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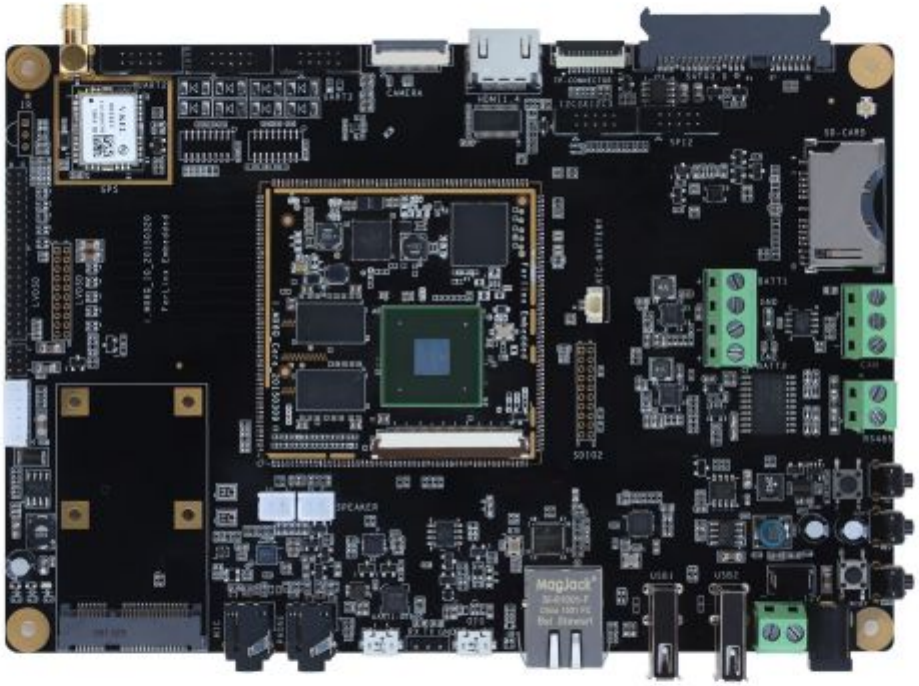
FORLINX EMBEDDED

i.MX6

OS Android4.4.2



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MUST READ BEFORE WORKING WITH OK335xD

Product Operation Environment:

Power Supply: DC12V ± 10%
Working Temperature: Expand Commercial: -20℃ – 105 ℃, up to 1.2 GHz Industrial: -40 – 105 ℃, up to 800 MHz Automatic Electronic: -40℃-125 ℃, AEC-Q100 up to 1 GHz
Humility: 10–90%（Non-condensing）

Please read the following notes carefully before using the board.

- Hot-plug of core board and peripheral modules is strictly prohibited.
- Please follow all the warnings and instructions marked on the product.
- Please always keep the product dry. Once it gets splashed or immersed by any liquid, cut off the power and dry it out immediately.
- Please store and operate the product in ventilating conditions to avoid damages brought by overhigh temperature.
- Please do not use or store the product in dusty or untidy conditions.
- Please do not use or store the product in alternate cold and hot conditions to avoid condensing which will damage components and accessories.
- Please do not treat the product rudely. Any falling-off, knocking and violent shaking may cause destruction to circuit and components.
- Please do not clean the product with organic solvents or corrodible liquids.
- Please do not dismantle or repair the product by yourself. Contact us when the product malfunctions.
- Please do not modify the product by yourself or use accessories unauthorized by us. Otherwise, the damage caused by that will be on your part and not included in guarantee terms.

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Contact Forlinx Technical Service Department if you have any questions.

Copyright Announcement

Updating Record

Date	Version	Updated
2015.05	V2.1	i.MX6-Android4.4 first version translated by Grace Wang
2015.09	V2.2	Dual-screen displayings testing added to user manual

Contents

Chapter1 Overview of i.MX6 Single Board Computer

Single board computer i.MX6 is based on Freescale i.MX6 Quad core processor. The i.MX 6Quad family encompasses a quad-core platform running up to 1.2GHz with 1 MB of L2 cache, hardware accelerated graphics and 64-bit DDR3 or 2-channel, 32-bit LPDDR2 support. Integrated FlexCAN and MLB busses, PCI Express ® and SATA-2 provide excellent connectivity while integration of dual, MIPI display port, MIPI camera port and HDMI v1.4 makes it an ideal platform for consumer, automotive and industrial multimedia applications. Supported with OS Android4.4 for industrial product designing. The iMX6Q single board computer is with structure of CPU module and base board. The CPU module integrates with chipset CPU, eMMC, Memory and PowerManage. By the CPU module, users just need develop your own base board to shorten your product time-to-market. Here let's have a look at the CPU module and base board resource for the iMX6Q.

Forlinx single board computer iMX6Q is with industrial standard, and CPU module with expand commercial temp -20℃to+105℃, industrial temp -40℃to+105℃ and auto electronics temp -40℃to+125℃.

The iMX6 Quad features are as below:

Supported with Freescale power management circuit(PMIC) MMPE0100.

CPU complex components

- 4x ARM® Cortex™-A9 core, and ezch with running frequency up to 1.2GHz;
- 1MB L2 cache;
- 32KB instruction set and data cache;
- NEON SIMD media accelerator;

Multi-media

- GPU 3D
  - O Vivante GC2000
  - O 200Mtri/s 1000Mpxl/s，OpenGL ES 3.0 & Halti，CL EP
- GPU 2D(vector)
  - O Vivante GC355
  - O 300Mpxl/s，OpenVG 1.1
- GPU 2D(complex)
  - o Vivante GC320
  - o 600Mpxl/s，BLIT
- Video decode
  - o 1080p 60 h.264
- Video encode
  - o 1080p30 H.264 BP/dual 720p encode
- Camera interface
  - o type:1x 20-bit parallel, MIPI-CSI2(4-channel), triple input at the same time

Storage

- DDR
- 2x 32 LP-DDR2, 1x 64 DDR3 / LV-DDR3
- Nand

  SLC/MLC, 40 -bit ECC, ONFI2.2, DDR

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Data connection

- 4x USB2.0
  - o 1x HS OTG + PHY
  - o 1x Host + PHY
  - o 2x Host USB HSIC
- Ethernet
  - o 1 Gbps + IEEE®1588
- Expand interface
  - o 3x SD/MMC 4.4, 1x SDXC
  - o 5x SPI, 5x UART, 3x I^2C
  - o MIPI-HSI
  - o PCIe 2.0 (single channel)

Display

- 2x4XGA(2048x1536)或 2x[1080p+WXGA(1280x720)]

Senior Power management

- PMU integrated
- Freescale PF100 PMU

Safety

- Senior safety supported with high reliability guidance, encryption engine, random number generator and tamper detection

Package and temp

1 x 21mm, 0.8 mm BGA
Consumer (-20C 至+105C), up to 1.2 GHz
Industrial control (-40C 至+105C), up to 800 MHz
Auto (-40C 至+125C), AEC-Q100, up to 1 GHz

Industrial development platform priority:

- The industrial platform BOM lectotype adopts industrial standard
- Running in high and low temp, electromagnetic radiation bad environment with wide temp range
- The RS485 and CAN interface with isolation protection
- Approved by CE&FCC

Below is the pin diagram for the i.MX6 Q

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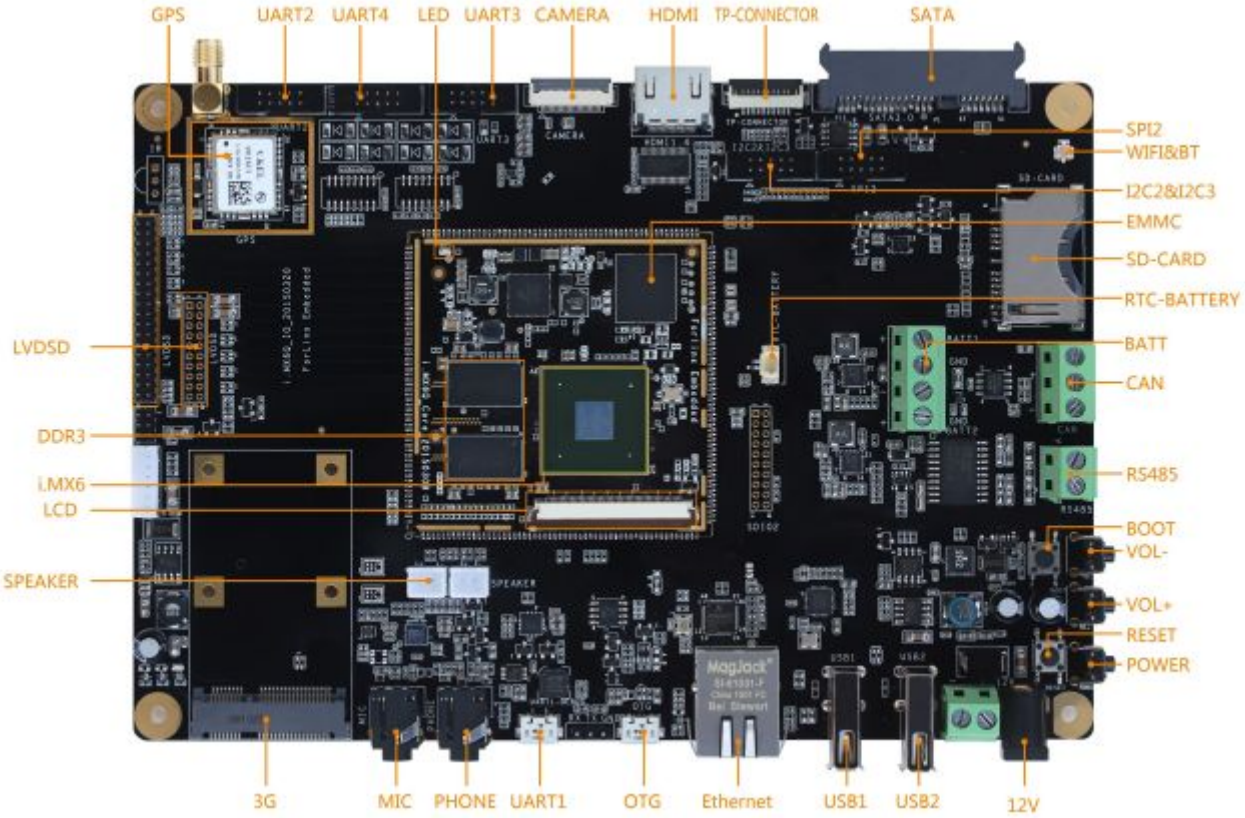


The industrial standard iMX6Q and commercial standard iMX6Q are with different designing ideas. The commercial one is with cost priority running in general environment than the industrial one, while the industrial one is with stability priority in complex environment like high and low temp, vibration environment and electromagnetic radiation environment than the commercial one.

Chapter2 Setting Up of Android Compiling Environment

2.1 Install Ubuntu 12.04.2 x64 bit and it's Compiling Environment

Hereby, we recommend installing Ubuntu to host before compiling. Refer to Appendix 1 for installation and configuration.
Note: PC with Core(TM)i7 processor and memory above 4G is recommended.

2.2 Install Lib for Android Compiling

2.2.1 Android4.2 installation lib

1. Necessary package for Android Compiling
   # apt-get -y install git gnupg flex bison gperf build-essential zip\
   curl libc6-dev libncurses5-dev:i386 x11proto-core-dev libx11-dev:i386 \
   libreadline6-dev:i386 libgl1-mesa-dri:i386 libgl1-mesa-dev g++-multilib \
   mingw32 tofrodos python-markdown libxml2-utils xsltproc zlib1g-dev:i386 \
   dpkg-dev libswitch-perl
2. Extra packages besides installation
   # apt-get install uuid uuid-dev
   # apt-get install zlib1g-dev liblz-dev
   # apt-get install liblzo2-2 liblzo2-dev
   # apt-get install git-core curl

3. JAVA environment installation
   #mkdir /usr/local/jdk
   Copy jdk-6u45-linux-x64.bin to /usr/local/jdk and execute ./jdk-6u45-linux-x64.bin
   The related environment variable has been defined in env.sh in the source code directory, for example, if to save the jdk in other directories, please configured this file accordingly.
4. Extra work
   # ln -s /usr/lib/i386-linux-gnu/mesa/libGL.so.1 /usr/lib/i386-linux-gnu/libGL.so
   # chmod u+x mkimage
   # cp mkimage /usr/sbin/mkimage

2.3 Compile Android

The OS Android 4.4.2 source code is saved in src/Android4.4.2 in android_kk4.4.2_1.0.0.tar.bz2, please copy it to /work/forlinx of the Ubuntu folder;
Note: before compiling, please extract the source code to the above path to avoid needless errors.

2.3.1 Extract Android Source Code

Commands are as follows:
#cd /work/forlinx

#tar -xvjf android_kk4.4.2_1.0.0.tar.bz2

Note: After extraction, folder android_kk4.4.2_1.0.0 includes file system, kernel and uboot
The kernel is in android_kk4.4.2_1.0.0/kernel_imx.
Uboot is in android_kk4.4.2_1.0.0/bootable/bootloader/uboot-imx

2.3.2 Android Compiling

1. compile Android

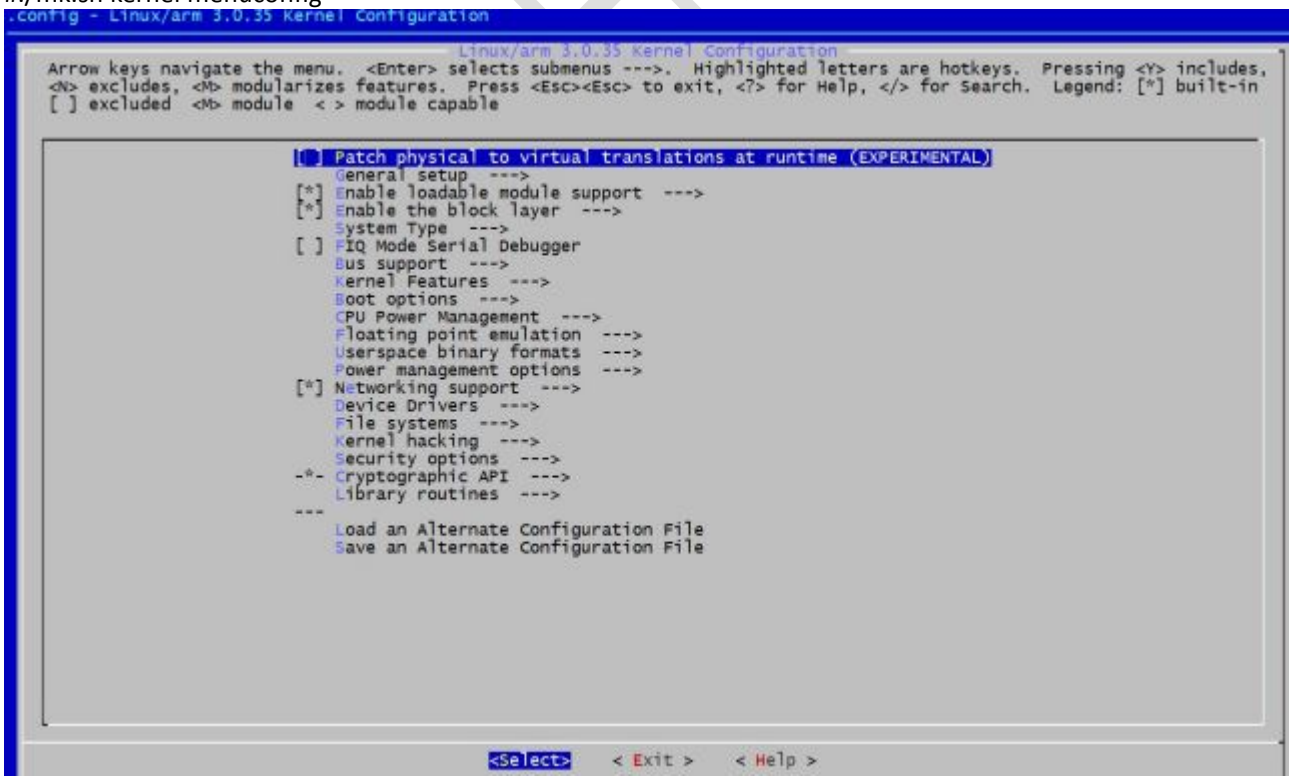
The Android4.4 compiling depends on three script files which are contained in the generated directory by extracting the source code, and please step into it and execute below command:

#cd /work/forlinx/android_kk4.4.2_1.0.0
source env.sh
source build/envsetup.sh
#lunch sabresd_6dq-eng
#make -j8 2>&1 | tee build.log

Note: 1. The compiling may last for several hours, it depends on the PC configuration.
2. The compiled images are all generated in android_kk4.4.2_1.0.0/out/target/product/sabresd_6dq, they are boot.img, recovery.img, system.img, u-boot-6q.bin

2. Compile the kernel individually

Compile by below command to configure the kernel:
#./mk.sh kernel menuconfig



Compile boot.img by below command
#./mk.sh kernel boot.img

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Clean the files during kernel compiling by below command
#./mk.sh kernel distclean
Note: 1. The Android flashing is in unit of boot.img, kernel updating is needed by compiling boot.img. The boot.img is contains of ramdisk.img, uImage and kernel booting parameters. Please check by above command whether there is the ramdisk.img, if without the ramdisk.img there, the ramdisk.img will be compiled at first, and then kernel, while if there is the kernel, it will be compiled directly.

3. Compile uboot individually
The compiling command is as below
#./mk.sh uboot

Please clean the files in uboot compiling by below command
#./mk.sh uboot distclean

2.3.3 Drive Code's Path

Device	Location of driver program's source code in kernel	Device Name
NIC driver	drivers/net/fec.c	eth0
LCD backlight driver	drivers/video/backlight/pwm_bl.c	/sys/class/backlight
USB U-disk	drivers/usb/storage/	/dev/sdX
USB mouse	drivers/hid/usbhid/	/dev/input/mice
USB3G	drivers/usb/serial/	/dev/ttyUSB*
USB Camera	drivers/media/video/uvc/	
SD card driver	drivers/mmc/card/	/dev/block/mmcblk0pX
SATA driver	drivers/ata/ahci_platform.c	/dev/sda*
OV5640	drivers/media/video/mxc/capture/ov5640.c	
LVDS	drivers/video/mxc/ldb.c	
HDMI	drivers/video/mxc_hdmi.c	
LCD FrameBuffer	drivers/video/mxc/mxc_lcdif.c	/dev/fb0
Capacitive touching driver	drivers/input/touchscreen/ft5x06_ts.c	/dev/input/event
RTC driver	drivers/rtc/rtc-dev.c	/dev/rtc0
SPI driver	drivers/spi/spidev.c	/dev/
3-serial port driver	drivers/tty/serial/imx.c	
Keyboard driver	drivers/input/keyboard/gpio_keys.c	
Watchdog driver	drivers/watchdog/imx2_wdt.c	/dev/watchdog
RS485 driver	drivers/tty/serial/imx.c	/dev/

CAN driver	drivers/net/can/flexcan.c	can0
USB BlueTooth		wlan0
Audio driver	sound/soc/codec/wm8962.c	/dev/snd/

2.3.4 eMMC Partition List

Below form is Android eMMC partition list:

Partition Type	Name	Deviation	Capability	File System	Content
N/A	Bootloader	1KB	1MB	N/A	bootloader
Master partition 1	Boot	8MB	8MB	Boot.img form, kernel+ramdisk	boot.img
Master partition 2	Recovery	Follow Boot	8MB	boot.img form, kernel+ramdisk	recovery.img
LPAR5	System	Follow Recovery	512MB	ext4. Mounted in /system	Android system file is in /system
LPAR6	Cache	Follow System	512MB	ext4. Mounted in /cache	Android is used for OTA to update image partition
LPAR7	Device	Follow Cache	8MB	ext4. Mounted in /vendor	For MAC storage
LPAR8	Misc	Follow Device	4MB	N/A	To recover and save the bootloader Information, hold it
Master partion4	Data	Follow Misc	All the residual capability	ext4. Mounted in /data	To save the system application and internal media partition(path: /mnt/sdcard/)

2.4 Install Android

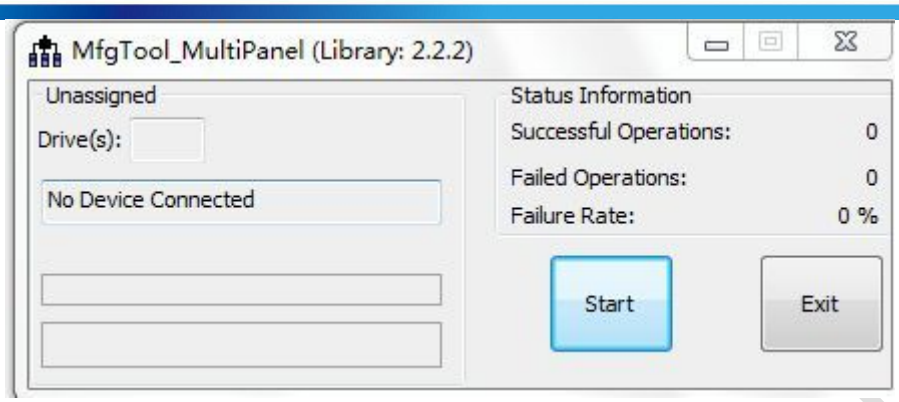
Q: How to check the kernel printed information?
A: 1.connect the USB interface of single board computer iMX6 to PC via the USB cable comes with the board.
2. Open hyper terminal and do below sets

Select as below according to your serial port connection

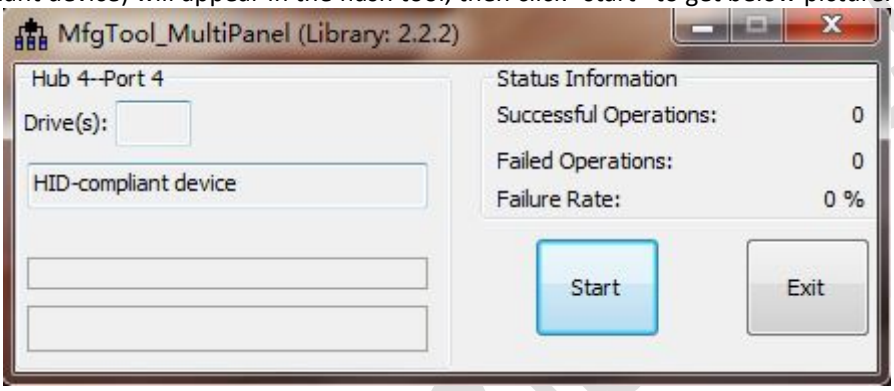
Then you can see all the debugging information for btoot from SD card or NandFlash as above settings are done.

2.4.1 Flash Image by the MfgTool2

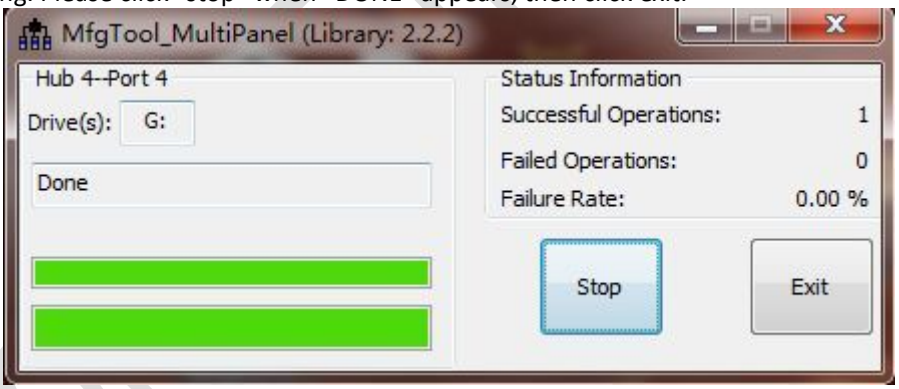
1. Open tool MfgTool2(win7 users please open it as an administrator)
At first please make sure in the flash tool directory
Mfgtools-Rel-13.01.00_ER_MX6Q_UPDATER\Profiles\MX6Q Linux Update\OS Firmware\files\android there are the files of
Boot.img ramdisk.img recovery.img system.img u-boot-6q.bin



2. Press BOOT key, power on the board or press the reset key.
3. During the first time updating, drivers will be automatically installed via network, after installation, the device name(HID-compliant device) will appear in the flash tool, then click “start” to get below picture.



4. When whether format dialogue appears, please select “cancel formatting” or just skip it, and keep patient until finishing flashing. Please click “stop” when “DONE” appears, then click exit.



5. After the flashing, just reset or power on the board.

Note: it’s better to flash the image in win7, the debug is in otg, and driver programs in http://www.ftdichip.com/products/ICs/FT232R.htm

1. Input 1 to get into below interface:

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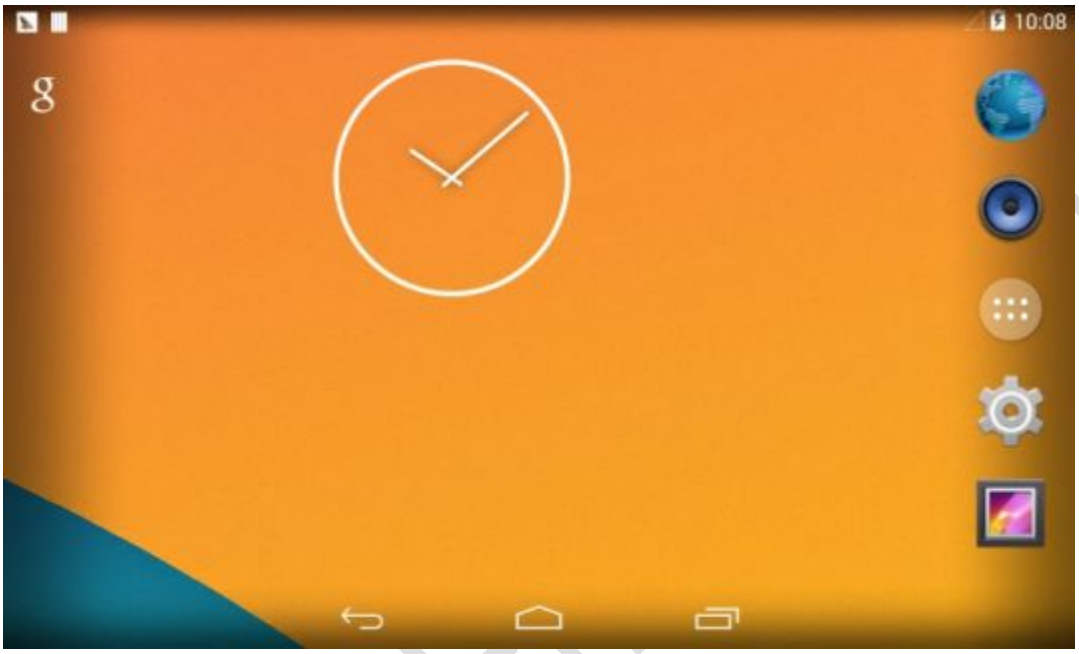
Chapter3 Android Function and Test

The i.MX6 Quad distinguished with 8G eMMC and other versions. If requirements for OS Android 4.4 and with APP in eMMC, please select hardware version of 8G eMMC

3.1 Android Main Interface



3.2 Android Application Program

Click “  ”icon on the main interface and interface below will appear:

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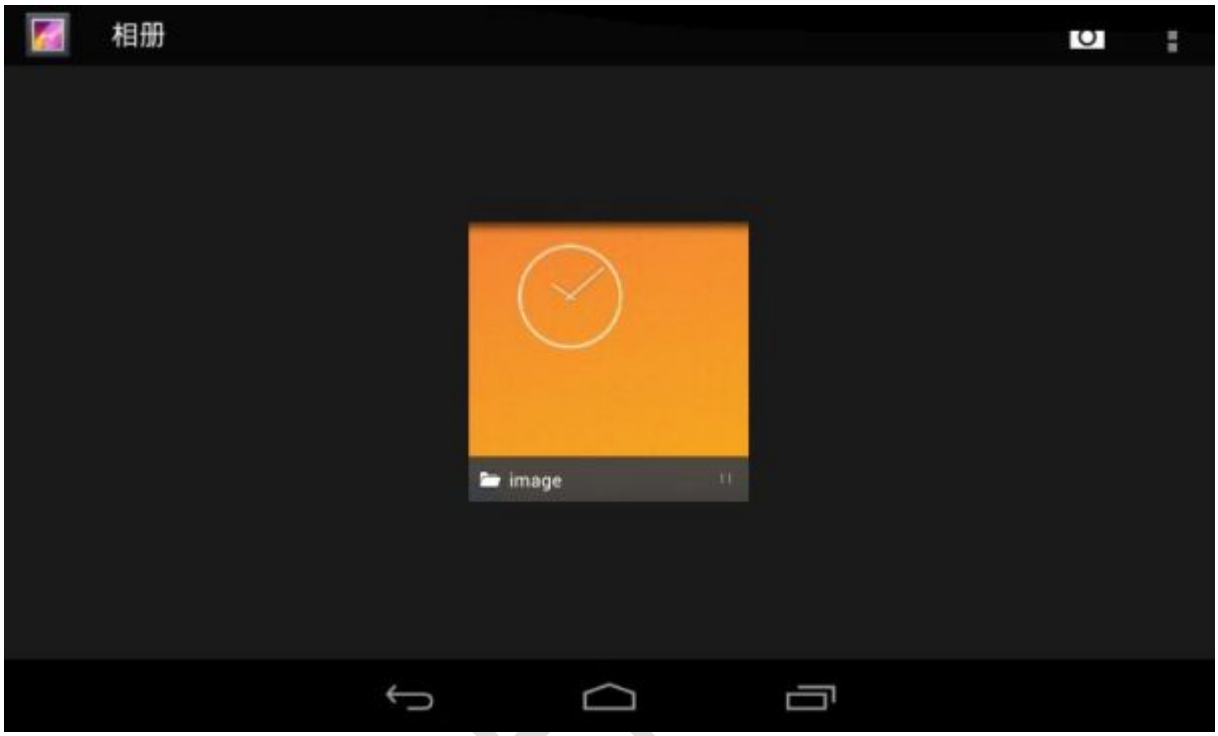
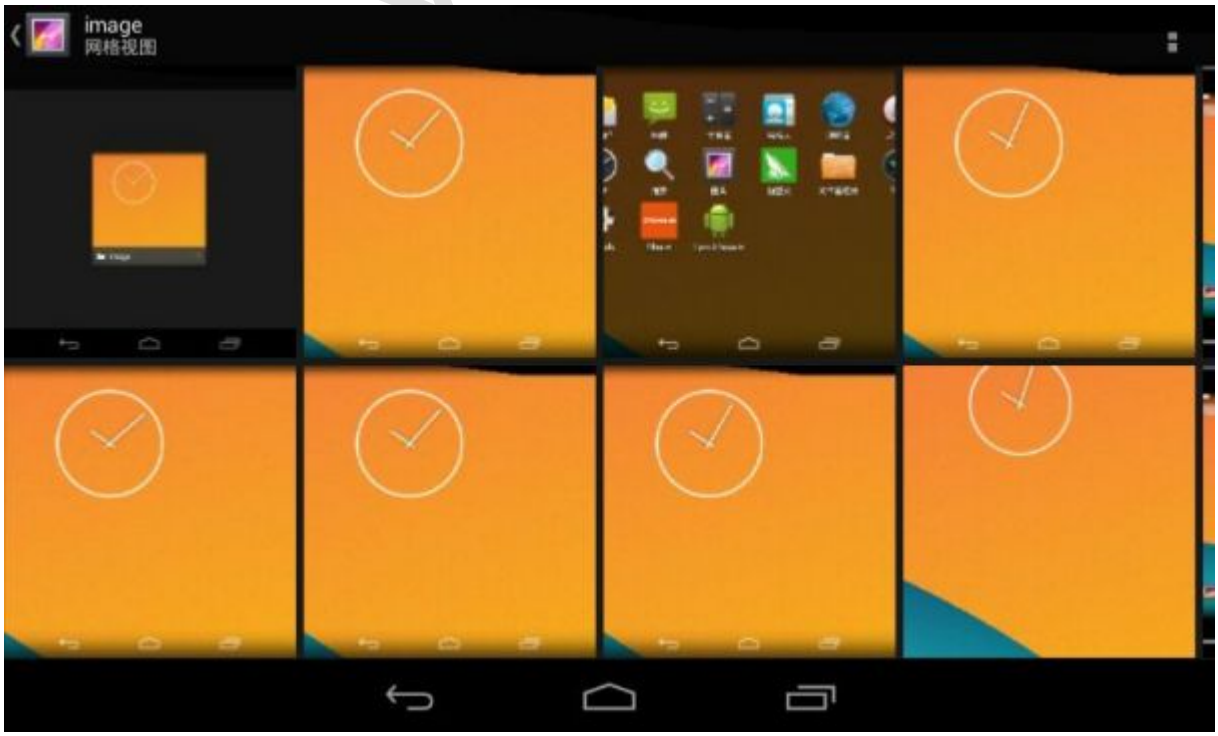
3.3 Android Photo Viewing

Click “  ”on the main interface, then click “Gallery” to view photos(please make the board is with SD card with photos).



Click “Images” to preview photos.



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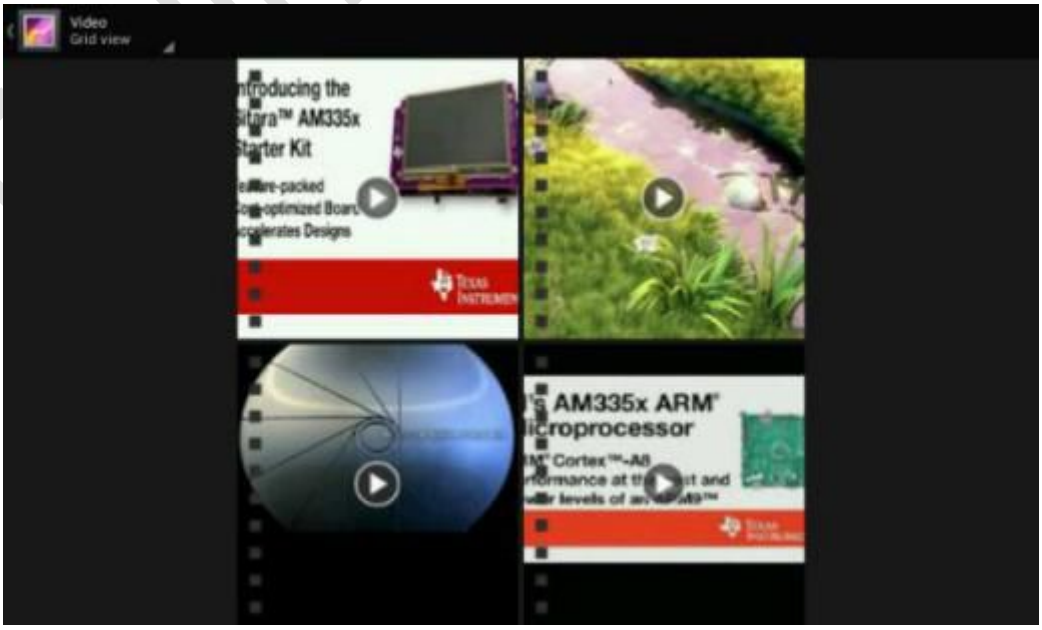
3.4 Android Photo Edition

Select“ ”->“Gallery”->“Images” to preview photos. Click the photo which you want to edit, and then click “ ”to edit.

3.5 Android Video Playing

Select“ ”->“Gallery”->“Video”. Then select the video which you like(please make sure the SD card is with video which is available).



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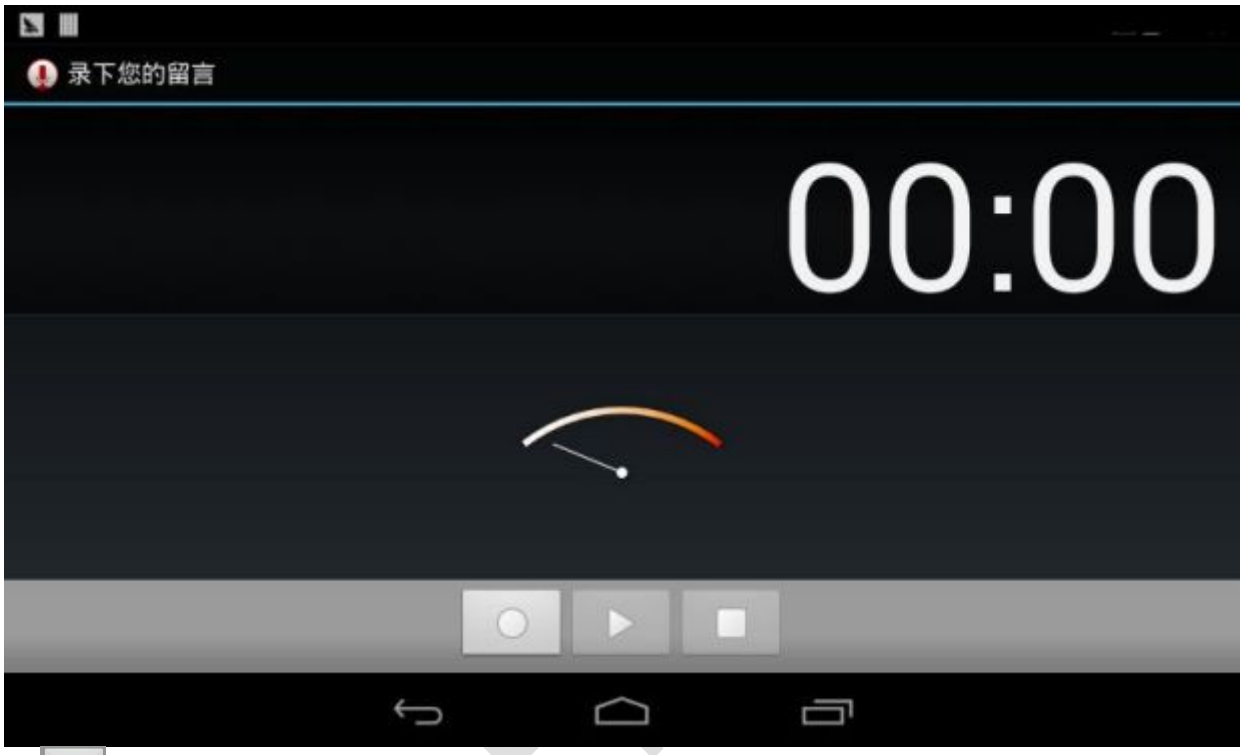
3.6 Android Music Playing

Select “ ” ->”Music”->“Artist”. Then select the music you like and click play(please make sure the SD card is with music to be played).

