Chipsee

Industrial PC

Ubuntu 12.04 OS on iMX6Q User Manual

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Contents

Ubuntu 12.04 OS

Ubuntu 12.04 OS User Manual

This manual provides users with a fast guide of Chipsee Industrial Computer (Abbreviate as IPC) about Ubuntu 12.04 OS development. Through this manual, users can quickly understand the hardware resources; users can build a complete compilation of Linux development environment; users can debug Ubuntu 12.04 OS via serial and Internet.

Revision	Date	Author	Description
V1.0	2021-12-30	Randy	Revised

SUPPORTED BOARDS:

> *CS10600F070 CS12800F101*

PREBUILT FILES PACKAGE:

Prebuilt files for the various industrial PCs can be found in the OS Downloads.
Below are the links to the prebuilt files for each industrial PC model.

- CS10600F070
- CS12800F101

System Features

Feature	Comment
Kernel	Kernel 3.14.52
Bootloader	Uboot 2015.04

Feature	Comment
System	Ubuntu 12.04 LTS
Python	Python 2.7.9 / Python 3.4.0
Qt	Need to be installed by user
GCC	4.8.2
Desktop	matchbox
user/password	[linaro/linaro] or [linaro/root]

Preparation

You will need to prepare the following items before you can start using the Prebuilt Files Package to re-flash the system.

Power Supply Unit (PSU) with the appropriate voltages, as follows:

- The CS12800F101 product needs a 12V to 36V power adapter.
- The CS10600F070 product needs a 6V to 36V power adapter.

You need to prepare the Power Adapter by yourself

Hardware Requirements

- Chipsee Industrial PC
- PSU according to the instructions above
- USB-to-serial or other serial cable for debugging
- USB A-A cable (used only if the hardware configured as OTG)
- Windows 7 PC
- Mini-B USB OTG Cable
- TF Card (at least 4GB) and card reader

Software Requirements

- Ubuntu 12.04 OS Prebuilt Files Package (from the link above)
- MFGTools
- QT4.8.4 for Linux

Getting Started and Tests

> **Note**
>
> Throughout this section, the user can use both the pre-built Ubuntu 12.04 image files and the MFGTools software to burn files to the system, boot system and perform necessary software and hardware test.

Downloading images

Boot Switch Configuration

CS-IMX6 has a boot configuration select switch, as shown on the figure below. You can use the boot select switch to change between three modes, namely

- TF Card
- eMMC Boot
- Download

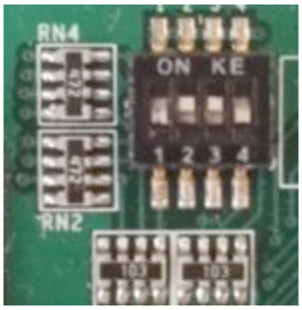


Figure 261: Boot Mode Setup

SW Mode	1	2	3	4
TF Card	1	0	0	0
eMMC	1	1	0	1
Download	0	1	1	0

Table 56 Boot Configuration Selection

> **Note**
>
> The user can use both the pre-built Ubuntu 12.04 image files and the **MFGTools** software to download new images to the system, boot system and perform necessary software and hardware test.

Prebuilt Files Package

You can get the Prebuilt Files Package for each model from links mentioned at the beginning of this documentation. You can also get the Prebuilt Files Package from the DVD in /Ubuntu 12.04/Prebuilds folder. However, it may be outdated so always compare the versions (the last number in the filename is the release date).

The prebuilt package has the following content:

Contents	Comment
boot/imx6q-eisd.dtb	TF Card boot dtb file
boot/u-boot-sd.imx	TF Card boot bootloader
boot/zImage	TF Card boot kernel file
boot/logo.bmp	TF Card boot logo file
filesystem/rootfs-emmc-flasher.tar.bz2	TF Card boot rootFS
mksdcard.sh	Shell tools to make bootable TF Card
README	Simple guidelines
S1.jpg	Boot Switch Config Figure
emmc-flash/emmc/rootfs.tar.bz2	RootFS in target eMMC
emmc-flash/emmc/u-boot-emmc.imx	Bootloader in target eMMC
emmc-flash/emmc/zImage	Kernel file in target eMMC
emmc-flash/emmc/zImage_framebuffer	Kernel file with frame-buffer
emmc-flash/emmc/imx6q-eisd.dtb	Dtb file in target eMMC
emmc-flash/emmc/imx6q-eisd.dtb_framebuffer	Dtb file with frame-buffer
emmc-flash/emmc/logo.bmp	Logo file in eMMC
emmc-flash/mkemmc.sh	Shell tool to download images to eMMC

Table 57 Prebuilt Files Package

Note

- The default `zImage` and `imx6q-sabresd.dtb` files support *'keep the logo from uboot to kernel'* but don't support framebuffer.
- We also provide `zImage_framebuffer` and `imx6q-eisd.dtb_framebuffer` file versions that support the framebuffer function but do not support the *'keep the logo from uboot kernel'* feature. If you need the framebufer, just rename these two files to `zImage` and `imx6q-eisd.dtb`.

Downloading Images by using MFGTool

The MFGTools can be used to download images into a target device. It is a quick and easy tool for downloading images.

Before downloading images with the MFGTools, set the boot switch to download mode. (refer to Boot Switch Configuration above)

CONFIGURING MFGTOOL

To configure MFGTool, follow these steps:

- Untar `Mfgtools-K3035-Vx.x.zip` file.
- **Open the extracted folder `Mfgtools-K3035-Vx.x` and edit `cfg.ini` file.**

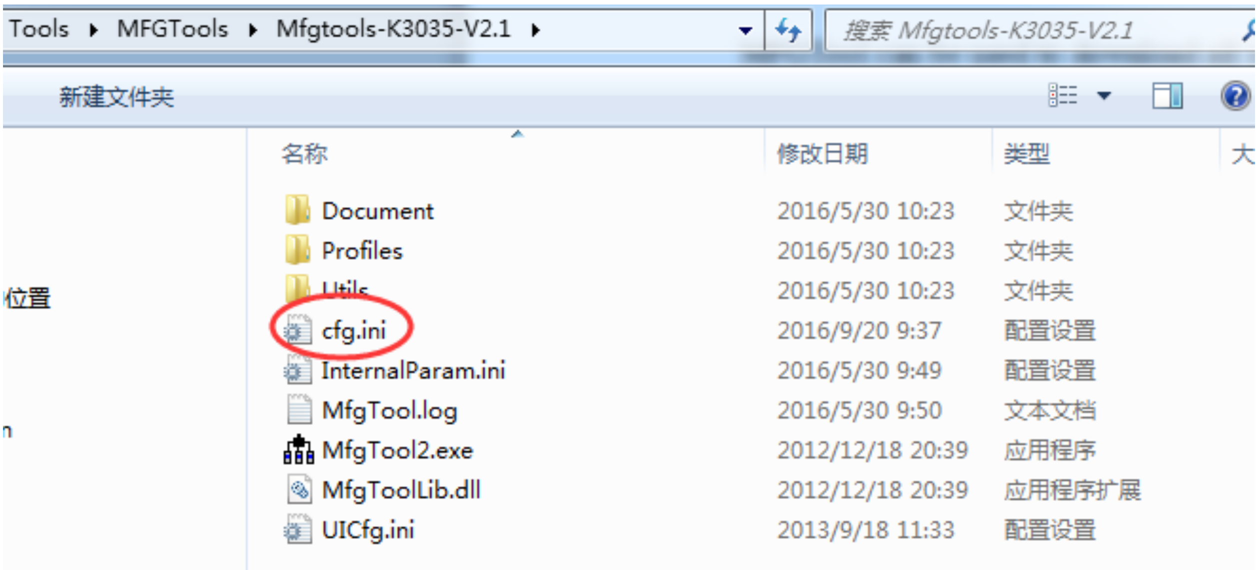


Figure 262: *Extracted Folder*

- **In the `cfg.ini` file, ensure the `name` variable is set to `Ubuntu-SabreSD-eMMC`, as shown on the figure below.**

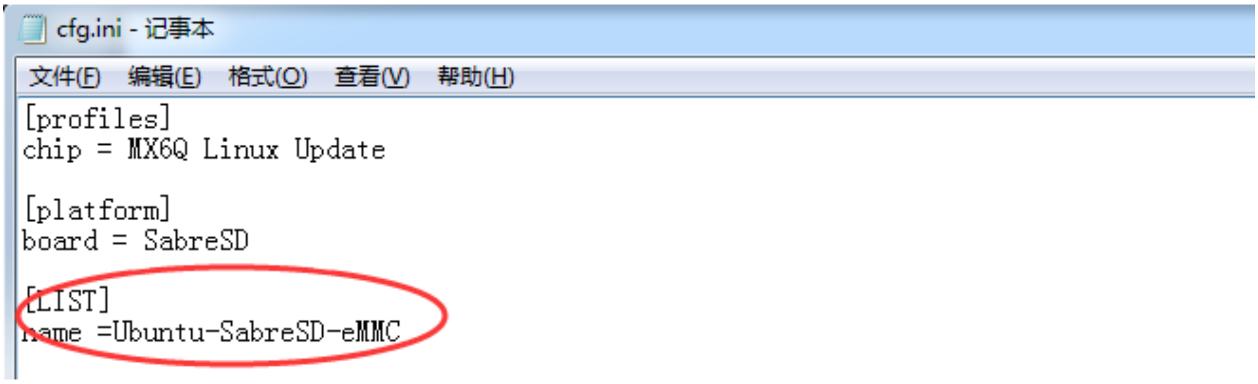


Figure 263: *Cfg.ini file*

Note

The default uImage disable the Frame buffer function. If you want to use Frame buffer, please rename the `uImage_has_console` to `uImage` to replace the default `uImage`.

COPY IMAGE TO ANDROID DIRECTORY

Follow these steps to copy image to Linux directory:

- Copy the images from *prebuilt-xxx/emmc-flash/emmc/* to *Mfgtools-K3035-Vx.x\Profiles\Linux\OS Firmware\files\ubuntu* directory. Copy the logo file to *Mfgtools-K3035-Vx.x\Profiles\MX6Q Linux Update\OS Firmware\files\logo* directory and rename it to *logo.bmp* .

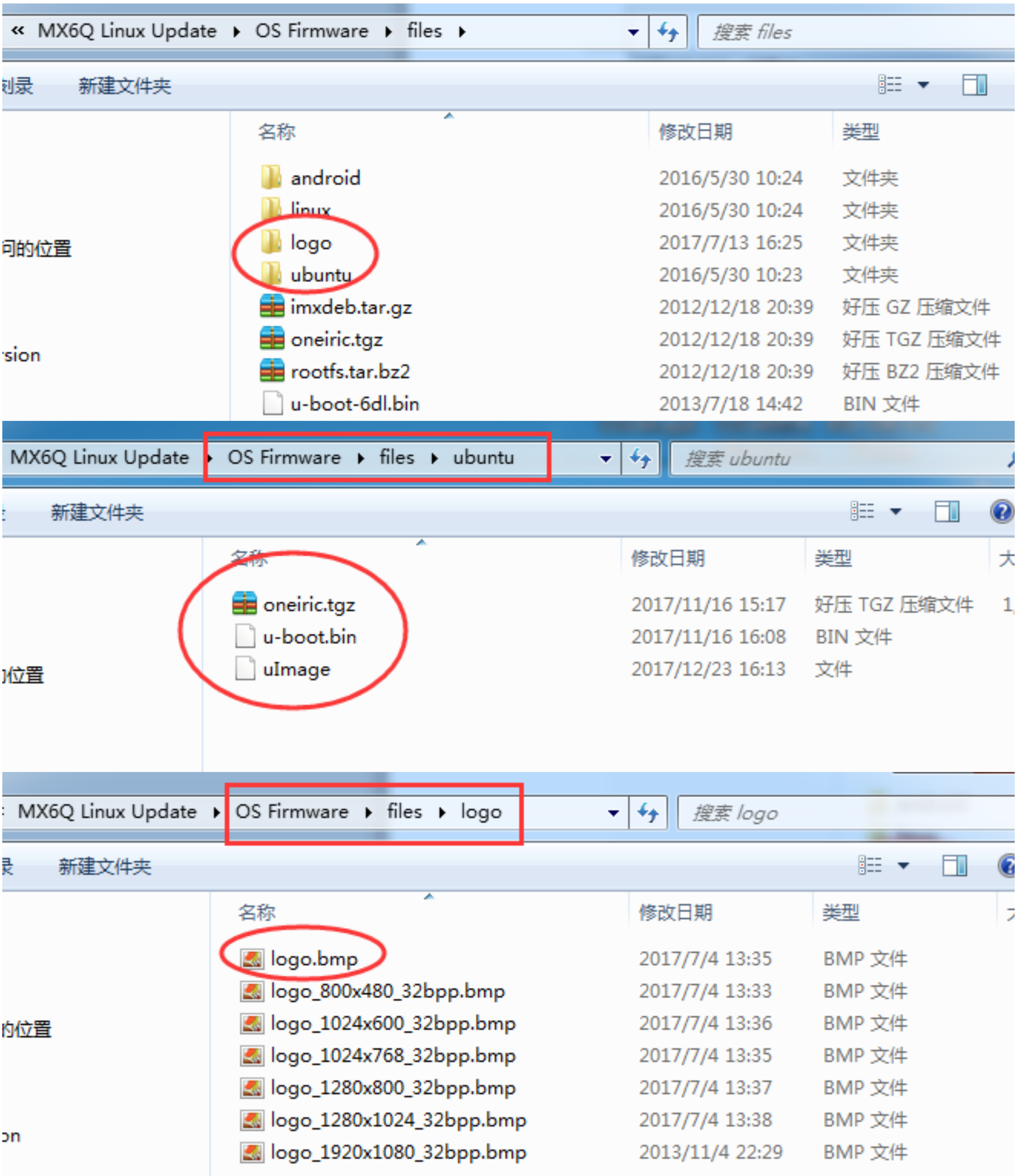


Figure 264: *Prepare Images*

USING MFGTOOL

1. Connect a USB OTG cable from a Windows PC to the USB OTG port on the IPC.
2. **Change the boot select configuration to 0 1 1 0, as shown on the figure below.**

