

User Guide

Android

Board Support Package For i.MX6 series



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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 lib1zo2-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
sudo update-alternatives --install /usr/bin/jar
                                                  javac
                                                         /usr/lib/jvm/jdk1.6.0_45/bin/javac
                                                                                            2
                                                         /usr/lib/jvm/jdk1.6.0_45/bin/jar
                                                  iar
sudo update-alternatives --install /usr/bin/javap
                                                  javap /usr/lib/jvm/jdk1.6.0_45/bin/javap
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.

Ar Hi <m< th=""><th>row key ghlight > modul</th><th><pre>/s navigate the menu. <&nter> selects submenus>. ced letters are hotkeys. Pressing <y> includes, <n> excludes, arizes features. Press <esc><esc> to exit, <?> for Help, to exend: [*] built-in [] evoluted (*) module < ></esc></esc></n></y></pre></th><th>i u u u</th></m<>	row key ghlight > modul	<pre>/s navigate the menu. <&nter> selects submenus>. ced letters are hotkeys. Pressing <y> includes, <n> excludes, arizes features. Press <esc><esc> to exit, <?> for Help, to exend: [*] built-in [] evoluted (*) module < ></esc></esc></n></y></pre>	i u u u
199	adadada	Maadaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa	1
x	A	Wetwork device support	1
x	< >	Intermediate Functional Block support	
х	< >	Dummy net driver support	
ĸ	< >	Bonding driver support	
х	< >	MAC-VLAN support (EXPERIMENTAL)	
x	< >	EQL (serial line load balancing) support	
8	<*>	Universal TUN/TAP device driver support	
x	$\langle \rangle$	Virtual ethernet pair device	
n i	< >	ARCnet support>	
ĸ	-*-	Generic Media Independent Interface device support	
m	∀(+)		

4) Refer to <u>1.4.1</u> 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

- 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:
```

Ι

/

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



Software Functionality

2. Software Functionality

2.1 Serial Port Test

2.1.1 Serial Port Setup

1) Click Serial Port



2) Click Setup

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Setup
Console
Loopback
Send01010101
About
Quit
5 A B

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

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WRELEDS & NETWORKS					
▼-W0+F1					
O Data usage					
Ethernet configuration					

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

WRELESS & NETWORKS			
* W (0)	1000	HALCHA	8
() Data usage		Designed with HTM/NETRO (NET) availables	×
Ethernet configuration		SAPIDO Internet with minit (minit a calibration)	*
More		ESSO Testing	÷
DEVICE		Generated and HEAVANIAN (MILL) and HEAVANIAN	

4) Input correct password



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



6) Wi-Fi connected

WRELESS & RETWORKS	_	- miki	
▼100	100 B	ESSE Testing	2
O Data usage		Coveral	×

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)

Configure Ethernet device		Configure Ethernet device			
Ethernet Devices: and		Ethernet Devices			
Connection Type * DrCP Trace Type IP address		Connection Type (n-C) Total II IP address 192.168.203.44			
Netmask		Netmask 255 255 255 0			
DNS address		DNS address 192.168.203.1			
Gateway address		Gateway address 192.168.203.1			
Disait	500 at	Deard	100 D		

2.4 To update system

- 1) Refer to <u>1.4.6</u> 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 :

Ethernet configuration		
Murs		_
evice	Additional system updates	
H Bound	Status	
D Display	Dates of the balance reflection and other information	
E Storage	Legal information	
3 Appa	Madei surelare	
1 Users	Android vention	
California:		
Location access	Busidiand version	
 Security 	A Second S	
Language & input	Rattal version 1.1.25-26(5-gdywadar	
D Bachup & reset	Weight Weight (1997) and the state of the st	
000ukm	apuild number	
+ Add account	rab, All Driving & 2.2.1.1.0 red ang winning 2014/071 10/011 environ	
INITEM		
9 Date & time		
Accessibility		
3 Developer options		
About tablet		

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

2 Settap					
¢r.					
0					
=					
17					
1	uses Acc	Dower off			
+					
		O shatty com.			
.03					
(9)					
100					
- P.					
. 6.					
105					
10					
			The second second		

5) It will take some time to update.



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.