Note: the speaker is pinned out to connect with sound to play audio.

3.7 Android Recording (Support Mic Input)

Select”  ”-> “Recorder”-> “  ”(please the board is with SD card).



Click “  ”to stop recording.

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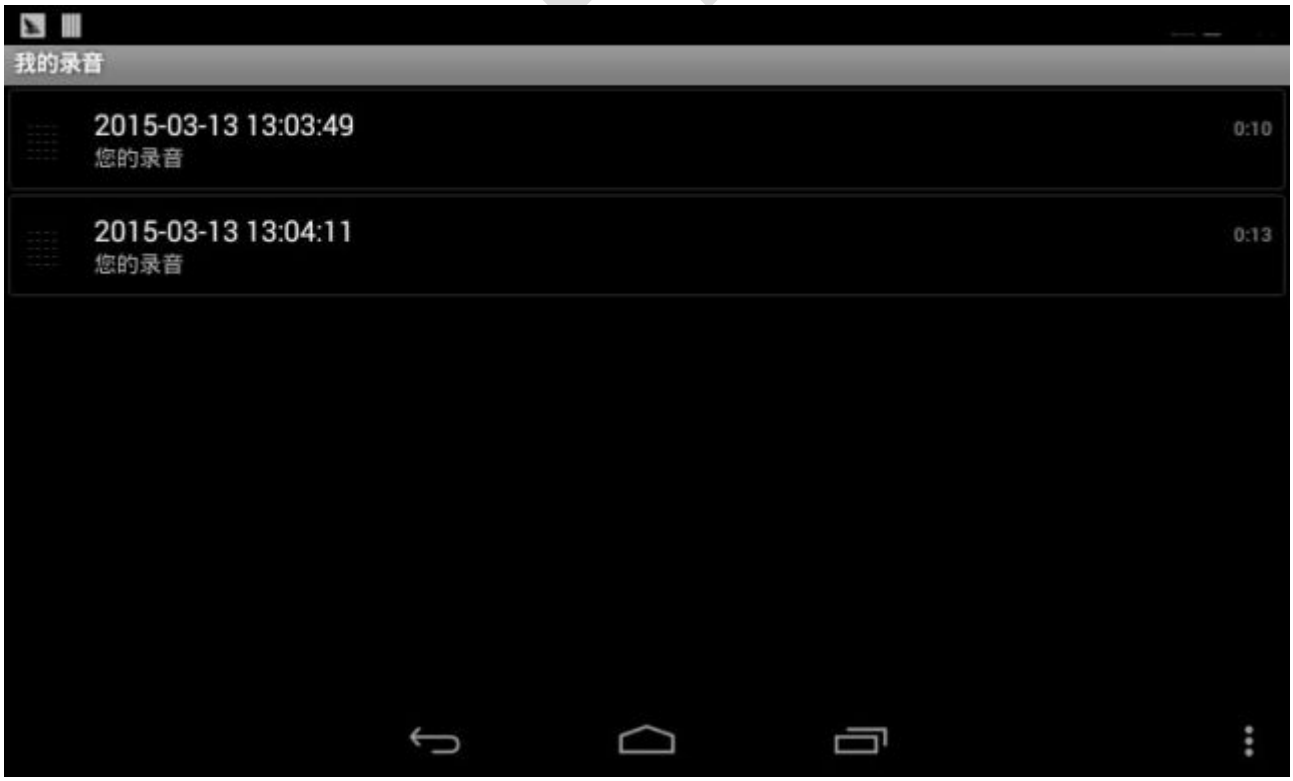
Click “  ” -> “Music” -> “Playlist” -> “My Recordings”

Click the saved recording to play.



3.8 Volume Adjustment

Select “  ” -> “Settings” -> “Sound” -> “Volumes”. From following picture we can see three options: Music, Video, games and other media. Users could adjust volume according to reality.

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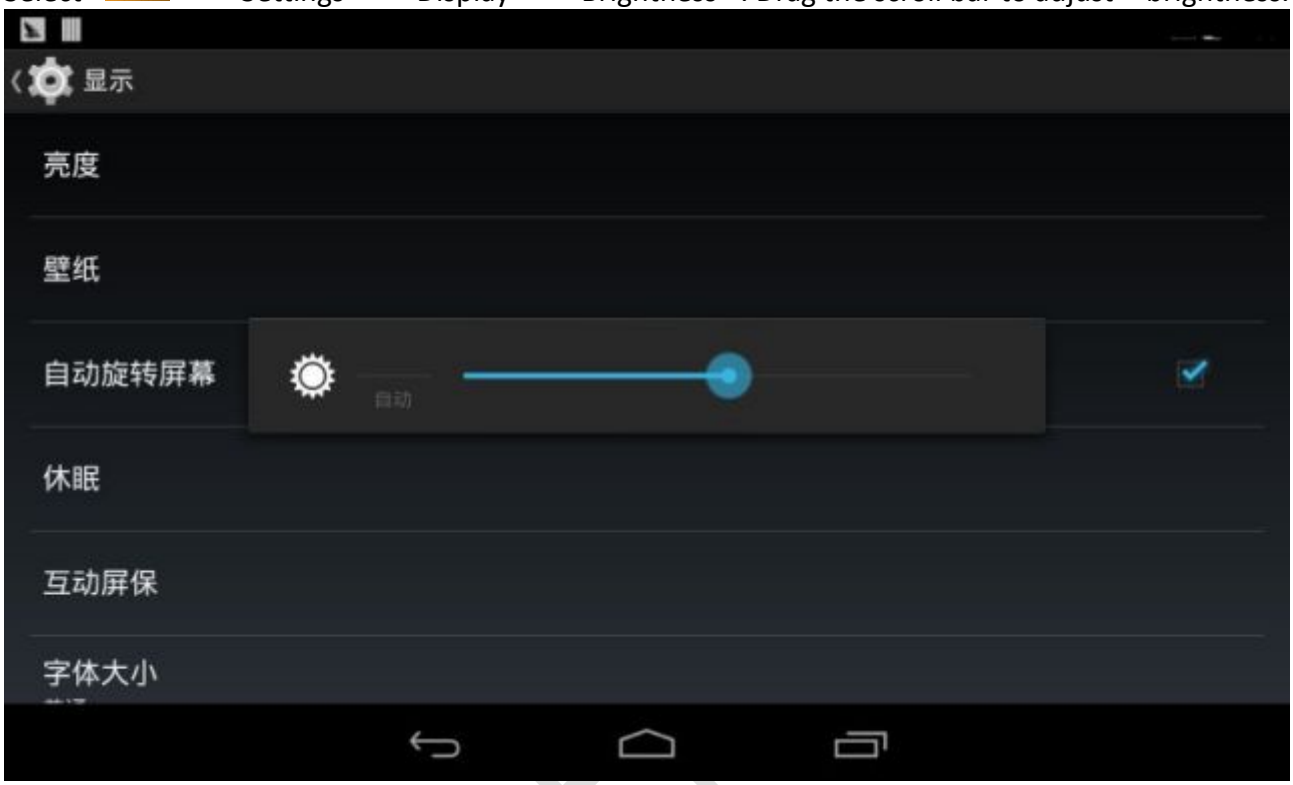
3.9 Android Backlight Control

Select “ ” -> “Settings” -> “Display” -> “Brightness”. Drag the scroll bar to adjust brightness.



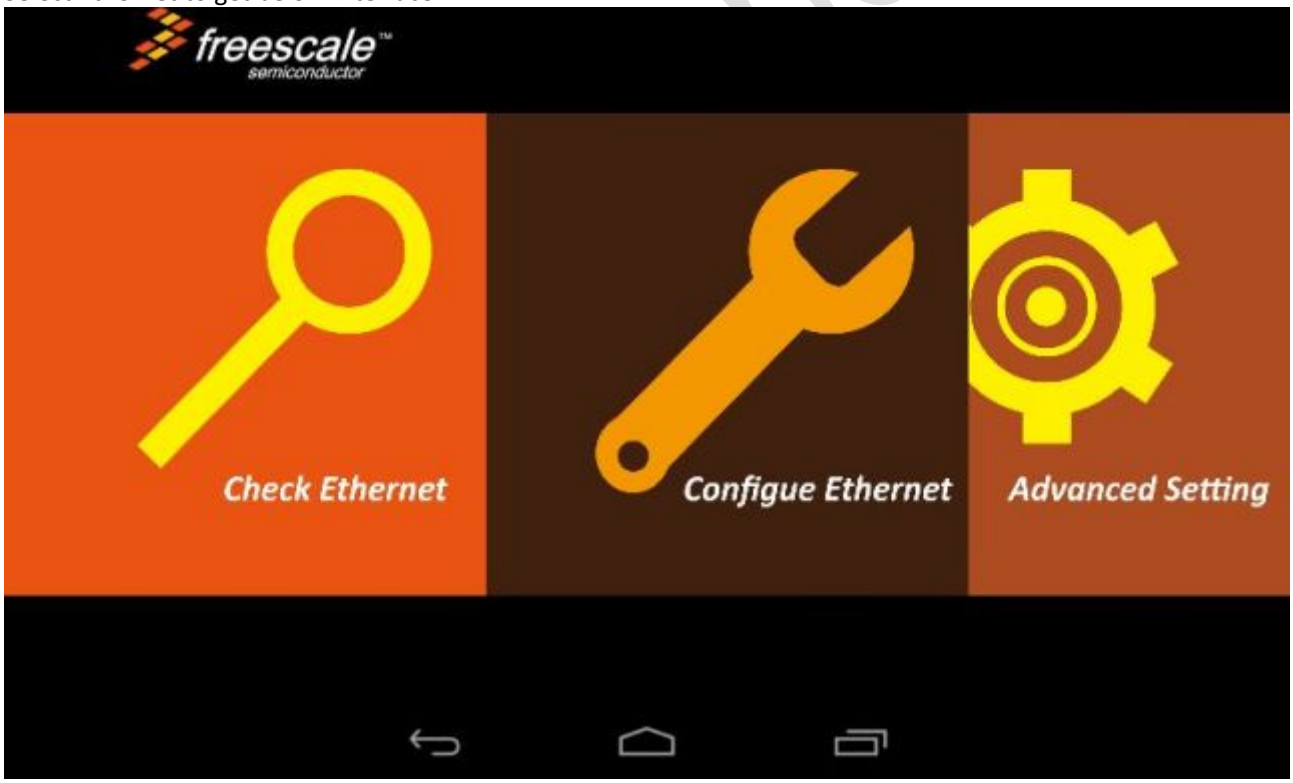
3.10 Android Time Setting(external RTC)

Select “ ” -> “Settings” -> “Date&Time” to set date and time. It will update synchronously even when power’s off (with button battery fixed on board).

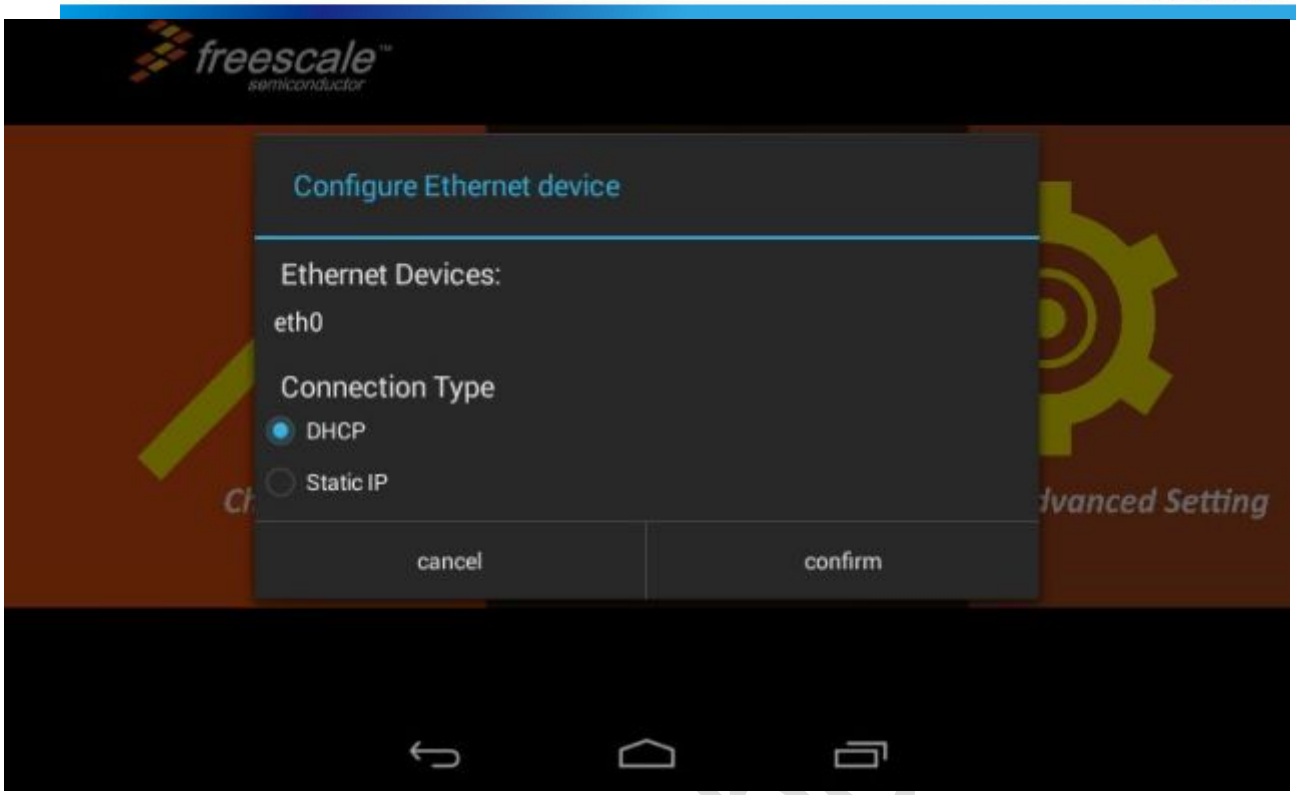
3.11 Android Ethernet Connection (Support Gigabit Ethernet)

1. Plugging in Ethernet cable, select “ ”->“ ”

Select Ethernet to get below interface

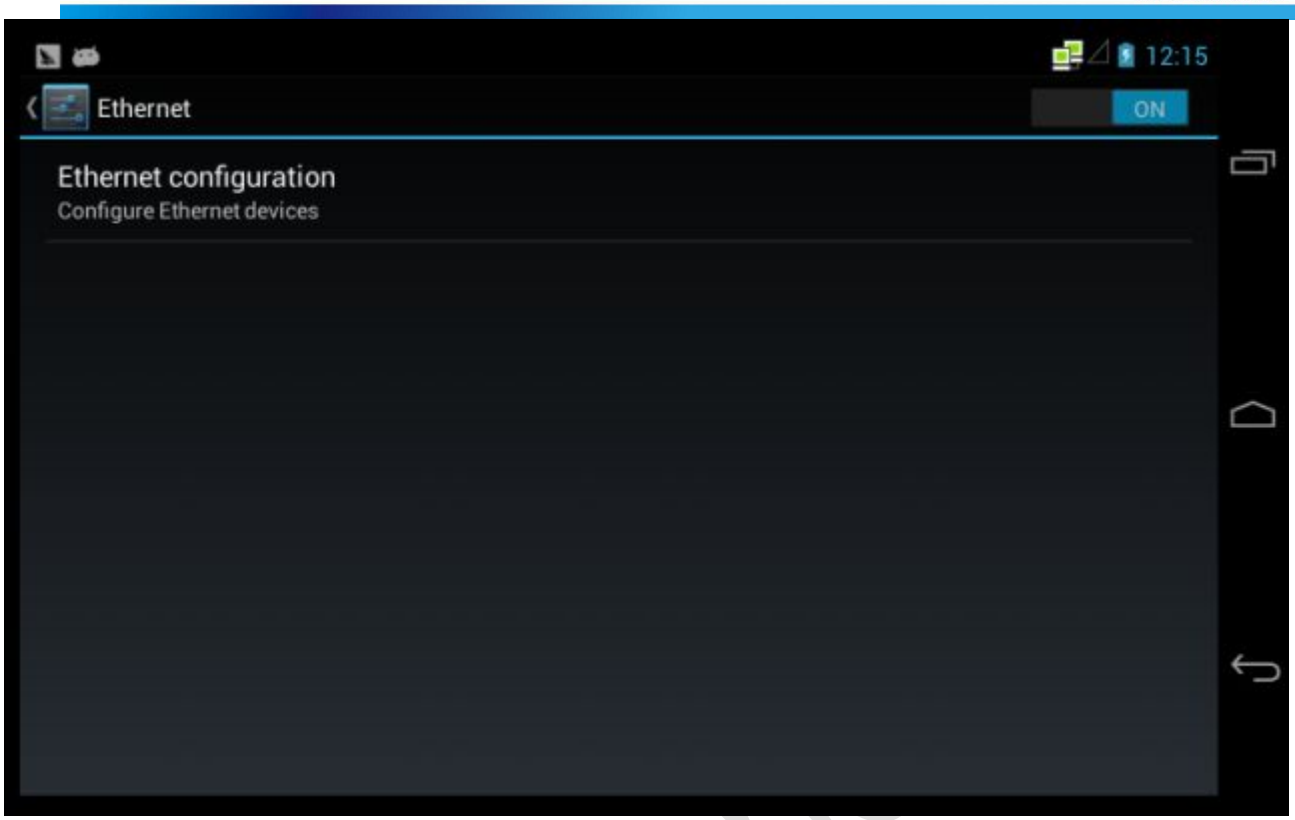


Here click configure Ethernet to prompt Ethernet setting interface

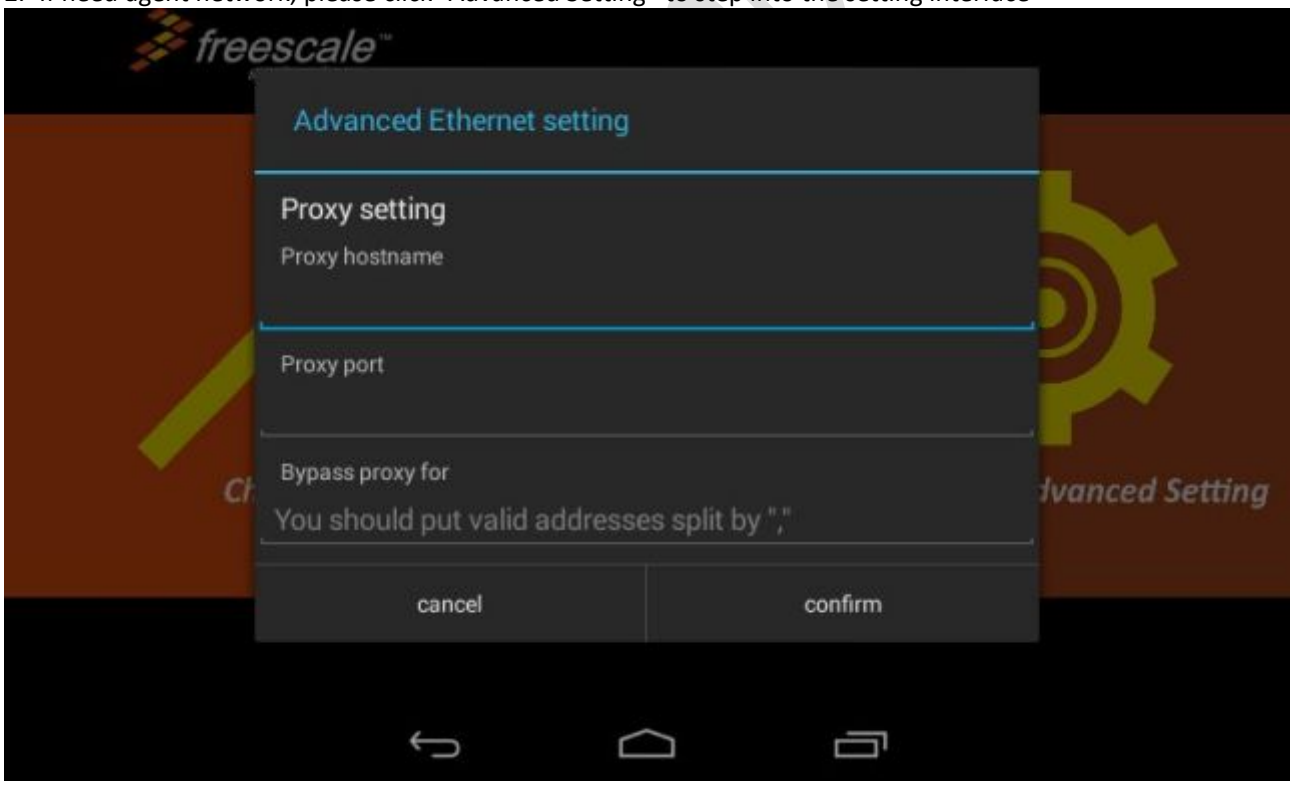


This menu is used for selecting Ethernet device, connection could be DHCP, Static IP. If select Static IP, then following IP address, subnet mask, DNS should be configured to be user's ethernet parameters(eg: IP: 192.168.1.2, subnet mask: 255.255.0, DNS address: 8.8.8.8, gate way address: 192.168.1.1), please click Save to save all the settings.

After saving, click ON/OFF at the up right corner of the LCD, get into ON mode, if Ethernet connection is successful, it will show a green connect sign  on the up right status bar of the LCD, thus you can surf the internet by browser. To close Ethernet, just click ON/OFF to switch it to OFF.

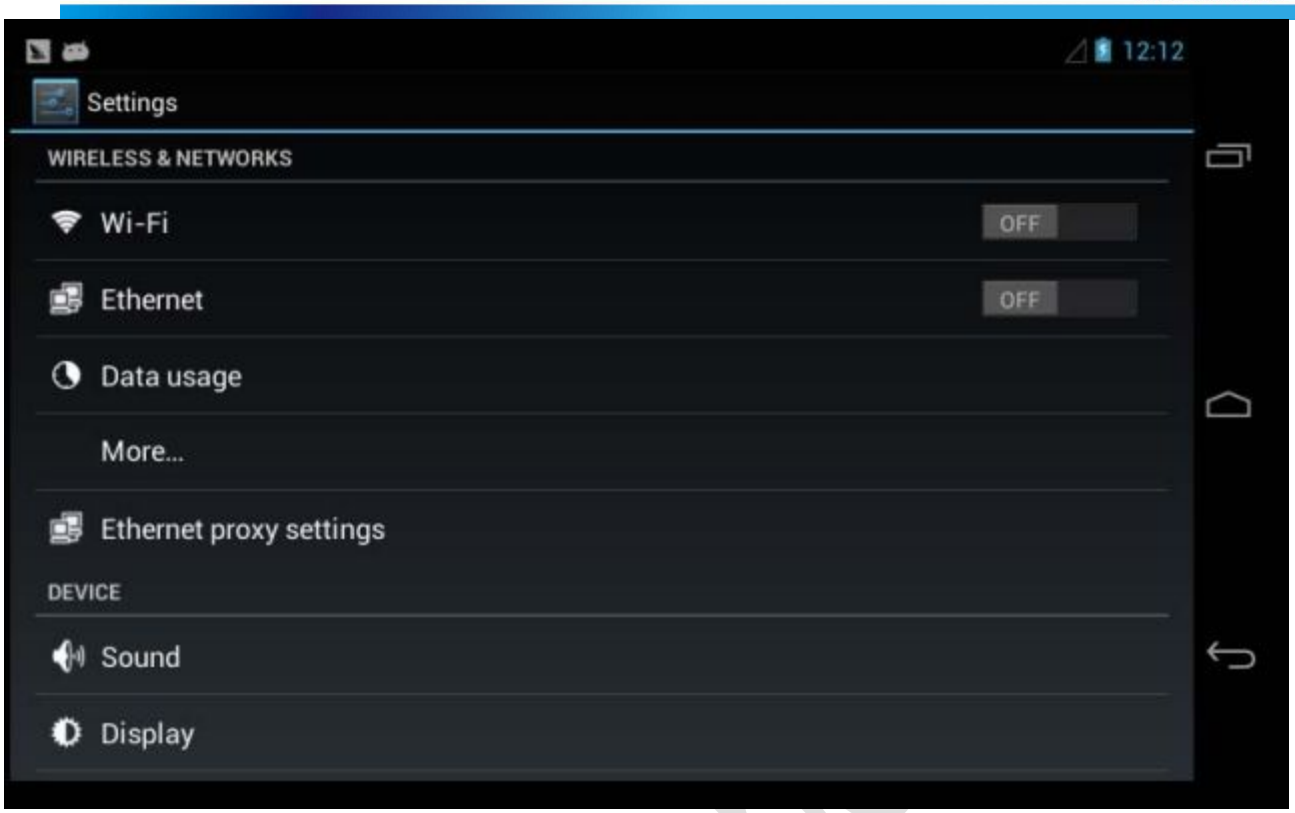


2. If need agent network, please click “Advanced Setting” to step into the setting interface

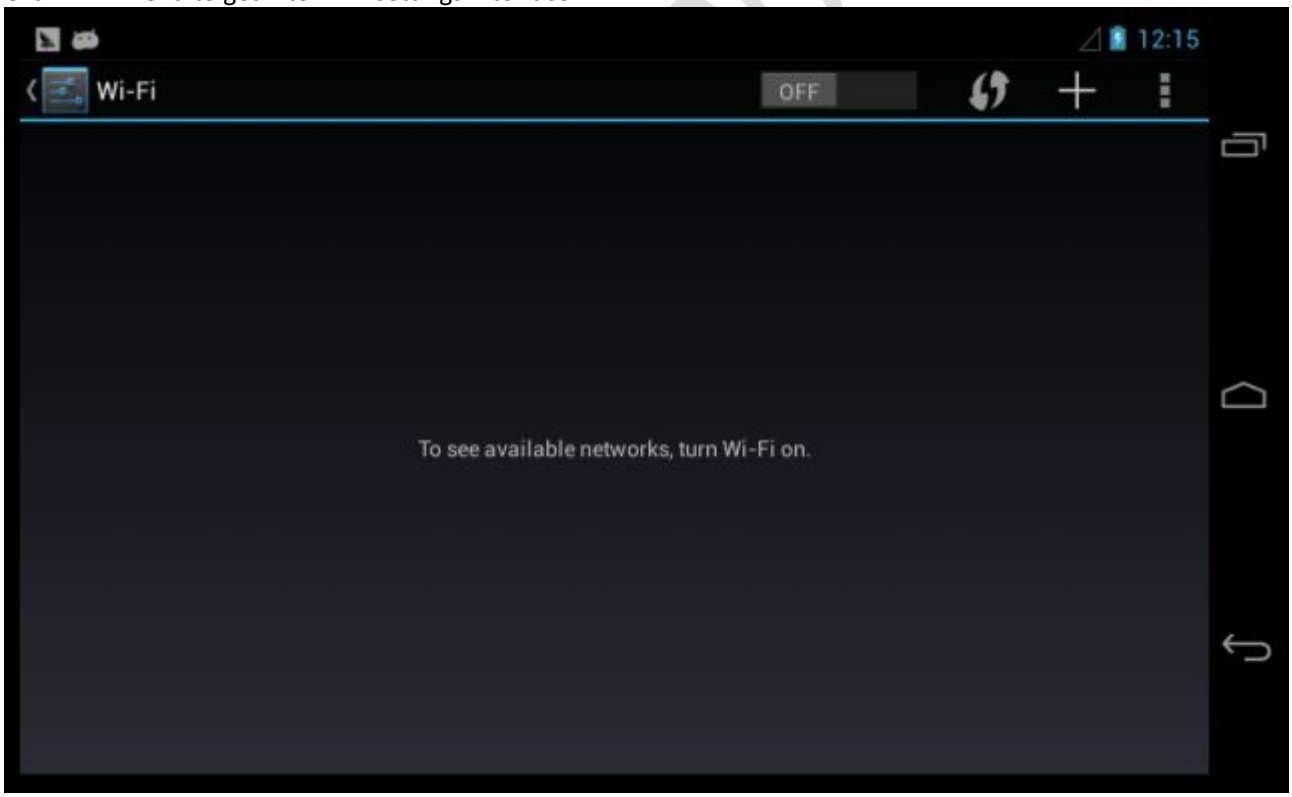


3.12 Android WIFI Testing

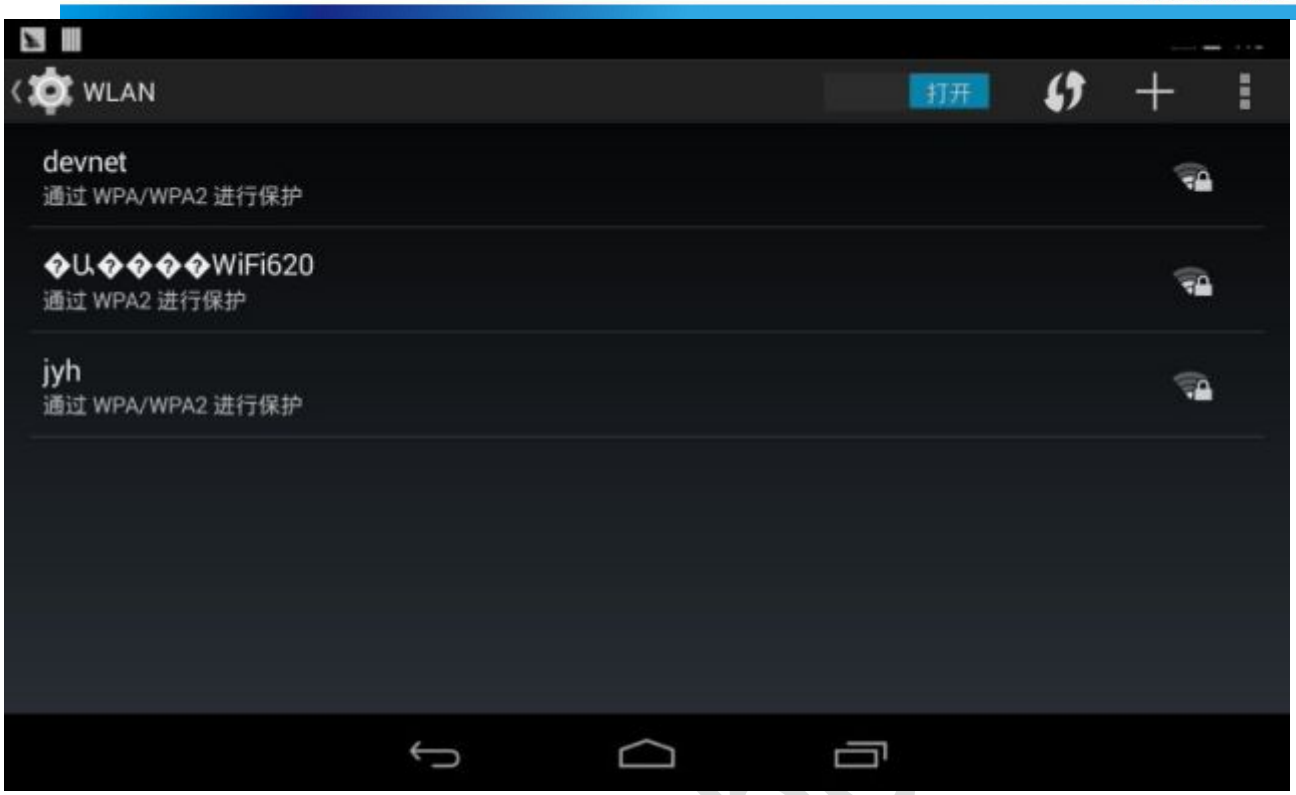
Plug WIFI module into single board computer, select  -> settings to get into below interface:



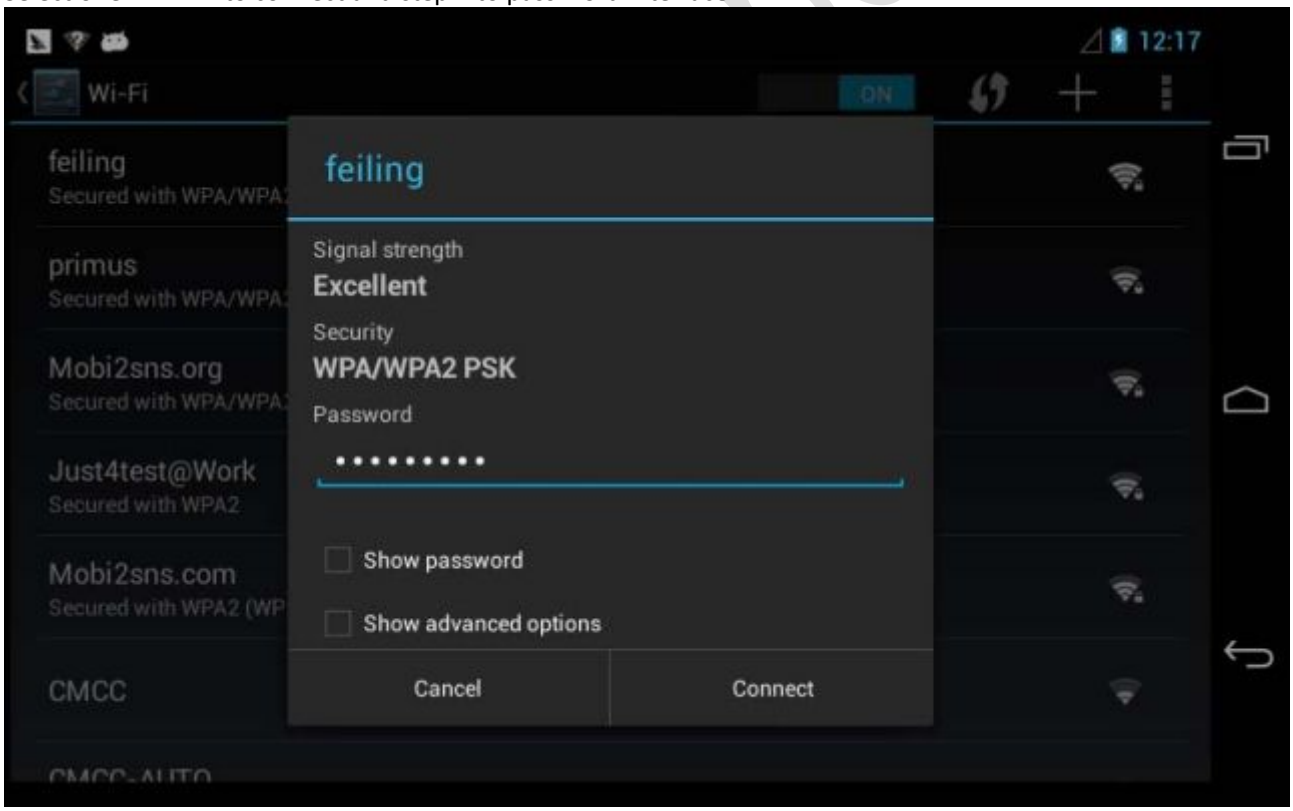
Click WIFI menu to get into WIFI settings interface



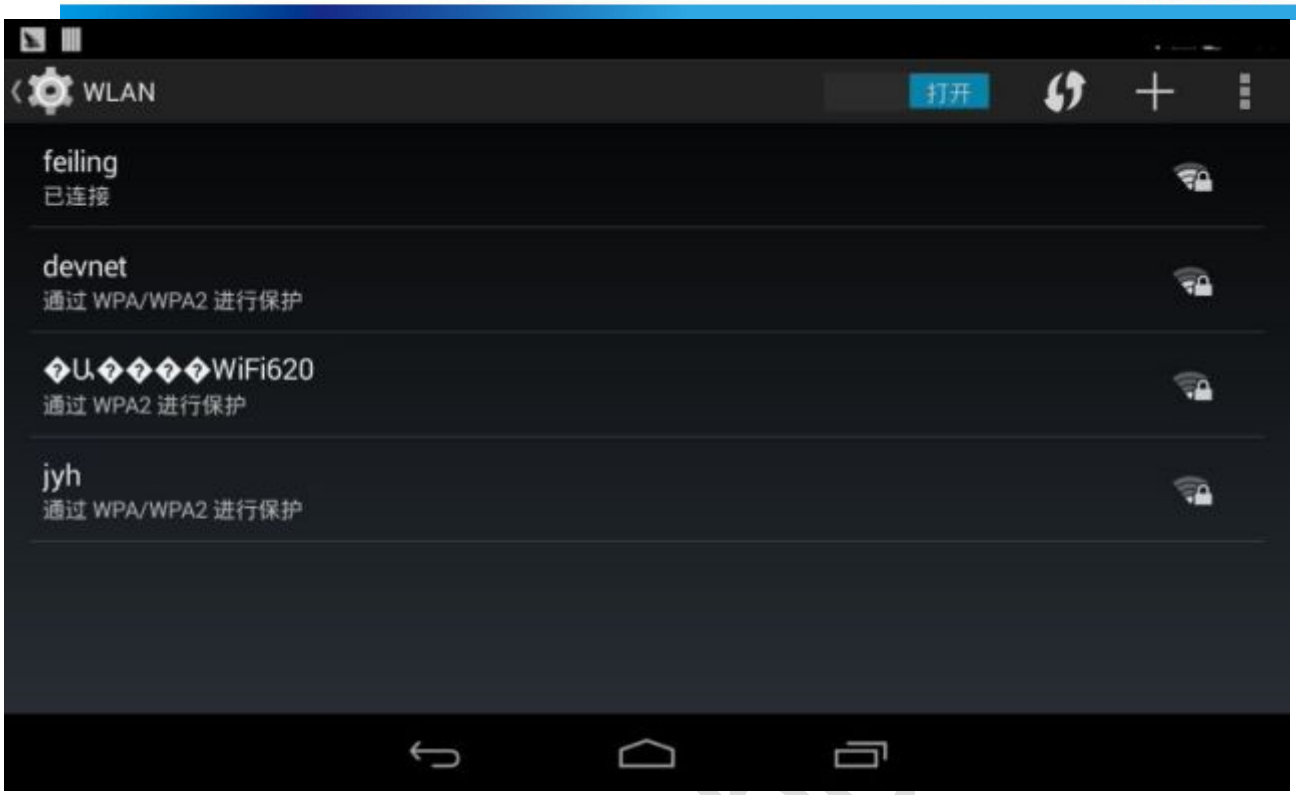
Click ON/OFF on up right corner of the screen, step into ON status to open WIFI, the searched AP will be listed on the screen



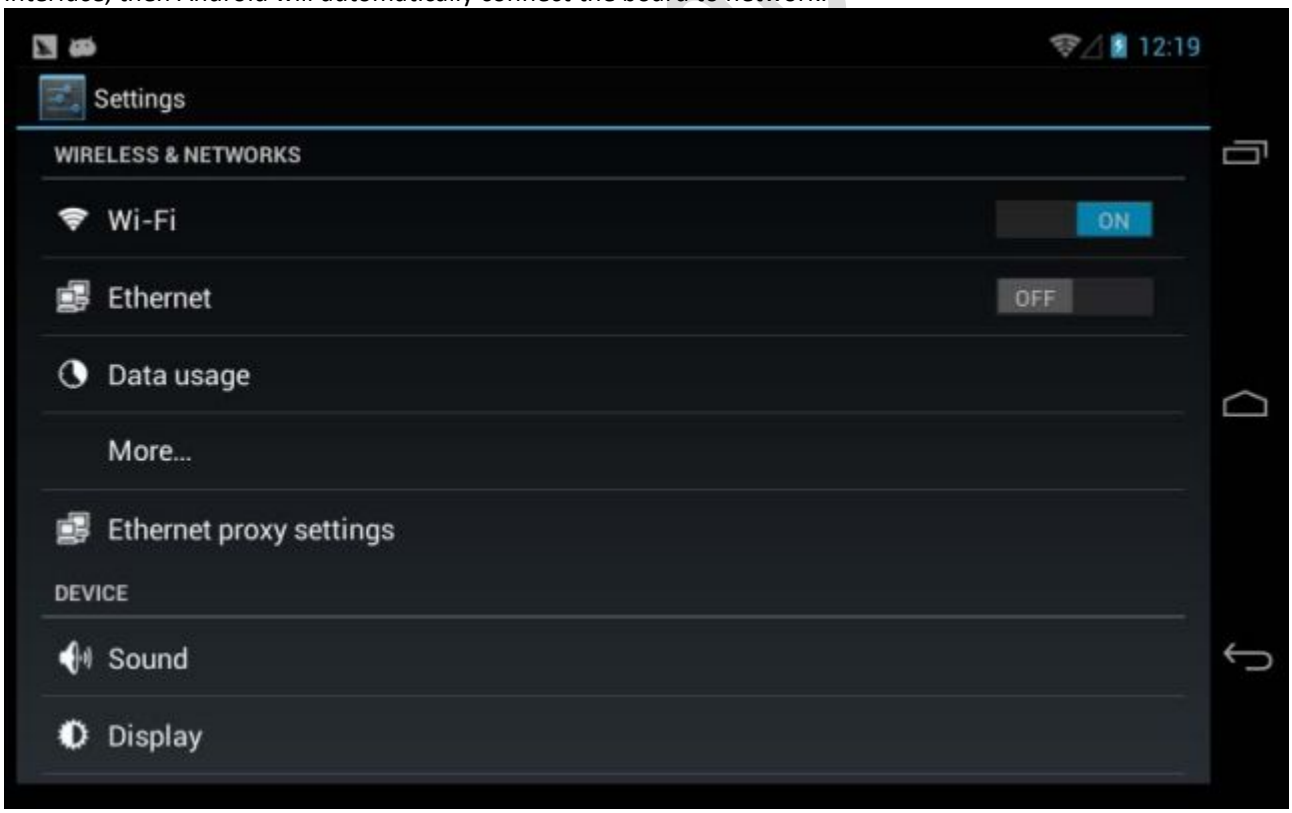
Select one WIFI AP to connect and step into pass word interface



Input pass code and click connect, if connection is done, the status will be shown as below, now the network application is available.