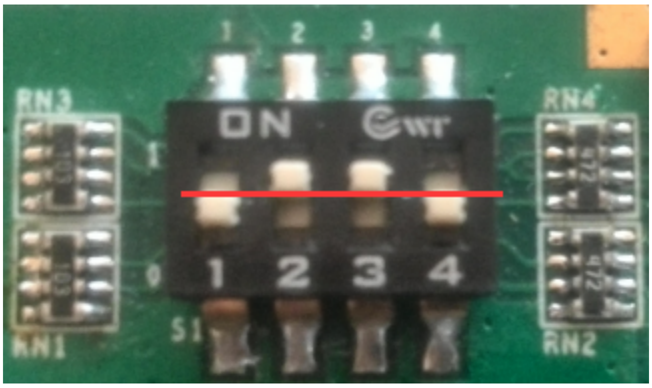


Figure 265: *Boot Switch Config*

3. Connect a 12V-2A power adapter to the IPC and power ON.
4. **On your Windows PC, open the** `Mfgtools-Rel-XXX_XXXXXX_MX6Q_UPDATER_VXX` **directory and run the** `MfgTool2.exe` **file, as shown on the figure below.**

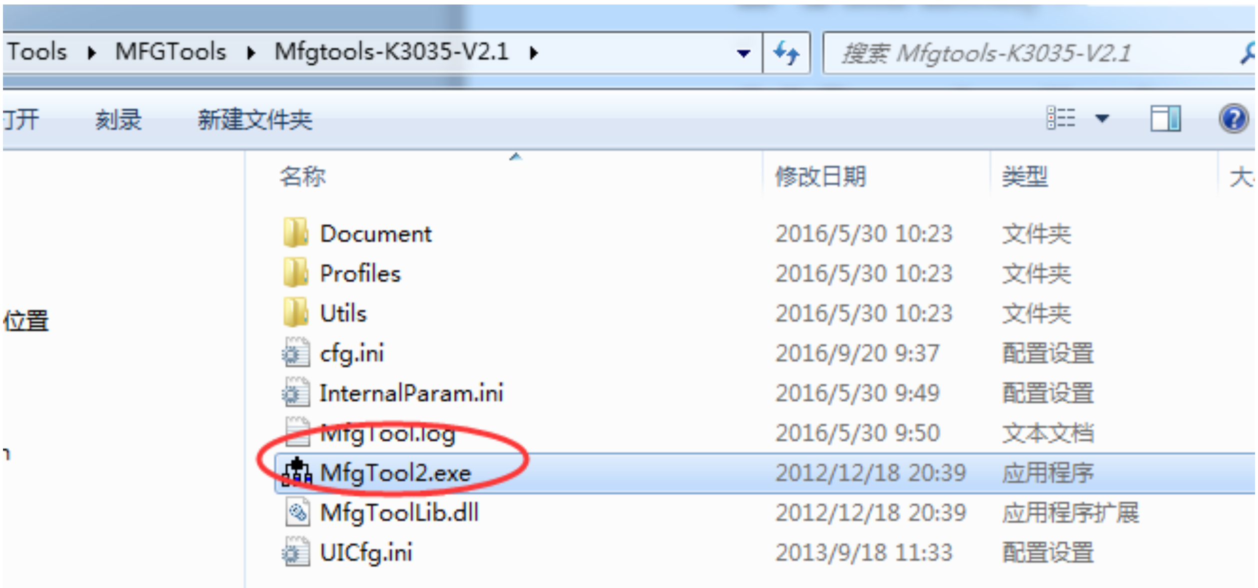


Figure 266: *Run* **MfgTools2.exe** *file*

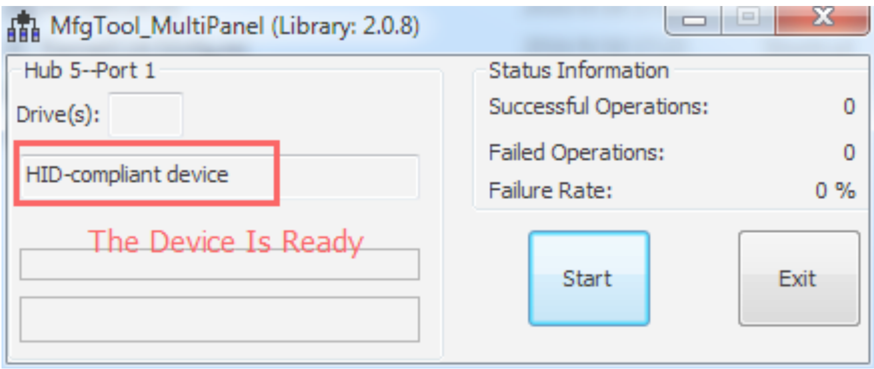


Figure 267: *Prepare to start*

Note

If you get a message saying *No Device Connected*, check the USB-OTG cable to ensure it is ready.

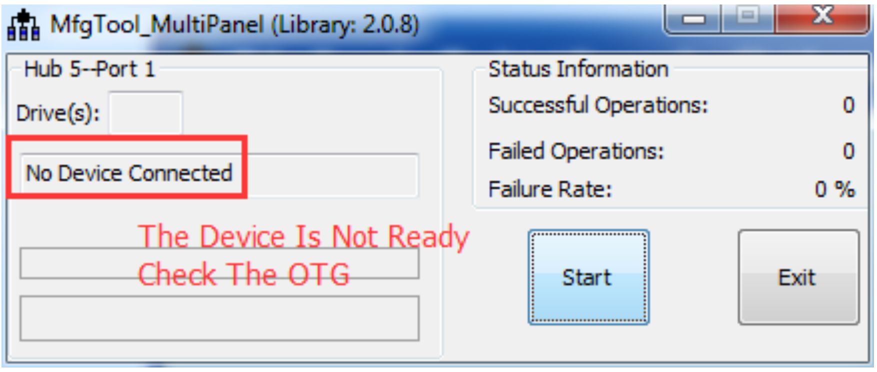


Figure 268: *The USB-OTG cable is not connected correctly.*

5. **Click on Start button to download the Image.**

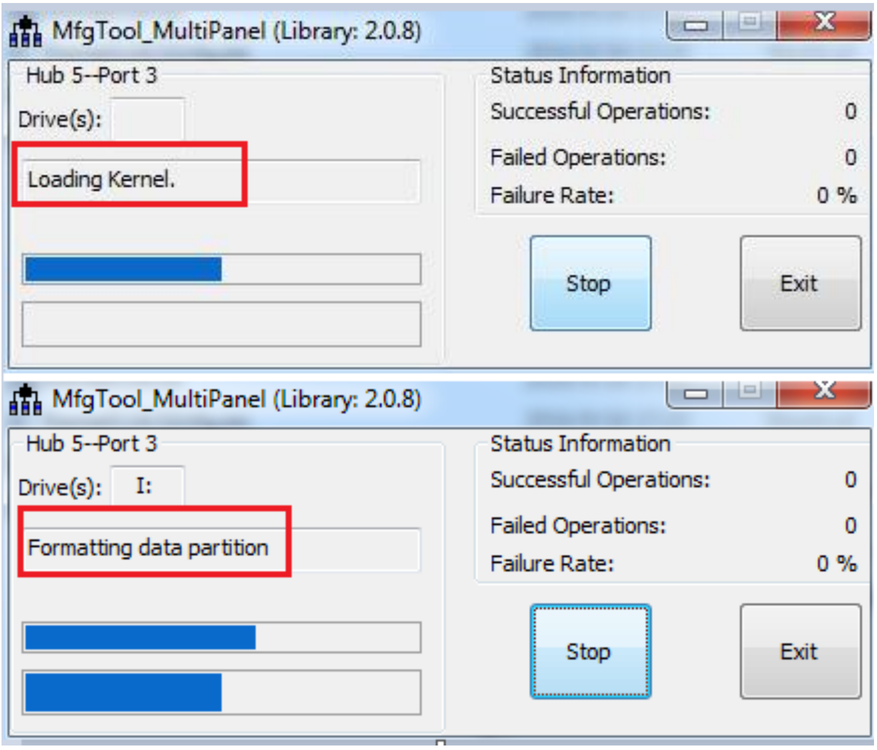


Figure 269: *Downloading Images*

Note

If you are using a Window 7 PC, you will receive a prompt that asks you to format the disk. Please ignore or cancel it.

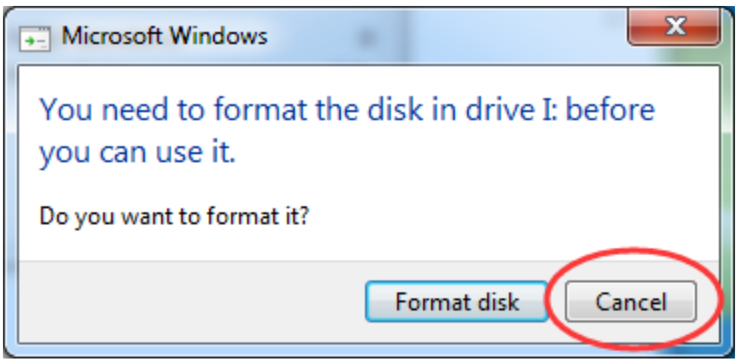


Figure 270: *Cancel format disk*

6. **When the process is complete, you click the Stop button to stop downloading Image and exit.**

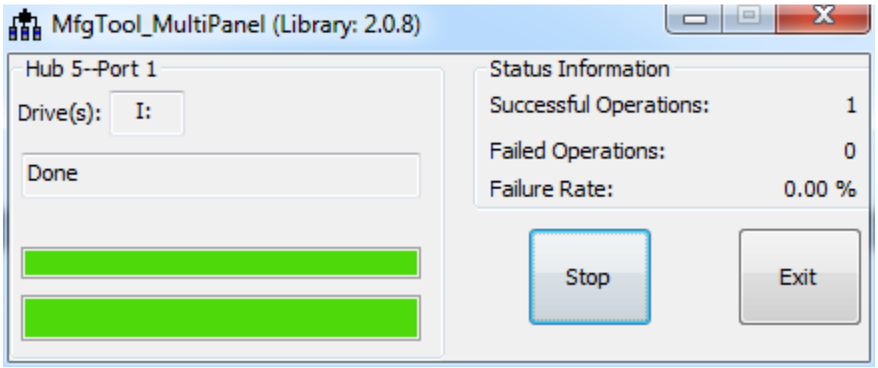


Figure 271: *Download Image is finished*

Downloading Images by using the TF card

Follow the steps below to download images onto the eMMC by using the TF Card:

1. Copy the Prebuilt Files Package to a Linux environment (such as Ubuntu 14.04).
2. Insert the SD card into your computer. If you are using virtual machines, please ensure the SD card is mounted to the Linux operating system.
3. **Confirm the SD card mount point, `/dev/sdX` (e.g., `/dev/sdc` or `/dev/sdb`, be sure to use the right one). In a Linux system, you can use the command below to find out what** X **is.**

```
$ sudo fdisk –l
```

4. Copy the `prebuilt-imxv1-csXXXXXfXXXvX-android6-emmc-YYYYMMDD.tar.gz` to somewhere(such as $HOME) on the Ubuntu PC.
5. **Extract the** `prebuilt-imxv1-csXXXXXfXXXvX-android6-emmc-YYYYMMDD.tar.gz`

```
$ tar -xzvf prebuilt-imxv1-csXXXXXfXXXvX-android6-emmc-YYYYMMDD.tar.gz
```

6. **Go to the folder**

```
$ cd prebuilt-imxv1-csXXXXXfXXXvX-android6-emmc-YYYYMMDD
```

7. **Use the following command to flash the Ubuntu 12.04 OS to the SD card**

```
$ sudo ./mksdcard.sh --device /dev/sd<?>
```

> **Note**
>
> - sd<?> means the SD card mount point, (e.g., `/dev/sdc` or `/dev/sdb`) in Ubuntu system.
> - The recommended SD card should be Sandisk Class4 level SD card or above.

