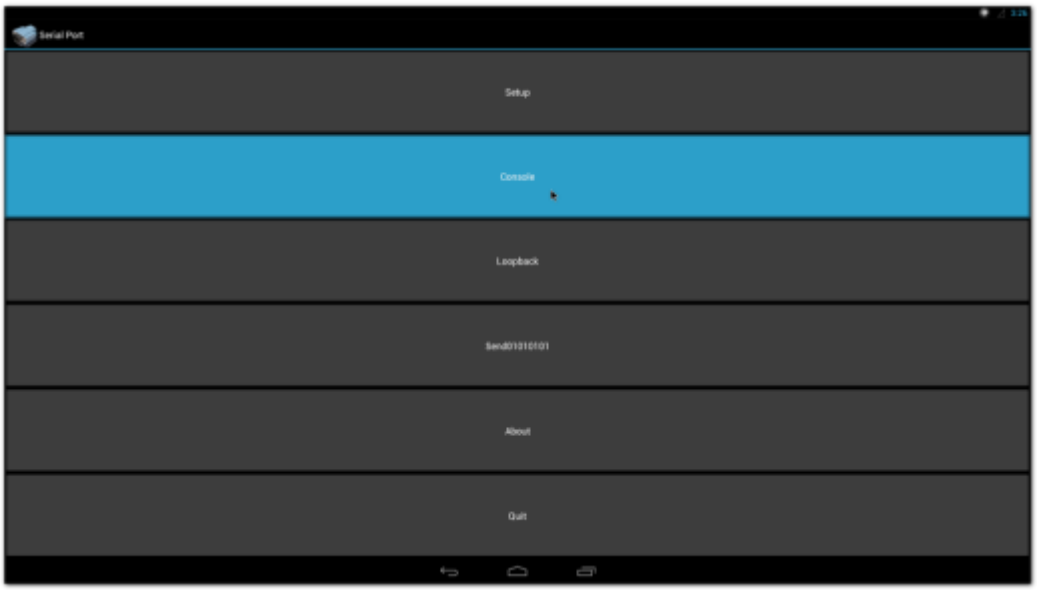
3) Click **Device** , and choose the used device(e.g. ttymxc1)

4) Click **Baud rate** , and choose the used baudrate(e.g. 115200)



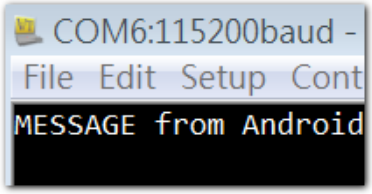
2.1.2 Console Test

1) Open one serial console.
2) Click **Console**



Typing some characters (e.g. "This is a test. 123456789ABCDEF") then pressing Enter in serial console, the identical message will shows up in reception block as below:

On the other hand, typing some message (ex. "MESSAGE from Android") in emission block, the identical message will shows up in serial console as below:



2.1.3 Loopback Test

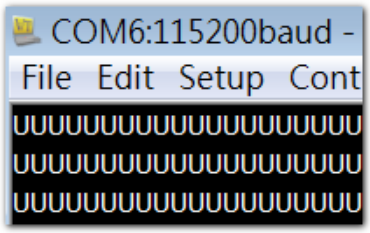
1) Plug loopback device into COM2
2) click **Loopback**

   The loopback test result will show up as below

2.1.4 Send01010101 Test

1) Open one serial console.
2) Click **Send01010101** .

   The character "U" (b'01010101) will show up continuously as below:



2.2 Display Output Option

2.2.1 Single HDMI Display

Perform the following command in u-boot:

```
setenv bootargs 'console=ttymxc0,115200 androidboot.console=ttymxc0
vmalloc=400M init=/init video=mxcfb0:dev=hdmi,1920x1080M@60,bpp=32
video=mxcfb1:off video=mxcfb2:off video=mxcfb3:off fbmem=28M
androidboot.hardware=freescale'
saveenv
reset
```

2.2.2 Single VGA Display

Perform the following command in u-boot:

```
setenv bootargs 'console=ttymxc0,115200 androidboot.console=ttymxc0
vmalloc=400M init=/init video=mxcfb0:dev=lcd,1920x1080M@60,bpp=32
video=mxcfb1:off video=mxcfb2:off video=mxcfb3:off fbmem=28M
androidboot.hardware=freescale'
saveenv
reset
```

2.2.3 Single LVDS Display

Perform the following command in u-boot:

```
setenv bootargs 'console=ttymxc0,115200 androidboot.console=ttymxc0
vmalloc=400M init=/init video=mxcfb0:dev=ldb,1024x768M@60,bpp=24
video=mxcfb1:off video=mxcfb2:off video=mxcfb3:off fbmem=28M
androidboot.hardware=freescale'
saveenv
reset
```

2.2.4 Dual Display

For example of HDMI & VGA, Perform the following command in u-boot:

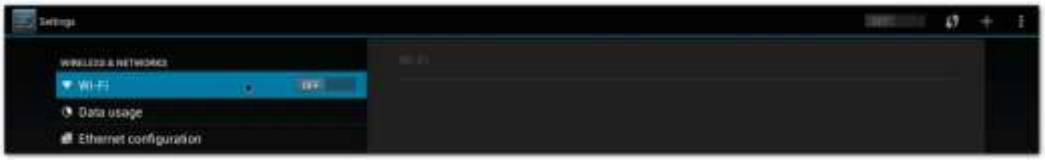
```
setenv bootargs 'console=ttymxc0,115200 androidboot.console=ttymxc0
vmalloc=400M init=/init video=mxcfb0:dev=hdmi,1920x1080M@60,bpp=32
video=mxcfb1:dev=lcd,1920x1080M@60,bpp=32 video=mxcfb2:off
video=mxcfb3:off fbmem=28M,28M androidboot.hardware=freescale'
saveenv
reset
```

2.3 Network Setup

2.3.1 Wi-Fi

1) Click **Settings**

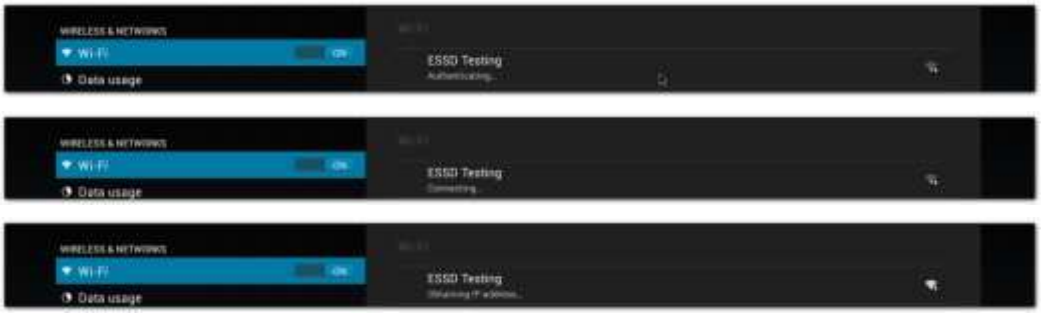
2) Turn Wi-Fi on



3) Choose ESSID (e.g. ESSD Testing)

4) Input correct password

5) Wi-Fi Authenticating/Connecting/Obtaining IP address



6) Wi-Fi connected

2.3.2 Ethernet

1) Click **Settings** / **Ethernet configuration** , then Turn on Ethernet

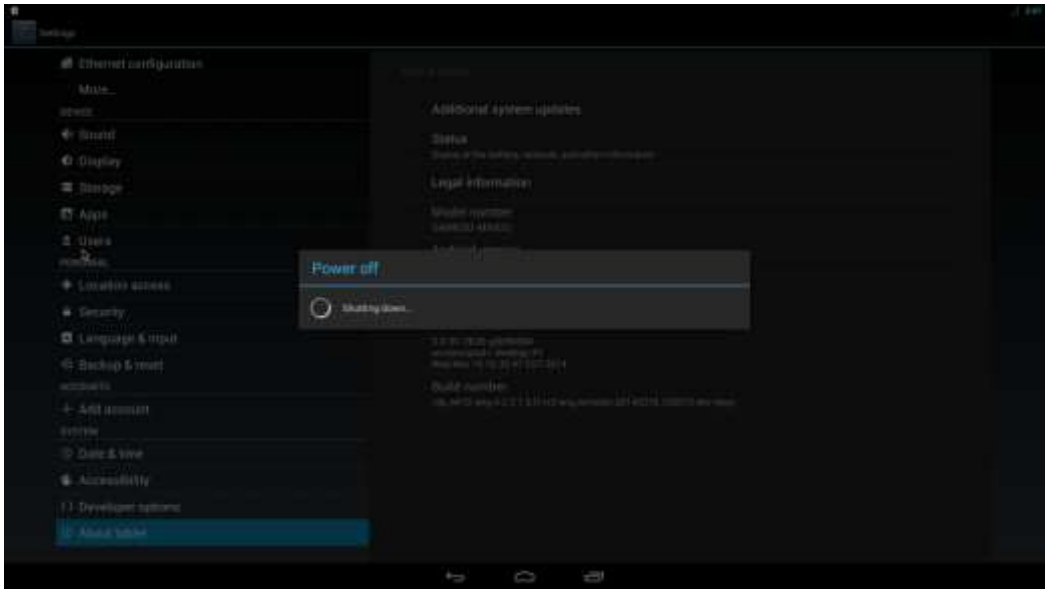
2) Click **Ethernet configuration**

3) Choose Connection Type (DHCP or Static IP)

2.4 To update system

1) Refer to 1.4.6 to build OTA package.
2) Plug SD card that contains OTA package(update.zip) into SD slot.
3) Click **Settings** / **About tablet** / **Addition system updates** :

4) Wait for one moment, system will reboot for updating



5) It will take some time to update.

Chapter 3

System Recovery

3. System Recovery

Please refer to 1.5.1 & 1.5.2 to create a bootable SD card and transfer whole system to on-board eMMC.