The system will remember the pass word of the connected WIFI AP, users could switch ON/OFF on the settings interface, then Android will automatically connect the board to network.



Network signal status could be shown on status column.

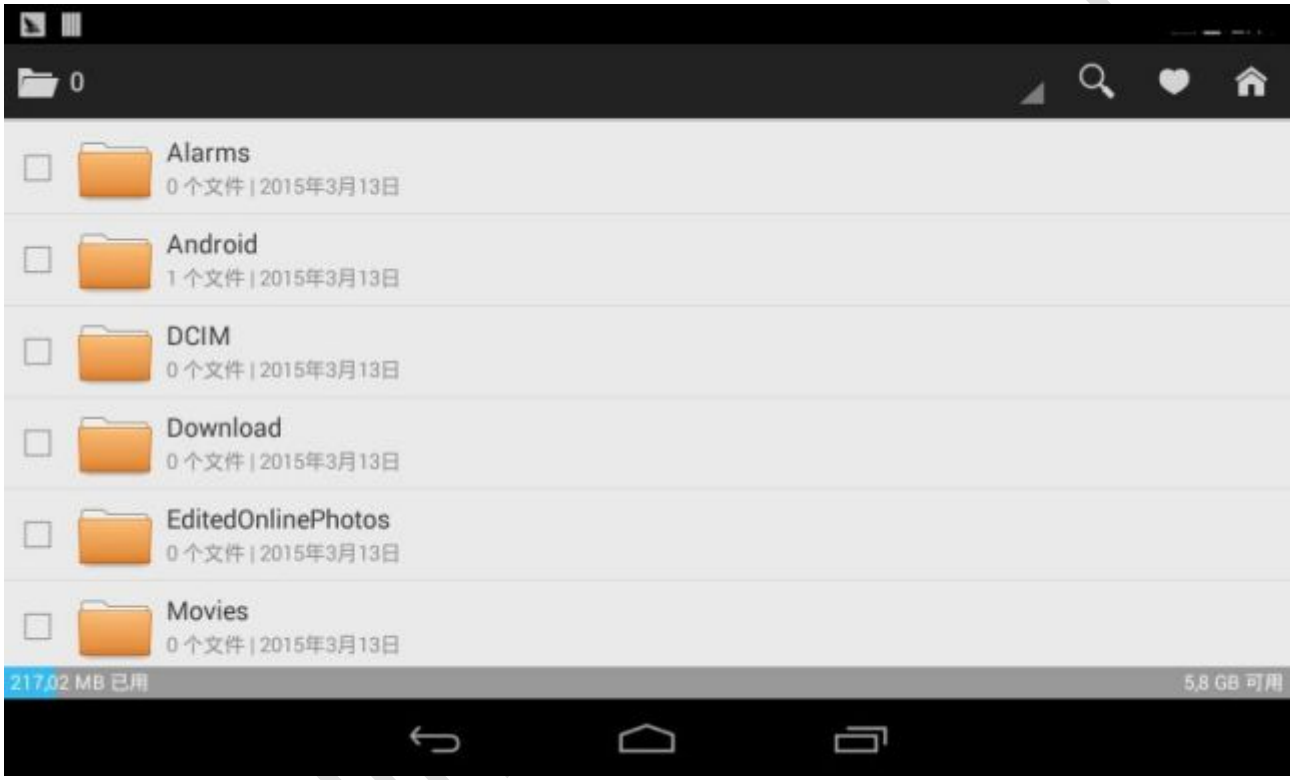
3.13 Android User Keys Testing

User keys K1 to K3 are available on the board
In Android4.4, K1 is for sleep waking, K2 is for volume+ and K3 is for volume -.

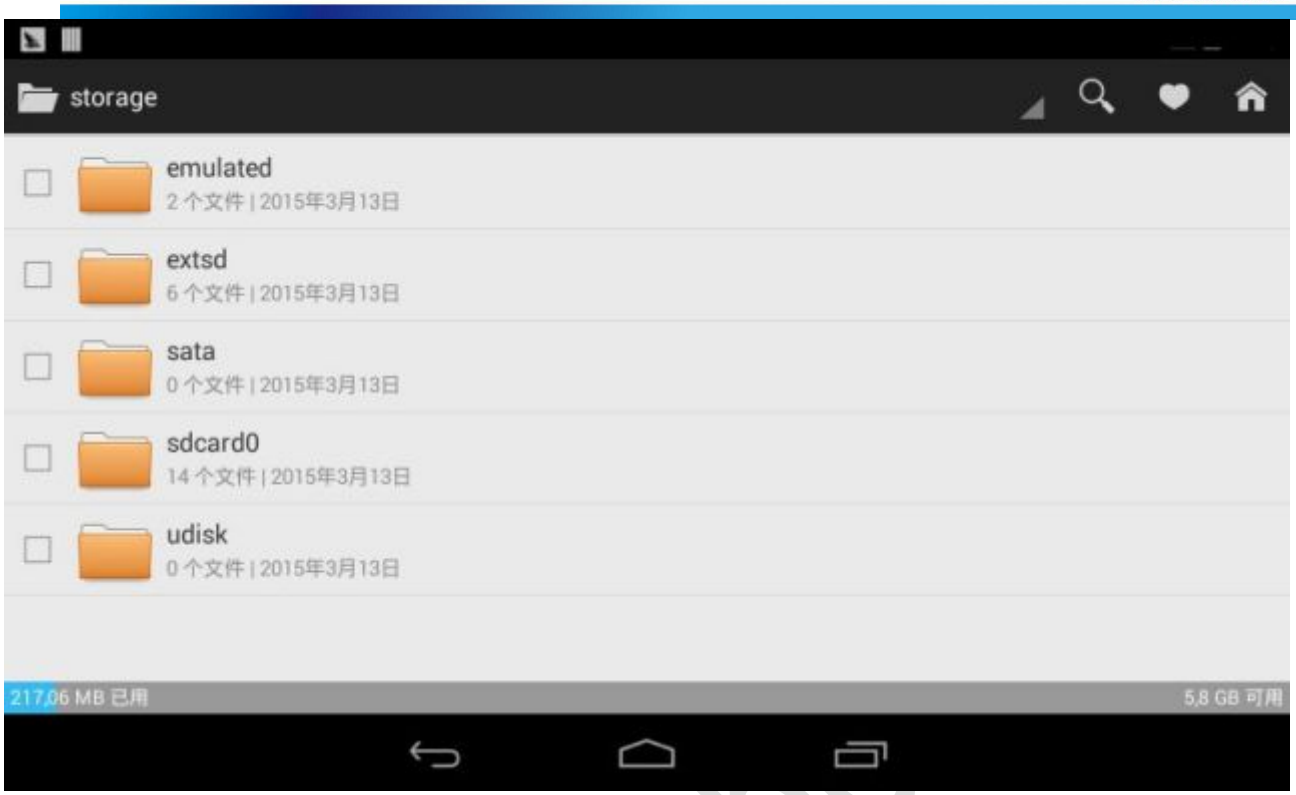
3.14 Android SD Card Testing

This test is for Android4.4 SD card testing

Select as “ ” -> “ ”



“sdcard0” is a analogy SD card by the left emmc of Android; “extsd” is the real SD card mount point, datas saved in external SD card could be seen in this folder.
Select “extsd” to see external storage directory nod built by Android.

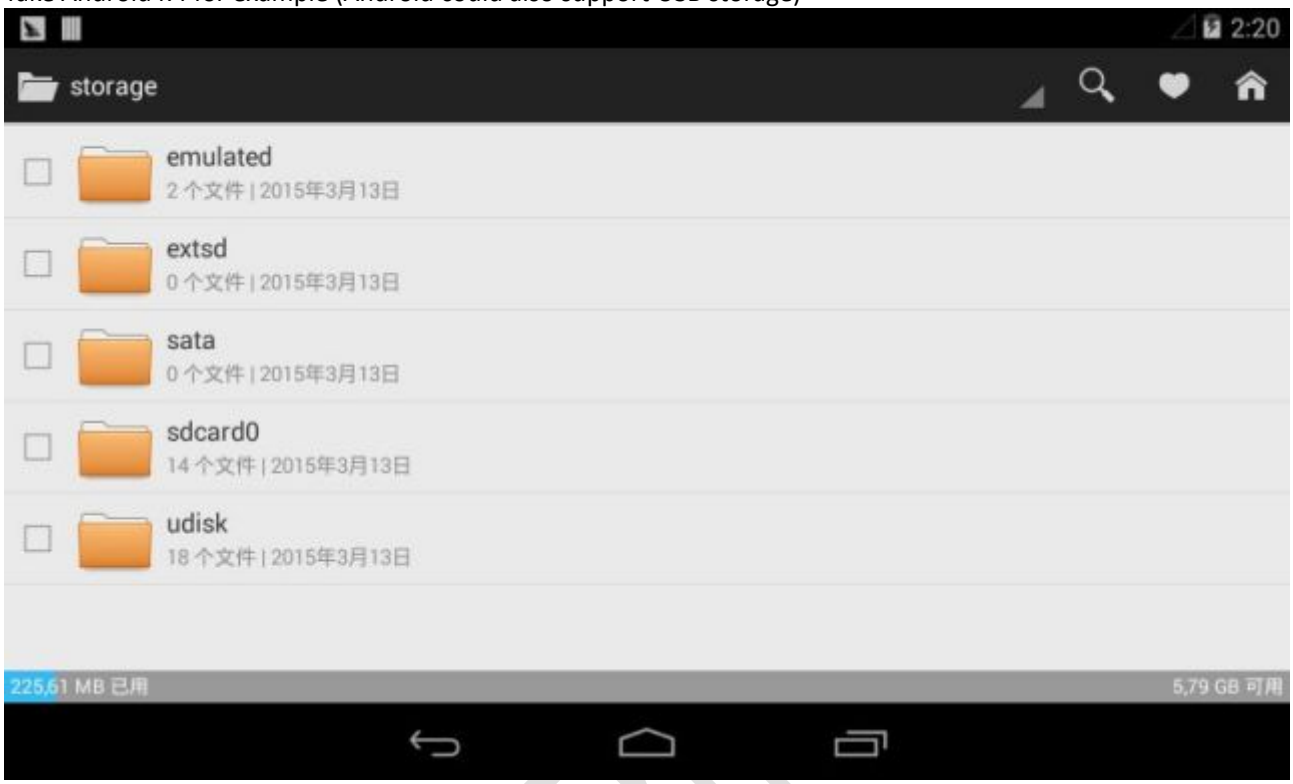


3.15 Android USB Mouse Test

After system running, plug USB mouse into USB host on OK335xD single board computer. USB mouse will be available after  appears, .

3.16 Android USB Storage Test

Take Android4.4 for example (Android could also support USB storage)



Select “udisk” to check datas saved in USB storage.

3.17 Android Watchdog Testing

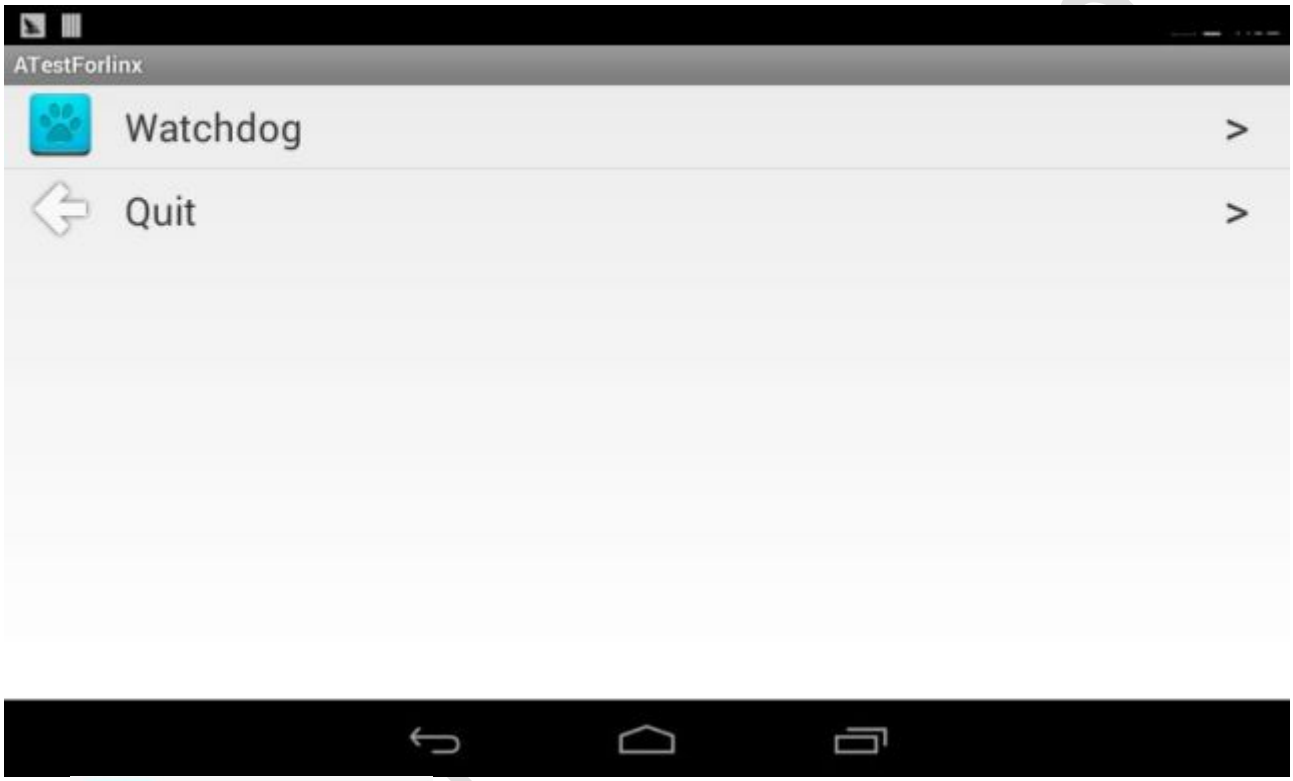
The iMX6 comes with Android hardware watchdog and Android system process guarding watchdog, they are in below folders

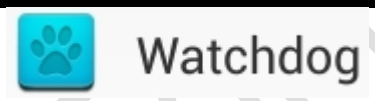
android_kk4.4.2_1.0.0/kernel_imx/drivers/watchdog/imx2_wdt.c

android_kk4.4.2_1.0.0/system/core/init/watchdogd.c

If users is going to user hardware watchdog, Folinx provided patch is available. When patch is putted, please recompile the whole android source code to generate image and flash, then below testing programs could be seen on the main interface.

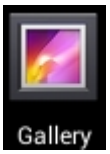
Select as “ ”-> “ ”.



Click 

to prompt the watchdog testing interface

Press the red button again to finish the recording

All the photos and recorded video are saved in 

Notice: USB camera could only be available for OK335xD with 1G NandFlash because of storage limited.

3.19 Watchdog Test

Select  -> 

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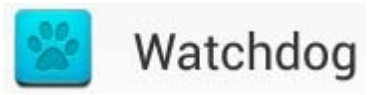
Click 

to prompt watchdog test interface

At first, please set the watchdog cycle in timeout interval(s), unit as second, and input range in 1~30;
Click “Start” to begin time counting down, when counting down to 0, please restart;
Click “feed” to feed the dog one time, when time counting down begins, please click “Stop”

3.18 Android Serial Port Test

There are 4 serial ports on the iMX6 named as uart1-debug, uart2, uart3, uart4. uart1-debug is for debugging and no need testing.

1) Uart3, TTL, with pin interface, device name is /dev/ttymxc2;
2) Uart2 is for GPS;
3) UART4 is multiplexed with RS485

Steps are as below:

1. Power off the board, connect the flat cable with TTL to RS232 module, and connect the other terminal of the TTL to RS232 module with PC

Select “  ”->“  ” , click RS232 to see following interface.

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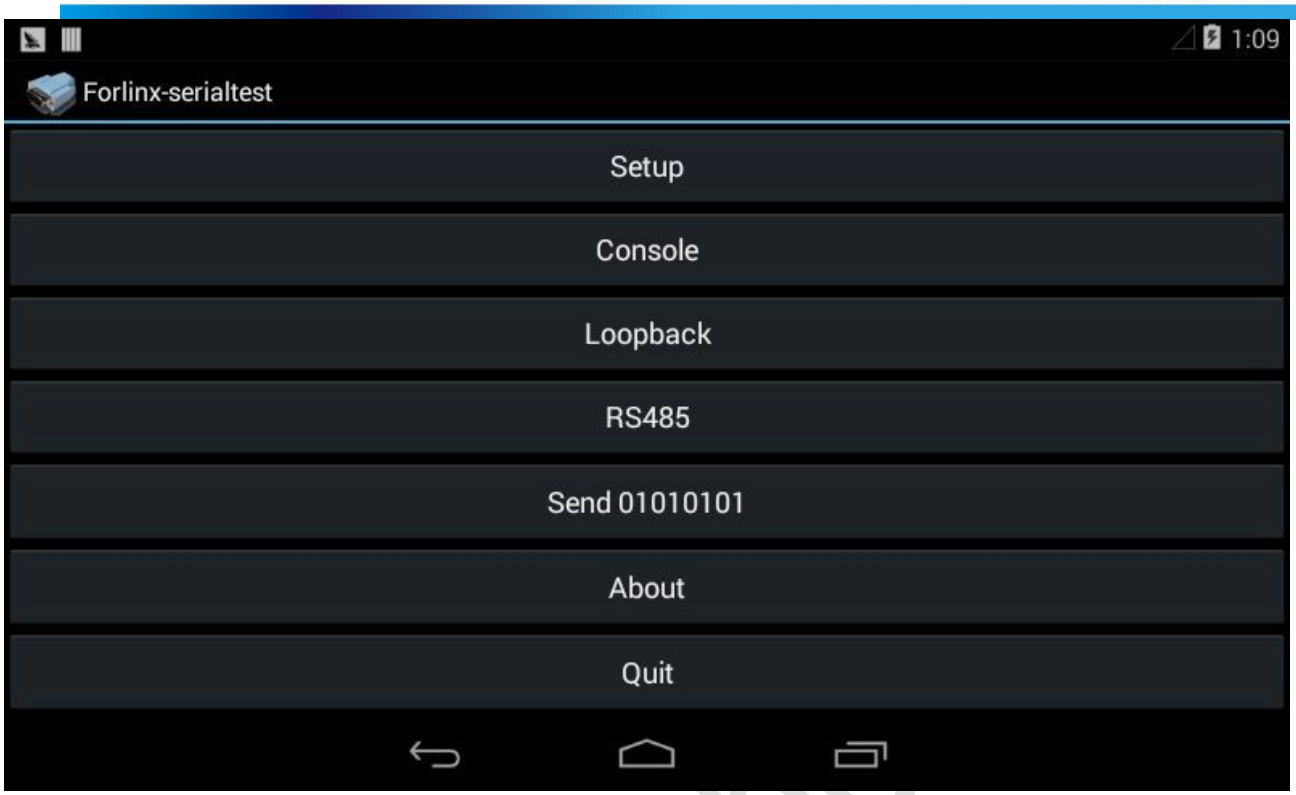
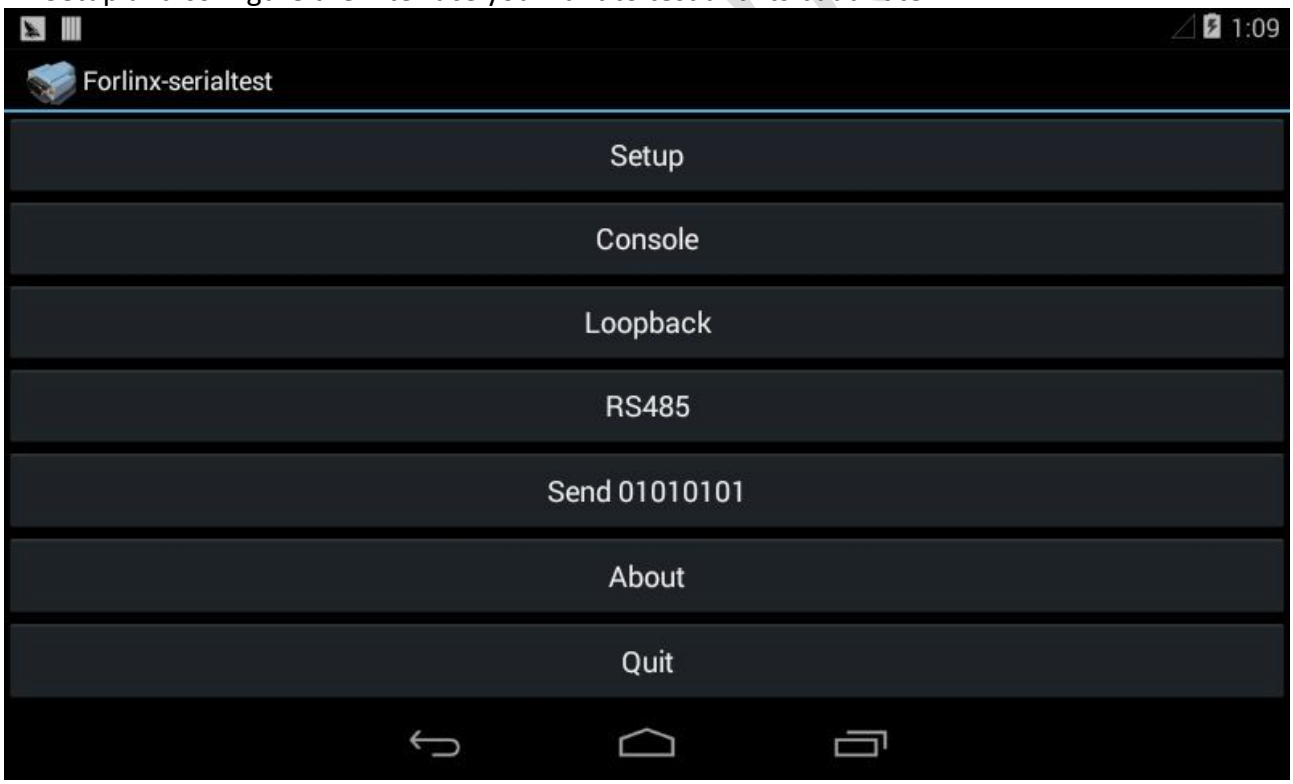
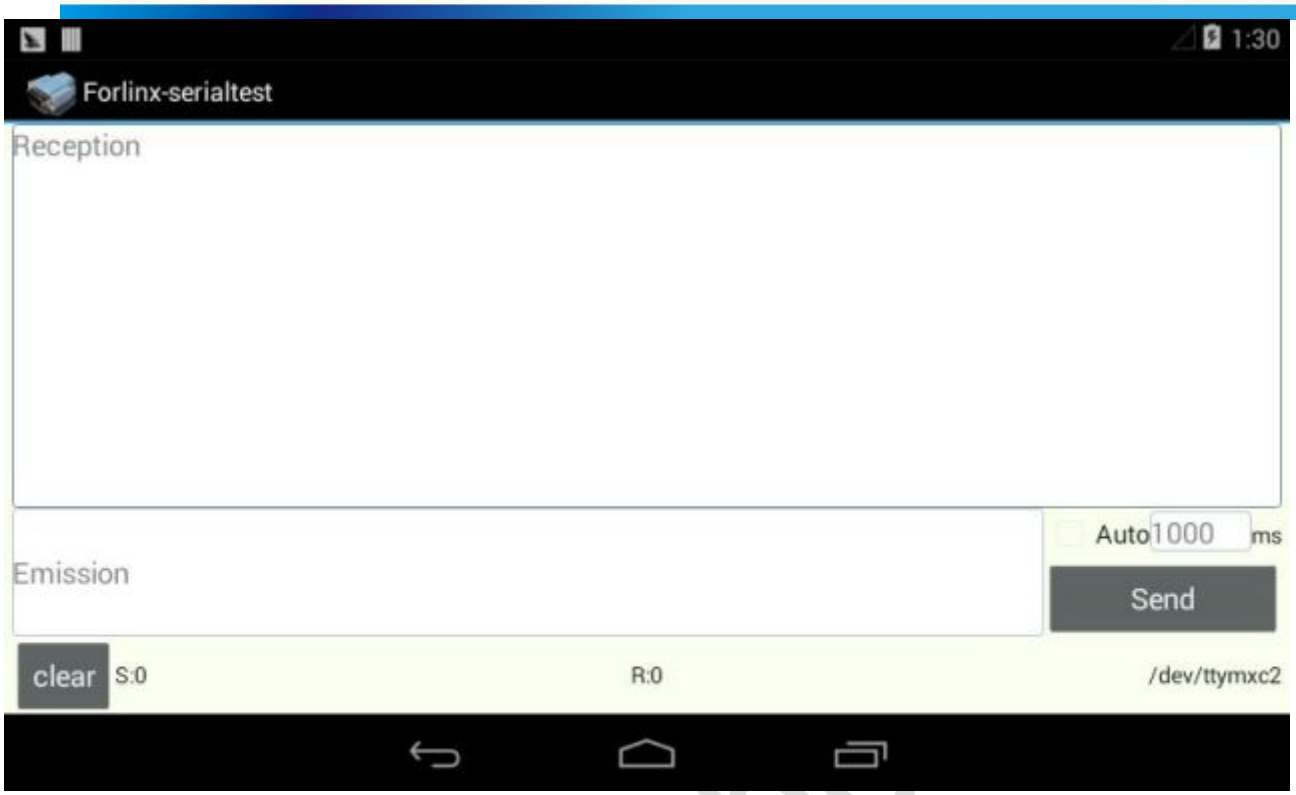
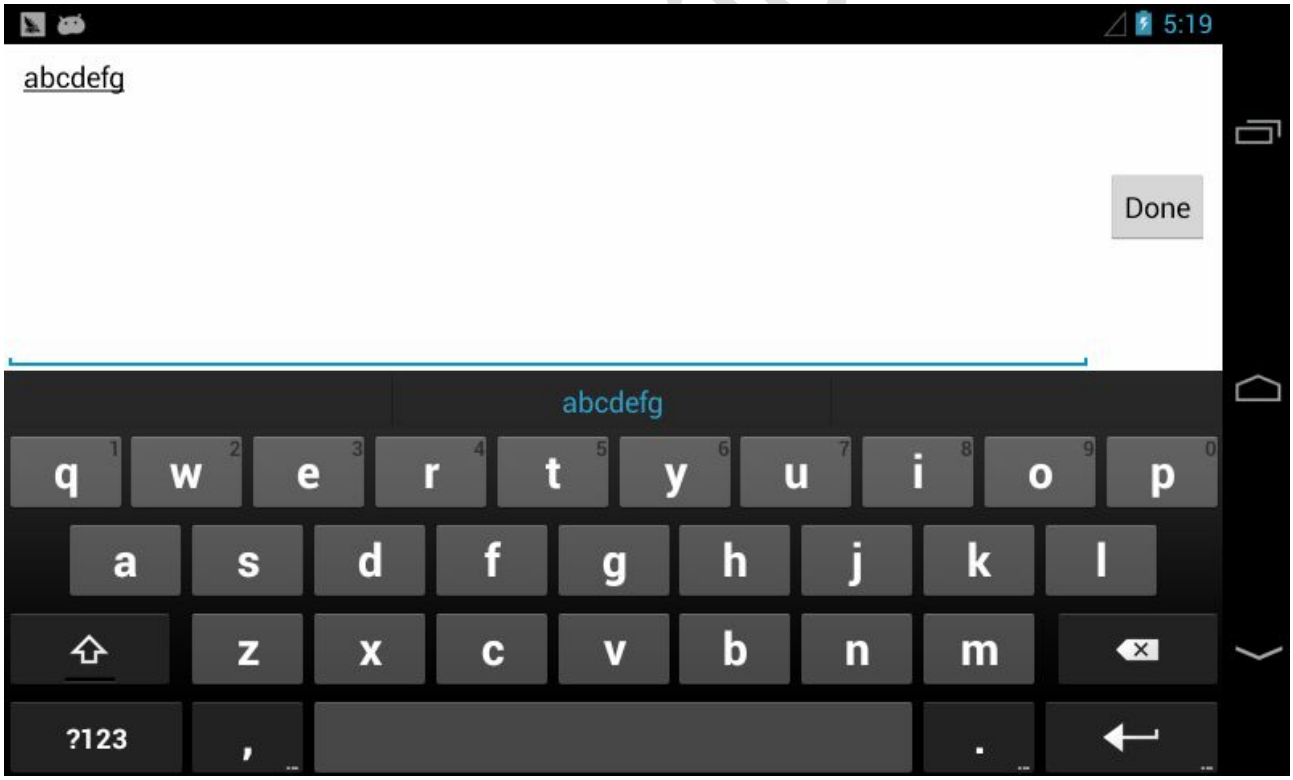


2. Setup and configure the interface you want to test and its baud rate



3. Click Console



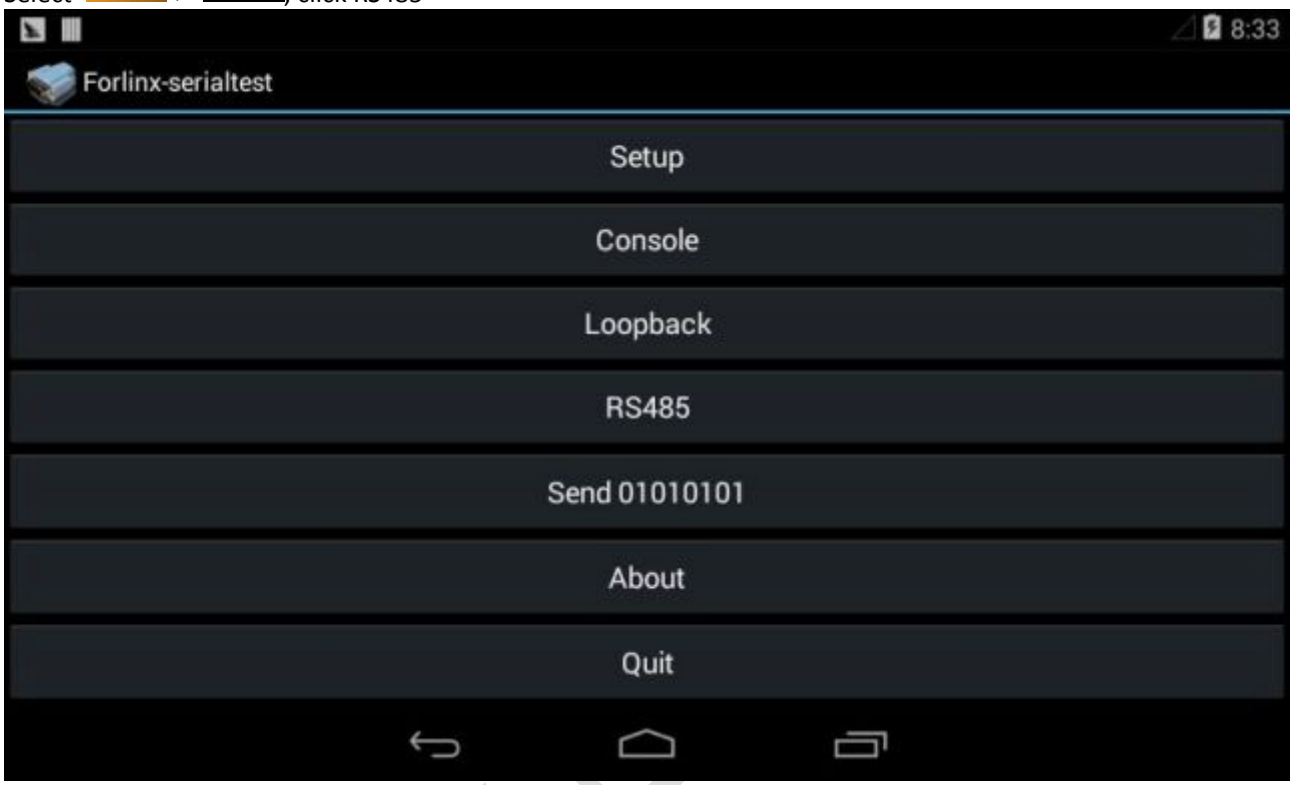


Input words in the word column, send and receive as ASCII characters. Input message in the sending column and click Dong to send it. The the data will be sent out by serial port. When the serial port receive it, it will be shown in the receiving column.

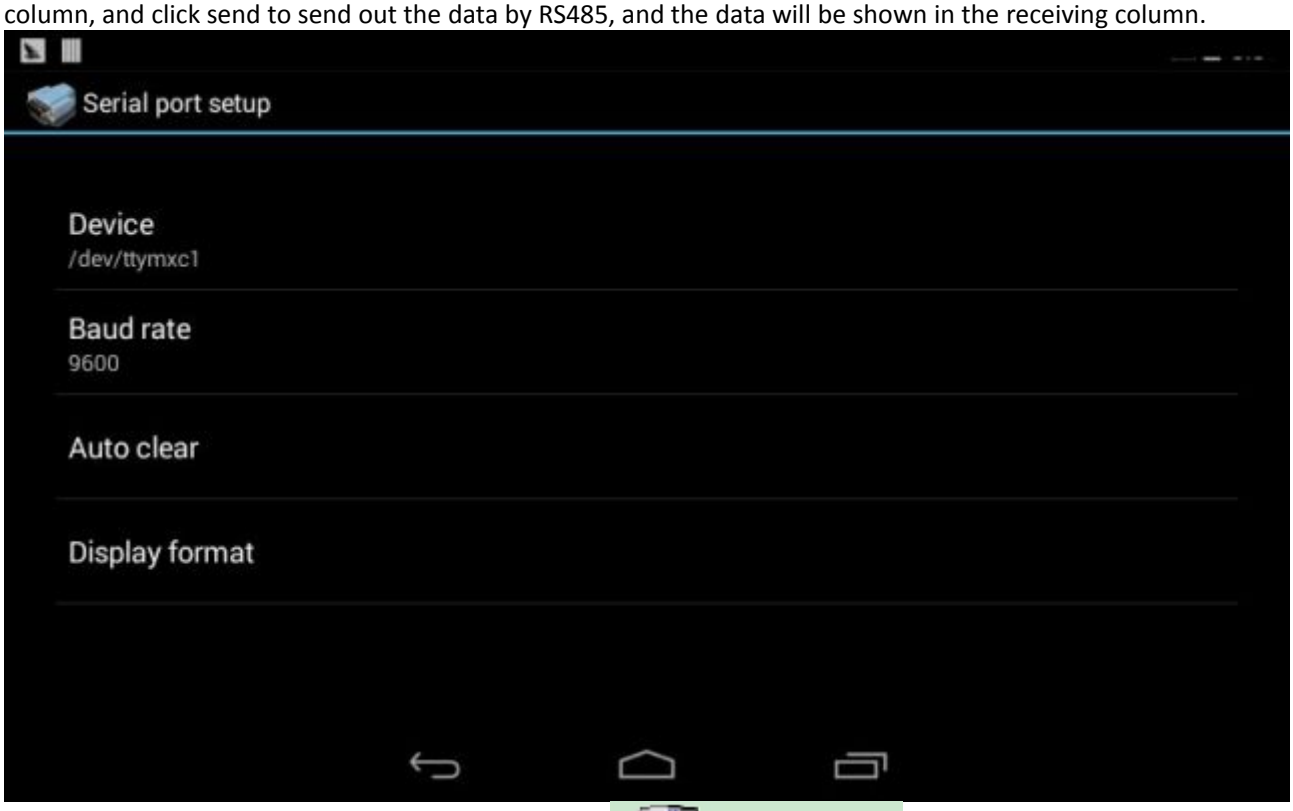
3.19 RS485 Testing

Connect a RS232 to RS485 module to single board computer iMX6. Connect as A+(RS232 to RS485 module) with A(single board computer iMX6), B+((RS232 to RS485 module) with B(single board computer iMX6).