8. The bootable SD Card is now ready. Power OFF the industrial PC and insert the SD Card.
9. Set the switch S1 to TF card boot mode. (refer to Boot Switch Configuration above)
10. Connect the industrial PC to PC via COM1. Power ON the IPC.
11. After 20 minutes, if the LED on industrial PC stays lit, flashing is completed. Using COM1, you can also find this message **>>>>>>> eMMC Flashing Completed <<<<<<<** which indicates that the system image was downloaded correctly to the eMMC.

12. Power OFF and set the switch S1 to eMMC boot mode. (refer to Boot Switch Configuration above)

Booting Ubuntu OS and Test

Note

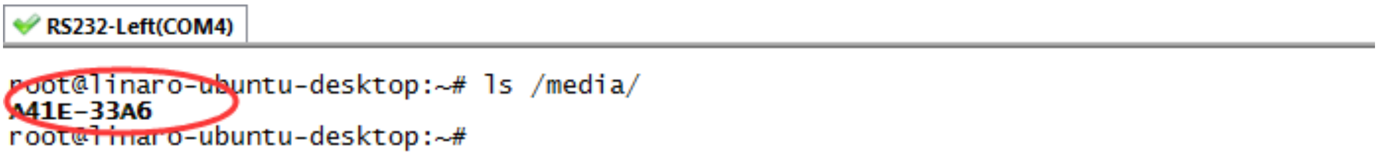
If you want to use root, use this command: *$ sudo passwd root*

The first time you start Ubuntu 12.04 OS on the industrial PC will take a little time. But after the first time, Ubuntu 12.04 OS will start quickly. It is a successful start if you see the Ubuntu 12.04 OS desktop such as the one shown in the figure below:

Figure 272: *Ubuntu 12 Desktop Screen*

SD Test

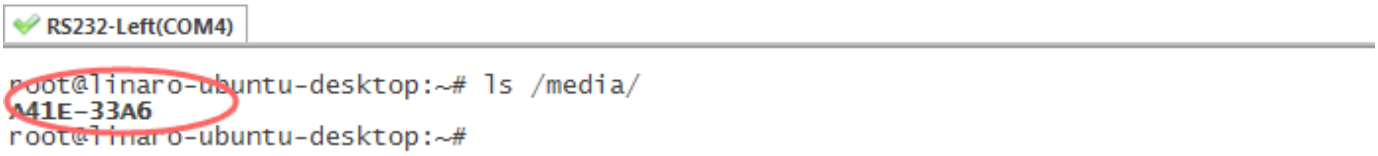
The IPC supports SD card hot-plug. The figure below shows the message when you plug the SD card into IPC. The IPC will mounts the SD Card to */media/xxxx-xxxx* directory.



RS232-Left(COM4)

```
root@linaro-ubuntu-desktop:~# ls /media/
A41E-33A6
root@linaro-ubuntu-desktop:~#
```

Figure 273: *Serial Message*



RS232-Left(COM4)

```
root@linaro-ubuntu-desktop:~# ls /media/
A41E-33A6
root@linaro-ubuntu-desktop:~#
```

Figure 274: *SD Card*

USB Flash Disk Test

The USB Flash Disk is like the SD Card. The IPC mounts the USB Flash Disk to *mnt/media_rw/* and */storage/* directory.

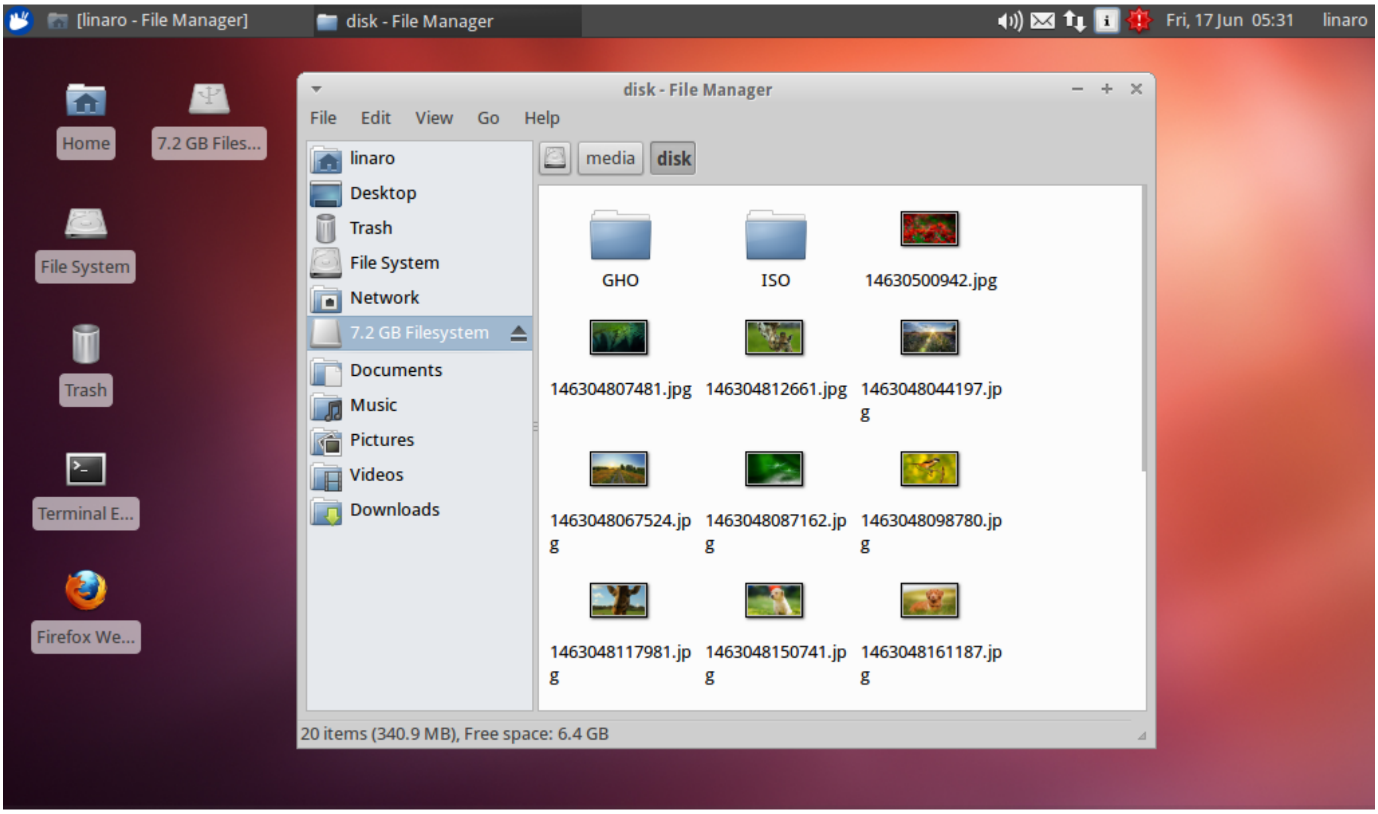


Figure 275: *USB flash disk test*

SATA Test

The SATA does not support hot-plug, but the Ubuntu 12.04 OS supports NTFS, EXT3, and FAT.

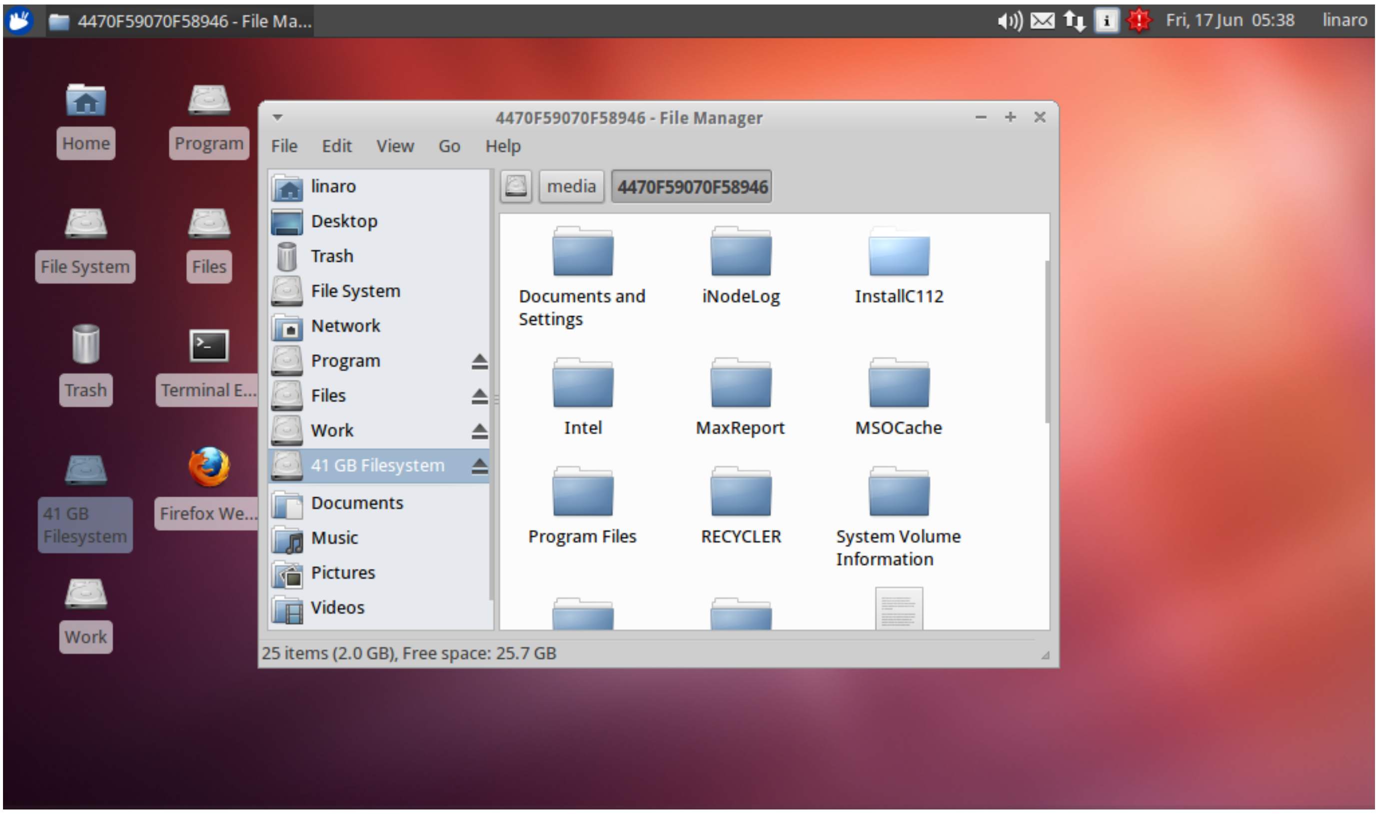


Figure 276: *SATA test*

Network Test

The network uses DHCP to get IP Addresses. You can get network access if you connect a LAN cable from the IPC to a router.
You can change the IP Address with this command.

```
# ifconfig eth0 down
# ifconfig eth0 192.168.xx.xxx up
```

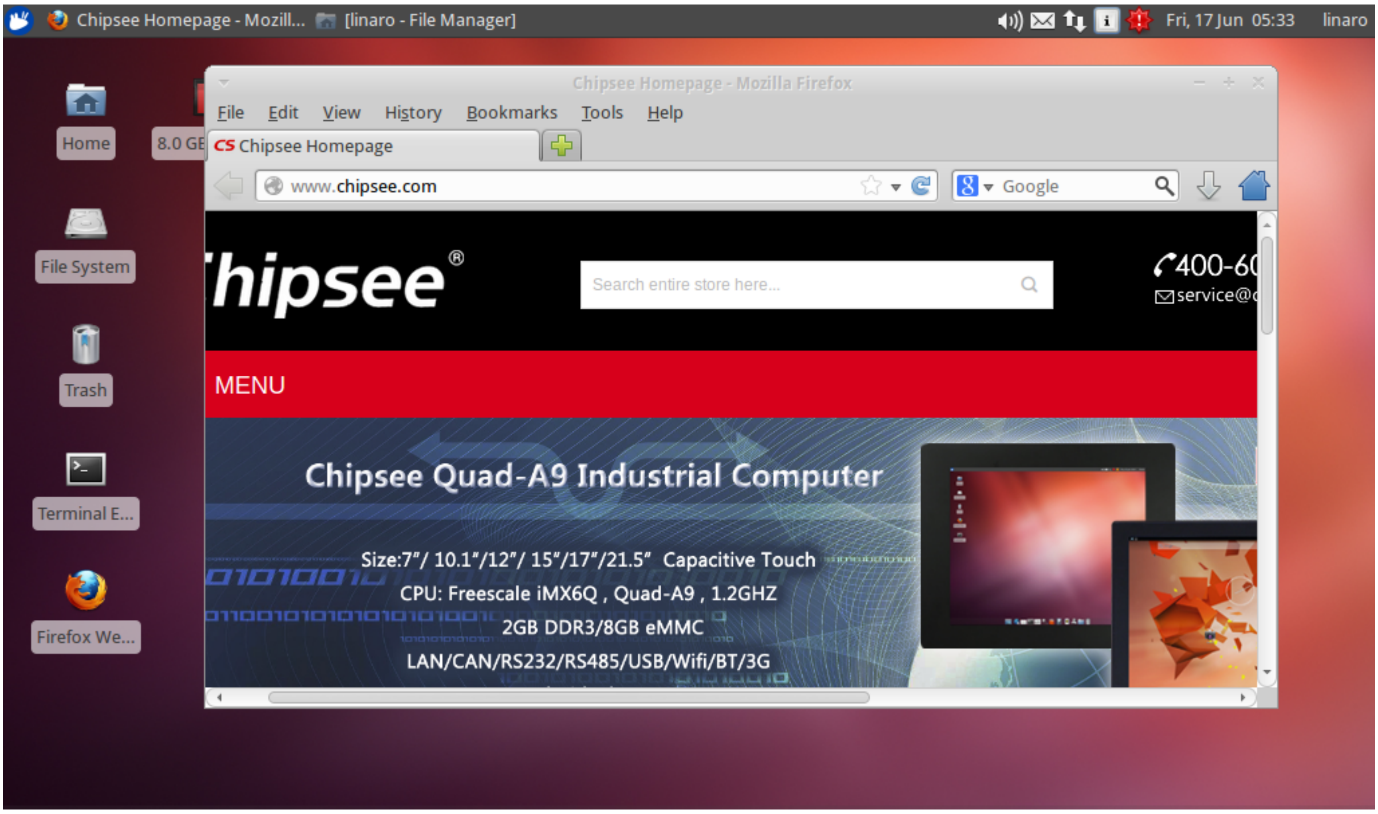


Figure 277: *Network Test*

Sound Card Test

Please open an audio file in Rhythmbox to test the Sound.

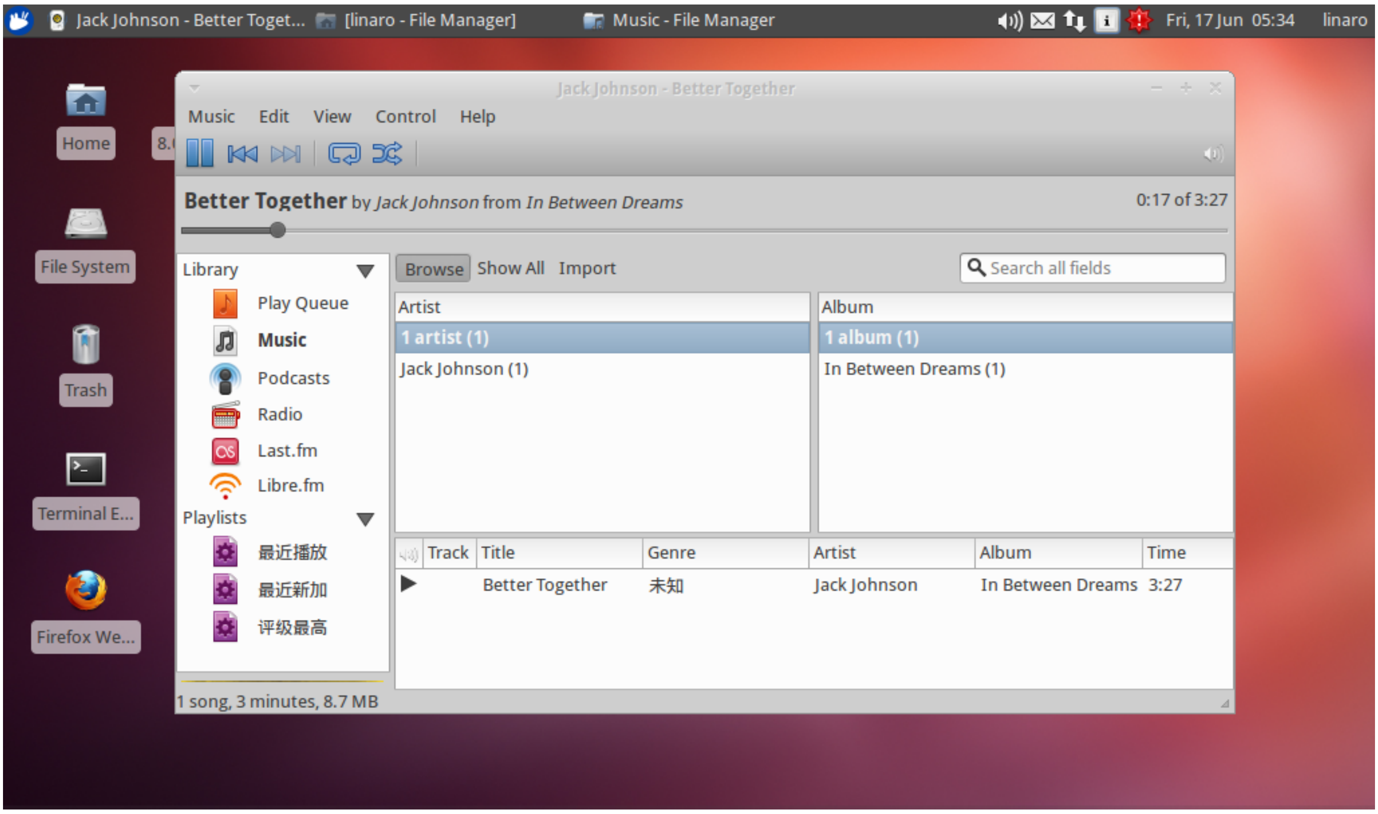


Figure 278: *Sound Test*

Video Test

Please open a video file to test the Video.

Figure 279: *Video Test*

HDMI Test

You can reference this document, `IMX6Q U-boot Setting HDMI Output For Android.pdf`, to learn about performing HDMI tests.

> **Note**
>
> HDMI does not support hot-plug. The sound comes from the HDMI monitor, neither the speaker nor the headset on board.

WIFI Test

You must ensure the IPC has an SDIO Wi-Fi module integrated before performing the Wi-Fi test. If the IPC has an SDIO Wi-Fi Module, you can connect to the Wi-Fi and open a browser to test.

Serial Test

There are five serial ports on the Chipsee IPC: 2 x RS232 and 3 x RS485 (can be customised). Refer to the table below for the available serial device nodes.

Ports	Device Node
COM1(RS232, Debug)	/dev/ttymxc0
COM2(RS485)	/dev/ttymxc1
COM3(RS232)	/dev/ttymxc2
COM4(RS485)	/dev/ttymxc3
COM5(RS485)	/dev/ttymxc4

Table 58 Serial Ports Nodes on the System

> **Note**
>
> If you use COM2(RS485), you can't use Bluetooth because COM2(RS485) share pin with Bluetooth.

You can install the **SecureCRT** or **Putty** software on a Windows 7 PC to test the serial ports by following these steps:

- Connect COM1 on industrial PC board to Windows 7 PC.
- Run **Serial Port API** App to communicate with Windows 7 PC, as shown on the figure below.

CAN Test

Chipsee Industrial PC is equipped with two CAN busses (CAN1 and CAN2). Two devices can be interconnected. You can test the CAN buses by using the **HT application** but you must add one 120Ω resistor between CAN_H and CAN_L on one of the two Boards, as shown on the figure below.

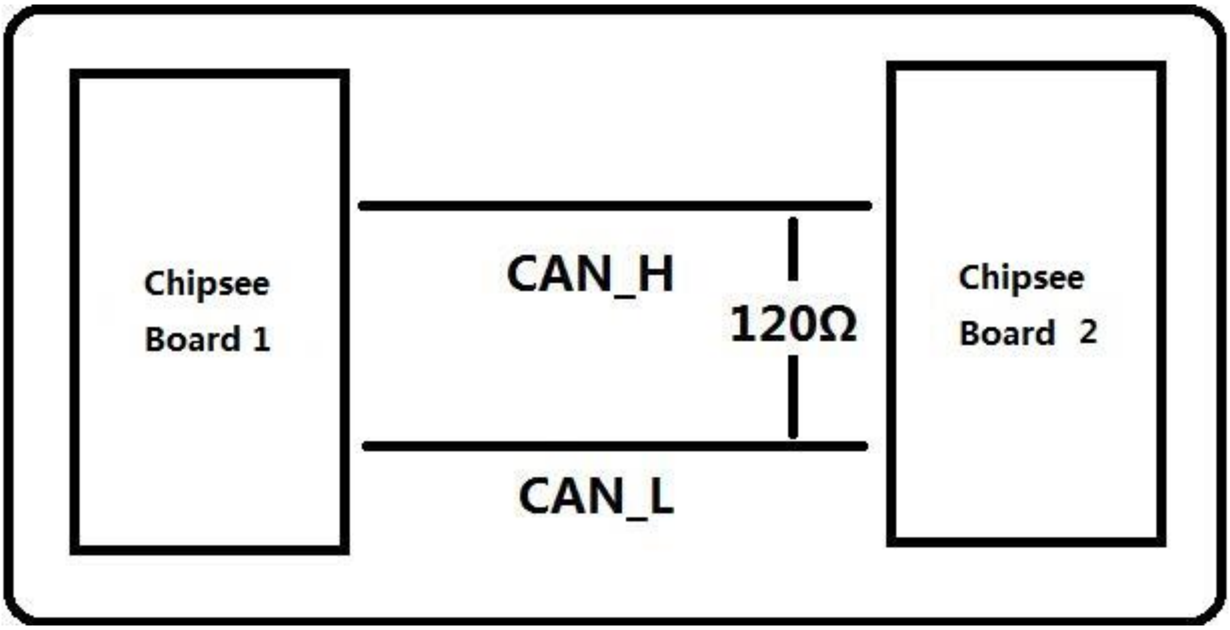


Figure 280: *CAN Connect*

> **Note**
>
> The Chipsee IPC does not mount the 120Ω matched resistor on all CAN signals by default.