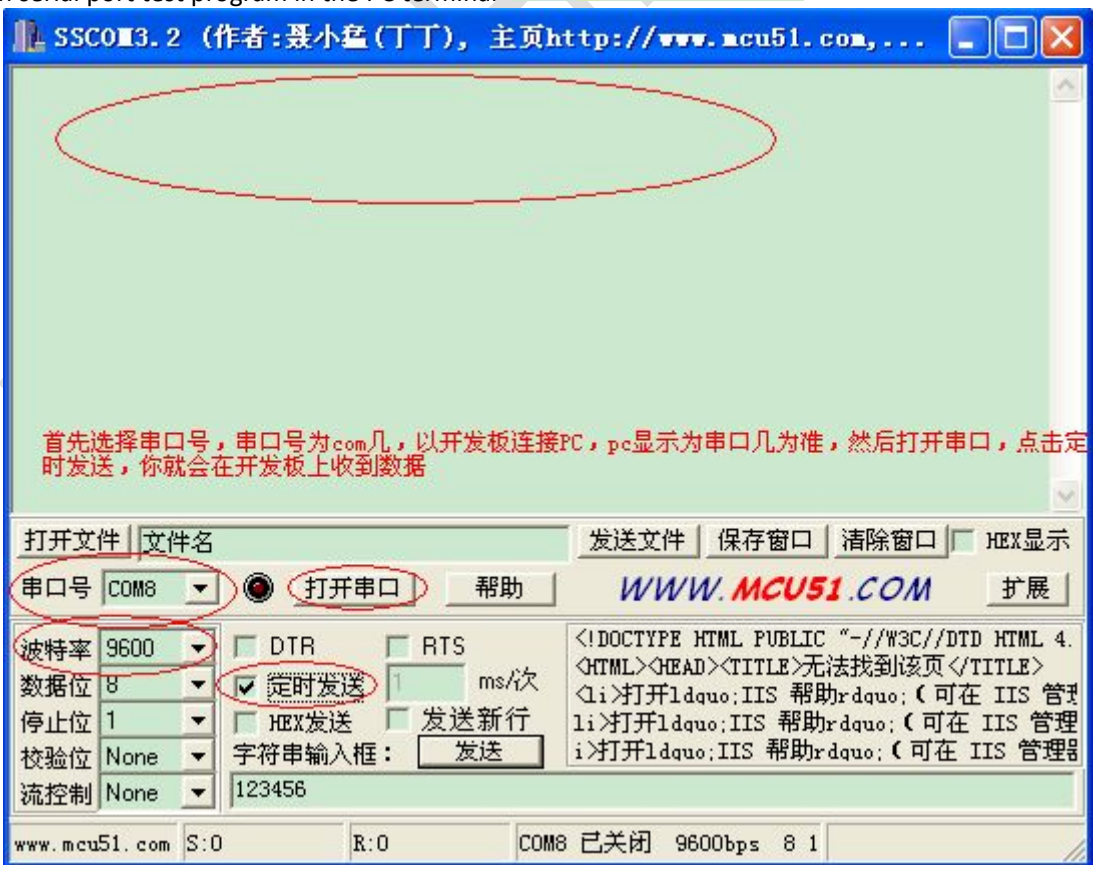
Select  ->  , click RS485



Device number matched with RS485 is ttymxc1, set the baud rate and send/rec mode. Input words in the sending column, and click send to send out the data by RS485, and the data will be shown in the receiving column.



PC : open serial port test program in the PC terminal



3.20 Android Bluetooth Testing

Bluetooth is supported by i.MX6 with OS Android4.4.2, all sen/rec data is to be save in SD card, please make sure the board is with SD card when doing the test.
Notice: hot plug is strictly prohibited during the operation of USB bluetooth, please plug in the USB bluetooth device before powering on the board)

Select  -> “Settings”-> “Wireless & networks” -> “Bluetooth settings” to get the bluetooth main interface

Set the press button to on, start the bluetooth device, click “searching nearby devices”

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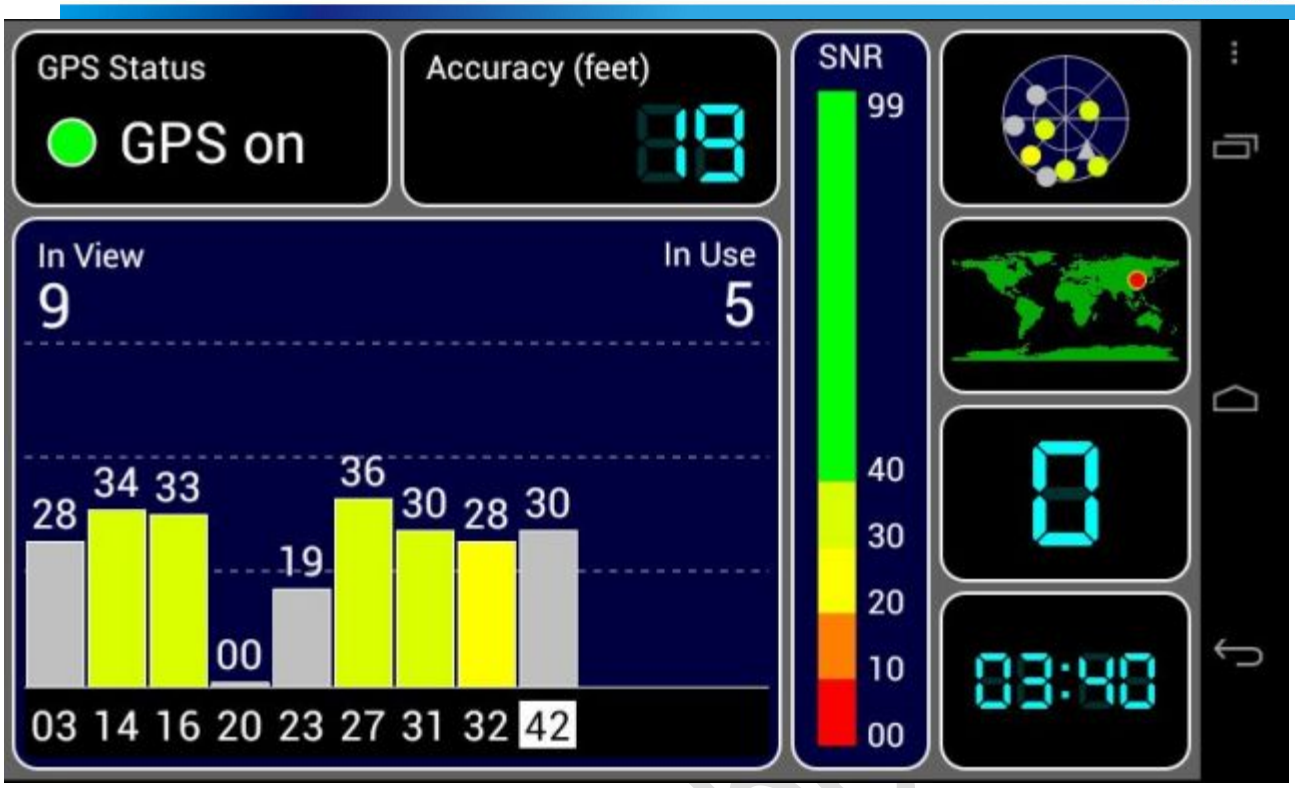
Click  on the right corner, users could rename the tablet, do detection over time settings, showing received files, here we take clicking “Mi cell phone” to match for example

The device and cell phone will show encryption key at the same time, if the showing are the same, then they are matched, then click to match .

3.21 Android GPS Testing

The i.MX6 is supported with GPS module VK1613 from Forlinx. Power on the board.
Please install the GPS APK to check your positioning information, and also the map could be successfully related.
Below are results from two different GPS application software



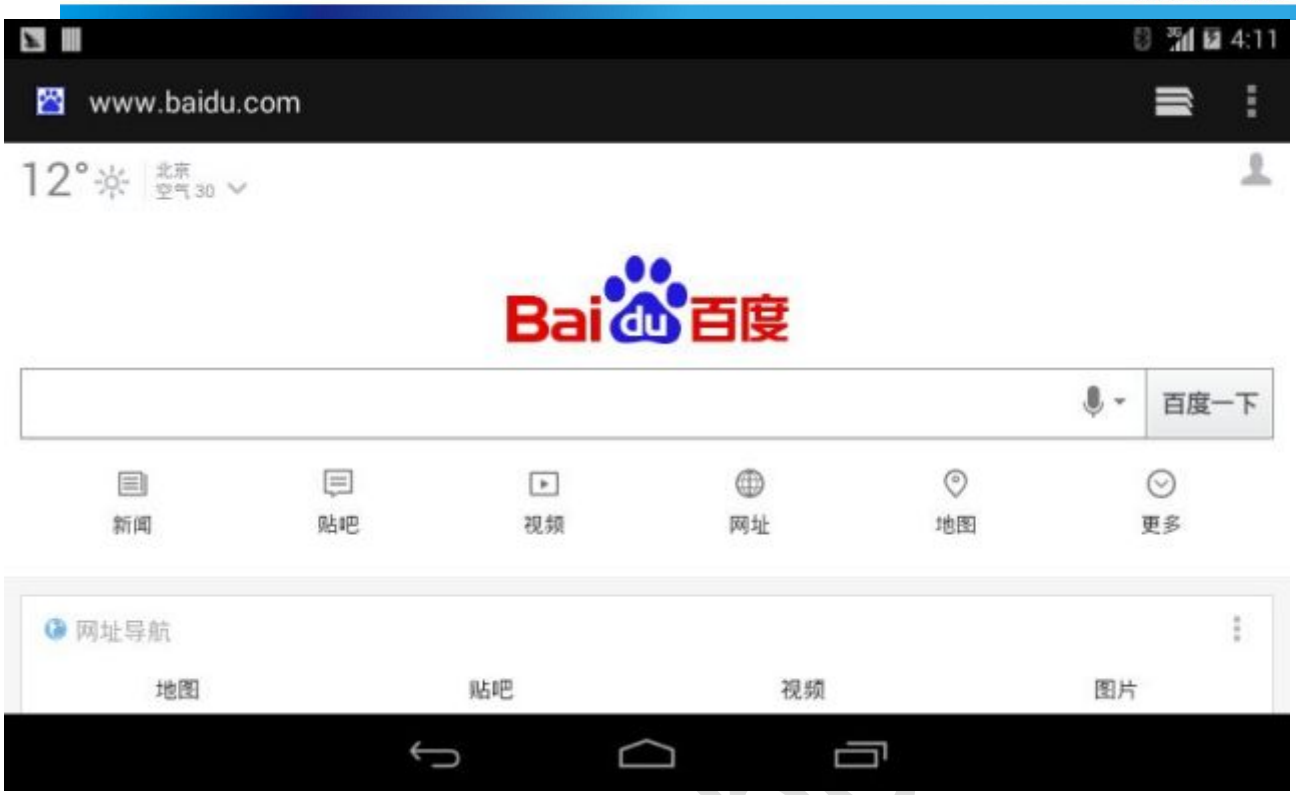
Notice: the positioning function is active by default in settings, if to close the whole Android positioning function, please step into Settings->Location access to close it.

3.22 3G Testing

ZTE MF210 (WCDMA) module with 3G dialing network is supported by the iMX6 by China Union 3G network.
Settings->> wireless and network->> more->> mobile network, select “open data throughout”

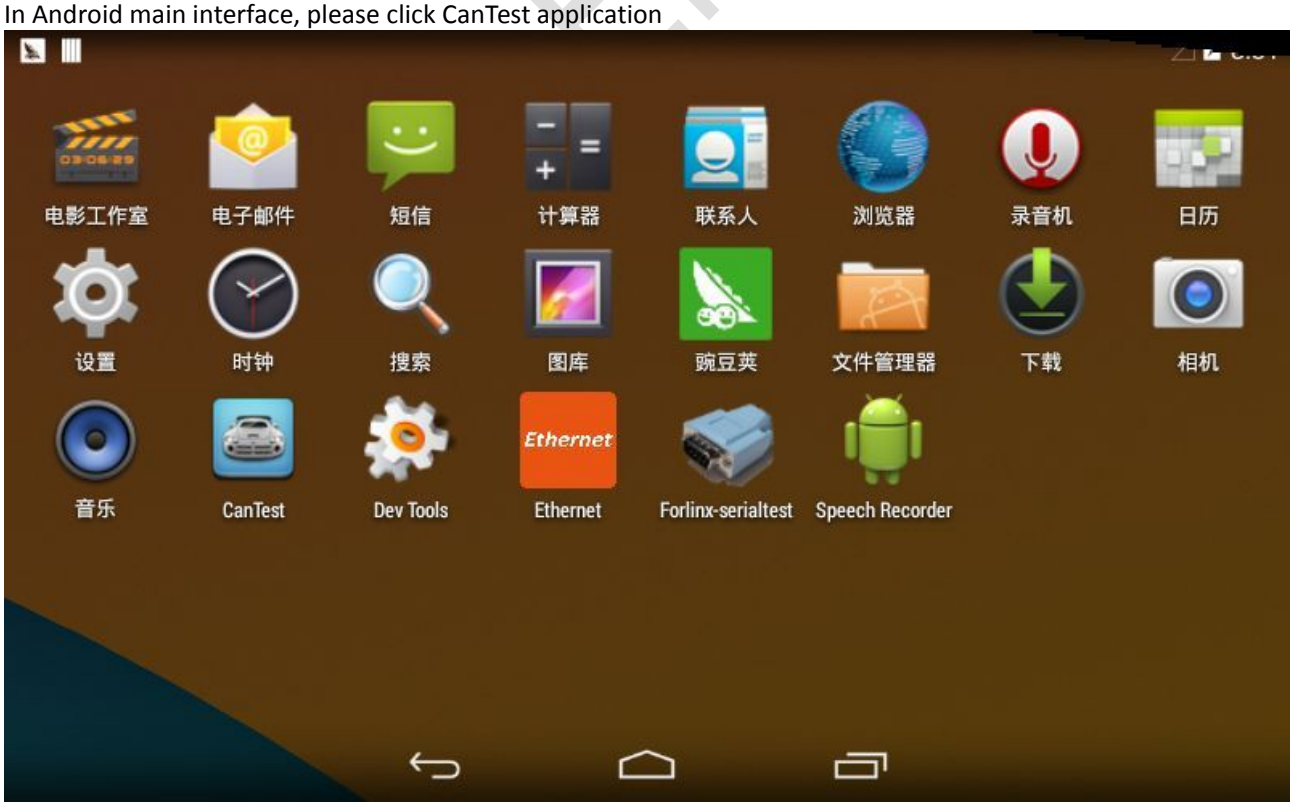
And the 3G signal will be shown on the right corner of the screen as below.

Then you can surf the internet

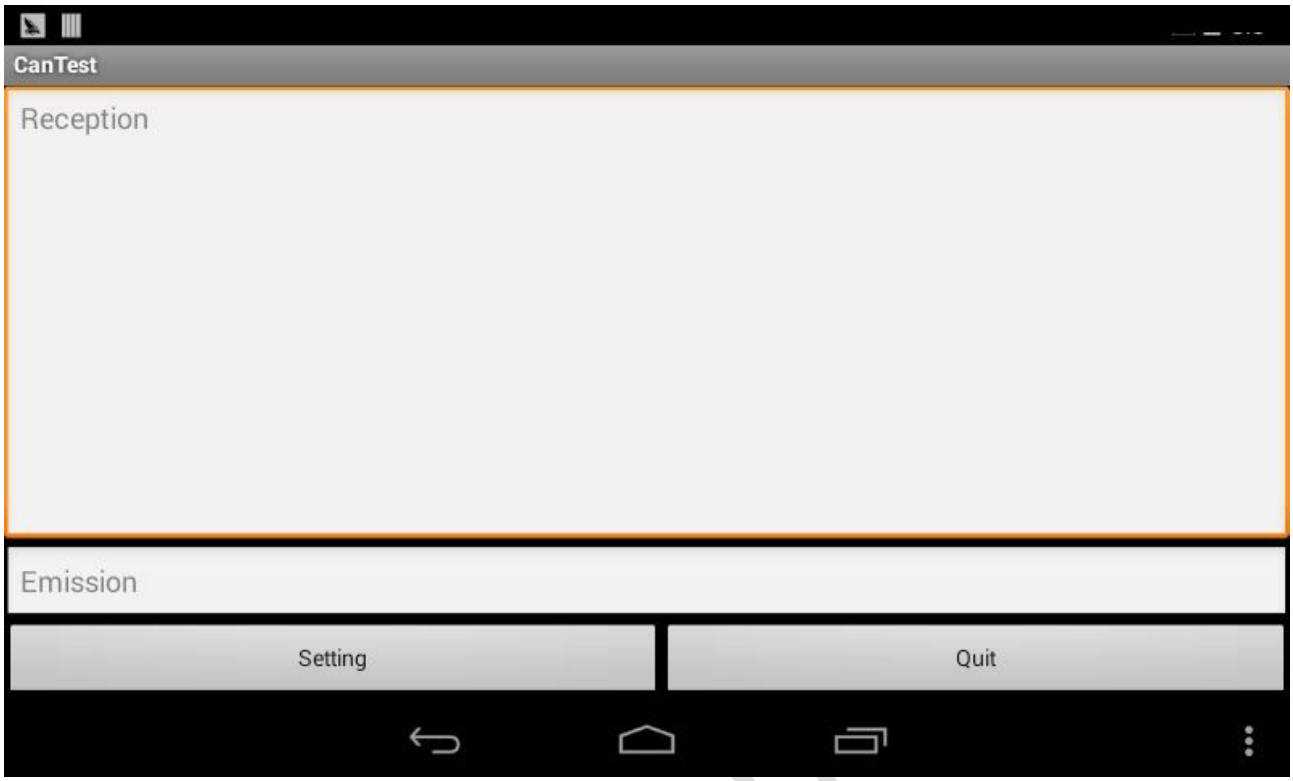


3.23 FlexCan Testing

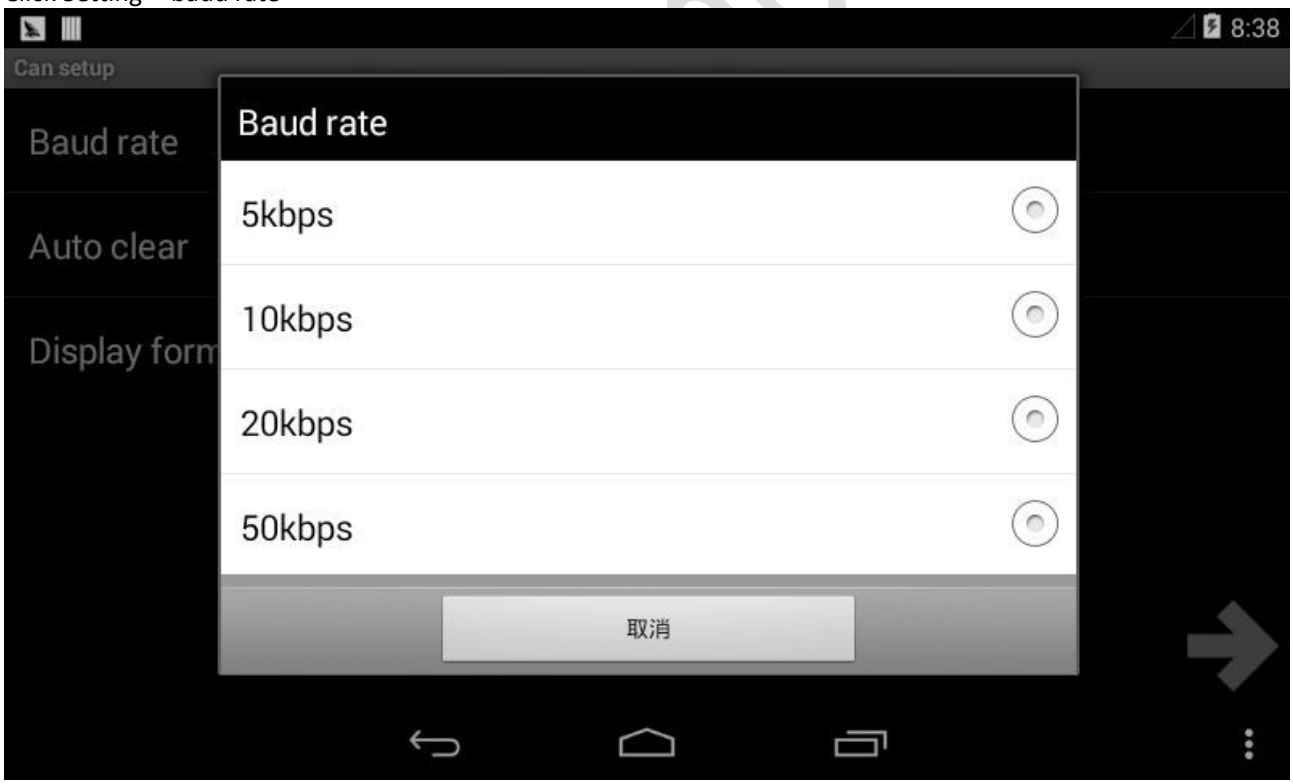
Before tesing, please connect CAN device to the board, here we take two boards to do the test.
In Android main interface, please click CanTest application



Can test main interface is as below



Click Setting-> baud rate



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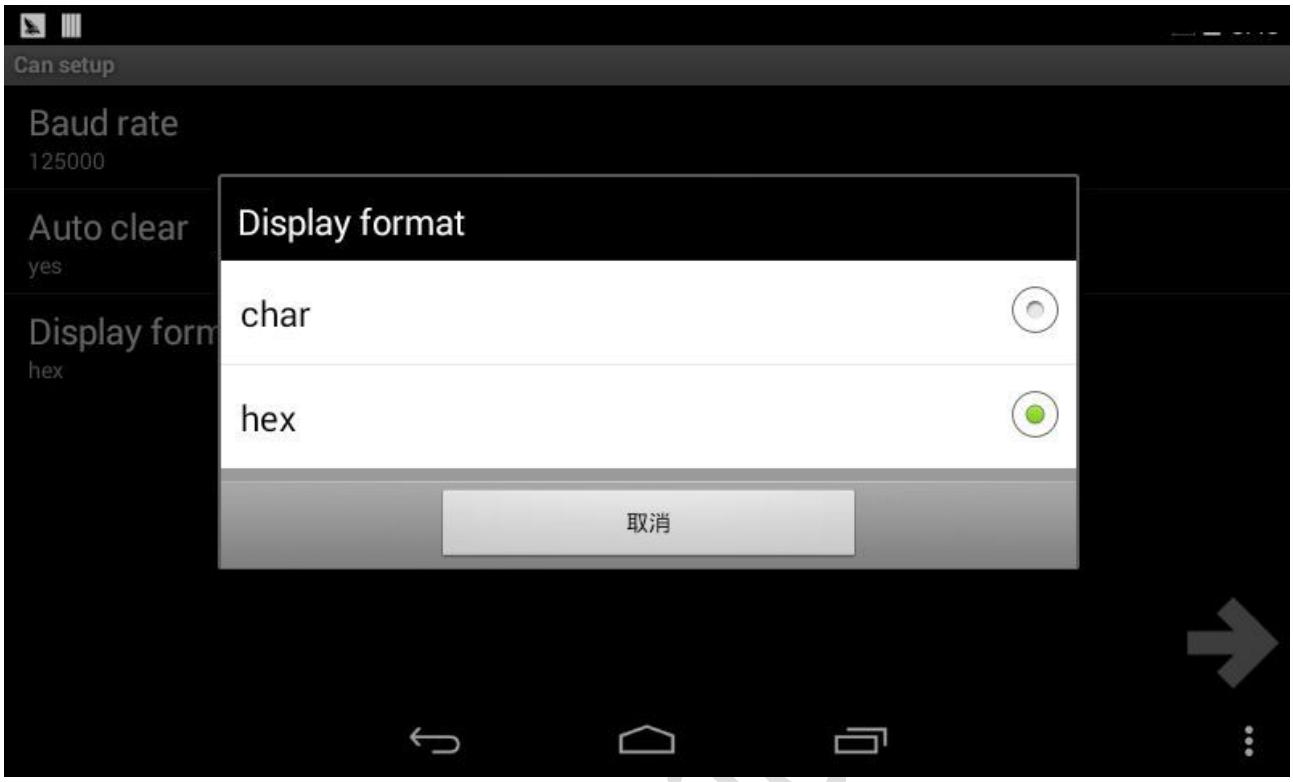
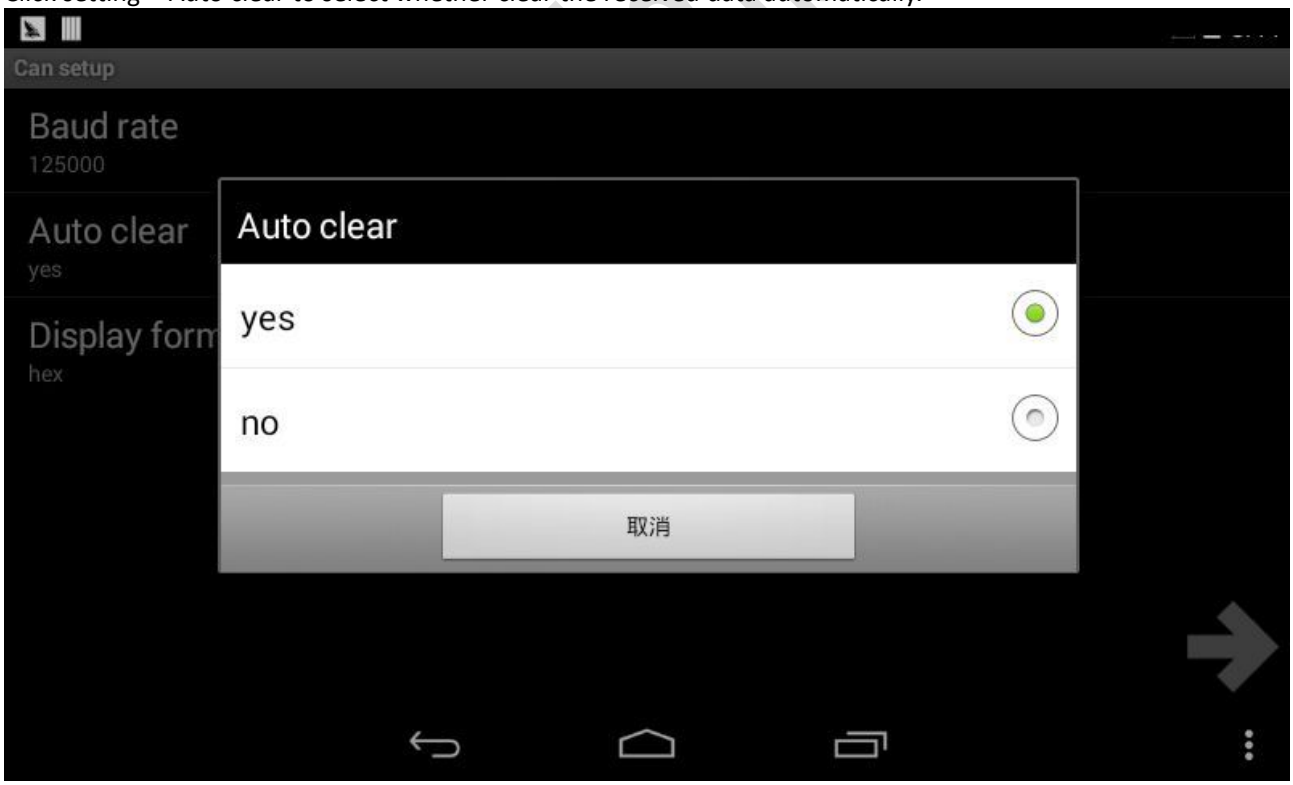
Click setting->> Display format



Click setting ->Auto clear to select whether clear the received data automatically.

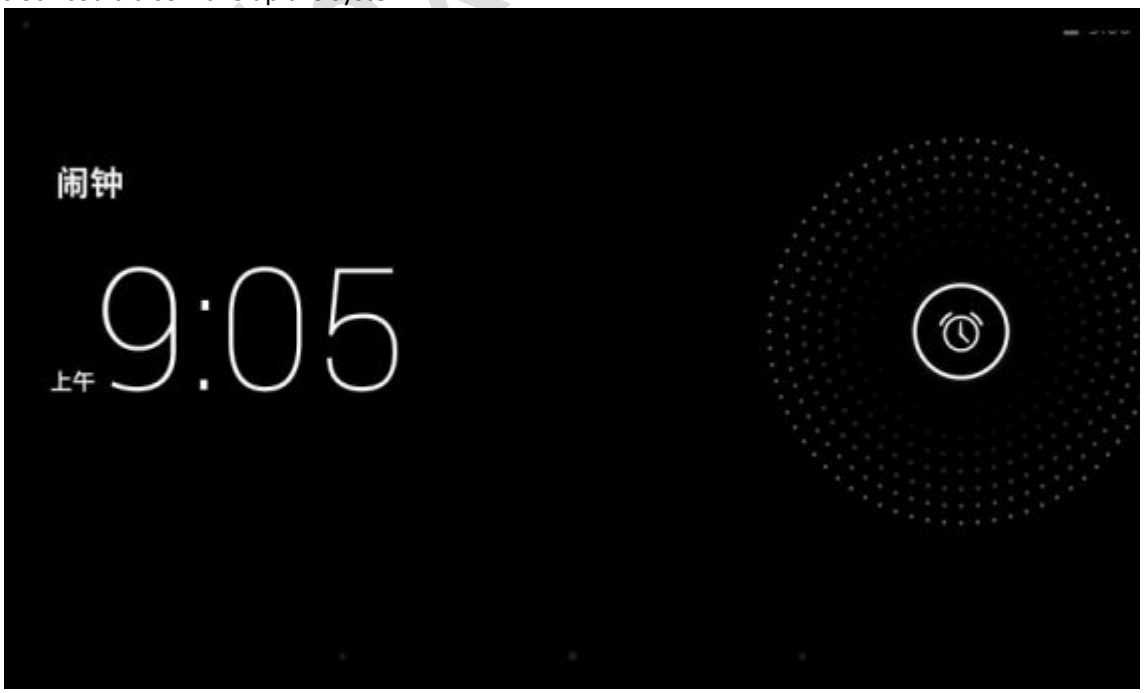


Input in Emission sending column to send data, and the data from other devices will be shown in receiving column

3.24 Sleep Waking Up Testing

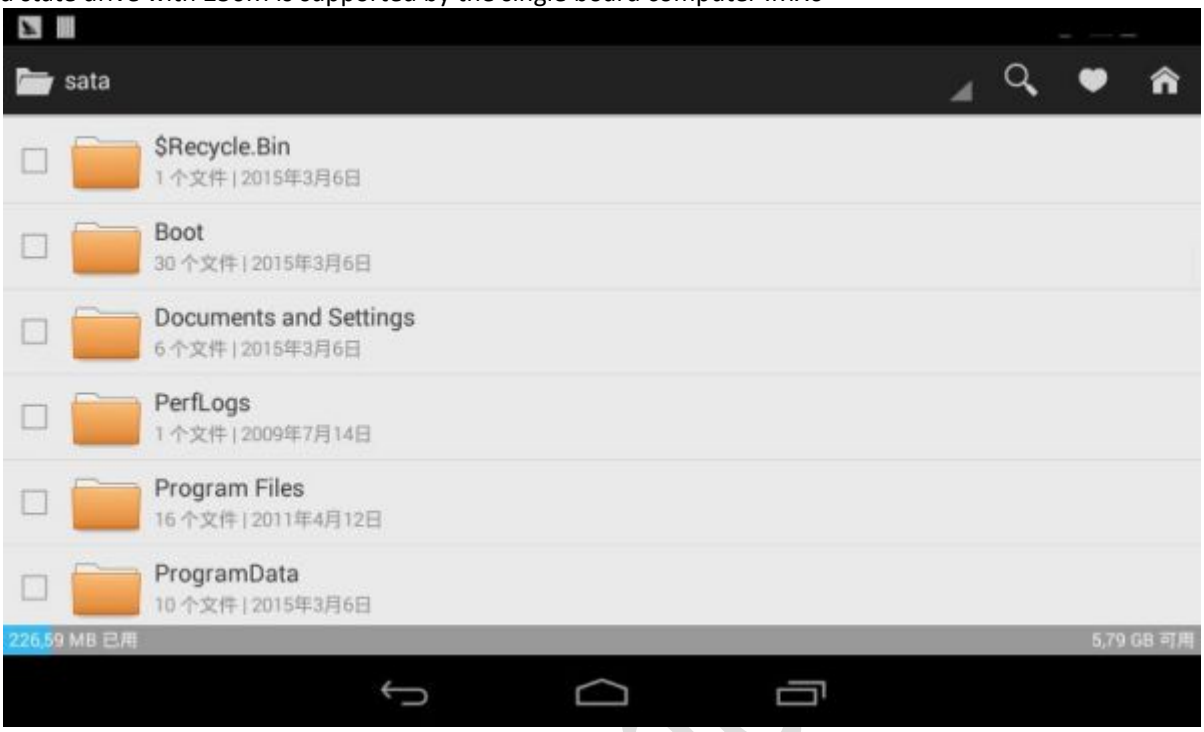
Android sleeping could be user active sleeping and system auto sleeping. User active sleeping means users positively press power key to make the system to sleep by pressing the power key on the bottom right corner of the board. System auto sleeping means users could set the counting down time, when time counting down begins, users do nothing operation, the system will step into sleeping mode automatically.
Setting->> display->> sleep

Android system waking up
Users could press the power key on the bottom right corner of the board to wake up the system. Besides, the alarm clock could also wake up the system.