Here are a few examples to test CAN by using CAN units

- **Install** *can-utils*

```
$ sudo apt install can-utils
```

- **Set the bit-rate to 50Kbits/sec with triple sampling using the following command (use ROOT user):**

```
$ sudo ip link set can0 type can bitrate 50000 triple-sampling on
```

OR

```
$ sudo canconfig can0 bitrate 50000 ctrlmode triple-sampling on
```

- **Bring up the device using the command:**

```
$ sudo ip link set can0 up
```

OR

```
$ sudo canconfig can0 start
```

- **Transfer packets**
  - Transmit 8 bytes with standard packet id number as 0x10

```
$ sudo cansend can0 -i 0x10 0x11 0x22 0x33 0x44 0x55 0x66 0x77 0x88
```

  - Transmit 8 bytes with extended packet id number as 0x800

```
$ sudo cansend can0 -i 0x800 0x11 0x22 0x33 0x44 0x55 0x66 0x77 0x88 - e
```

  - Transmit 20 8 bytes with extended packet id number as 0xFFFFF

```
$ sudo cansend can0 -i 0xFFFFF 0x11 0x22 0x33 0x44 0x55 0x66 0x77 0x88 -e
--loop=20
```

- **Receive data from CAN bus**

```
$ sudo candump can0
```

- **Bring down the device**

```
$ sudo ip link set can0 down
```

GPIO

There are 8 GPIOs, 4 Output, and 4 Input, they are all isolated. You can control the output or input pin voltage by feeding the VDD_ISO suite voltage. The pin voltage should be from 5V to 24V. Refer to the tables below for a detailed port definition:

Pin Number	GPIO Number
11	205
12	106
13	29
14	30
15	28
16	204
17	94
18	95

Table 59 CS80480F070 – V1.0 P11 Port

Pin Number	GPIO Number
3	106
4	30
6	95
7	87
8	29
9	28
11	94
12	130

Table 60 CS12800F010 – V1.0 P28 Port

> **Note**
>
> You need `ROOT` permissions to control GPIO.

Set *gpio106 Output* to high or low using this command

```
# echo  106  > /sys/class/gpio/export              //export gpio106
# echo  out  > /sys/class/gpio/gpio106/direction    //set gpio106 Output
```

```
# echo  1  > /sys/class/gpio/gpio106/value           //Set gpio106 high
# echo  0  > /sys/class/gpio/gpio106/value           //Set gpio106 low
```

Set *gpio30 Input* using this command

```
# echo  30  > /sys/class/gpio/export                  //export  gpio30
# echo  in  > /sys/class/gpio/gpio30/direction        //Set  gpio30 input
```

Un-export *gpio30* using this command

```
# echo  30  > /sys/class/gpio/unexport                 //un-export  gpio30
```

Ubuntu 12.04 system debug in Windows

In this section, we will discover how to view the Ubuntu 12.04 system via the serial port and debug the system via USB OTG.
Also, we will discover how to install and uninstall applications via USB OTG.
The following operation is under the Windows 7 x64 environment, similar to other Windows platforms.

View Ubuntu 12.04 system via the serial port

Install the **SecureCRT** or **Putty** software on a Windows 7 PC to view the Ubuntu 12.04 system via the serial ports.
Follow these steps to view Ubuntu 12.04 system via the serial port:

- Connect COM1 on the industrial PC board to Windows 7 PC.
- **Open the SecureCRT or Putty software on the Windows 7 PC and configure it as shown on the figure below.**

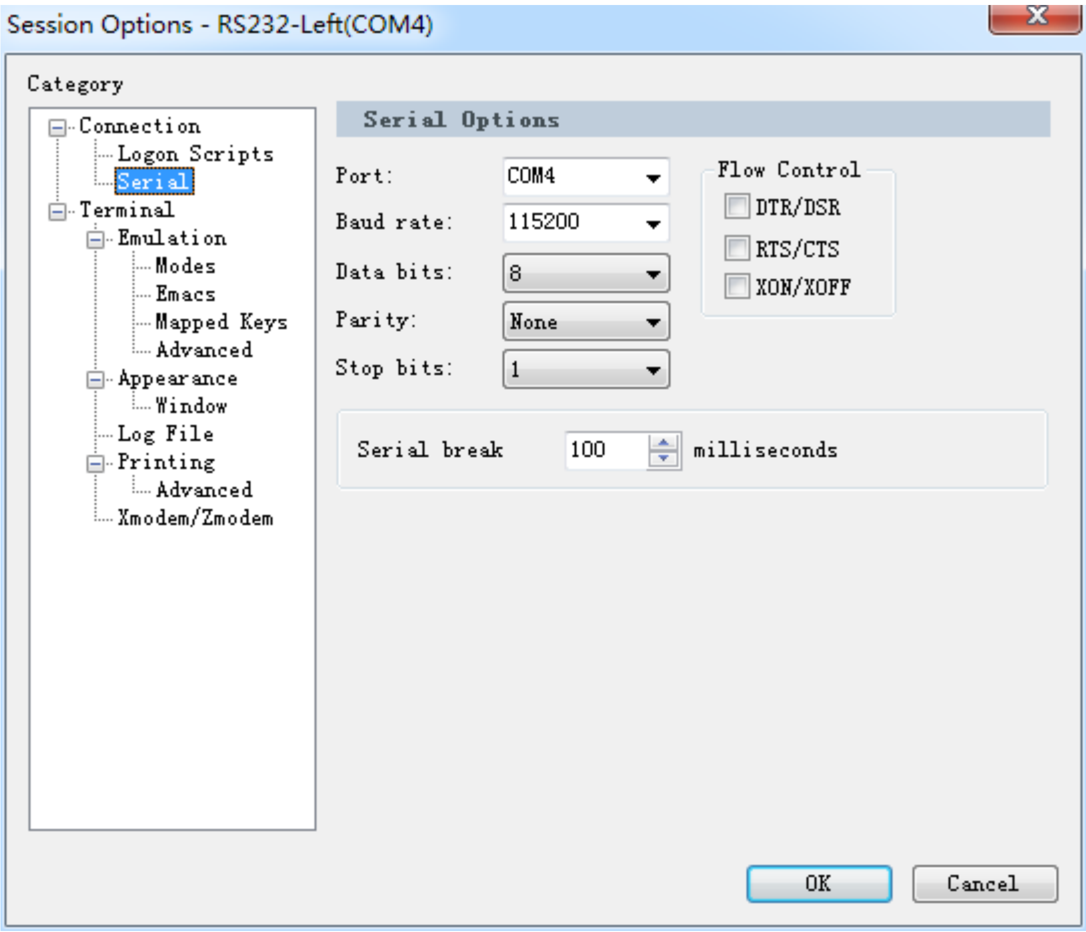


Figure 281: *SecureCRT configuration*

- **Power ON the industrial PC. You will see the serial output information as shown on the figure below.**

```
Hit any key to stop autoboot:  0
mmc3(part 0) is current device

MMC read: dev # 3, block # 2048, count 12288 ... 12288 blocks read: OK
## Booting kernel from Legacy Image at 10800000 ...
   Image Name:   Linux-3.0.35-2508-g54750ff
   Image Type:   ARM Linux Kernel Image (uncompressed)
   Data Size:    4805952 Bytes =  4.6 MB
   Load Address: 10008000
   Entry Point:  10008000
   Verifying Checksum ... OK
   Loading Kernel Image ... OK
OK

Starting kernel ...

Uncompressing Linux... done, booting the kernel.
Linux version 3.0.35-2508-g54750ff (root@chipsee-build) (gcc version 4.6.2 20110630 (prerelease) (Freesc
CPU: ARMv7 Processor [412fc09a] revision 10 (ARMv7), cr=10c53c7d
CPU: VIPT nonaliasing data cache, VIPT aliasing instruction cache
Machine: Freescale i.MX 6Quad/DualLite/Solo Sabre-SD Board
Ignoring unrecognised tag 0x54410008
Memory policy: ECC disabled, Data cache writealloc
CPU identified as i.MX6Q, unknown revision
PERCPU: Embedded 7 pages/cpu @8c80e000 s5440 r8192 d15040 u32768
Built 1 zonelists in Zone order, mobility grouping on.  Total pages: 462848
Kernel command line: console=ttySAC0,115200 video=mxcfb0:dev=ldb,LDB-WXGA,if=RGB24,bpp=32 ldb=sin0 videc
kernel time=10:10:07,date=Jun 23 2016
PID hash table entries: 4096 (order: 2, 16384 bytes)
Dentry cache hash table entries: 262144 (order: 8, 1048576 bytes)
Inode-cache hash table entries: 131072 (order: 7, 524288 bytes)
Memory: 1568MB 256MB = 1824MB total
Memory: 1836188k/1836188k available, 260964k reserved, 262144K highmem
Virtual kernel memory layout:
    vector  : 0xffff0000 - 0xffff1000   (   4 kB)
    fixmap  : 0xfff00000 - 0xfffe0000   ( 896 kB)
    DMA     : 0xf4600000 - 0xffe00000   ( 184 MB)
    vmalloc : 0xea800000 - 0xf2000000   ( 120 MB)
    lowmem  : 0x80000000 - 0xea000000   (1696 MB)
    pkmap   : 0x7fe00000 - 0x80000000   (   2 MB)
    modules : 0x7f000000 - 0x7fe00000   (  14 MB)
      .init : 0x80008000 - 0x8003d000   ( 212 kB)
      .text : 0x8003d000 - 0x80c44bf0   (12319 kB)
      .data : 0x80c46000 - 0x80cccbe0   ( 539 kB)
       .bss : 0x80cccc04 - 0x80d252ec   ( 354 kB)
SLUB: Genslabs=13, HWalign=32, Order=0-3, MinObjects=0, CPUs=4, Nodes=1
Preemptible hierarchical RCU implementation
```

Figure 282: *Serial output information*

• You can communicate with the system when system boot is complete.

QT development

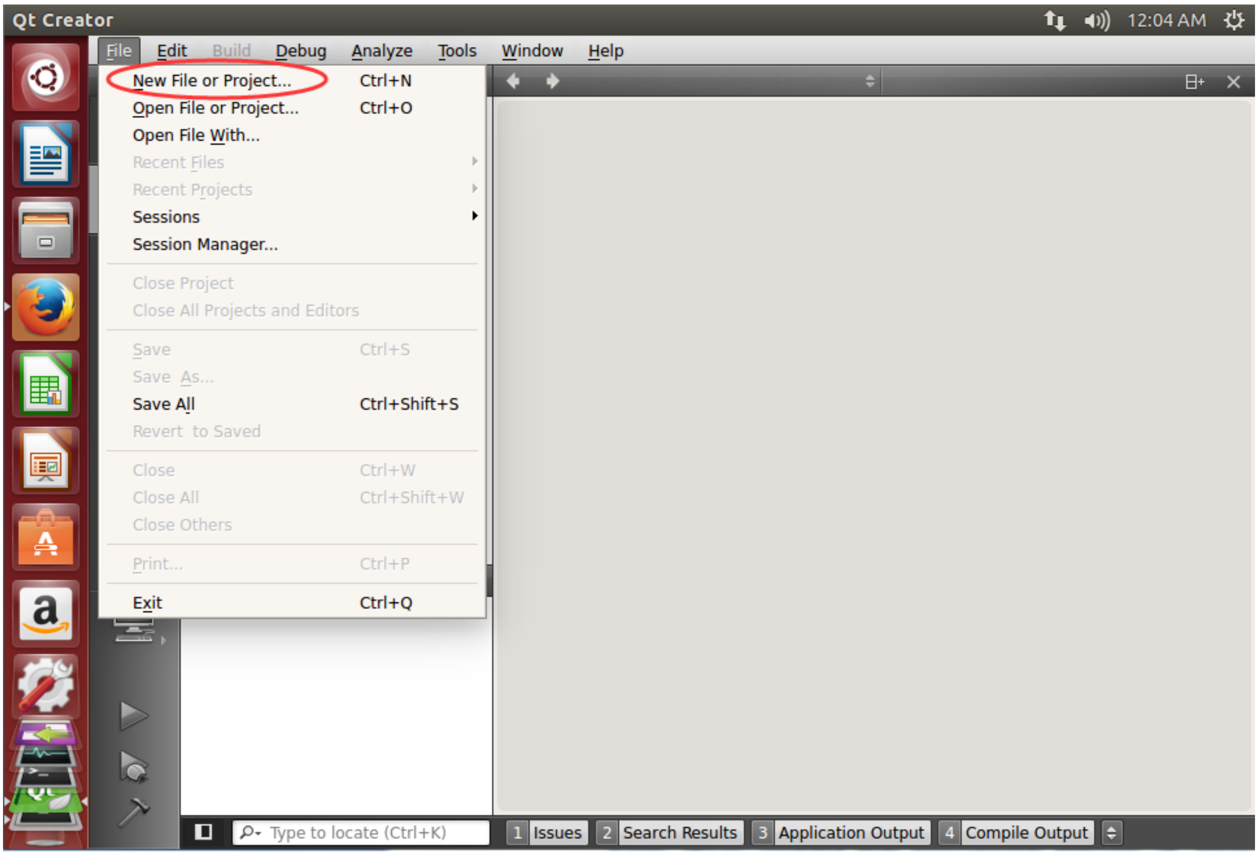
In this chapter, you will learn how to set up the QT development environment, and develop the first QT application on Chipsee IPC boards.