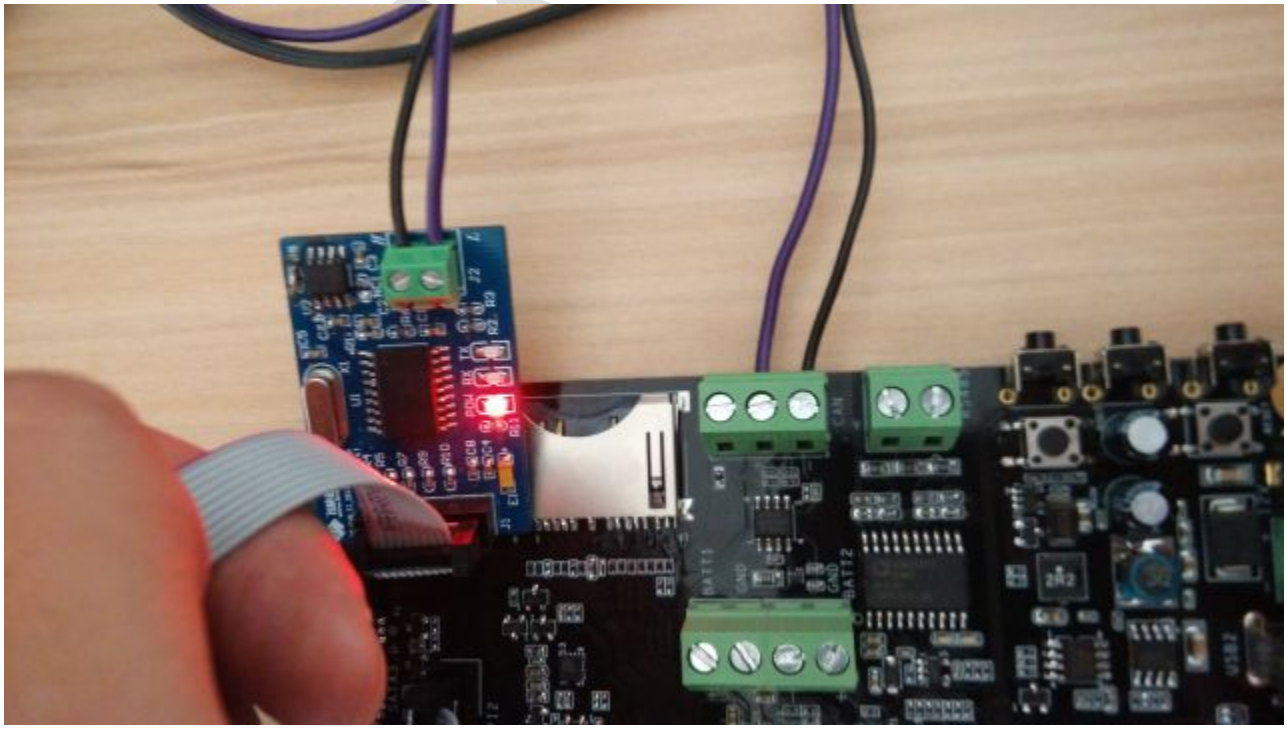
3.25 Android SATAII Hard Disk Testing

Solid state drive with 256M is supported by the single board computer .MX6



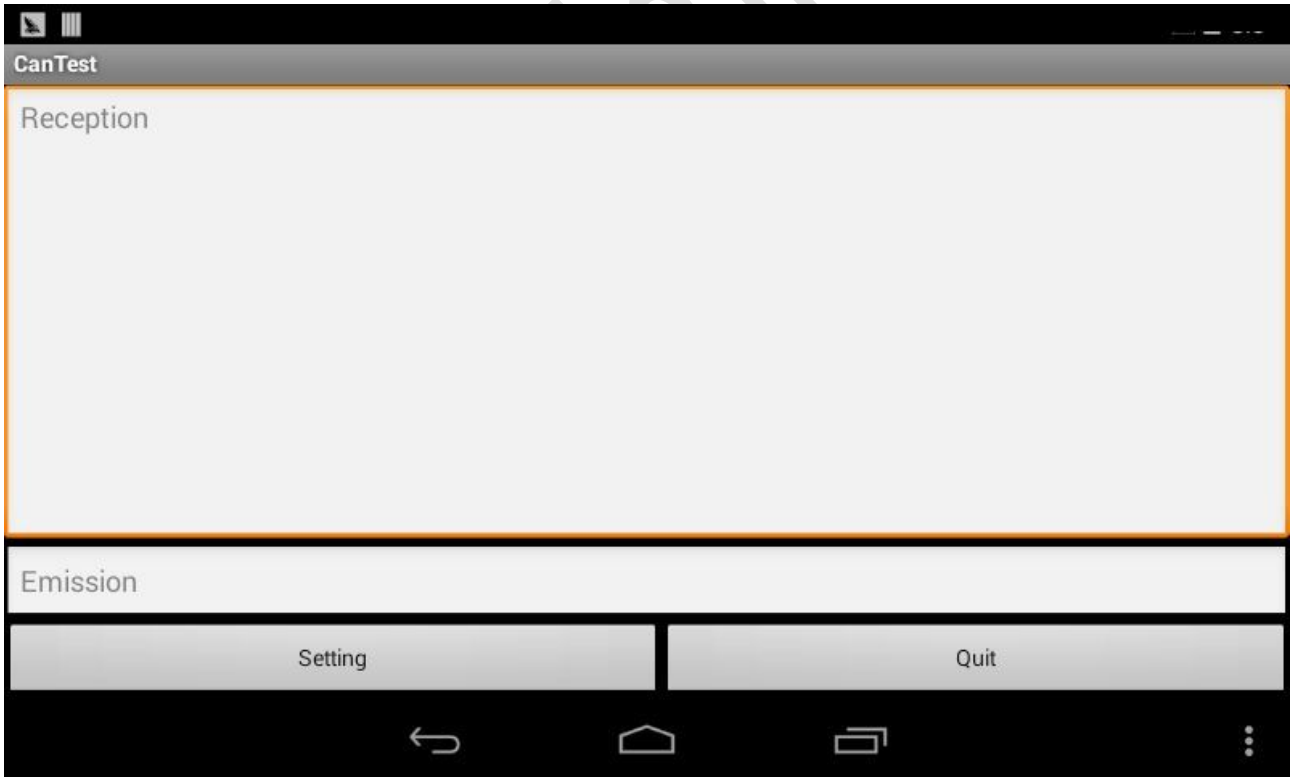
3.26 Android MCP2515 Module(SPI to CAN) Testing

The below iMX6 is with FlexCan for the testing of MCP2515.
At first, connect the SPI-2 of iMX6 with MCP2515 module via a 10-pin flat cable. The MCP2515 module silk print is wrongly marked, please exchange the H and L when connecting. See as below
See as below:

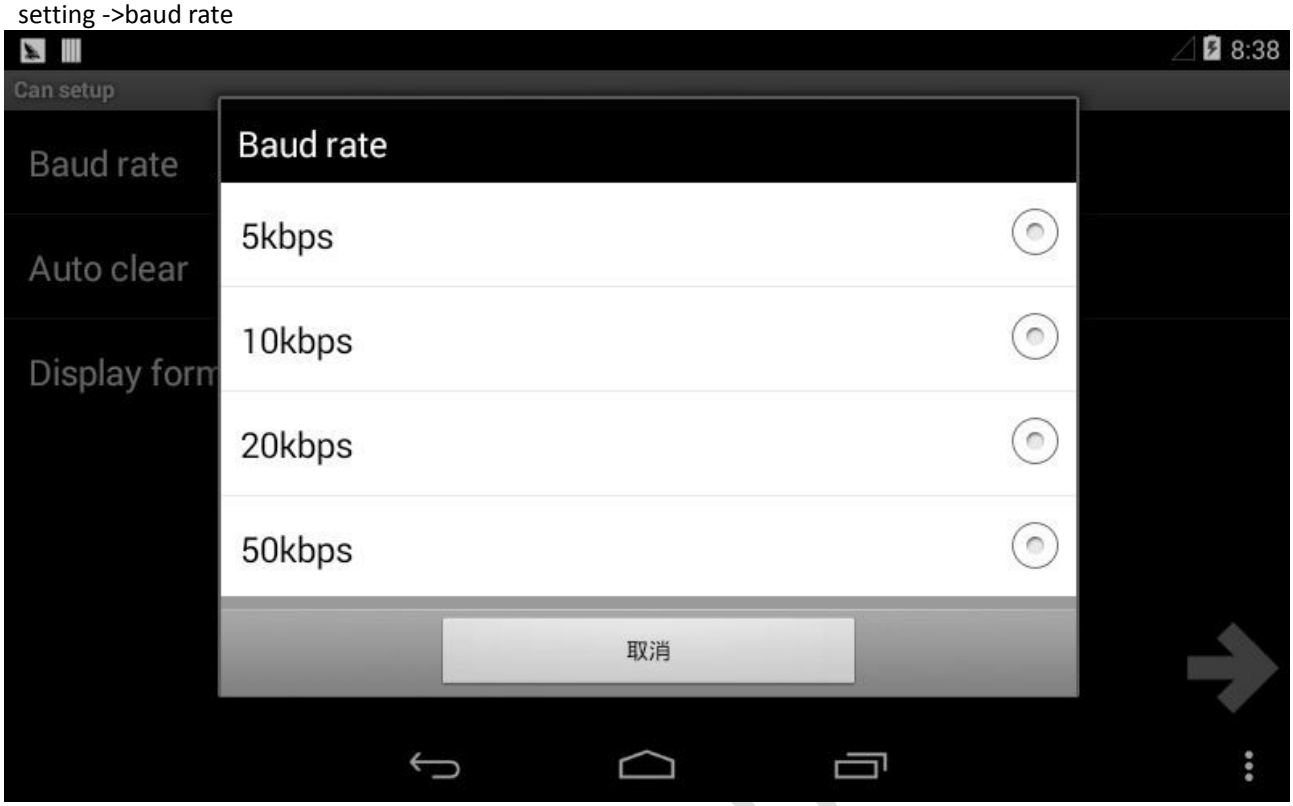


Step into Android main interface, click CanTest application. The application open to run Can0 device(MCP2515) by default.

CAN Test main interface is shown as below

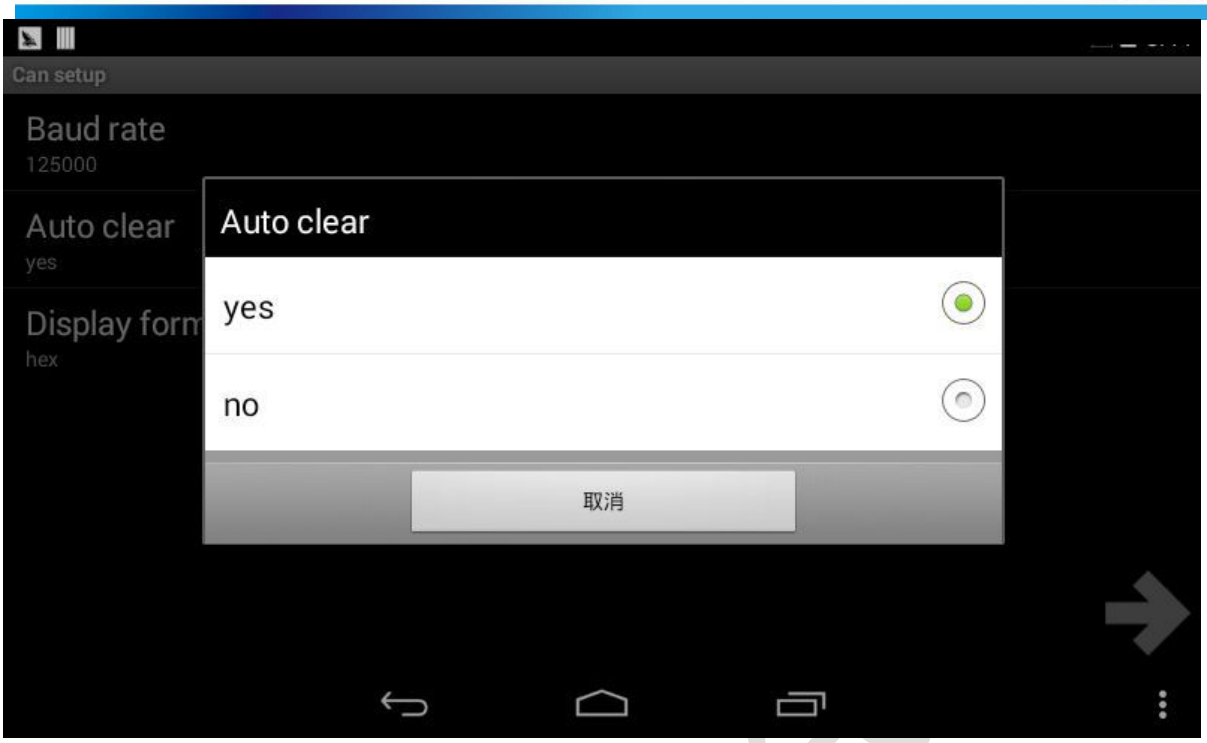


setting ->baud rate



setting ->Display format as below

setting ->Auto clear to select whether clear the received data automatically or not



Input message in Emission column to send data, and data received from other devices will be shown in the receiving column.

Test steps are as below

Step into shell interface, set the Can1 device(FlexCan) as below:

1. Set the baud rate to be 125KBPS, and enable the CAN device

root@sabresd_6dq:/ # canconfig can1 bitrate 125000 ctrlmode triple-sampling on

root@sabresd_6dq:/ # canconfig can1 start

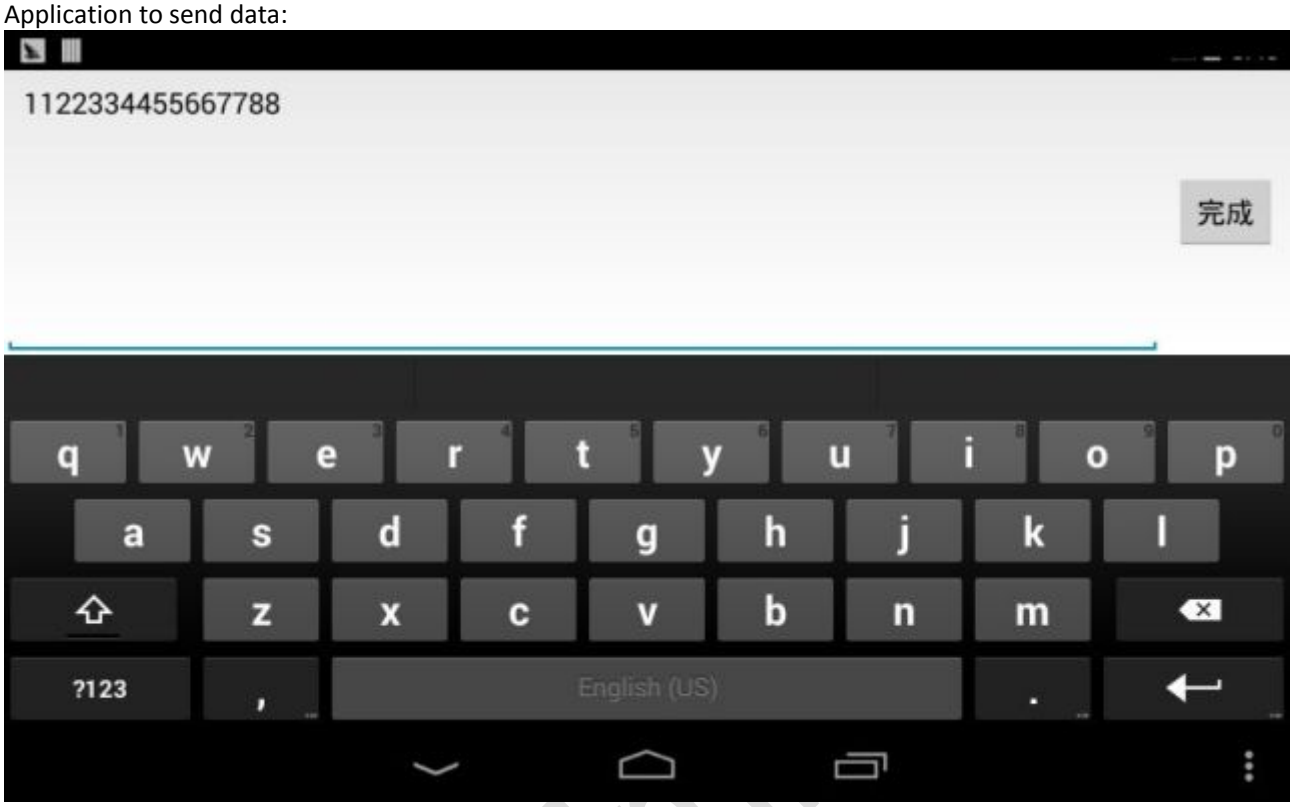
2. Can0 to receive data(application), and Can1 to send data(command line)

Execute below command to send data pack(please check whether data shown in application)

root@sabresd_6dq:/ # cansend can1 -i 0x10 0x11 0x22 0x33 0x44 0x55 0x66 0x77 0x88

3. Can0 to send data(application) and Can1 to receive data(command line)

Execute below command to receive data
root@sabresd_6dq:/ # candump can1
Application to send data:



Below data shown in command line interface indicates the communication is successful
root@sabresd_6dq:/ # candump can1
candump can1
interface = can1, family = 29, type = 3, proto = 1
<0x123> [8] 11 22 33 44 55 66 77 88

3.27 Android HDMI Testing

At present, the iMX6 with OS Android4.4 is supported with HDMI individually output images to display screen or TV, which is generally used for internet TV, intelligent TV, game player, and entertainment devices. Data cable interface iHDMI typeA.

a. Output to liquid screen

Step 1: connect HDMI cable to single board computer, and the other terminal to display screen which is with HDMI interface).

Step 2: power on the single board computer and the image will be shown on the display screen synchronously.

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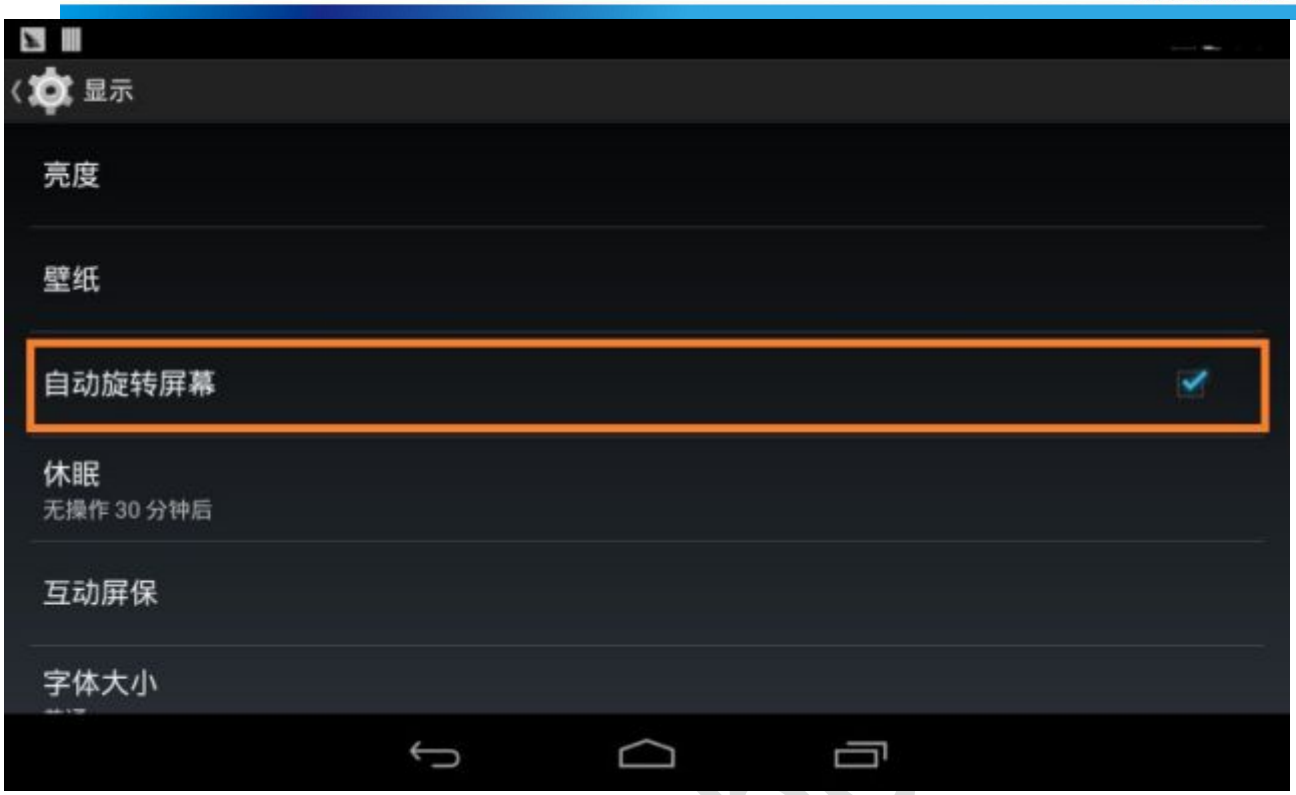
b. HD video displaying(please make sure the SD card is with video in 1080p)

3.28 Android G-sensor Testing

Setting->> Display->> Auto-rotate screen

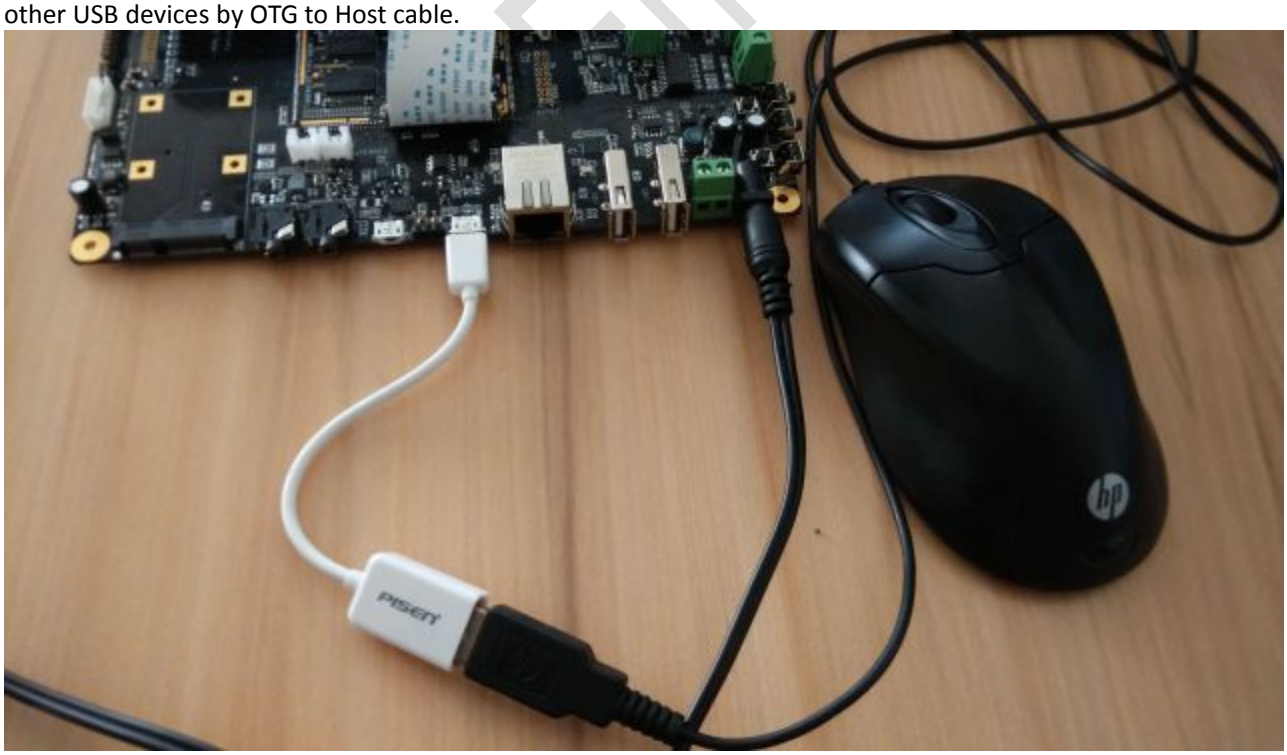


LCD horizontal displaying

LCD vertical displaying

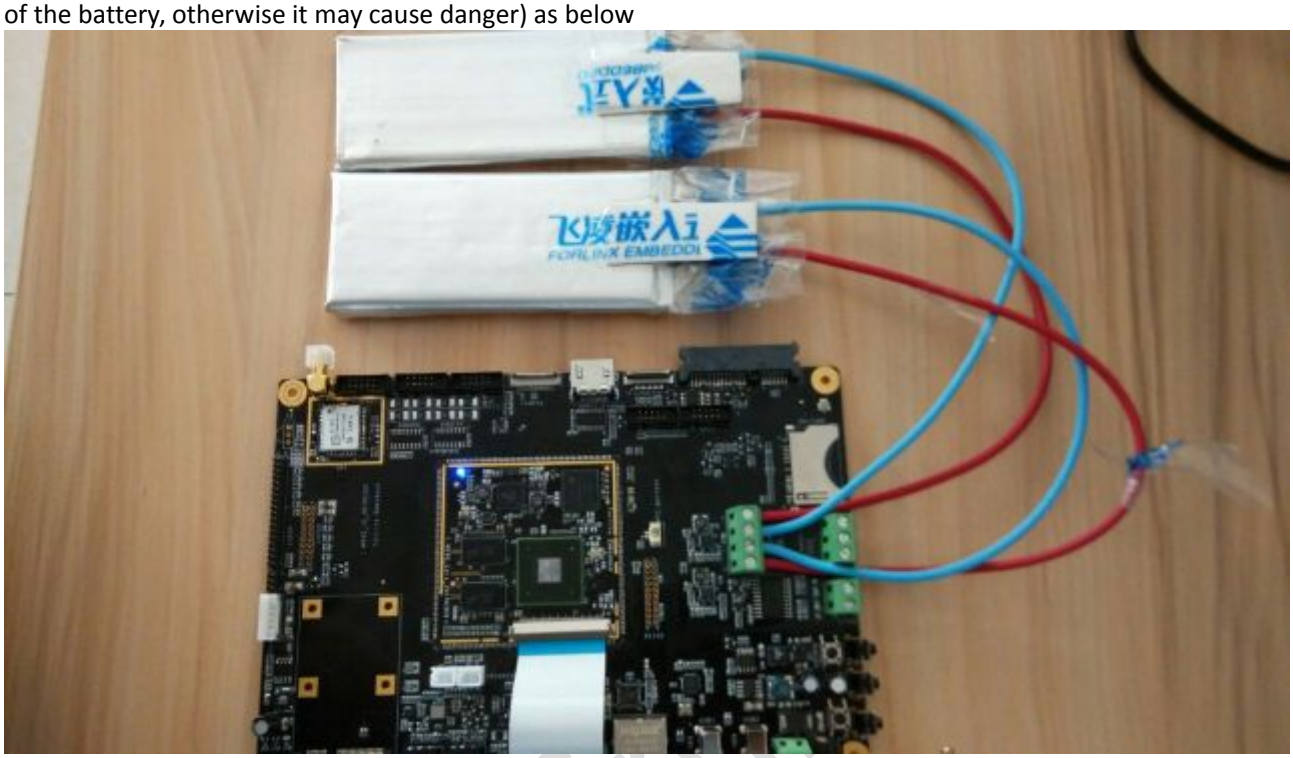
3.29 Android USB OTG Testing

USB OTG is supported by the single board computer i.MX6. To connect USB mouse, USB keyboard, U-disk and other USB devices by OTG to Host cable.



3.30 Android Battery Testing

The single board computer i.MX6 could connect with an external battery(please don't short circuit the two poles of the battery, otherwise it may cause danger) as below



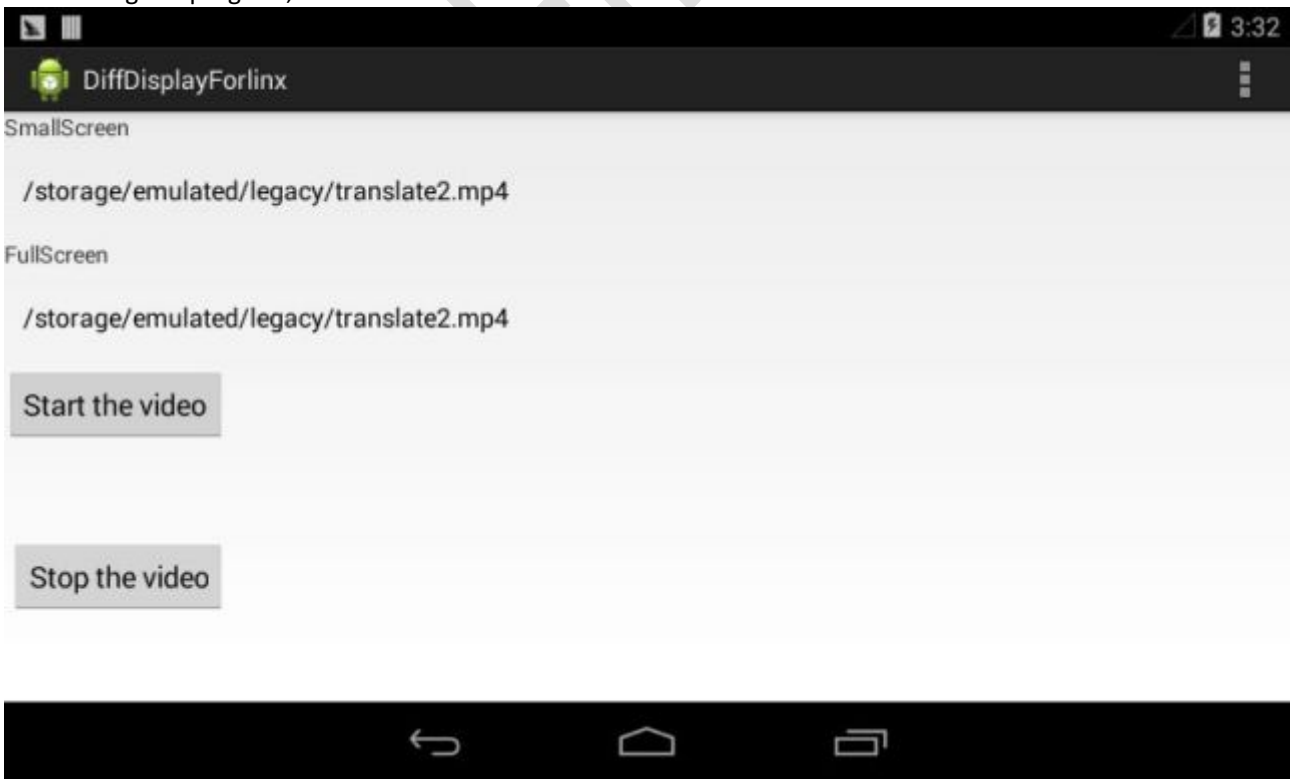
Setting->> battery to check the battery level

3.31 Android Dual-screen Sync. Displayings Testing

LCD and HDMI synchronously displaying are supported by the single board computer iMX6.

1. Before the testing, please prepare two short video files and save them in /storage/emulated/legacy;
2. Connect an HDMI device to single board computer iMX6 via a cable and start the board;
3. Run DiffDisplayForlinx. Before runing this program, the HDMI and LCD are with same displaying, after running this program, the two screen will with different displayings synchroniously.

4. When running the program, it shows users the two loaded videos as below:



Video in SmallScreen will be played in the HDMI device with a thumbnail screen, and video saved in FullScreen will be played with full screen, select the video file to display as below

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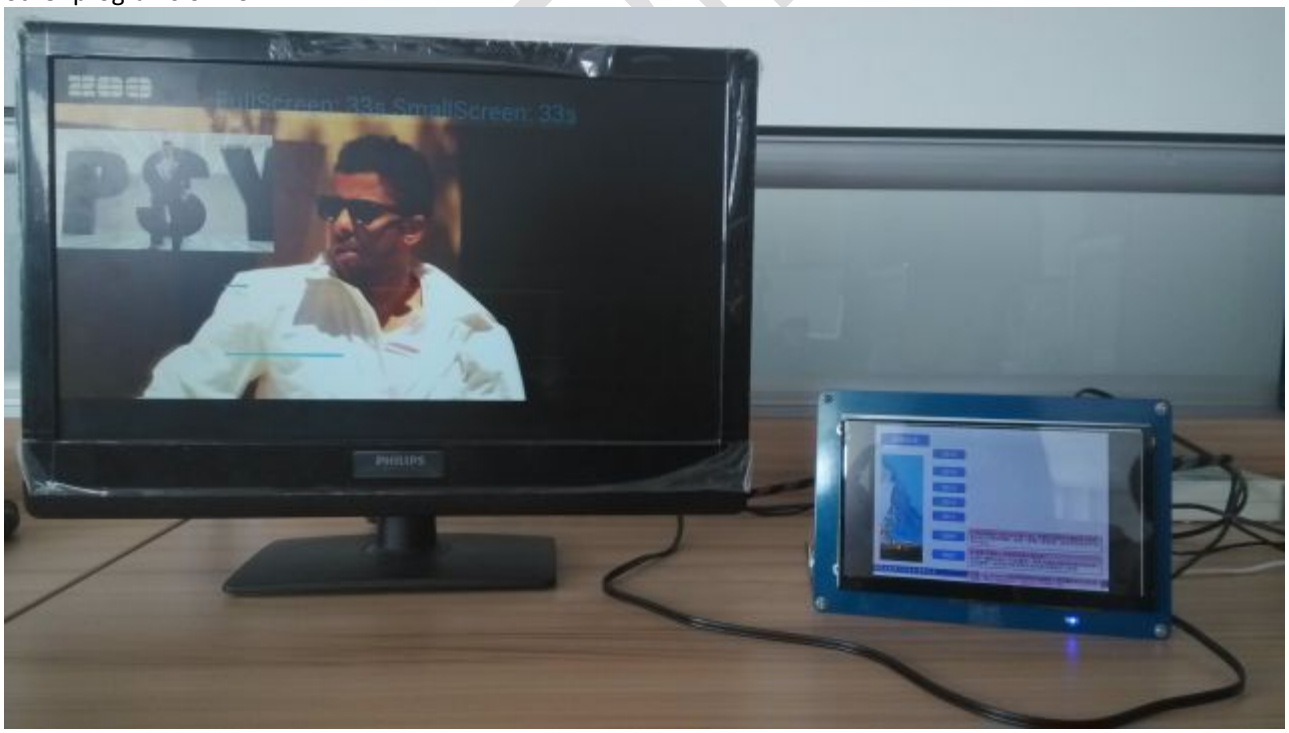
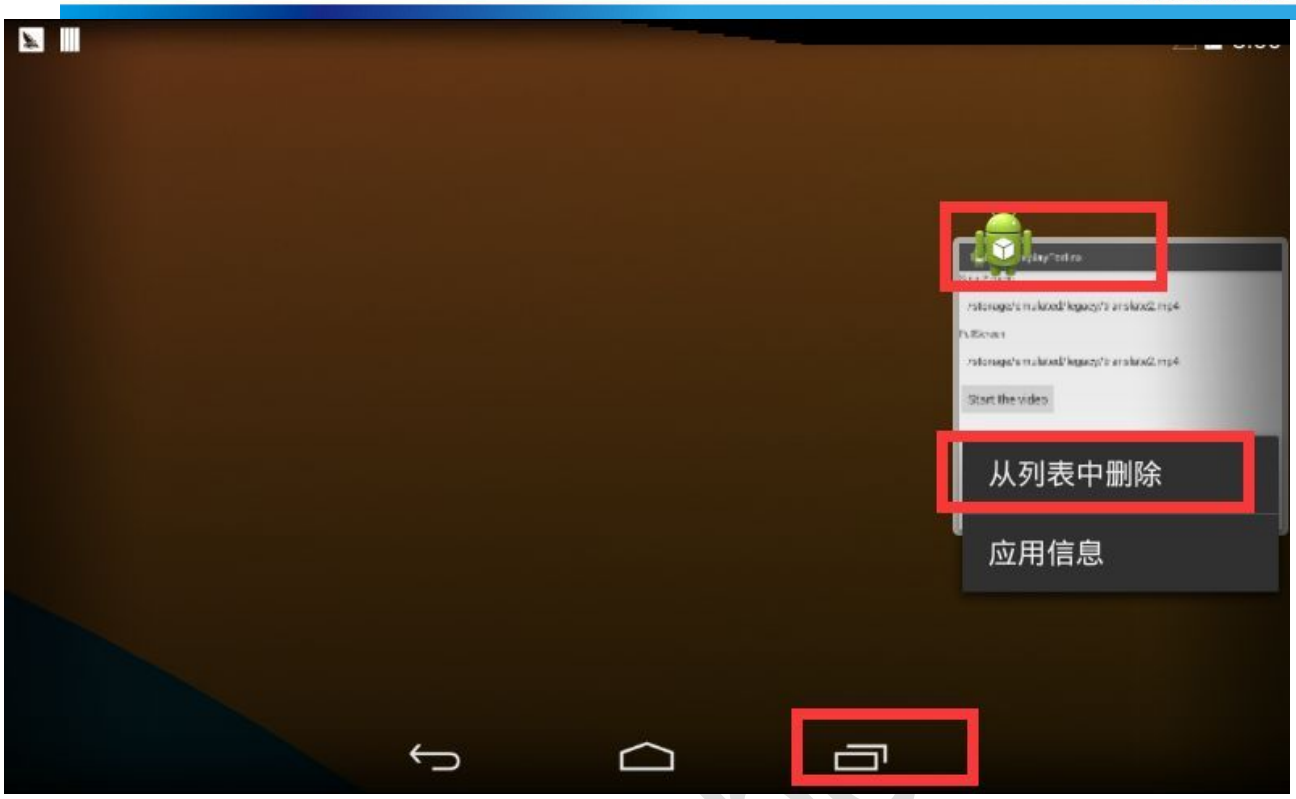
5. Click ‘Start the video’ or ‘Stop the video’ to control the displaying. LCD screen and HDMI screen will show the same image synchroniously .

Click ‘back’ on LCD to make program DiffDisplayForlinx running in backaground and meanwhile users could run other programs on LCD.



6. to quit this program, please click to prompt all the backaground programs, select ‘DiffDisplayForlinx’ and choose ‘delete from the list’ to quit the program.

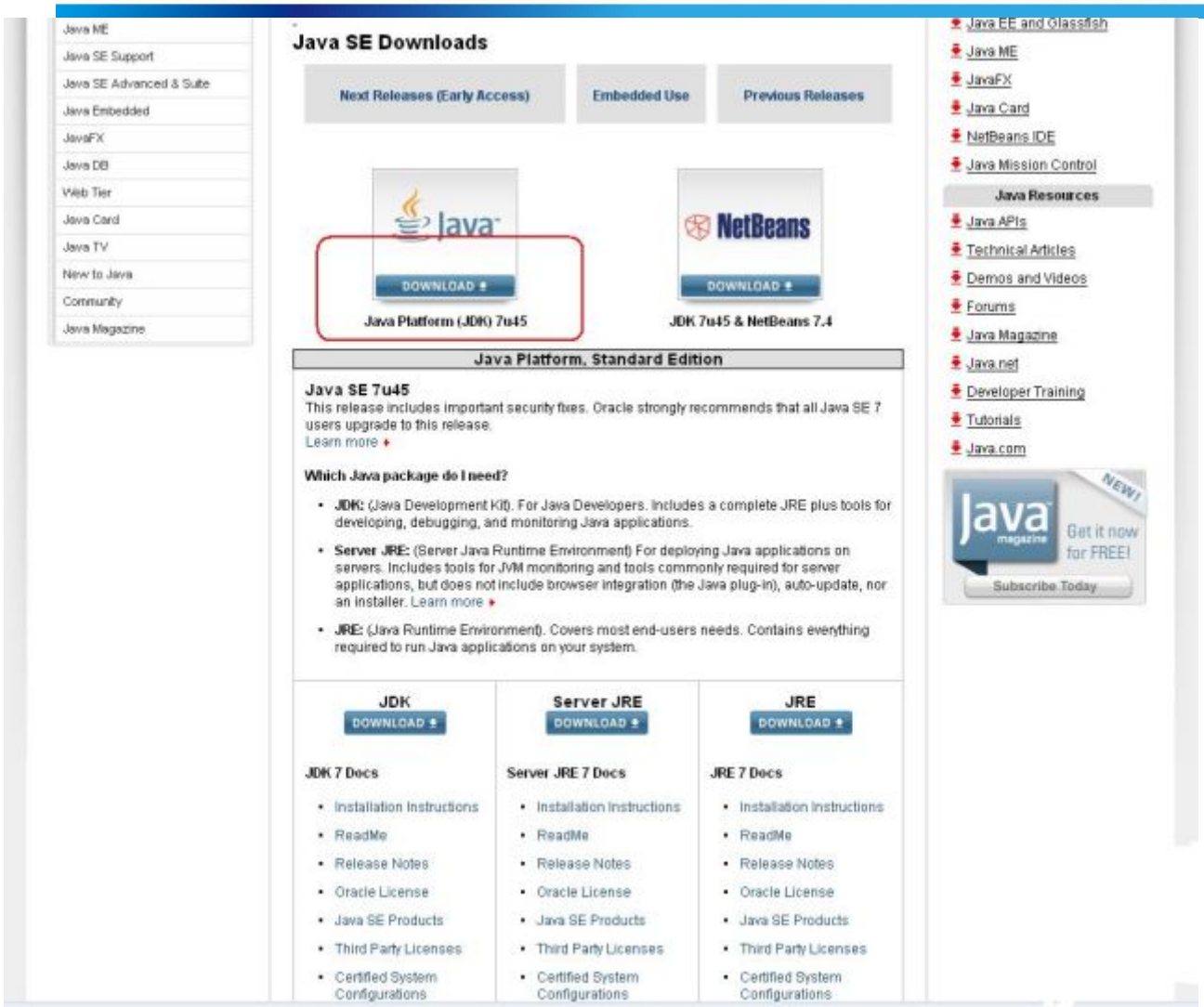


Chapter 4 Android Application Development

4.1 Setup Android Application Environment

4.11 Download and Install JDK(Java SE Development Kit)

This is a link for JDK
http://www.oracle.com/technetwork/java/javase/downloads/index.html
Click JDK at the page


Java ME
Java SE Support
Java SE Advanced & Suite
Java Embedded
JavaFX
Java DB
Web Tier
Java Card
Java TV
New to Java
Community
Java Magazine
Java SE Downloads
Next Releases (Early Access)
Embedded Use
Previous Releases
DOWNLOAD
Java Platform (JDK) 7u45
NetBeans
DOWNLOAD
JDK 7u45 & NetBeans 7.4
Java Platform, Standard Edition
Java SE 7u45
This release includes important security fixes. Oracle strongly recommends that all Java SE 7 users upgrade to this release.
Learn more
Which Java package do I need?
JDK: (Java Development Kit). For Java Developers. Includes a complete JRE plus tools for developing, debugging, and monitoring Java applications.
Server JRE: (Server Java Runtime Environment) For deploying Java applications on servers. Includes tools for JVM monitoring and tools commonly required for server applications, but does not include browser integration (the Java plug-in), auto-update, nor an installer. Learn more
JRE: (Java Runtime Environment). Covers most end-users needs. Contains everything required to run Java applications on your system.
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ReadMe
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Java SE Products
Third Party Licenses
Certified System Configurations
JRE 7 Docs
Installation Instructions
ReadMe
Release Notes
Oracle License
Java SE Products
Third Party Licenses
Certified System Configurations
Java EE and Glassfish
Java ME
JavaFX
Java Card
NetBeans IDE
Java Mission Control
Java Resources
Java APIs
Technical Articles
Demos and Videos
Forums
Java Magazine
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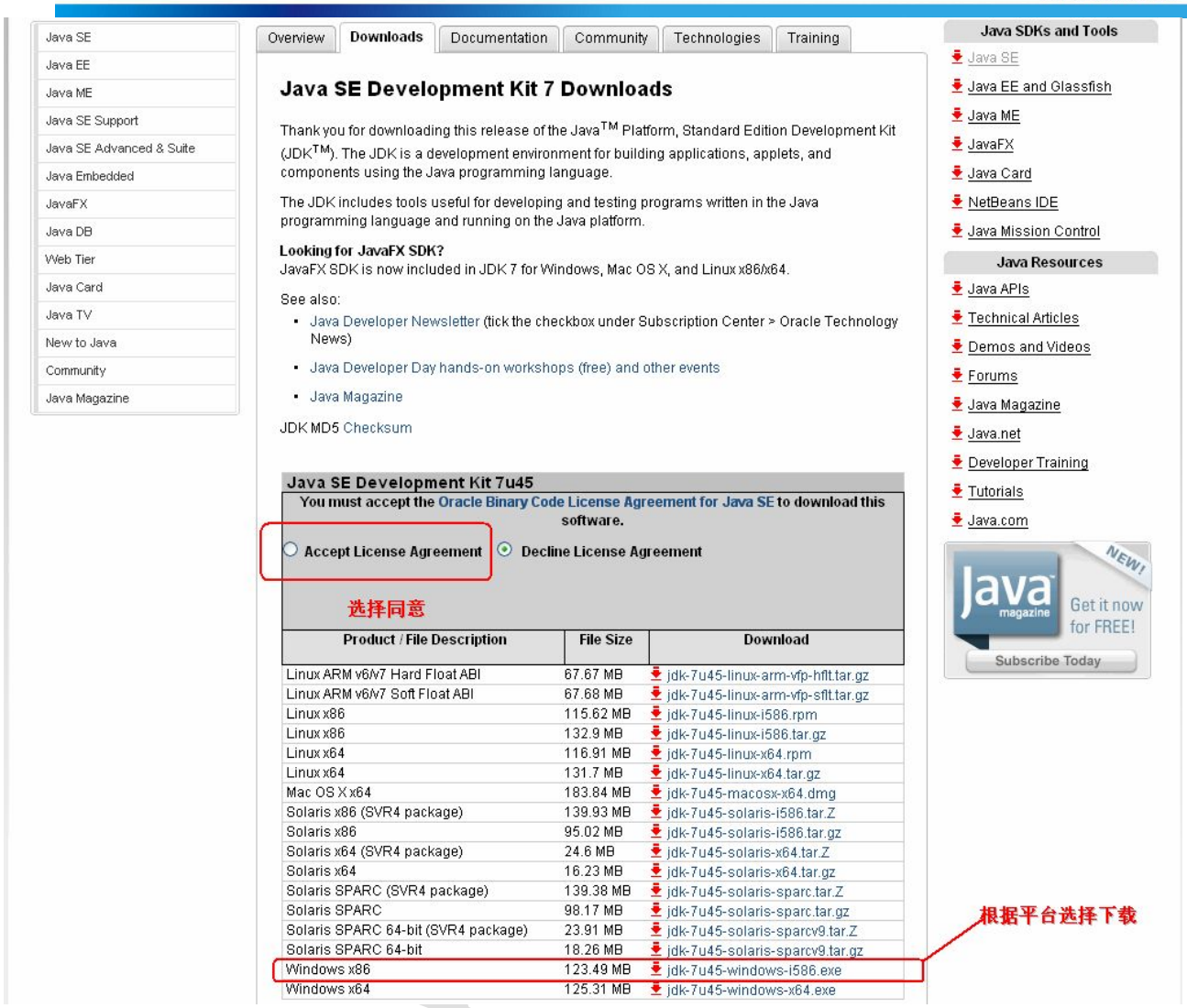
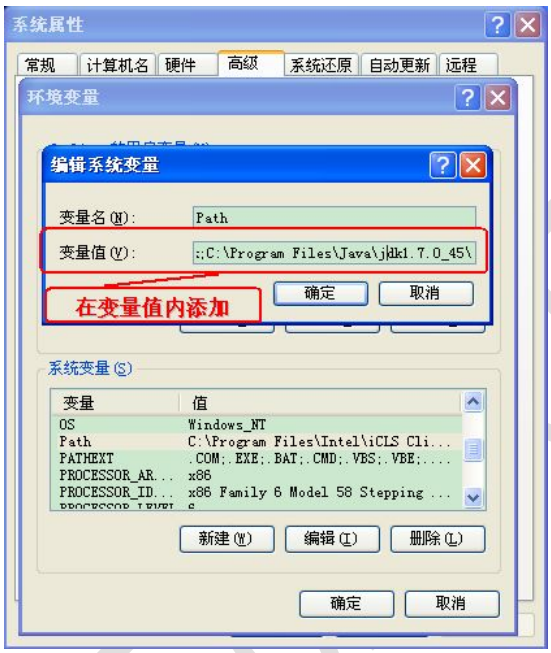


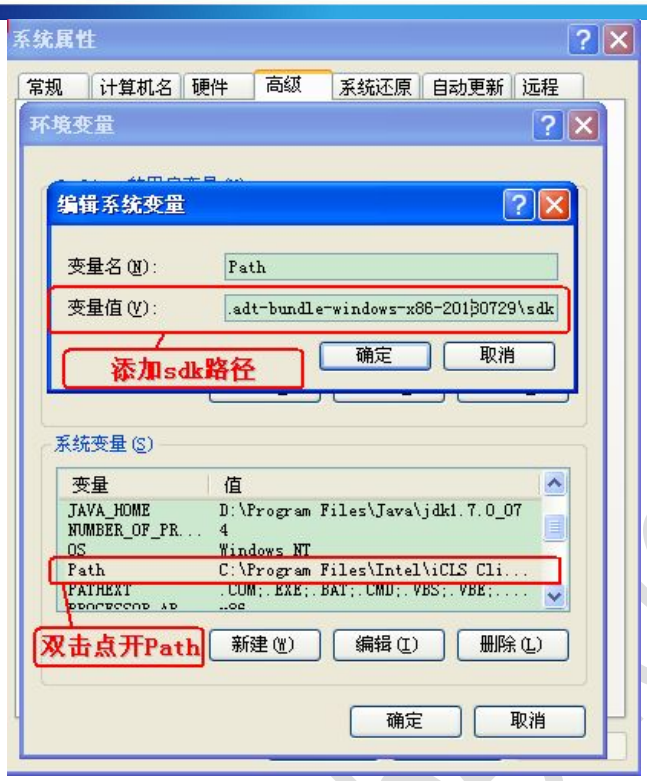
After downloading, please double click it to install.
When finishing the installation, please add JDK command to Path variable as below

1) right click “My Computer”-> Property, then select “advanced settings”
2) Click “environment variable” on the bottom right corner
3) In “system variable” find out path variable and double click it, add below information in the front of the variable value:
“C:\Program Files\Java\jdk1.7.0_45\”
4) click “sure” to finish environment variable settings.



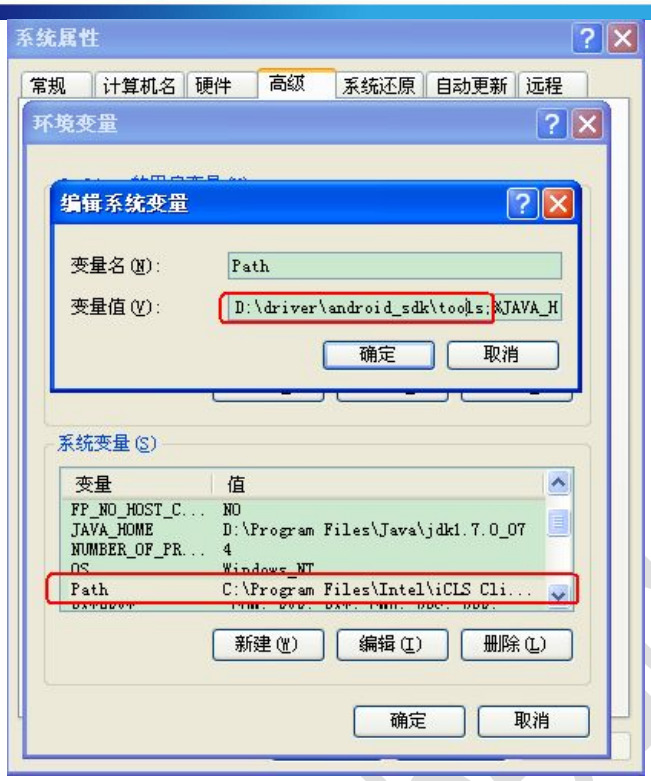
4.1.2 Install adt-bundle-windows

Copy adt-bundle-windows-x86-20130729.zip and extract it to your PC, and you can get eclipse, sdk and SDK Manager.exe in adt-bundle-windows-x86-20130729.
You need add the sdk into Path variable: method is the same with adding jdk variable.



Copy android_sdk.rar to the PC and extract it in android_sdk to get below interface

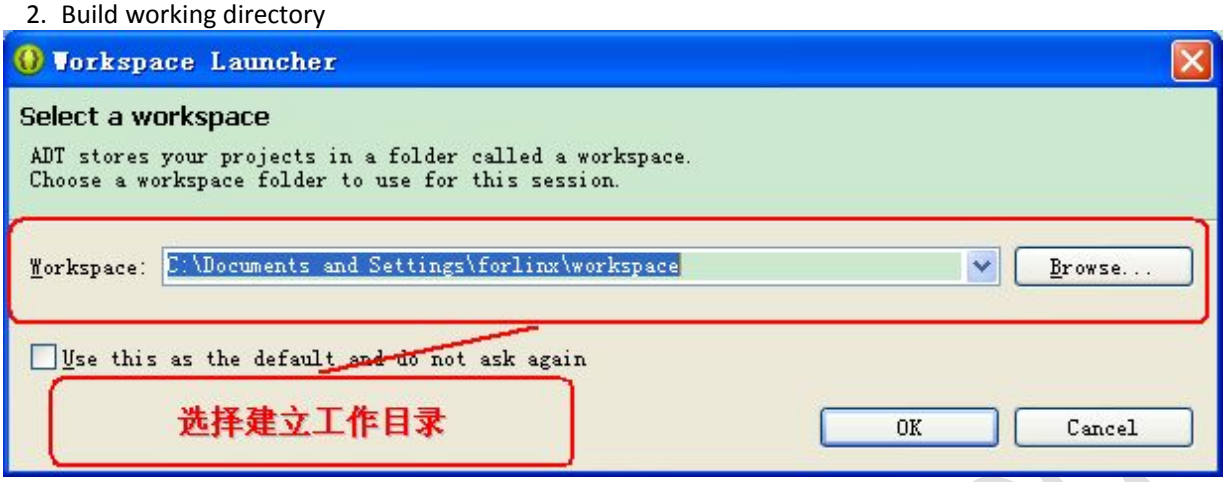
Add android_sdk to Path variable: method is the same with jdk

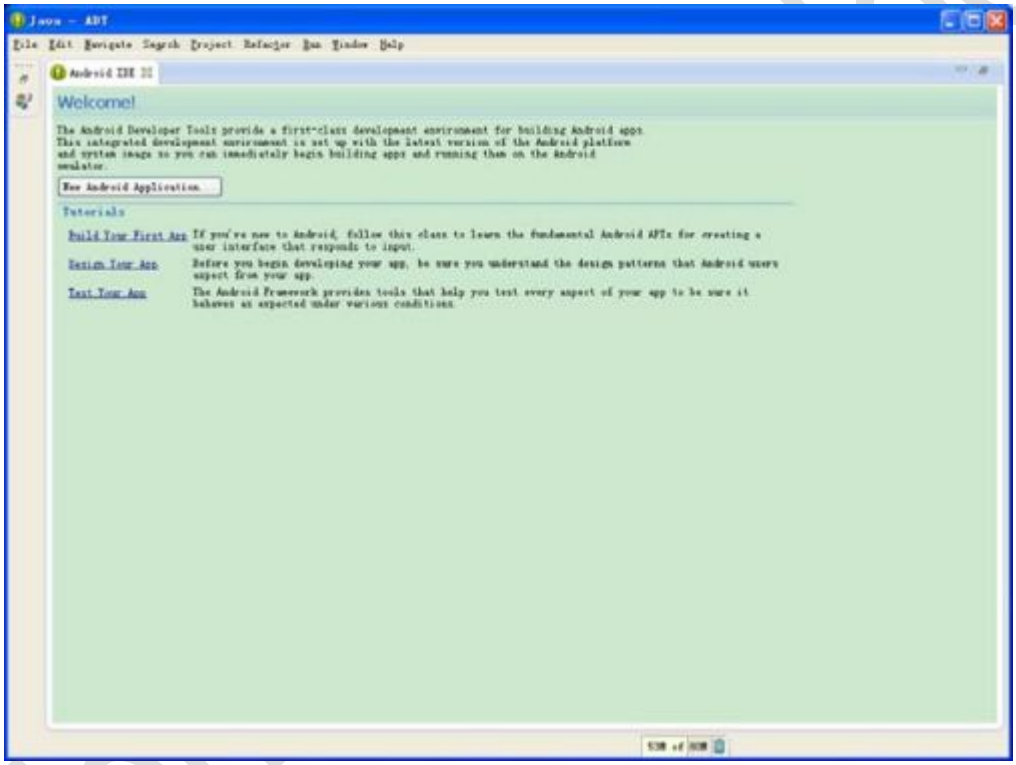


4.1.3 Build helloworld Project

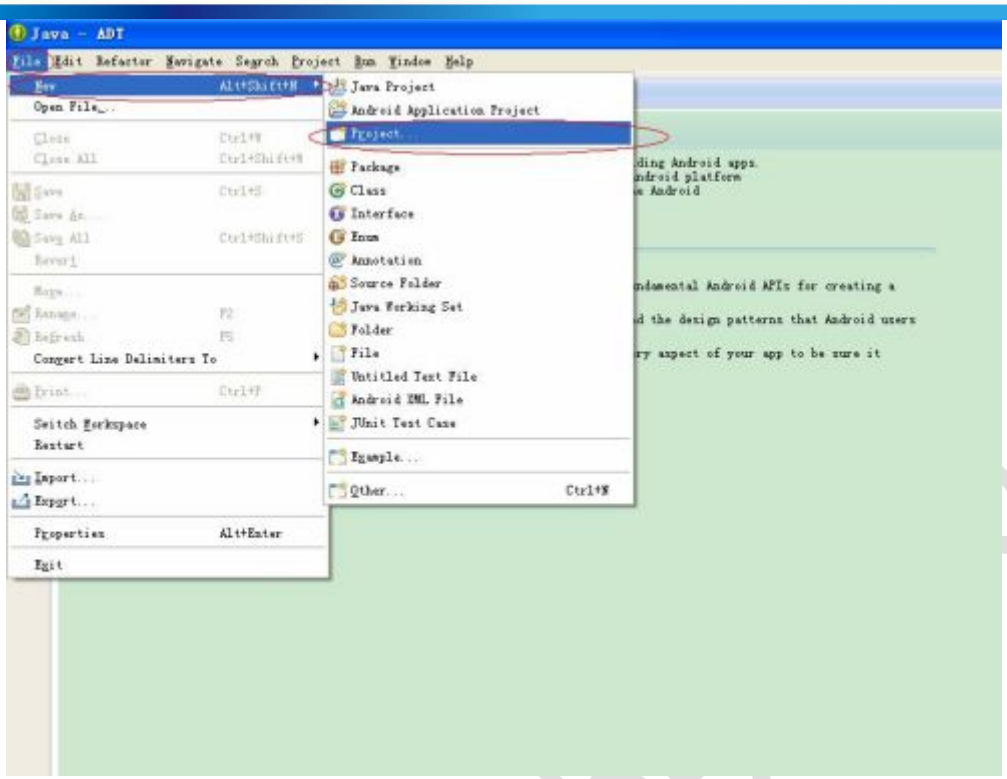
1. Open eslipse

2. Build working directory

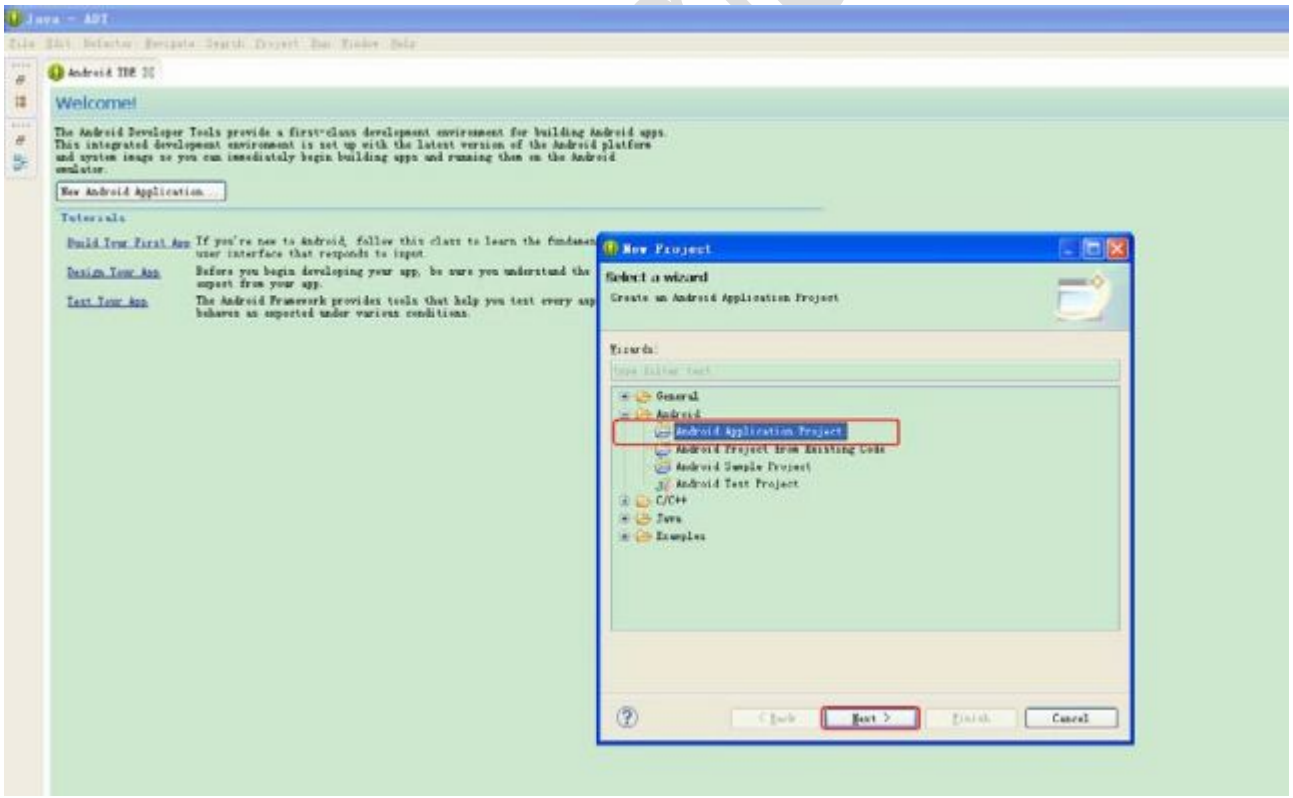




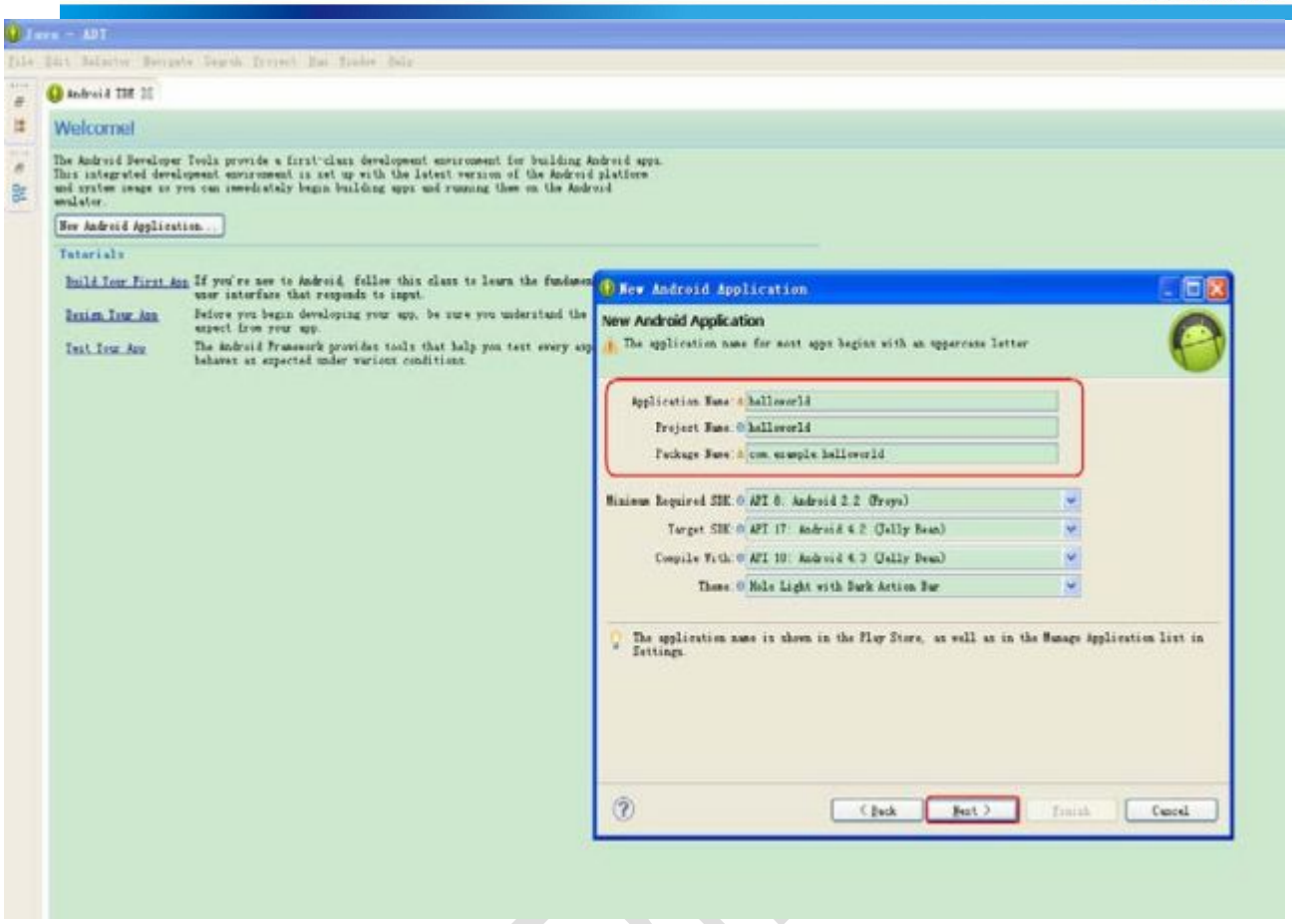
3. Build a new project

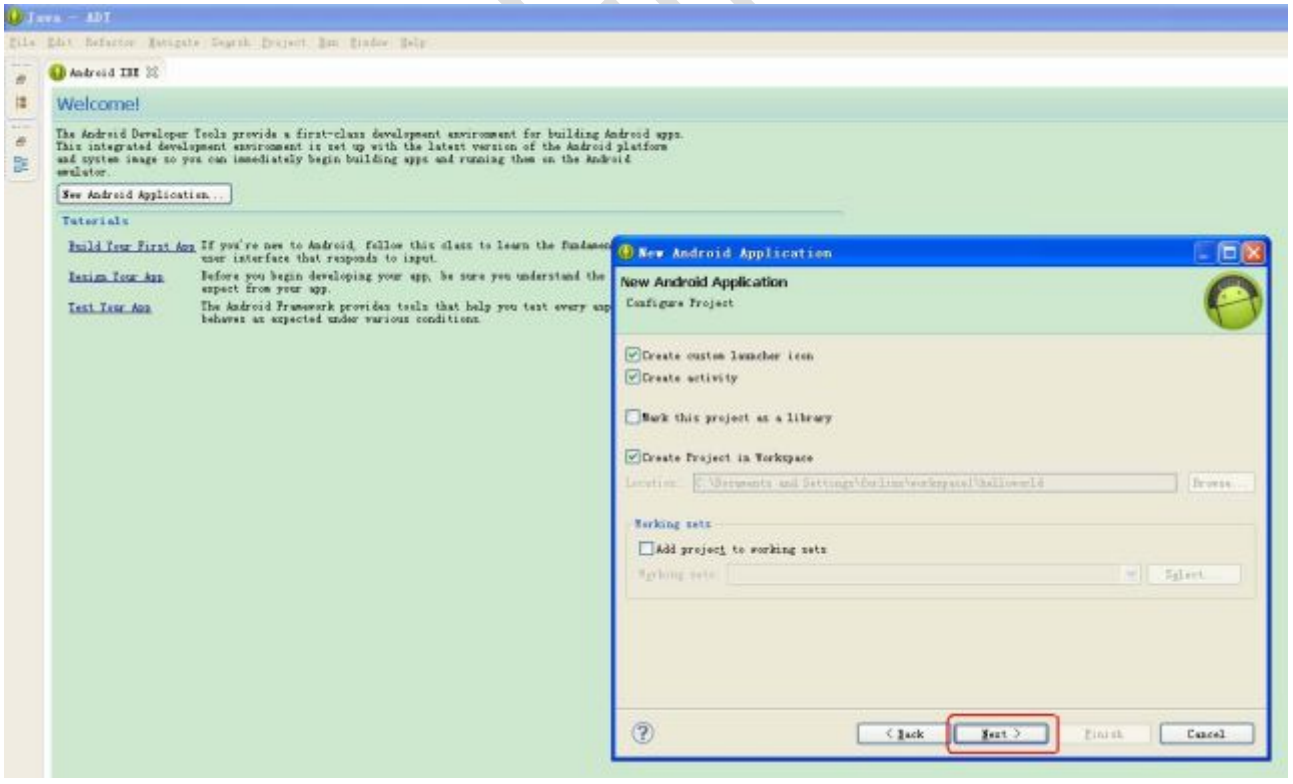


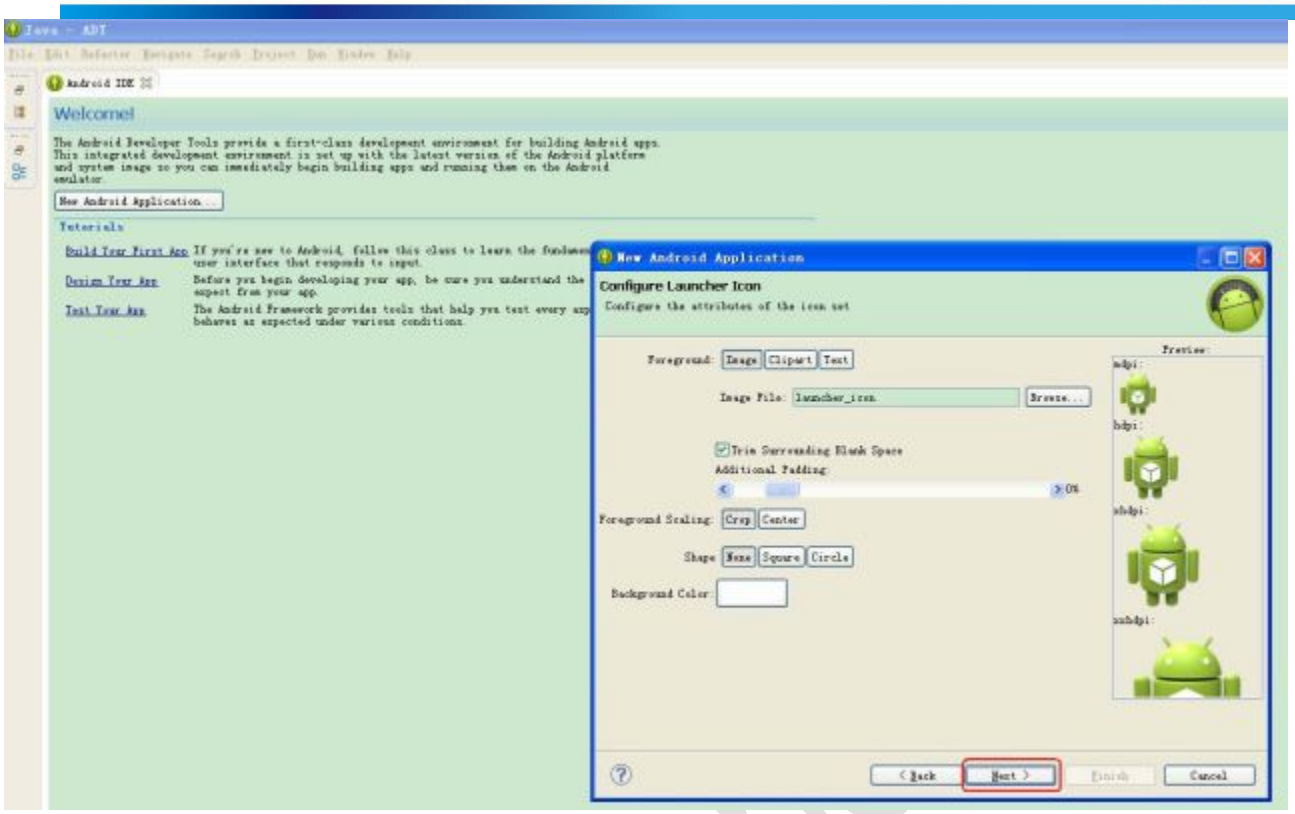
4. Select Android Application Project and click to next step

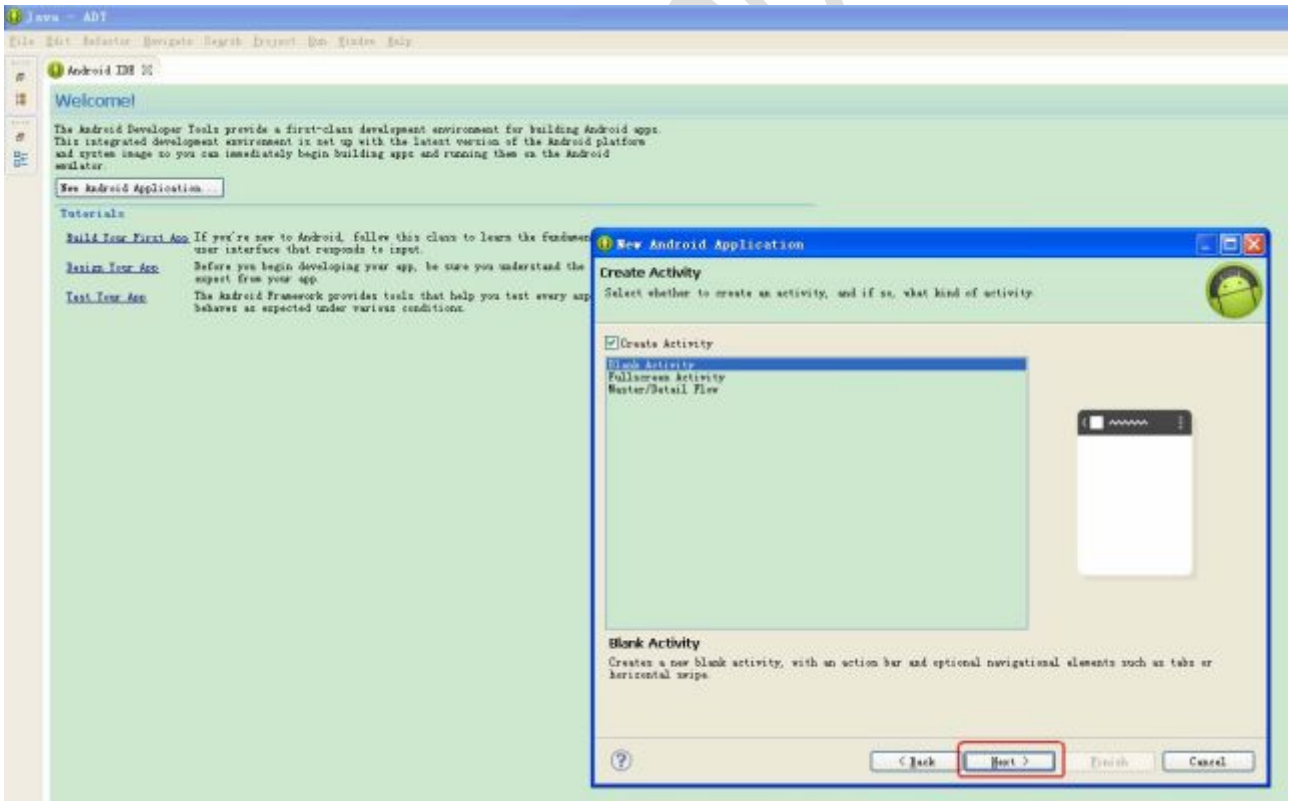


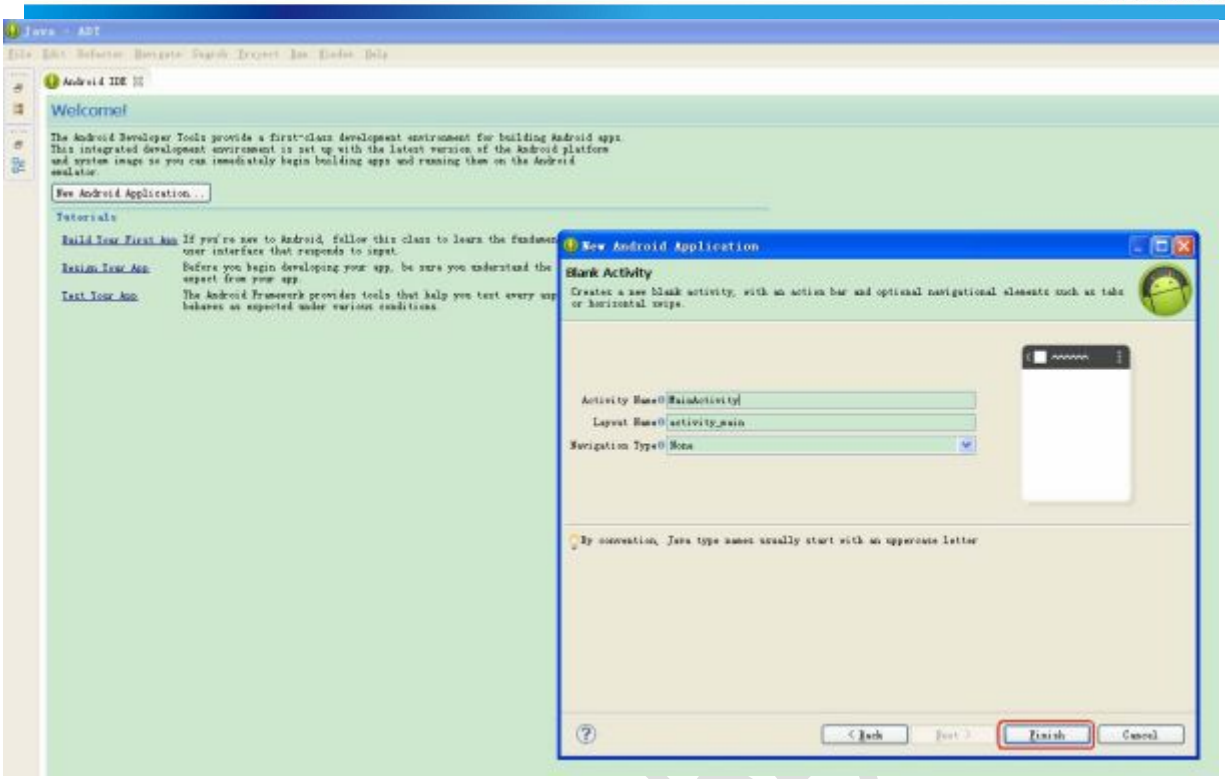
5. Keep the project name as it is and click to next step


Welcome!
New Android Application...
Tutorials
New Android Application
New Android Application
Application Name:
Project Name:
Package Name:
Minimum Required SDK:
Target SDK:
Compile With:
Theme:
Back
Next >
Finish
Cancel