Preparation

1. Download and install QT4.8.4 and QTCreator2.6.2.

Example — Develop a `HelloWorld` Program

1. **Use QtCreator to create a project, named `HelloWorld`, as shown on the figure below.**



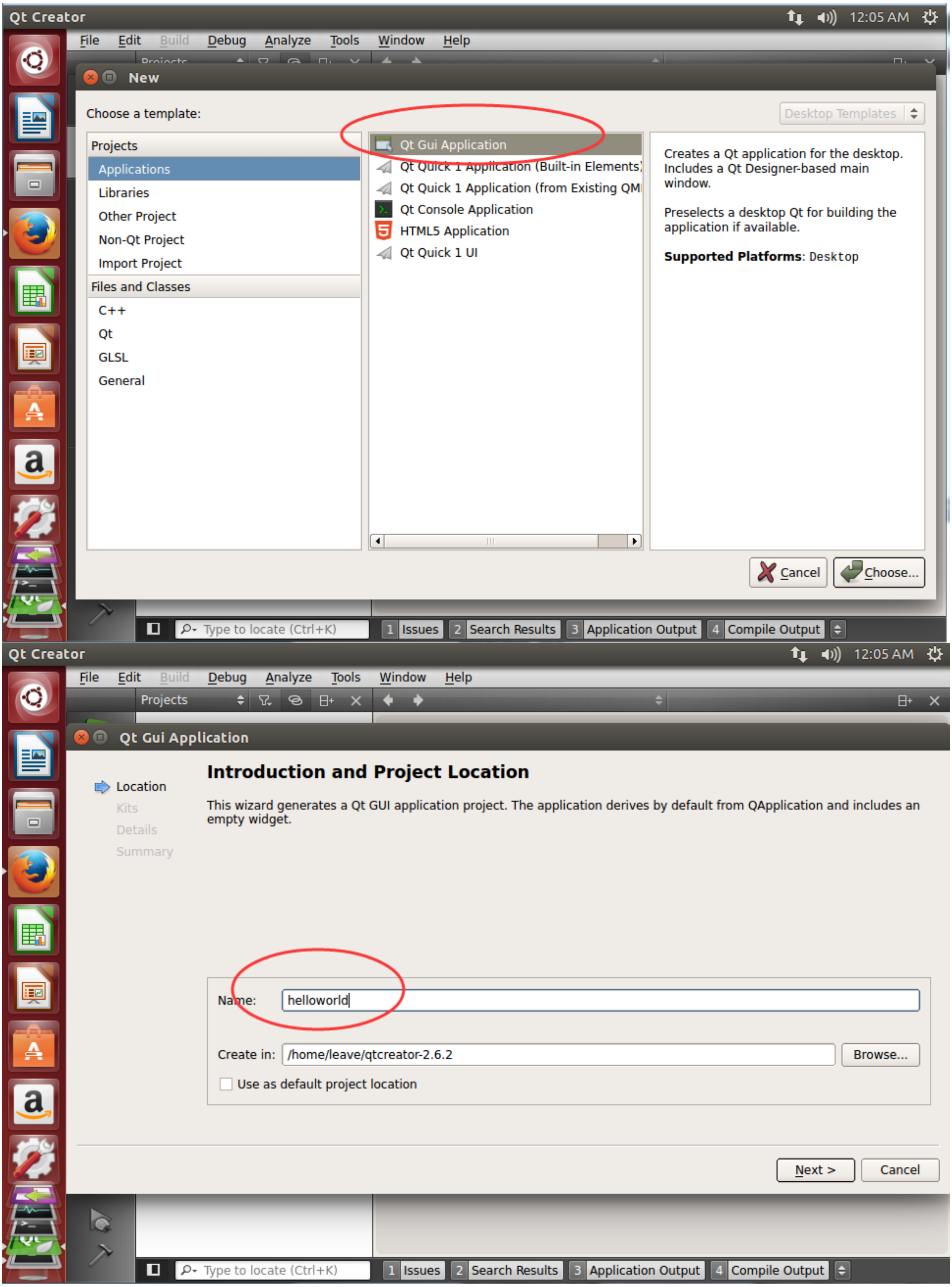


Figure 283: *Create Application*

2. **Select IMX kits, as shown on the figure below.**

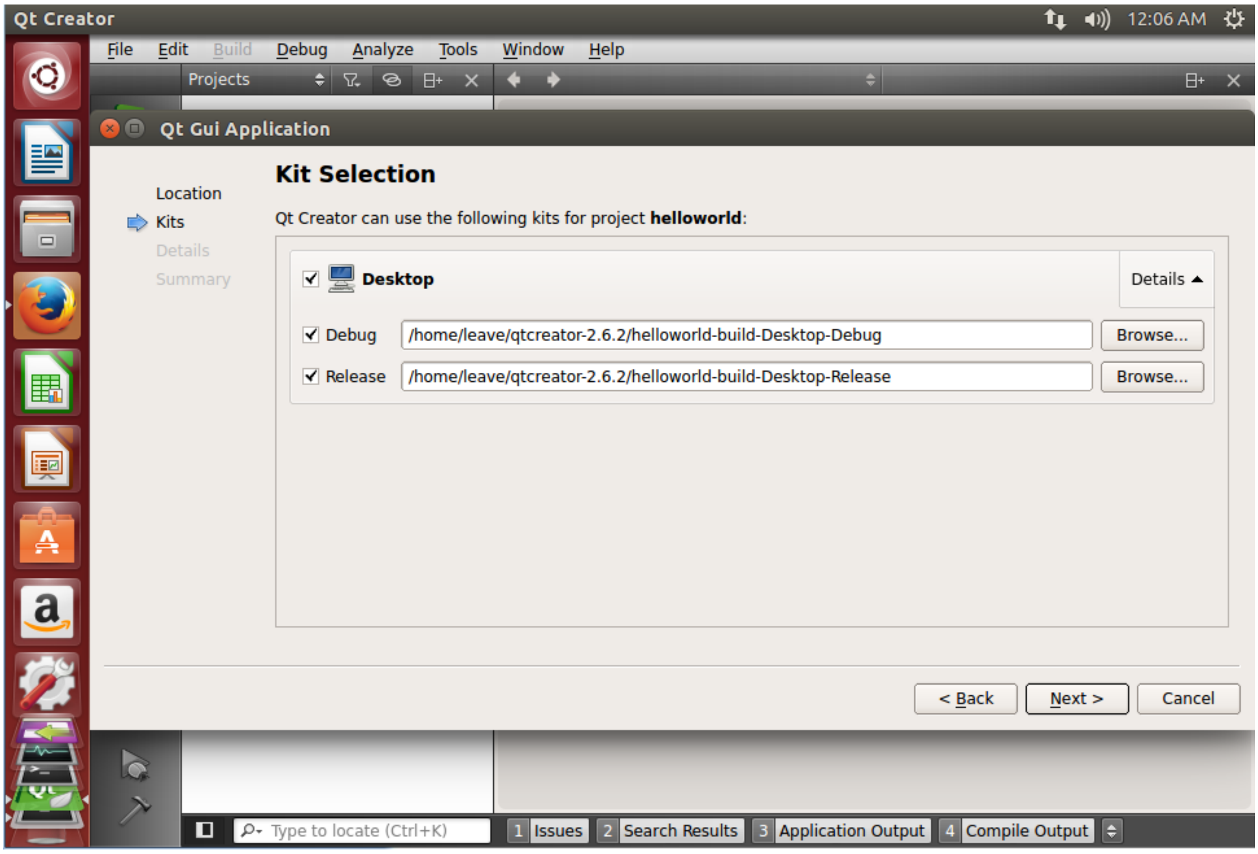


Figure 284: *Kit Selection*

3. **Use QMainWindow as the Base class, as shown on the figure below.**

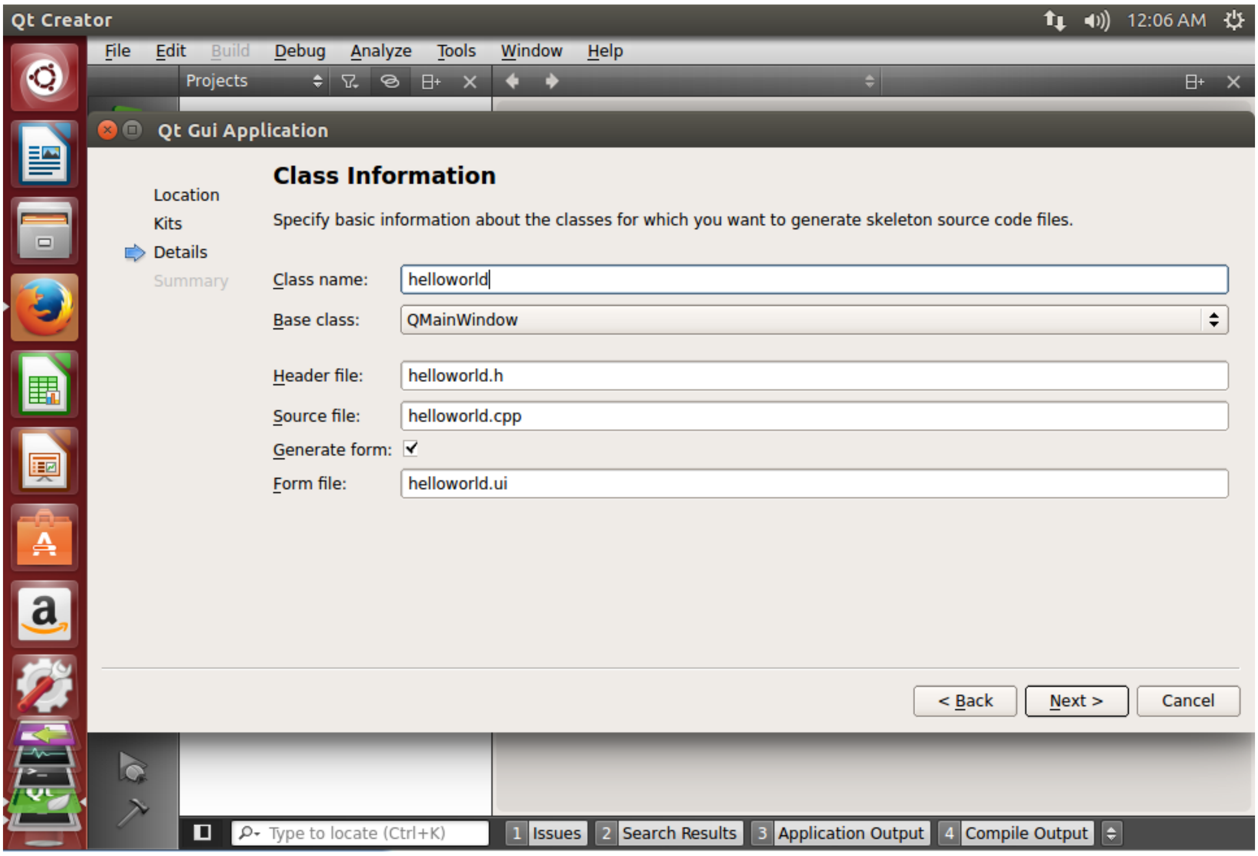
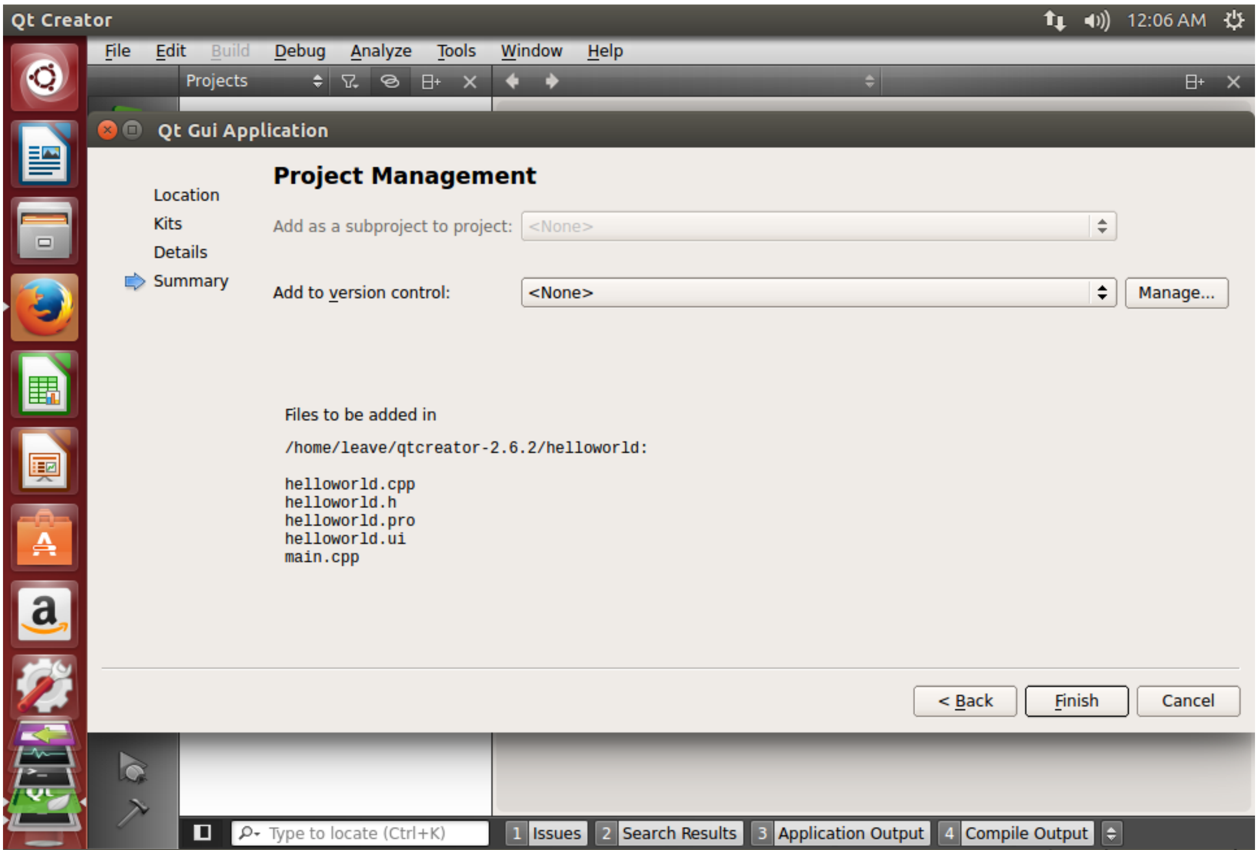
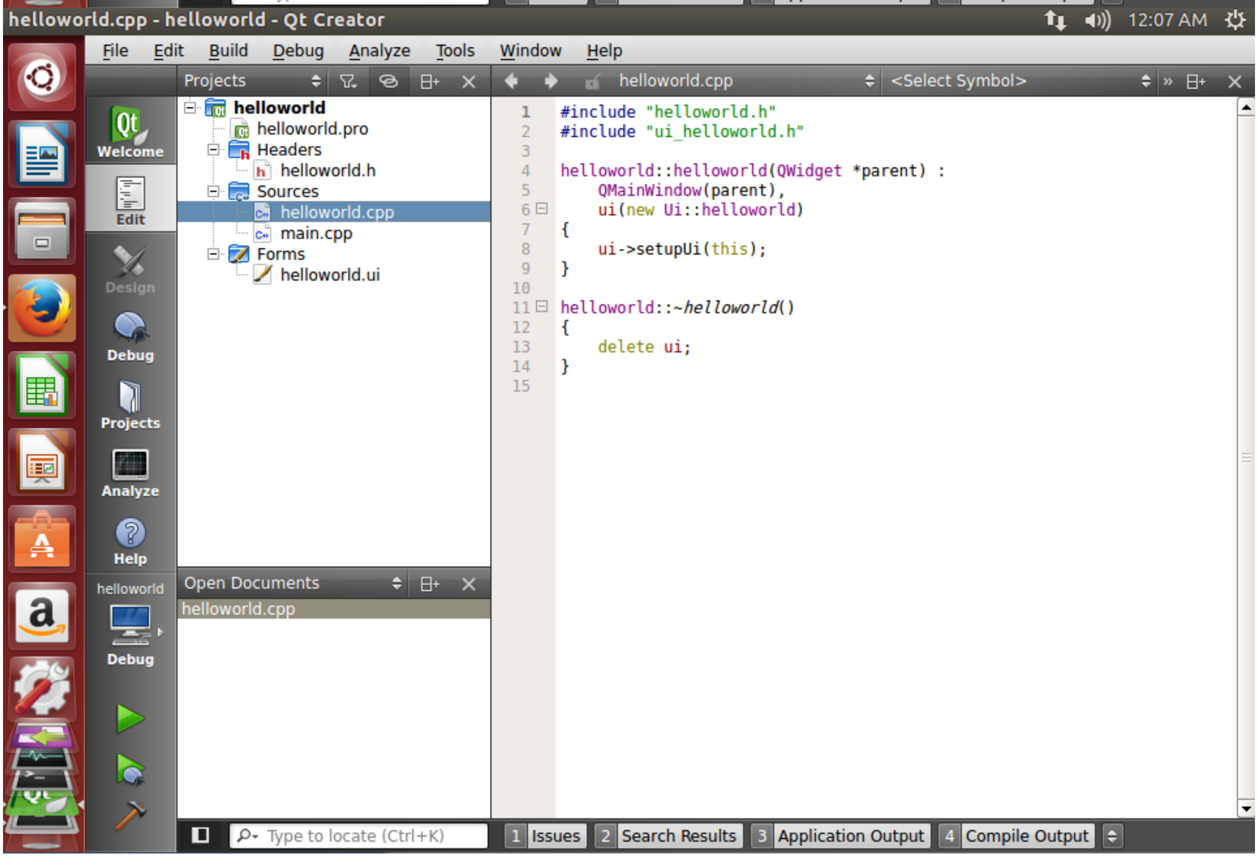


Figure 285: *Base Class*

4. **Click the Design icon to add one label widget, as shown on the figure below.**


Qt Creator
File Edit Build Debug Analyze Tools Window Help
Qt Gui Application
Project Management
Location
Kits
Details
Summary
Add as a subproject to project: <None>
Add to version control: <None>
Manage...
Files to be added in
/home/leave/qtcreator-2.6.2/helloworld:
helloworld.cpp
helloworld.h
helloworld.pro
helloworld.ui
main.cpp
< Back
Finish
Cancel
1 Issues 2 Search Results 3 Application Output 4 Compile Output


helloworld.cpp - helloworld - Qt Creator
File Edit Build Debug Analyze Tools Window Help
Projects
helloworld.cpp
<Select Symbol>
helloworld
helloworld.pro
Headers
helloworld.h
Sources
helloworld.cpp
main.cpp
Forms
helloworld.ui
Welcome
Edit
Design
Debug
Projects
Analyze
Help
#include "helloworld.h"
#include "ui_helloworld.h"
helloworld::helloworld(QWidget *parent) :
QMainWindow(parent),
ui(new Ui::helloworld)
{
ui->setupUi(this);
}
helloworld::~helloworld()
{
delete ui;
}
Open Documents
1 Issues 2 Search Results 3 Application Output 4 Compile Output

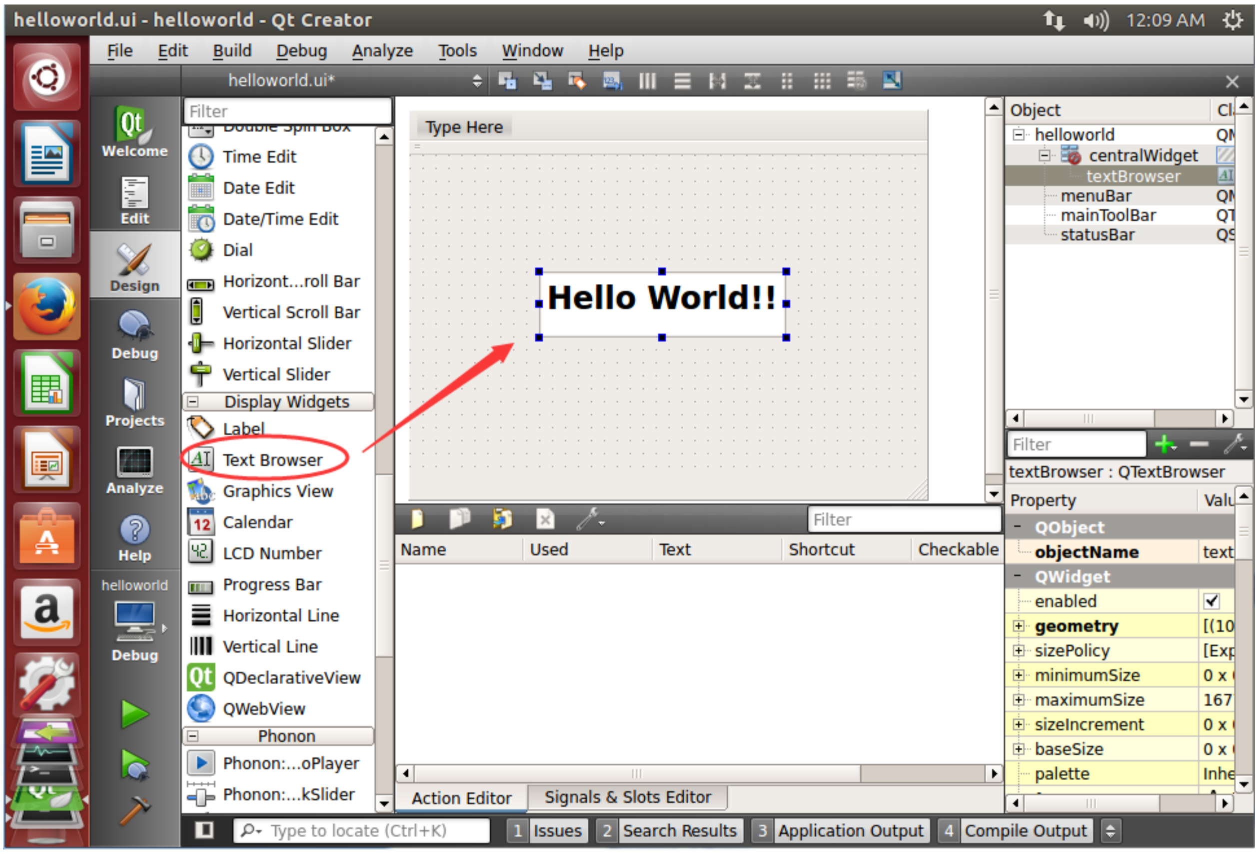
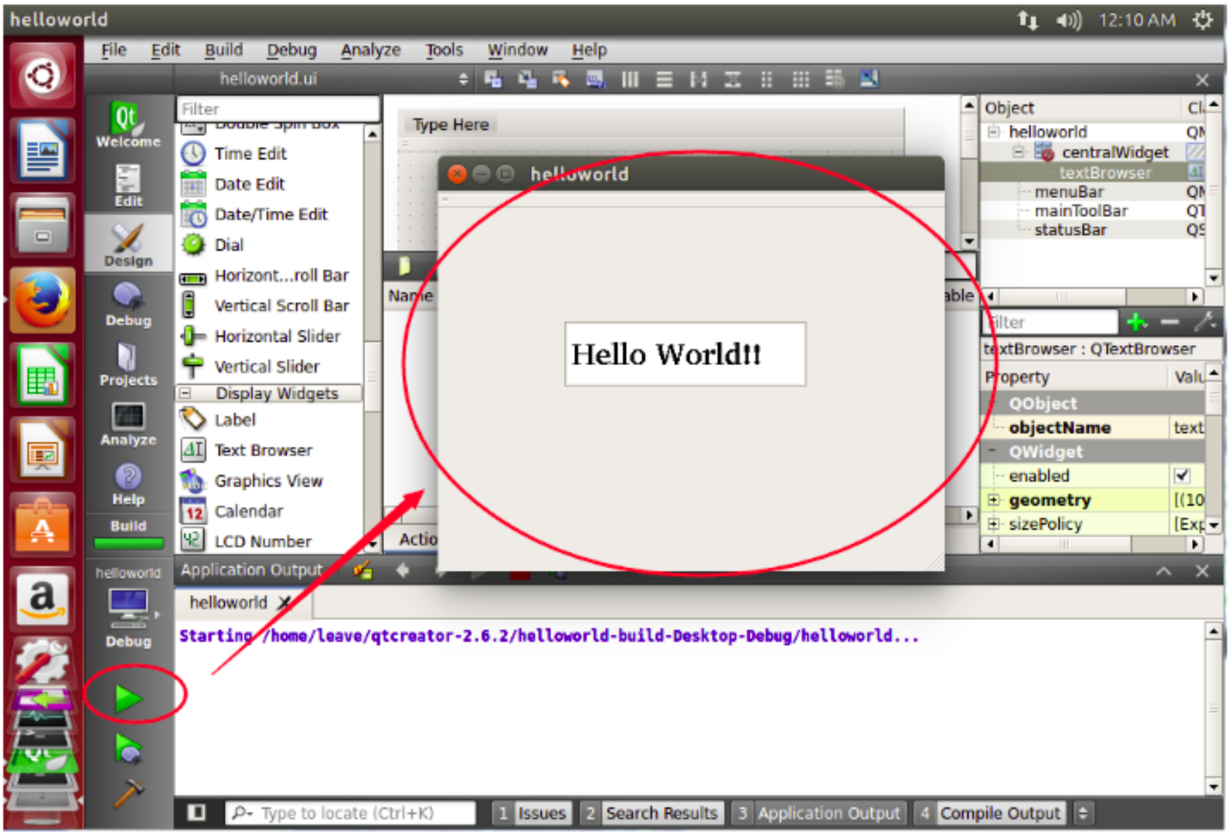