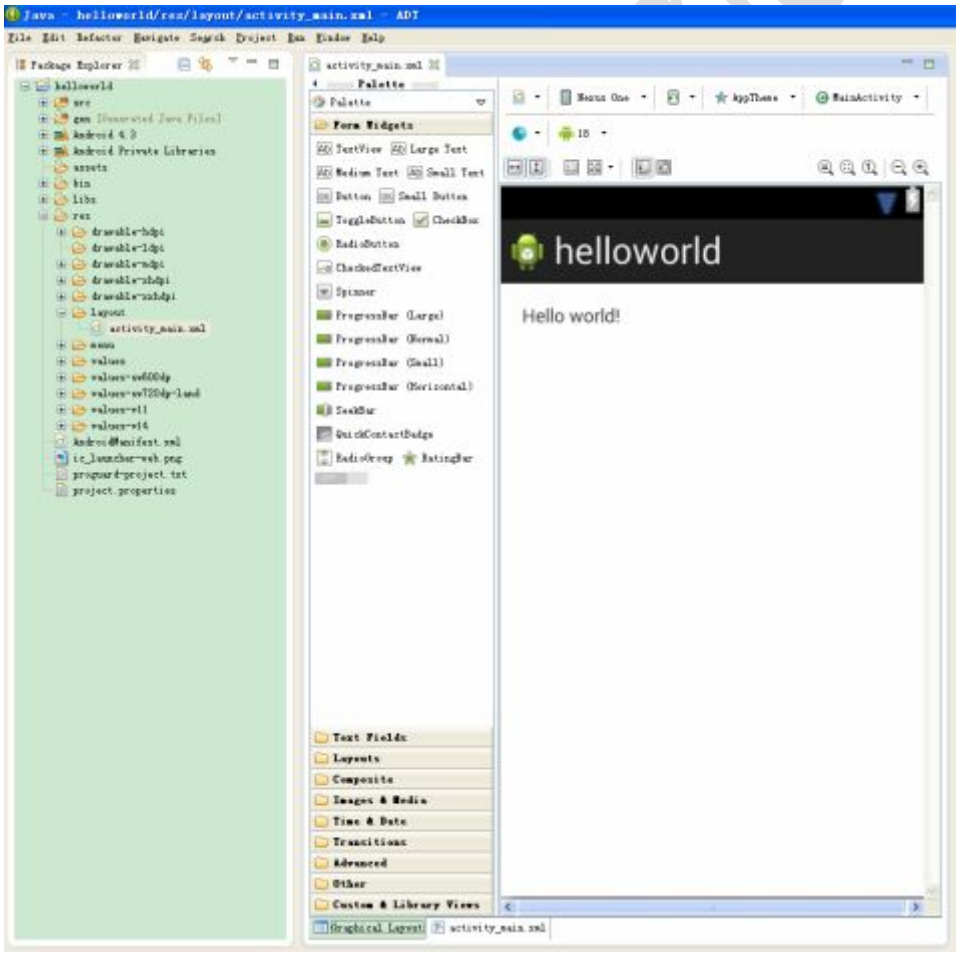

Welcome!
New Android Application...
Tutorials
New Android Application
New Android Application
Configure Project
Create custom launcher icon
Create activity
Mark this project as a library
Create Project in Workspace
Working sets
Add project to working sets
Back
Next >
Finish
Cancel


Welcome!
New Android Application
Configure Launcher Icon
Configure the attributes of the icon set
Foreground:
Image File:
Trim Surrounding Blank Space
Additional Padding:
Foreground Scaling:
Shape:
Background Color:
Preview:
< Back
Next >
Finish
Cancel

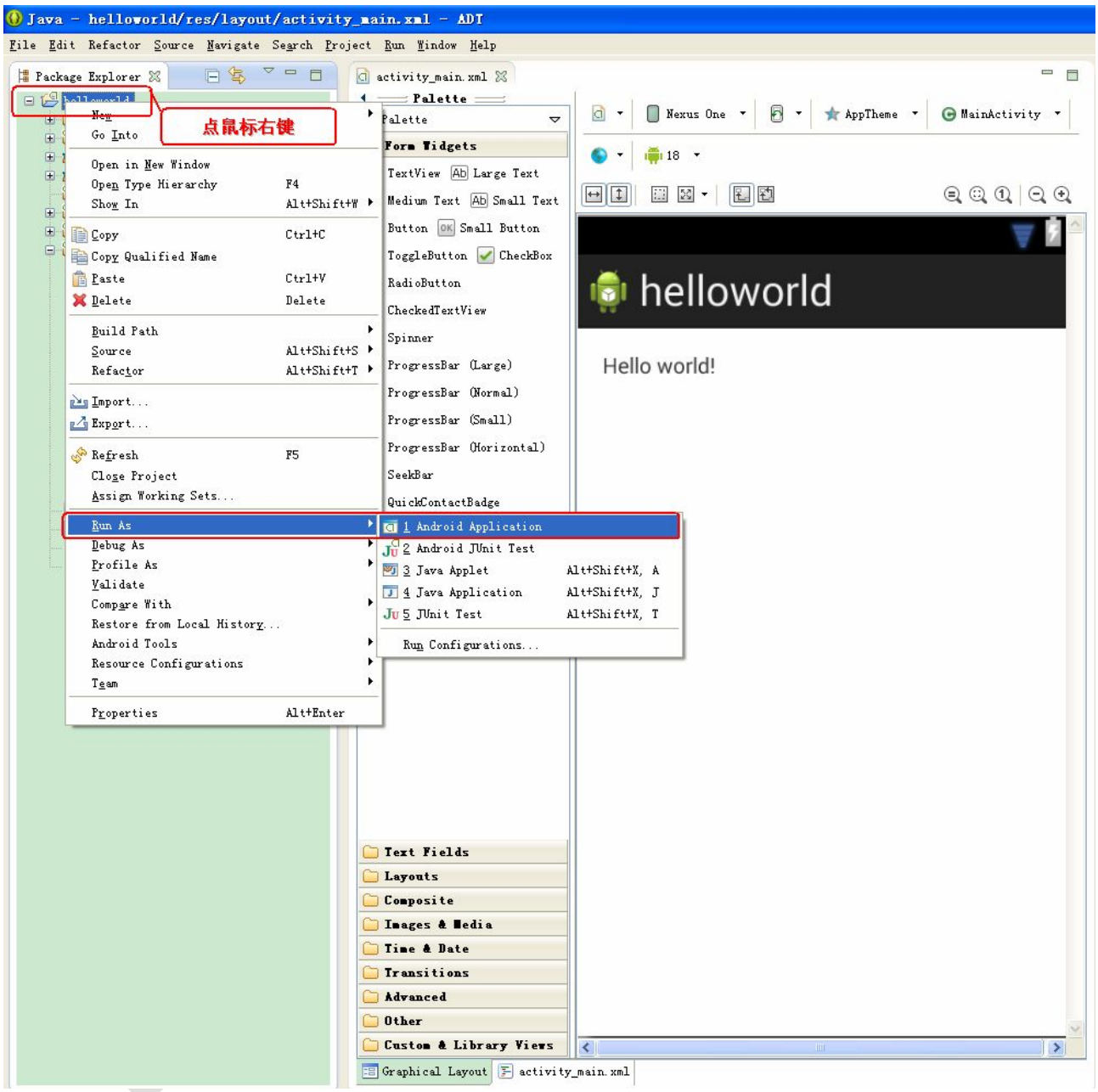

Welcome!
New Android Application
Create Activity
Select whether to create an activity, and if so, what kind of activity
Create Activity
Blank Activity
Fullscreen Activity
Master/Detail Flow
Blank Activity
< Back
Next >
Finish
Cancel



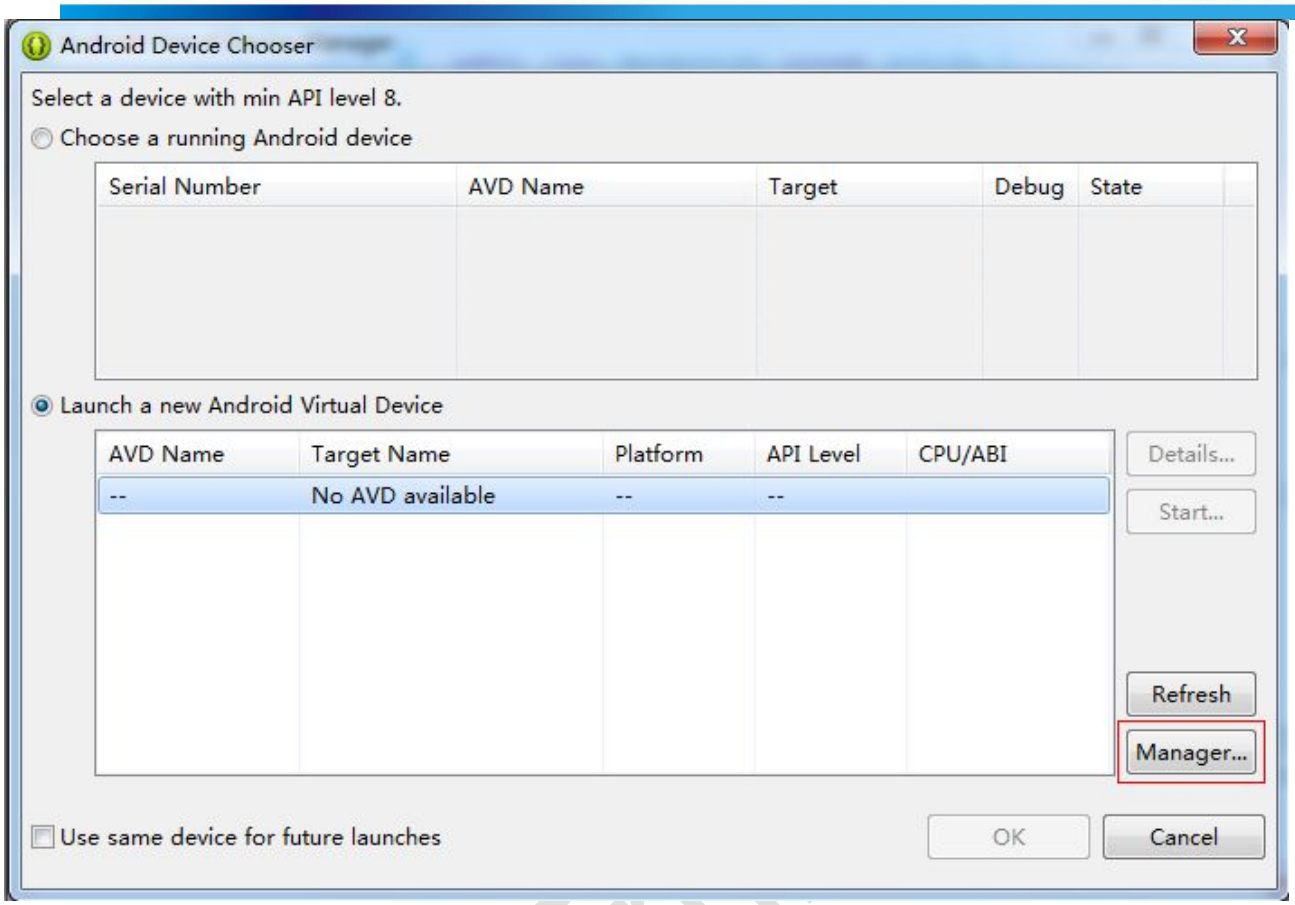
Click “Finish” to complete the building of helloworld project



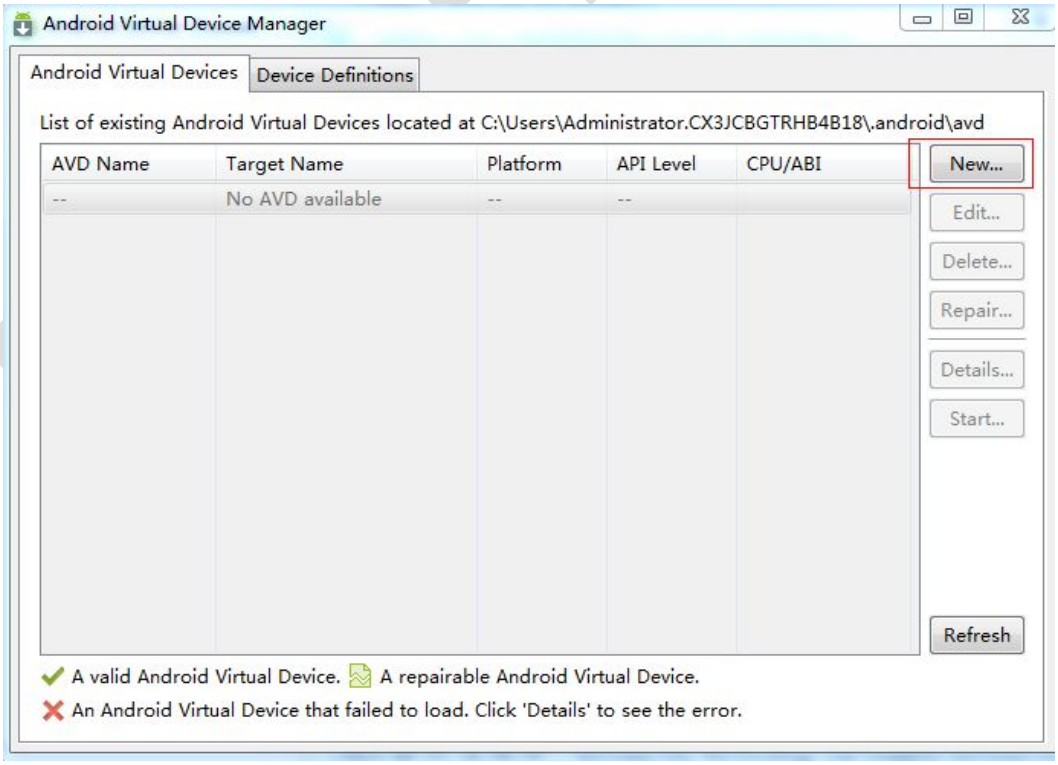
6. Run the helloworld in simulator



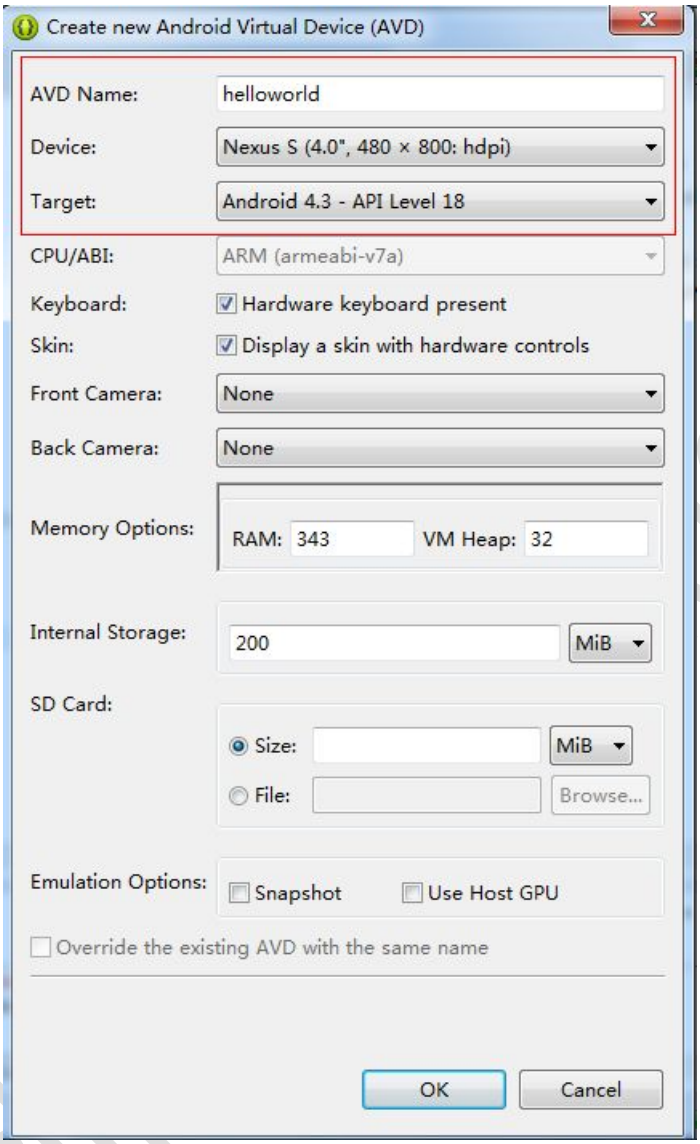
It will prompt a running environment settings interface when it first time running. It confirm with you whether running at an Android device or at an Android virtual device. The Android SDK is with one VM ware which is available for APP to convenient for APP development. Here please select run at the virtual Android device.



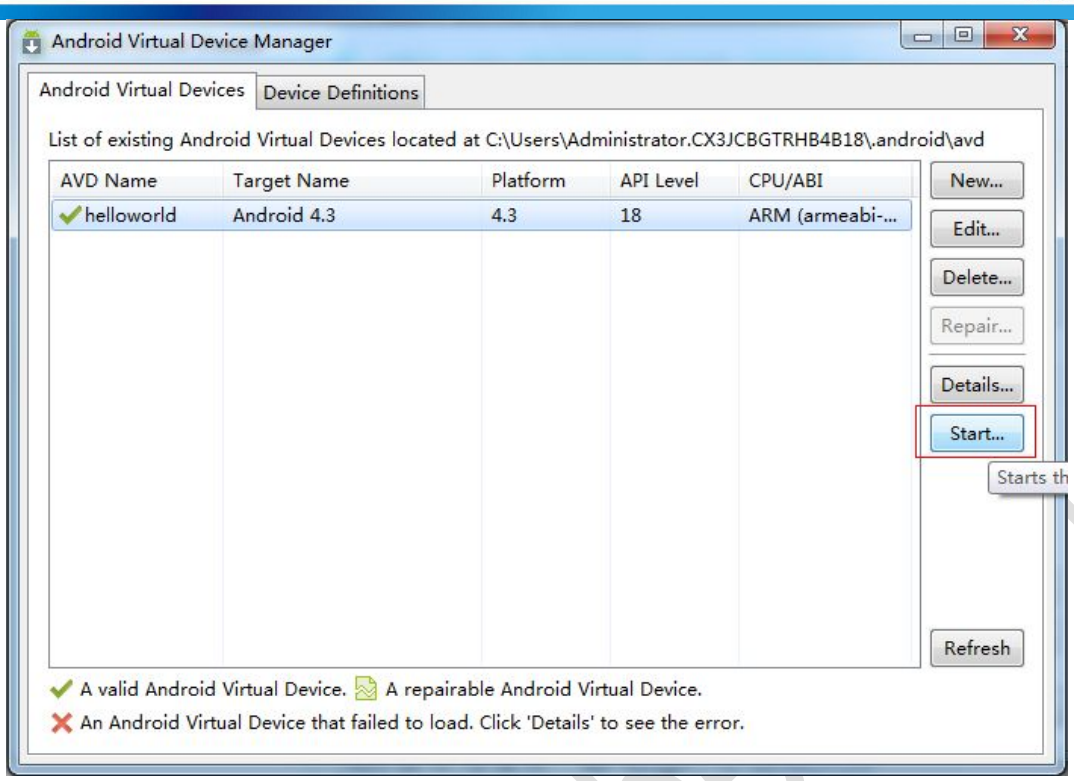
Click “manager”



Click “New”



Please input the virtual device name “helloworld” at the AVD Name column, and select Nexus device with resolution of 480x 800AVD Name for the Device, and select API of Android4.3 for the Target, then please click “OK”



Click Start to run the Android virtual device

The Helloworld will automatically running when the virtual device finishes starting.

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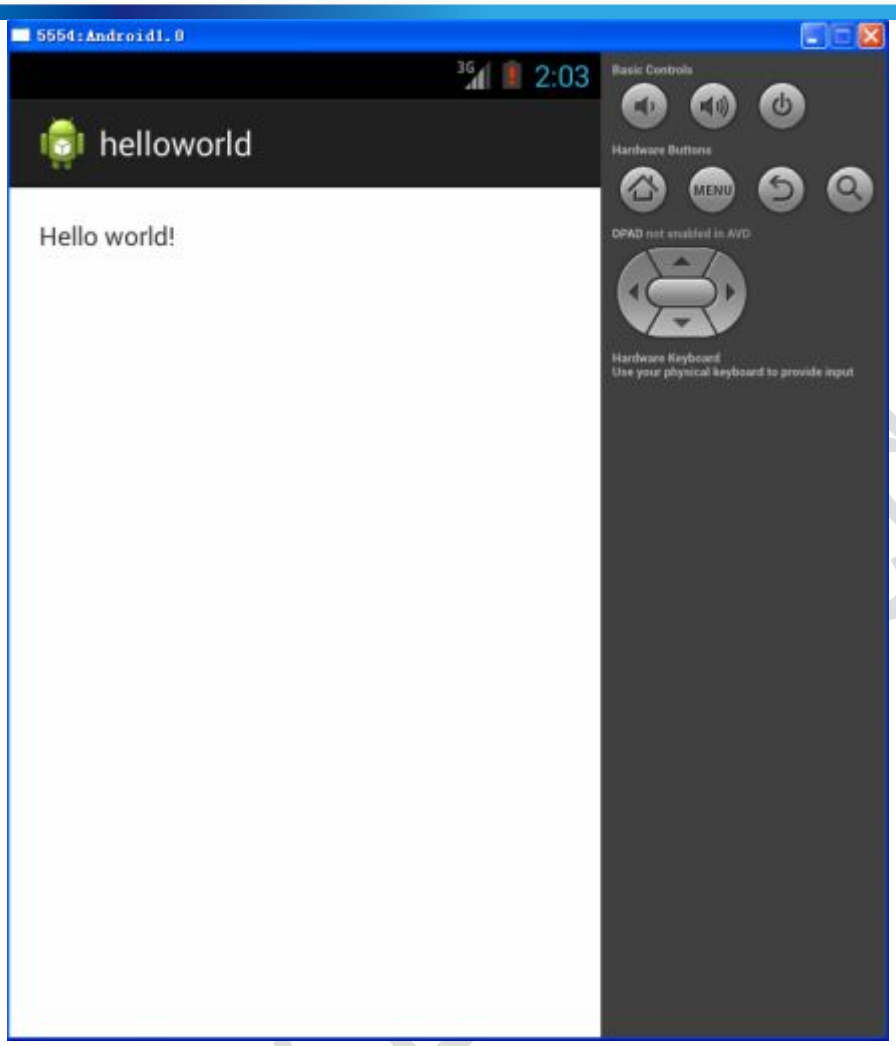
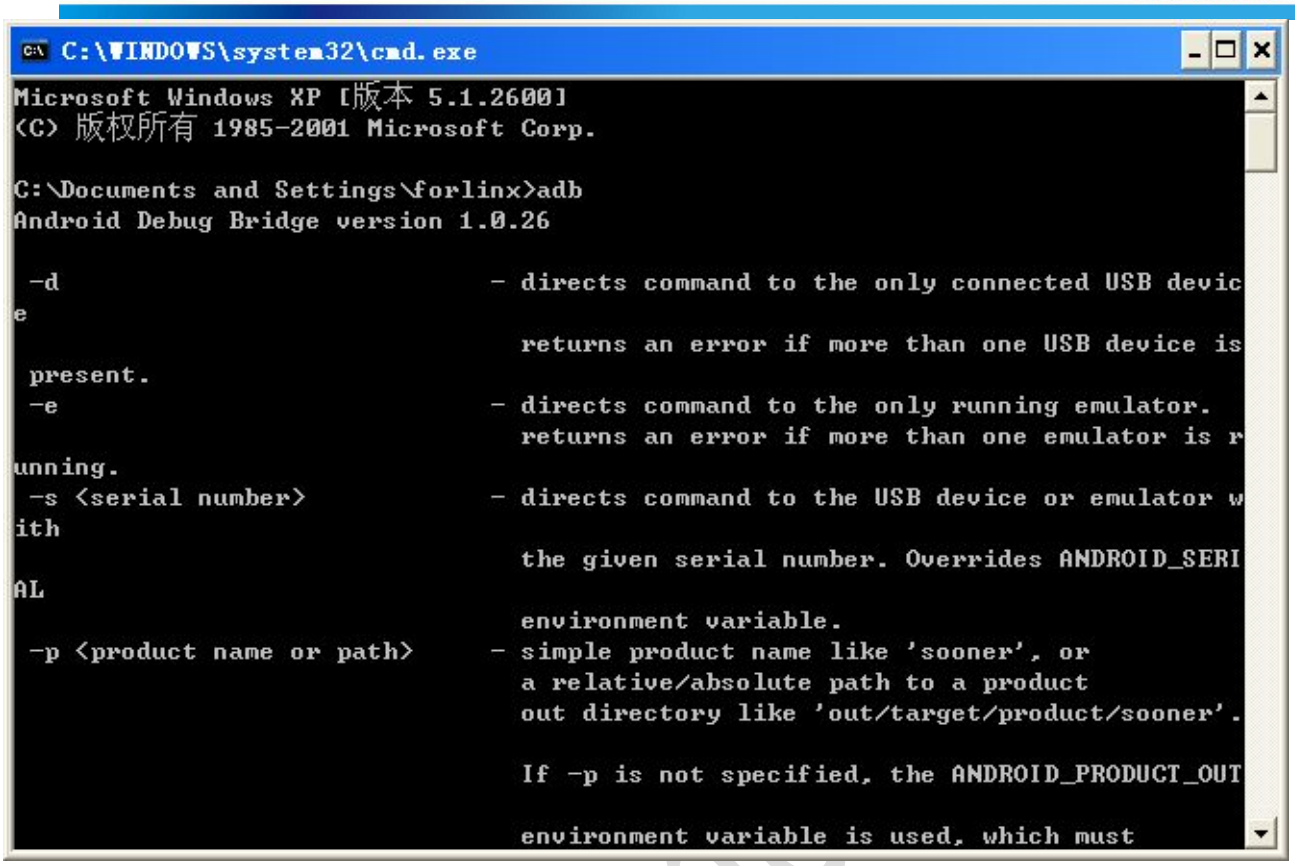


4.1.4 Use adb

Users could also use adb to install and debug application(the adb was already added in to variable when importing to android_sdk)

1. Check whether adb was installed

Click start menu, and input cmd in the searching bar, and press enter key at the cmd.exe to run DOS. Please input adb and press enter key in the DOS window, below printed information indicates all the variable settings are OK.

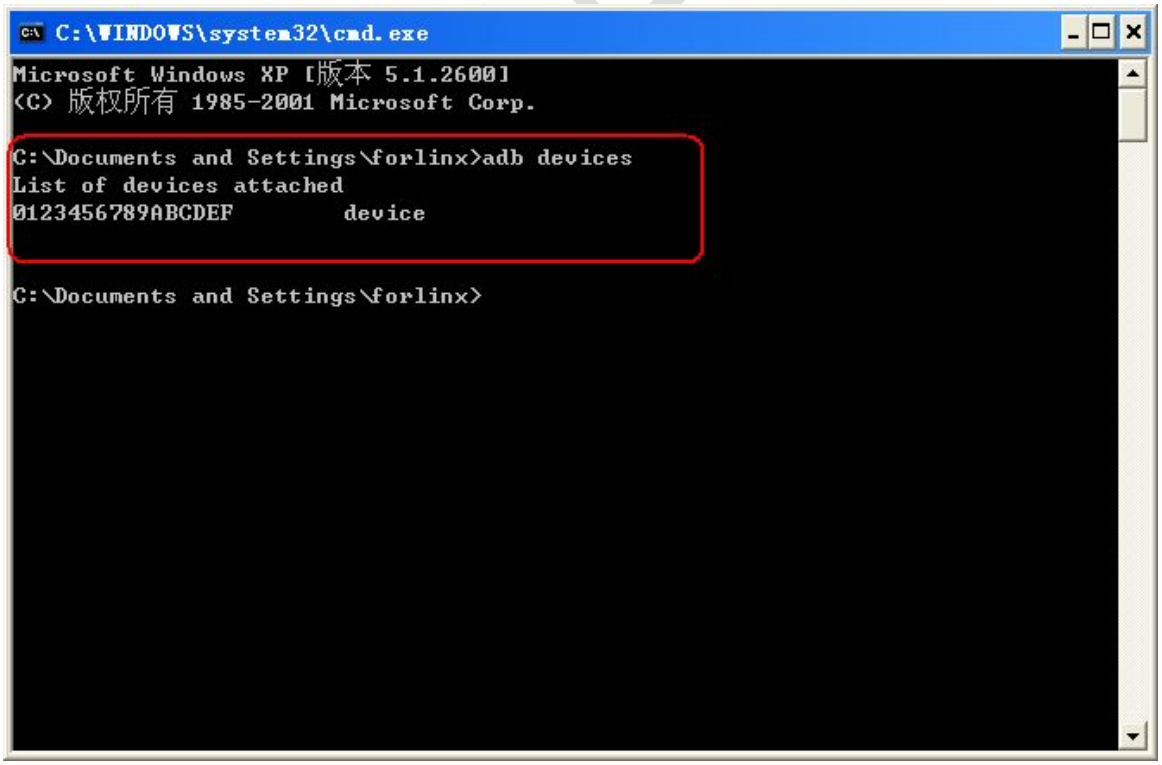


2. Test adb

Please check the device connection status at first. Run OS Android in i.MX6, and connect the i.MX6 with PC via mini USB cable, and input below command at the DOS window to check whether the i.MX6 is connected:

#adb device

Below information shows the connection is successful

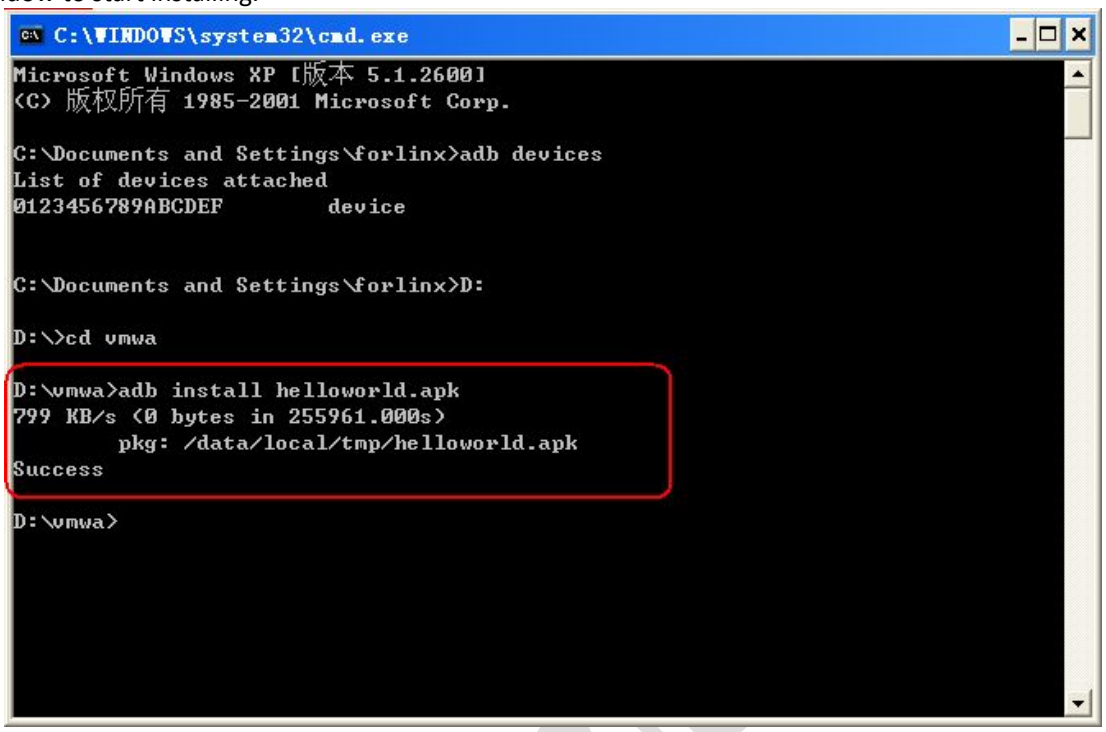


Get into ADB shell, and enter into i.MX6 terminal by below command

#adb shell

Note: Input exit in the i.MX6 terminal to back to DOS prompt.

Install software by ADB. Take D:\helloworld.apk for example, input command adb install D:\helloworld.apk in the DOS window to start installing.



ADB is a powerful tool for software installing, uninstalling, debugging and shell, besides, it could also support file transfer to single board computer.

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Appendix1

Installation and Configuration of Ubuntu

F1.1 Ubuntu Installation

Step1: Make a Ubuntu12.04.02 installation CD. Insert it into CD-ROM and boot PC from disk by setting from bios in PC.

🗁 User CD(A)：\Tools\ubuntu-12.04.2-desktop-amd64.iso

Step2: After starting PC, select language by arrow keys on PC keyboard. Here we select “English”, then click “Install Ubuntu”.

Step3: Select “Erase disk and install Ubuntu”. Then click “Continue”.

(Note: if Ubuntu is not going to be installed into the virtual machine that has been set in your host, disk C will be formatted in the Ubuntu installation.)

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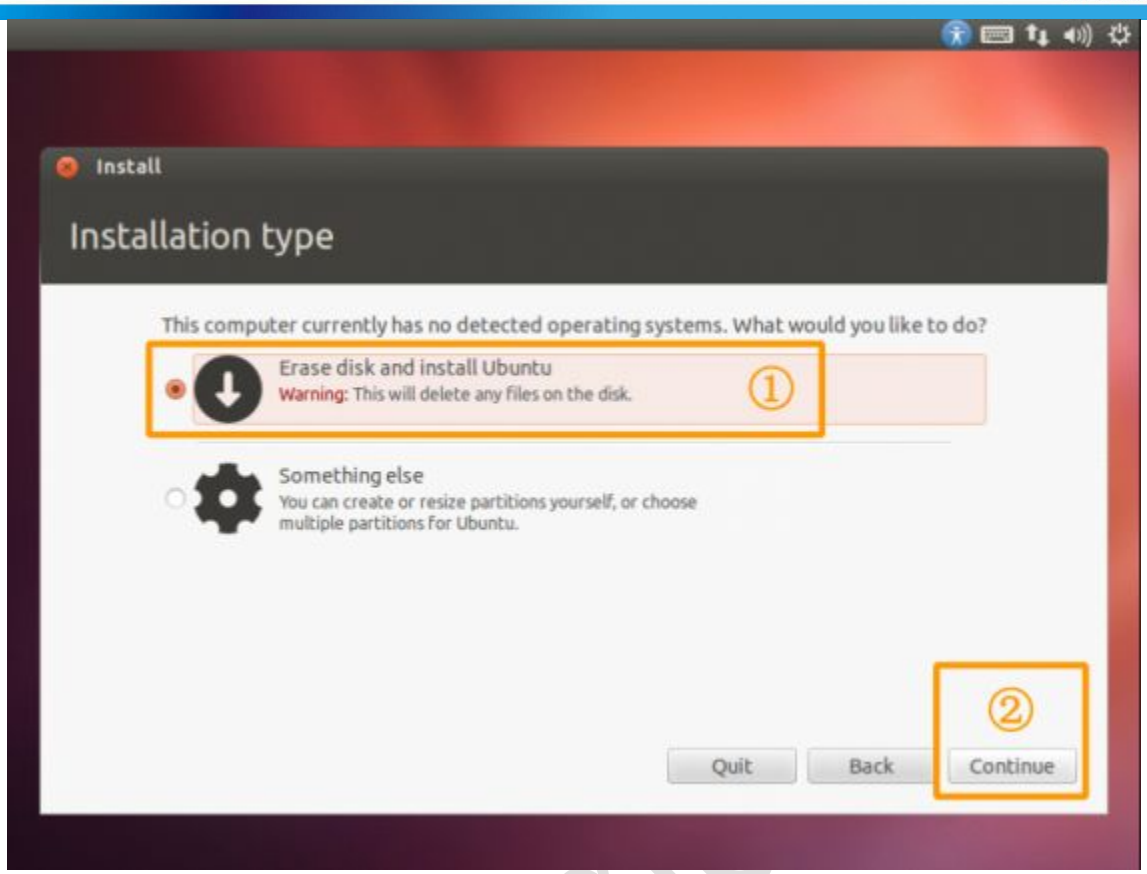
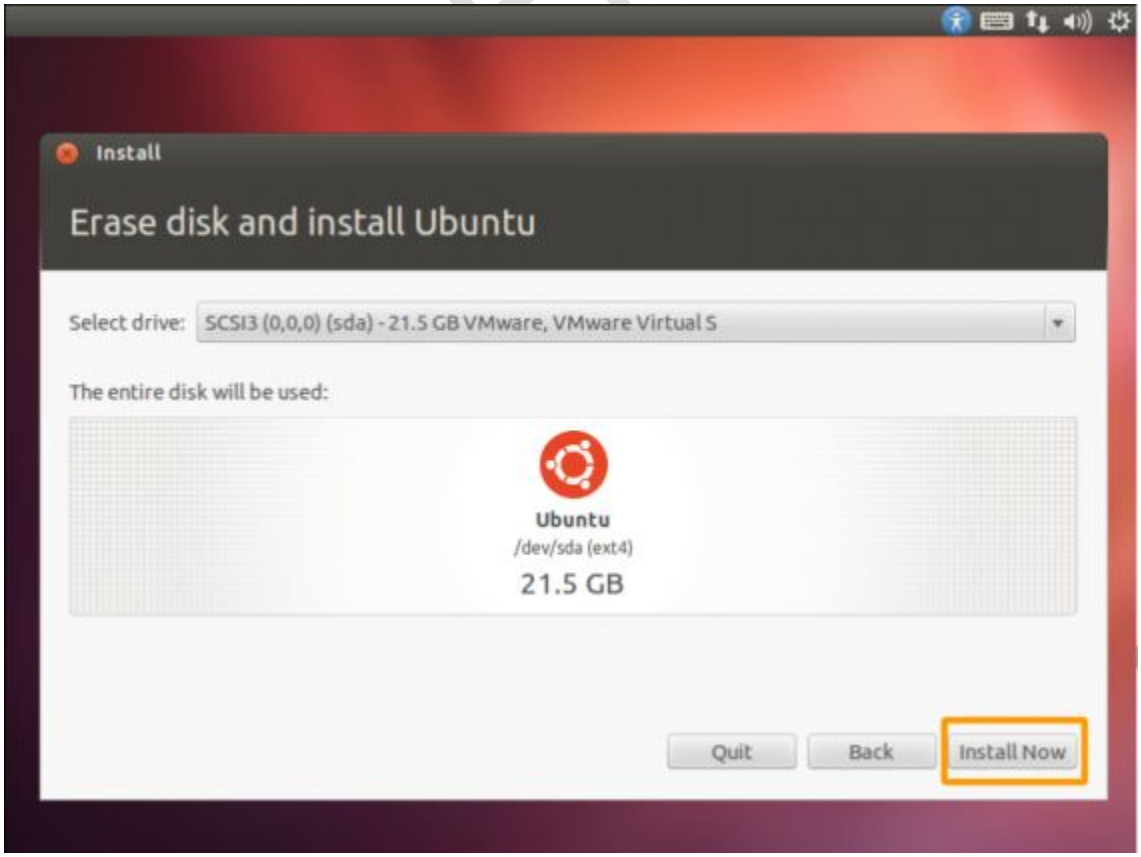
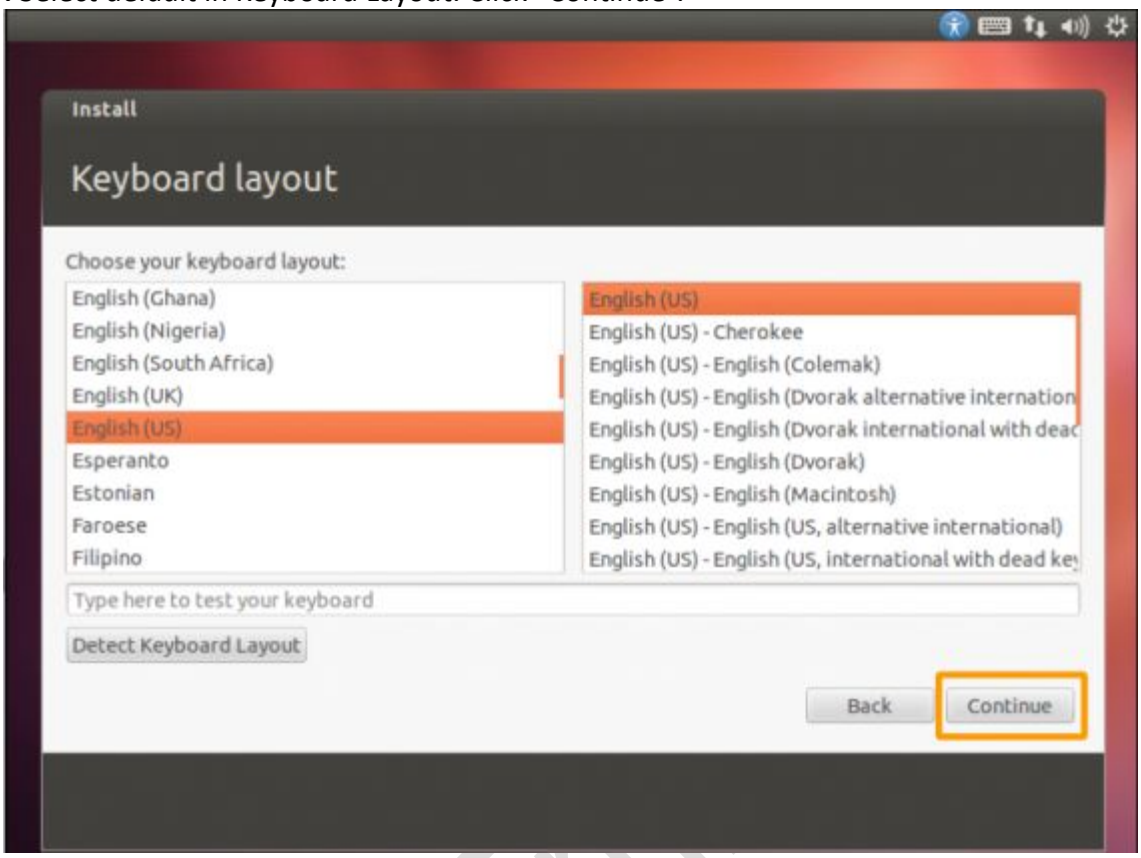


Step4: Allocate hard disk space and mount points. Here you can either select by default or make self-setting. Then click “Install Now”.

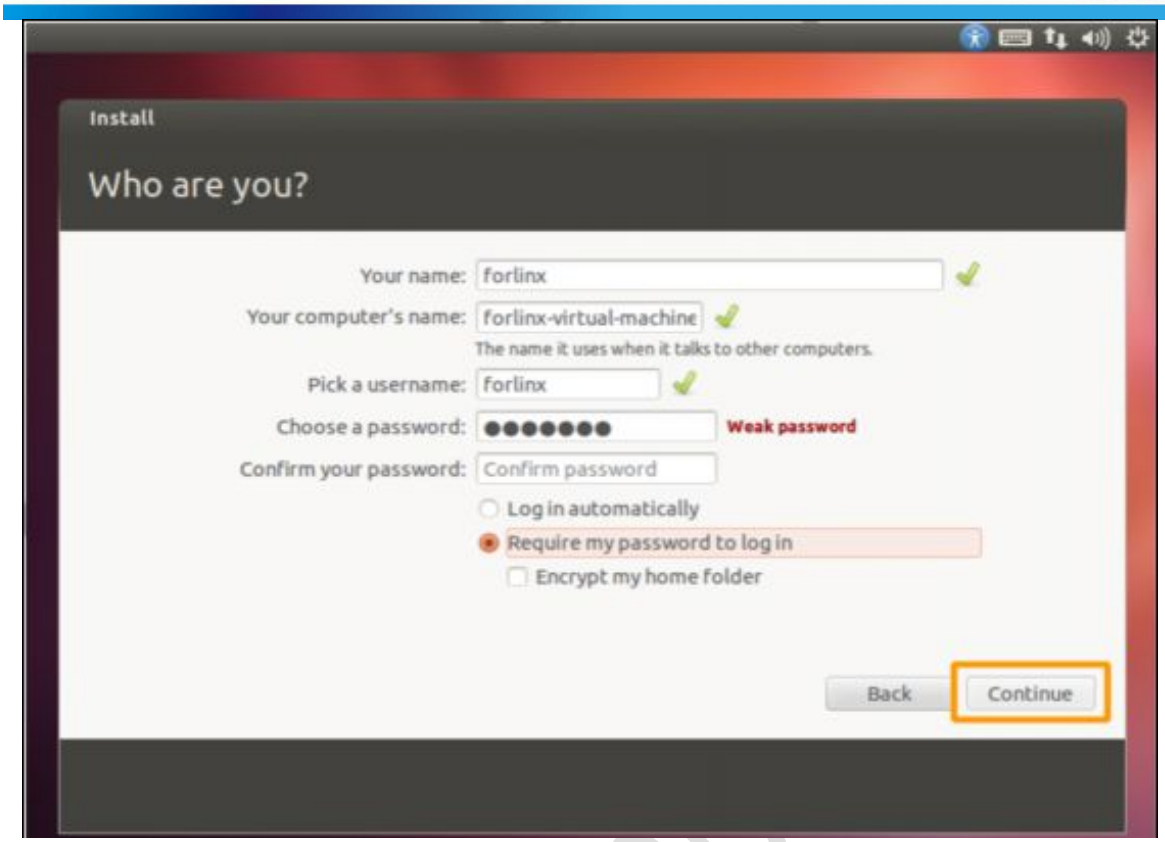


Step5: Select default in Keyboard Layout. Click “Continue”.



Step6: Select location, and then click “Continue”. Here we select “Shanghai”.

Step7: Enter user name and password. Here we take user name forlinx and password 123456 as an example. Click “Continue” to complete system installation.



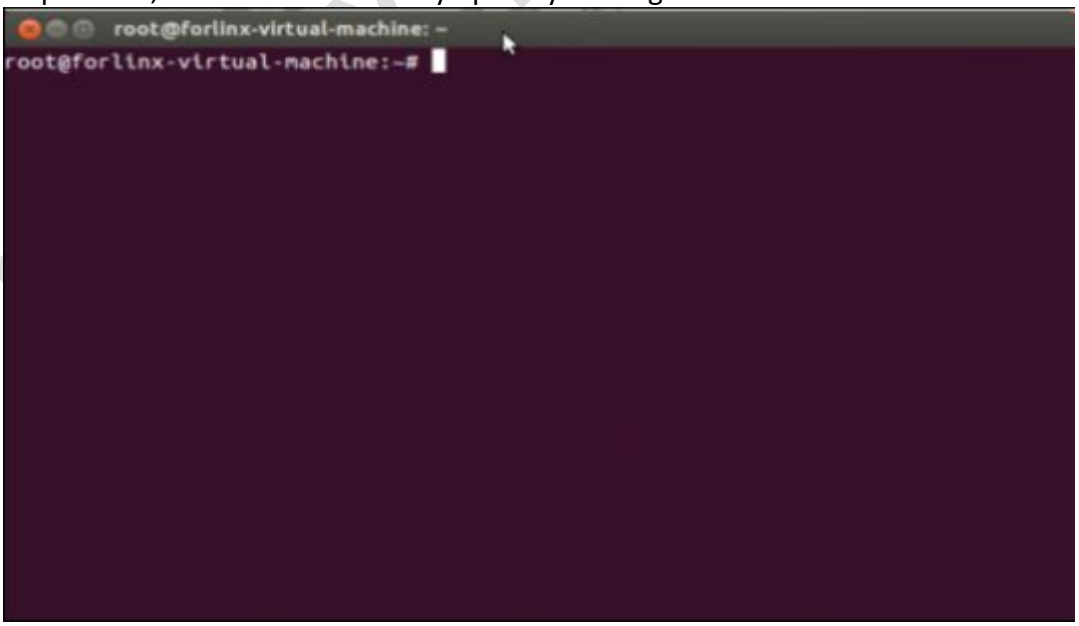
Note: The user name here is only a normal one that has no access to root authorities.

F1.2 Linux Terminal

In Linux system, terminal is a practical and interactive window with operation system. Compiling application programs and launching all kinds of system service can all be undertaken through terminal. Therefore, terminal is very important in Linux.

See the picture below. Click the icon in area 1. Type in word terminal in area 2. Select icon in the lower left and drag it to area 3 by mouse. Now, shortcut icon of terminal is available.

After this operation, terminal will be easily open by clicking this shortcut icon.



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F1.3 How to Log in as the Ubuntu12.04.02 Root User

By default, logging in as root user is not allowed by Ubuntu12.04.02. It is only available for normal users and visitors. In order to log in as root user, we need to log in Ubuntu as a normal user first and then make some modification.

Step1: After logging in as normal user, switch to hyper user mode, enter command: $sudo –s into the terminal.
Step2: Enter password set when installing Ubuntu12.04.02, to enter root user's permissions.
Step3: Run $gedit /etc/lightdm/lightdm.conf in terminal
Step4: Delete all texts in this interface and enter following:

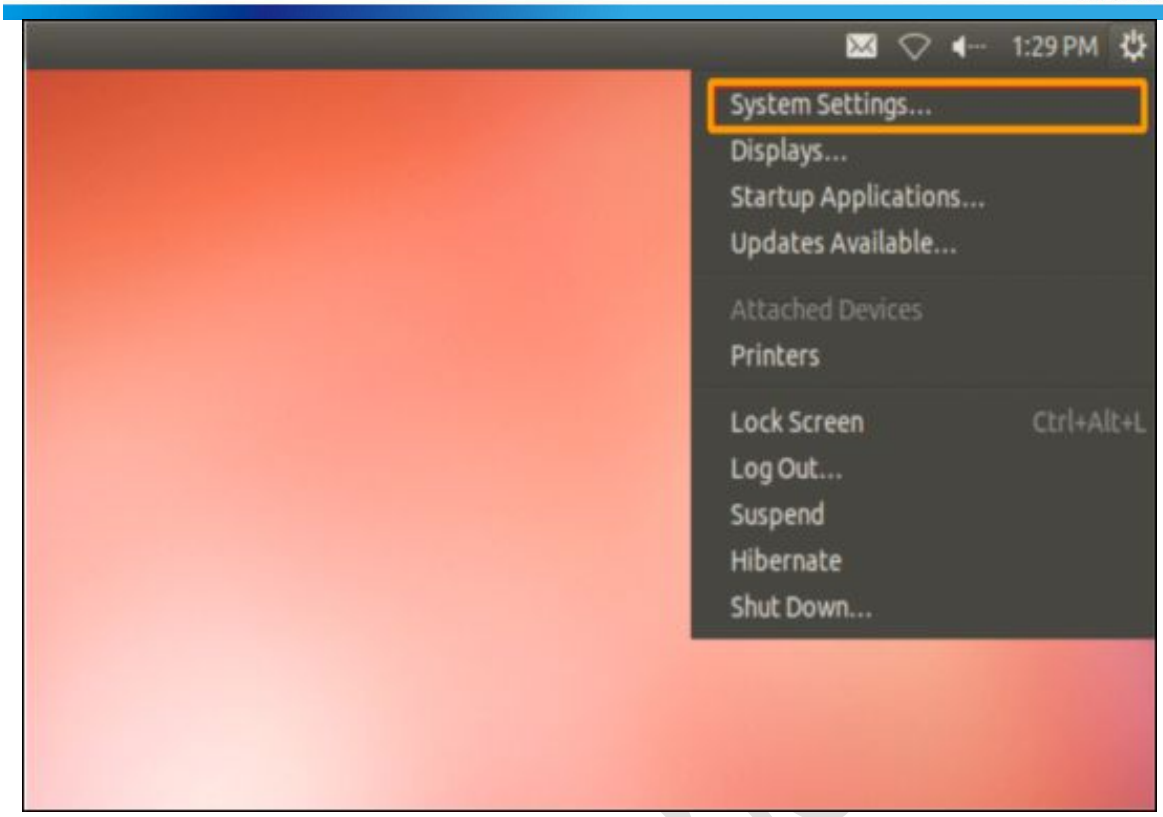
```
[SeatDefaults]
allow-guest=false
autologin-user=root
autologin-user-timeout=0
autologin-session=lightdm-autologin
user-session=ubuntu
greeter-session=unity-greeter
```

Step5： Restart root account by entering： $ sudo passwd root
Step6： Enter root account name and password.(Note: there is no symbol prompt when entering password in Linux.)
Step7: Restart Ubuntu, system will automatically log in as root user.

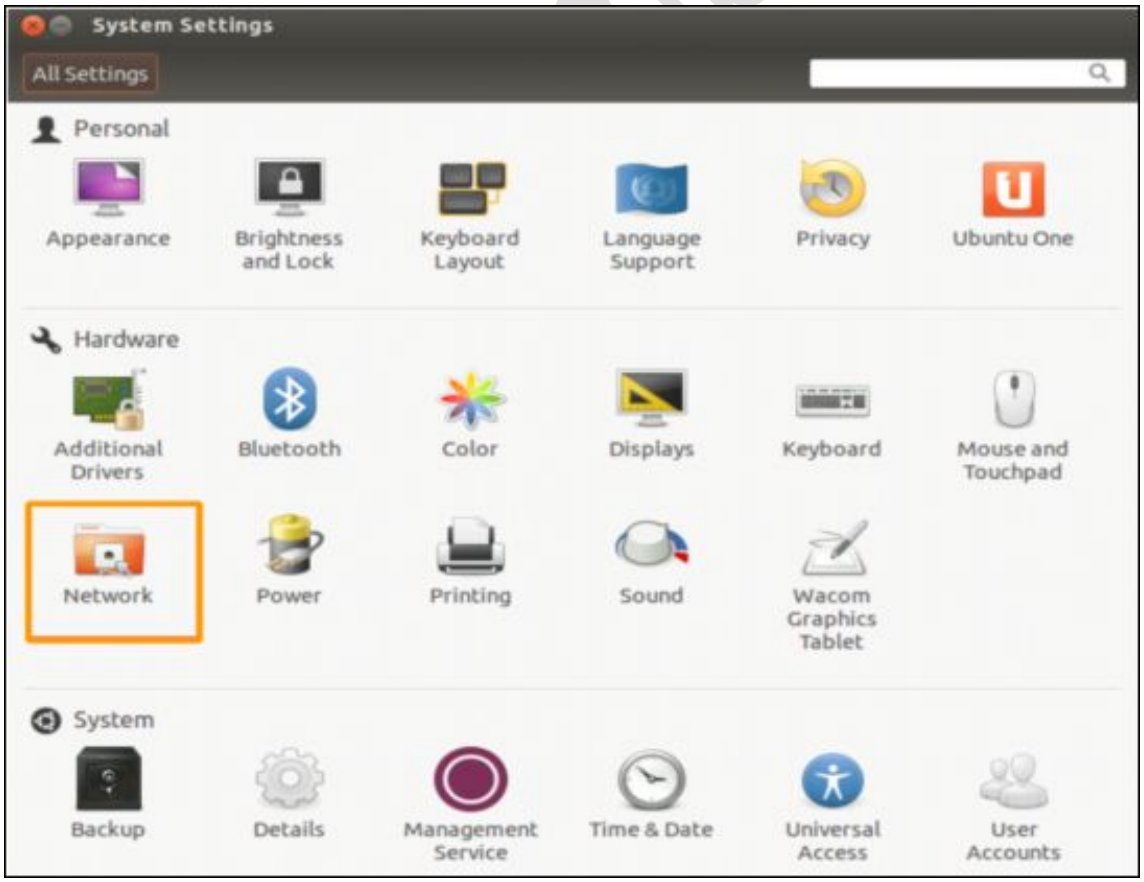
F1.4 Ubuntu Network Parameter Setting

Different PC may have different network environments so that setting it according to your situation is necessary. If there is something wrong with this setting, you could ask for help from Ubuntu official forum. Here we are doing to introduce setting network environment for PC Linux. Just for your reference.

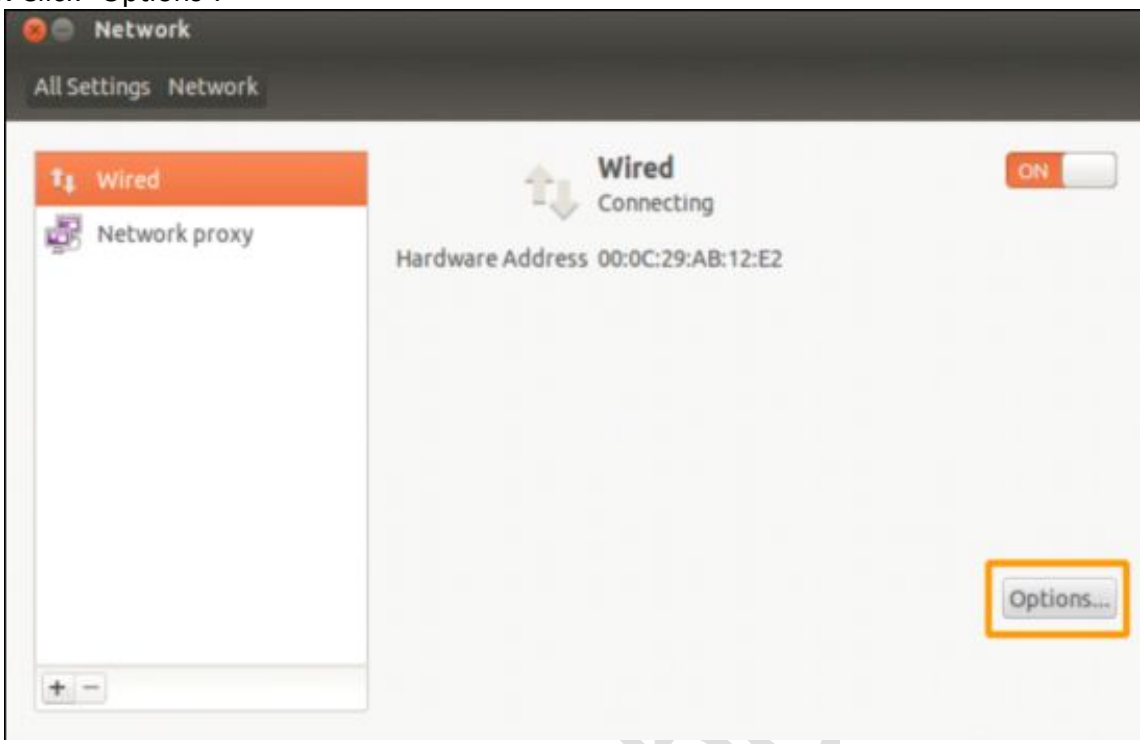
Step1: Boot Ubuntu logging. Click"  "on the upper right corner. Following options will be shown.



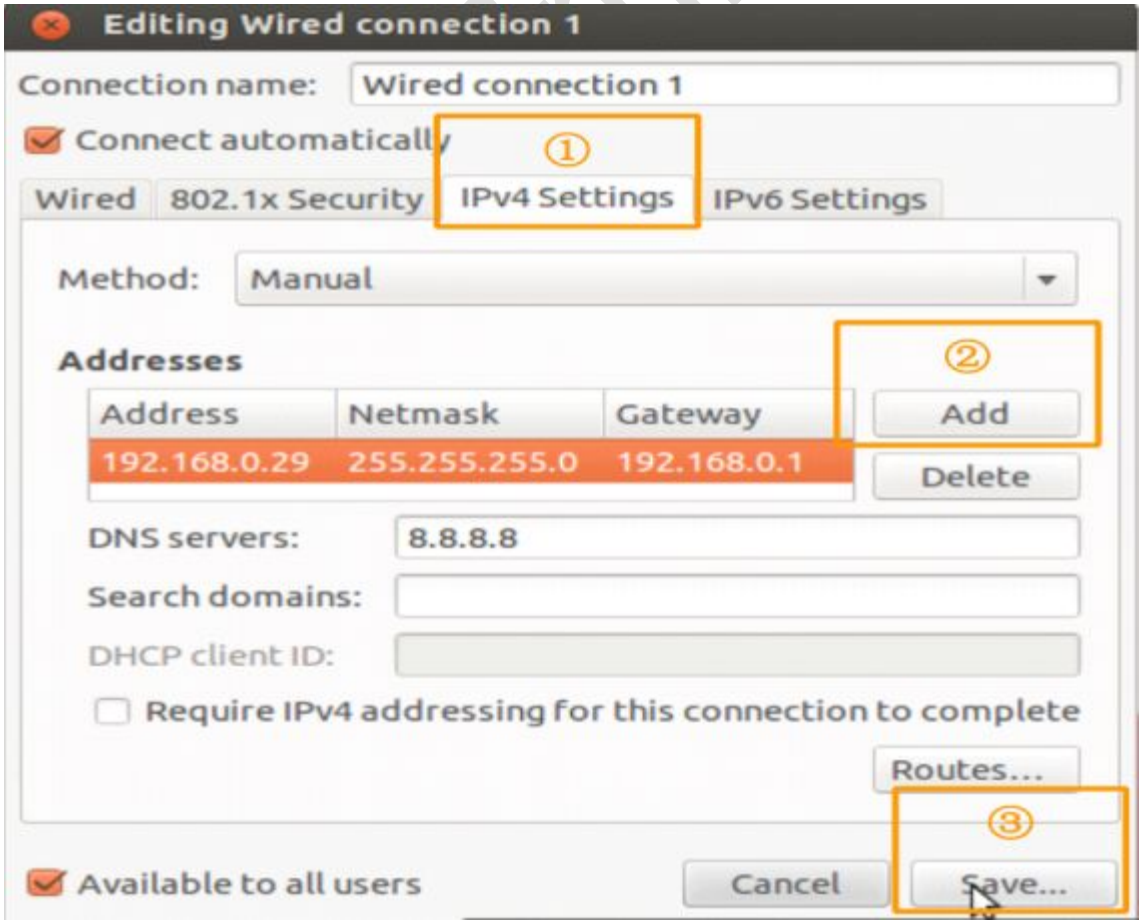
Step2: Select “System Settings” and double click “Network” to enter network setting.



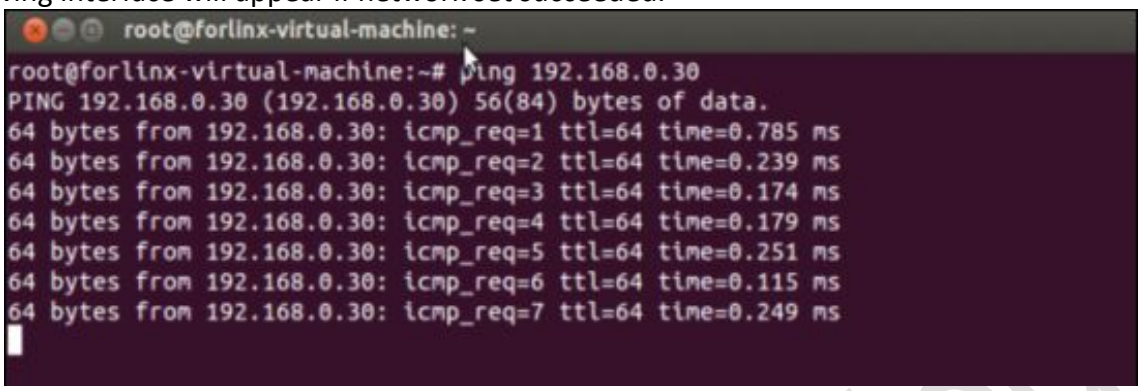
Step3: Click “Options”.



Step4: Select “IPV4 setting”, enter your IP address, subnet mask, gateway, DNS, and click “Save...” at last.



Step5: Let's test it. Suppose host machine's IP is 192.168.0.30. Ping it through virtual machine. Following interface will appear if network set succeeded.



Appendix 2: Install ADB Driver

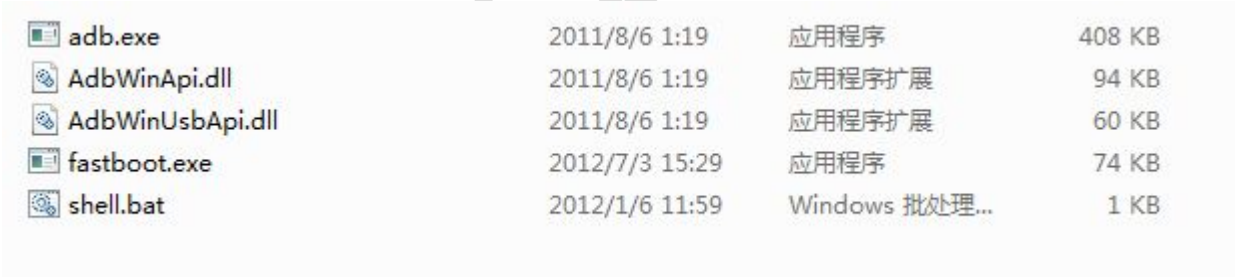
This chapter is finished in Windows 7

1. ADB driver and ADB application

Find android_usb_driver.rar in tools folder and extract it:

X64 is the ADB driver for system with 64bit, and x86 is the driver for system with 32bit

Adb.rar in tools folder is the ADB application in windows, this program is depended on adb driver.



2. Install ADB

If the PC is without ADB driver, it will be shown as below.

The Android ADB interface of Android phone will be recognized in the PC manager after installation of the driver

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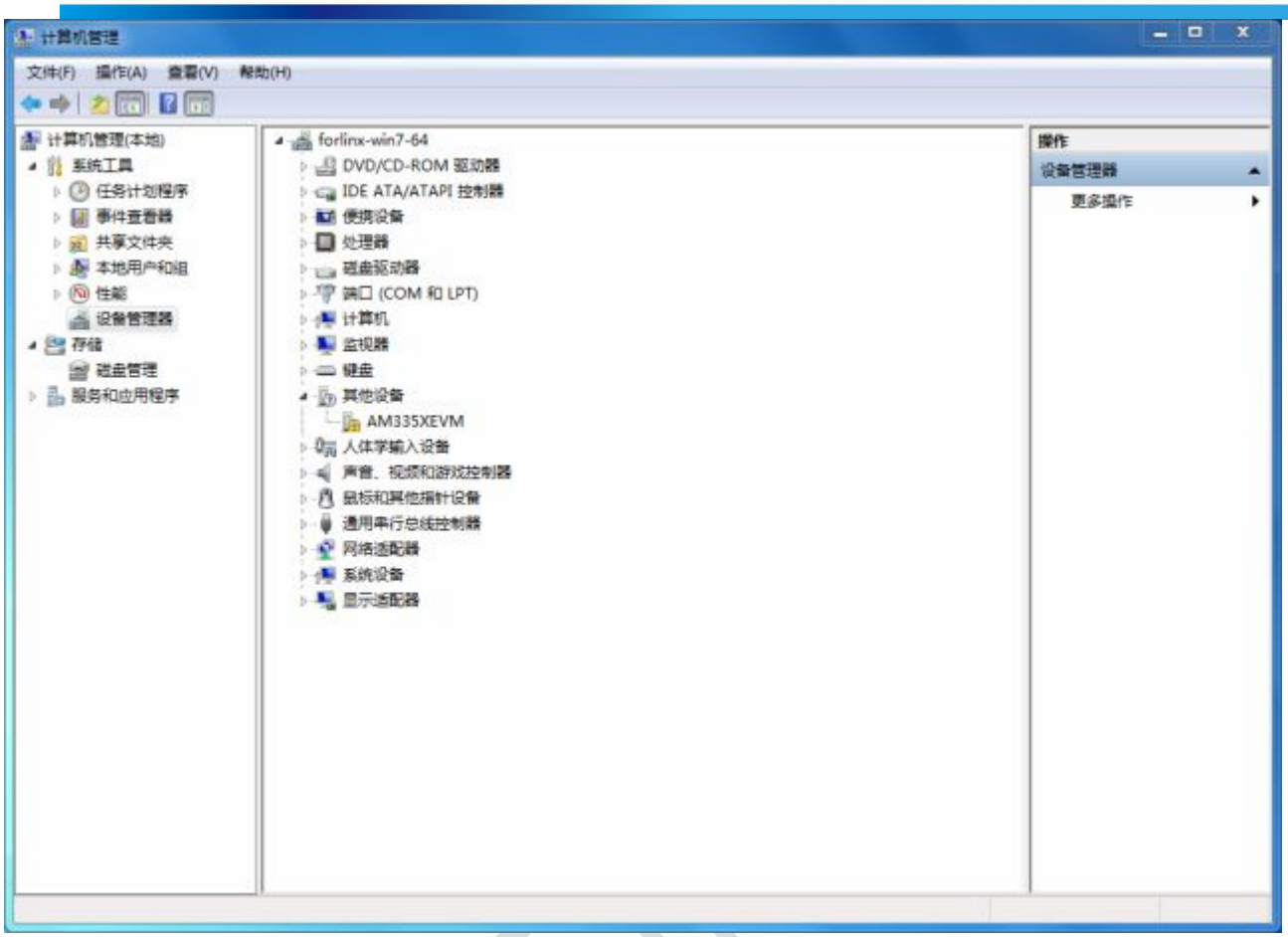
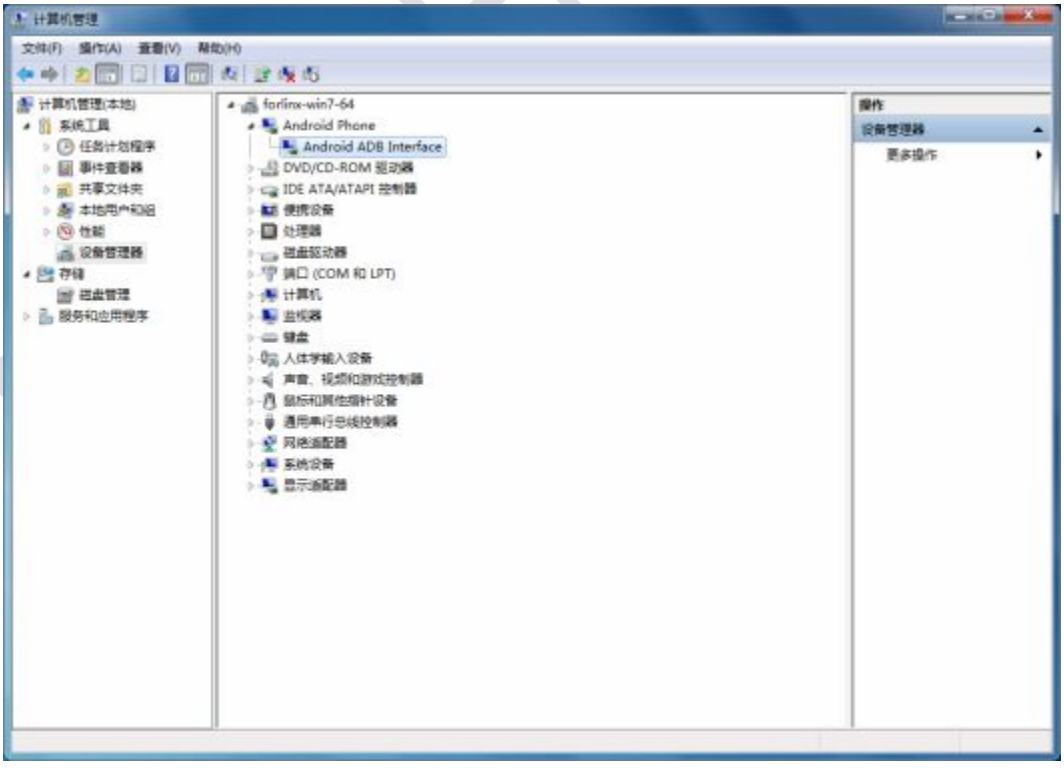
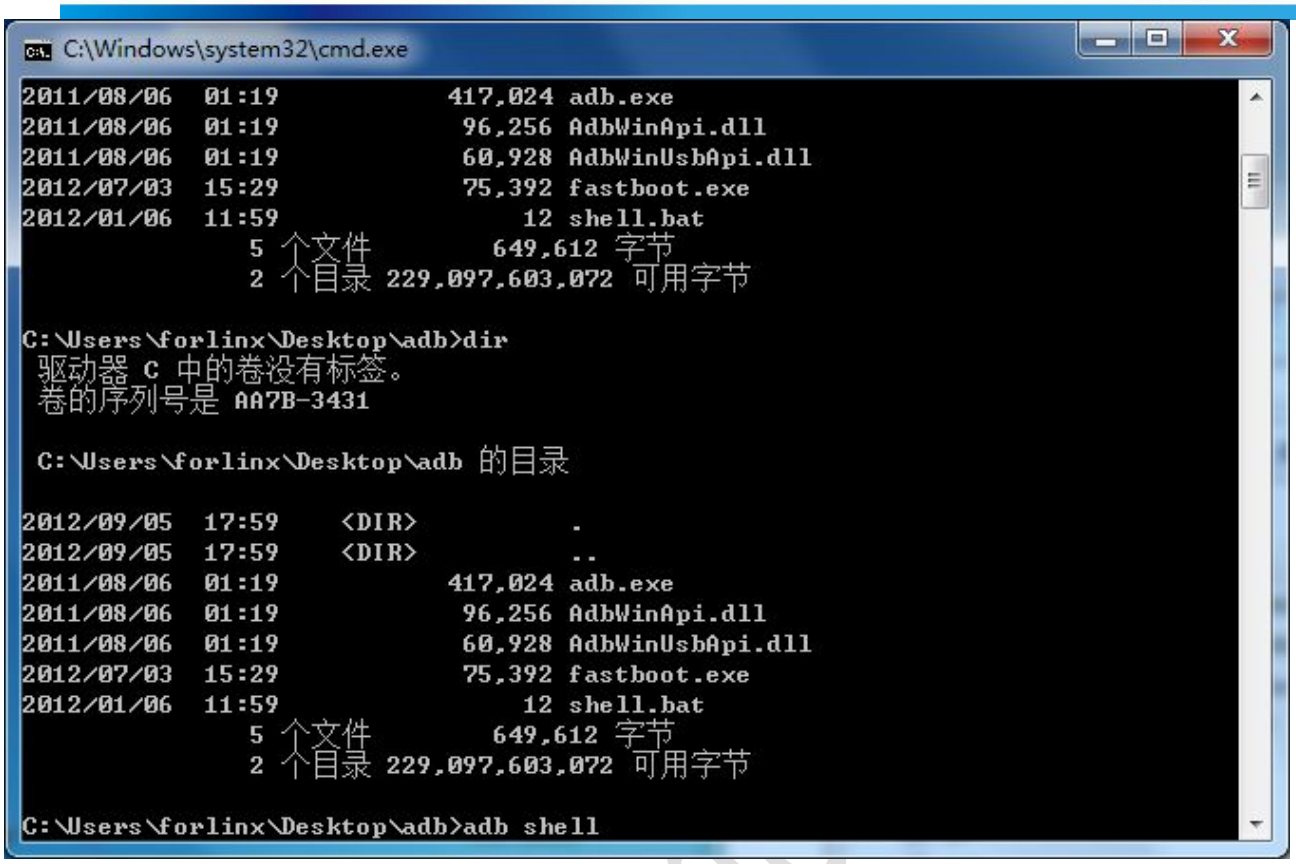




Then users could connect Android shell by ADB or install APK by adb install


C:\Windows\system32\cmd.exe
2011/08/06 01:19 417,024 adb.exe
2011/08/06 01:19 96,256 AdbWinApi.dll
2011/08/06 01:19 60,928 AdbWinUsbApi.dll
2012/07/03 15:29 75,392 fastboot.exe
2012/01/06 11:59 12 shell.bat
5 个文件 649,612 字节
2 个目录 229,097,603,072 可用字节
C:\Users\forlinx\Desktop\adb>dir
驱动器 C 中的卷没有标签。
卷的序列号是 AA7B-3431
C:\Users\forlinx\Desktop\adb 的目录
2012/09/05 17:59 <DIR> .
2012/09/05 17:59 <DIR> ..
2011/08/06 01:19 417,024 adb.exe
2011/08/06 01:19 96,256 AdbWinApi.dll
2011/08/06 01:19 60,928 AdbWinUsbApi.dll
2012/07/03 15:29 75,392 fastboot.exe
2012/01/06 11:59 12 shell.bat
5 个文件 649,612 字节
2 个目录 229,097,603,072 可用字节
C:\Users\forlinx\Desktop\adb>adb shell