Figure 286: *Add Label Widget*

5. **Click on the Build icon to build app, as shown on the figure below.**



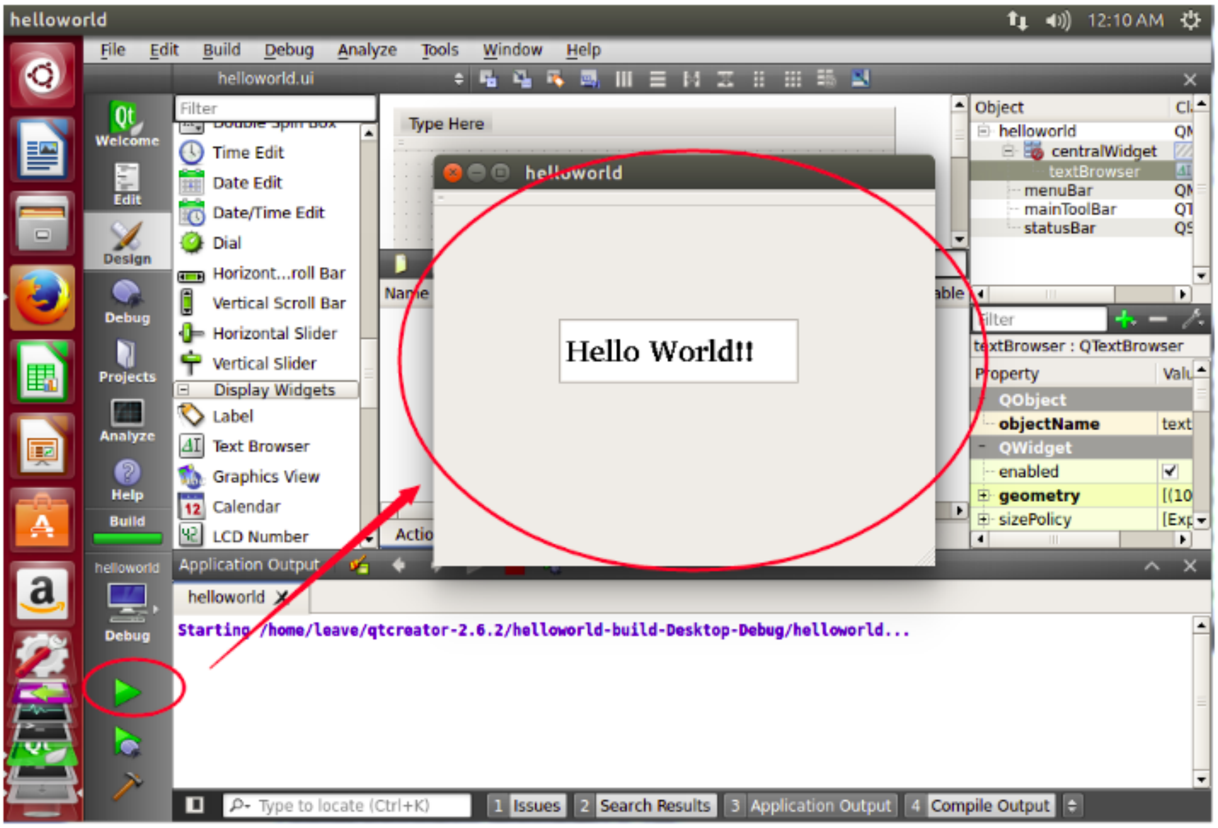


Figure 287: *Build App*

6. **Copy the** `Helloworld` **app from the** */home/leave/qt-creator2.6.2/helloworld* **to the IPC board's** */home/root/* **directory and use the following command to run it:**

```
# export DISPLAY=:0.0
# ./HelloWorld
```

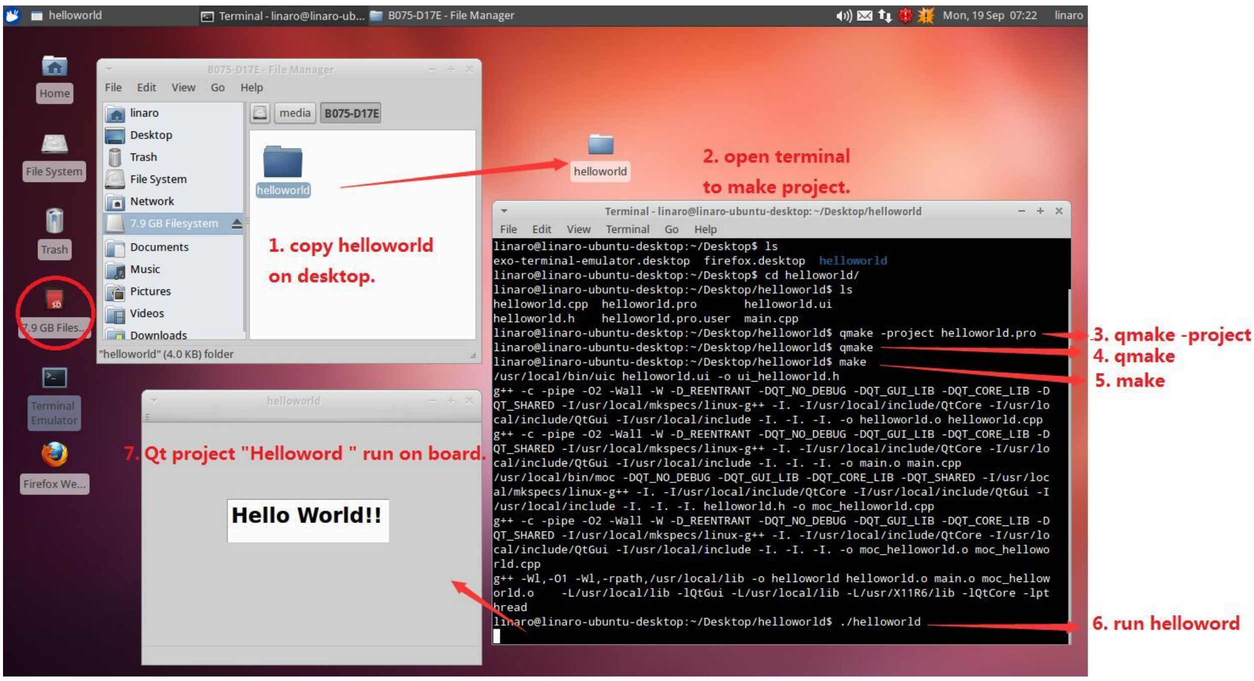


Figure 288: *Install app on IPC*

> **Note**
>
> The command *qmake -project* , *qmake* , & *make* must be done on board, like above.

7. **Add a startup icon for `helloworld`.**

```
$ cd /usr/share/applications
$ sudo vi helloworld.desktop
```

8. **Add the following content in the `helloworld.desktop` file, as shown on the figure below.**

```
[Desktop Entry]
Version=1.0
Encoding=UTF-8
Type=Application
Name=helloworld
Comment=helloworld
NoDisplay=true
Exec=/home/linaro/Desktop/helloworld/helloworld %f   // the path of qt
binary.
Icon=/home/linaro/Desktop/helloworld/helloworld.png  // you can replace it
by you own icon.
Name[en_US]=helloworld
```

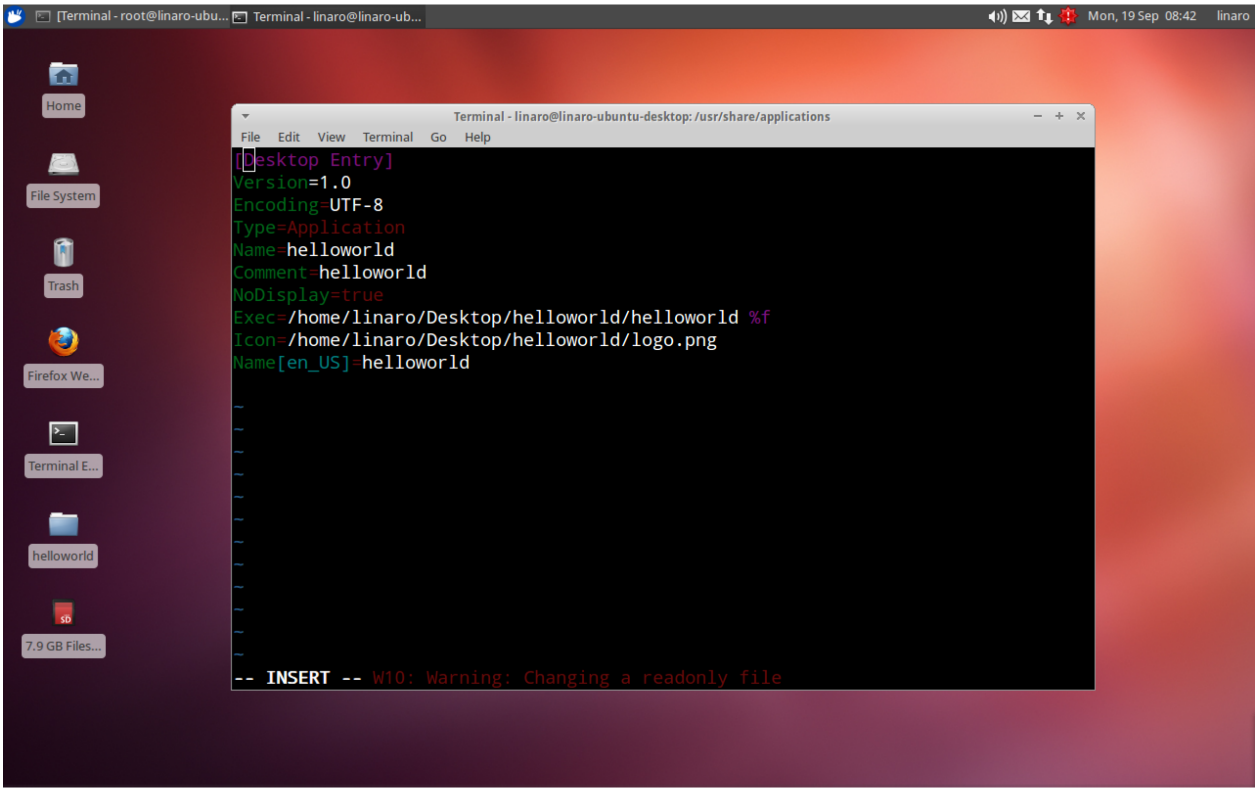


Figure 289: *Add app to desktop*

9. **Locate the directory with app icon and copy it to the desktop, as shown on the figure below:**

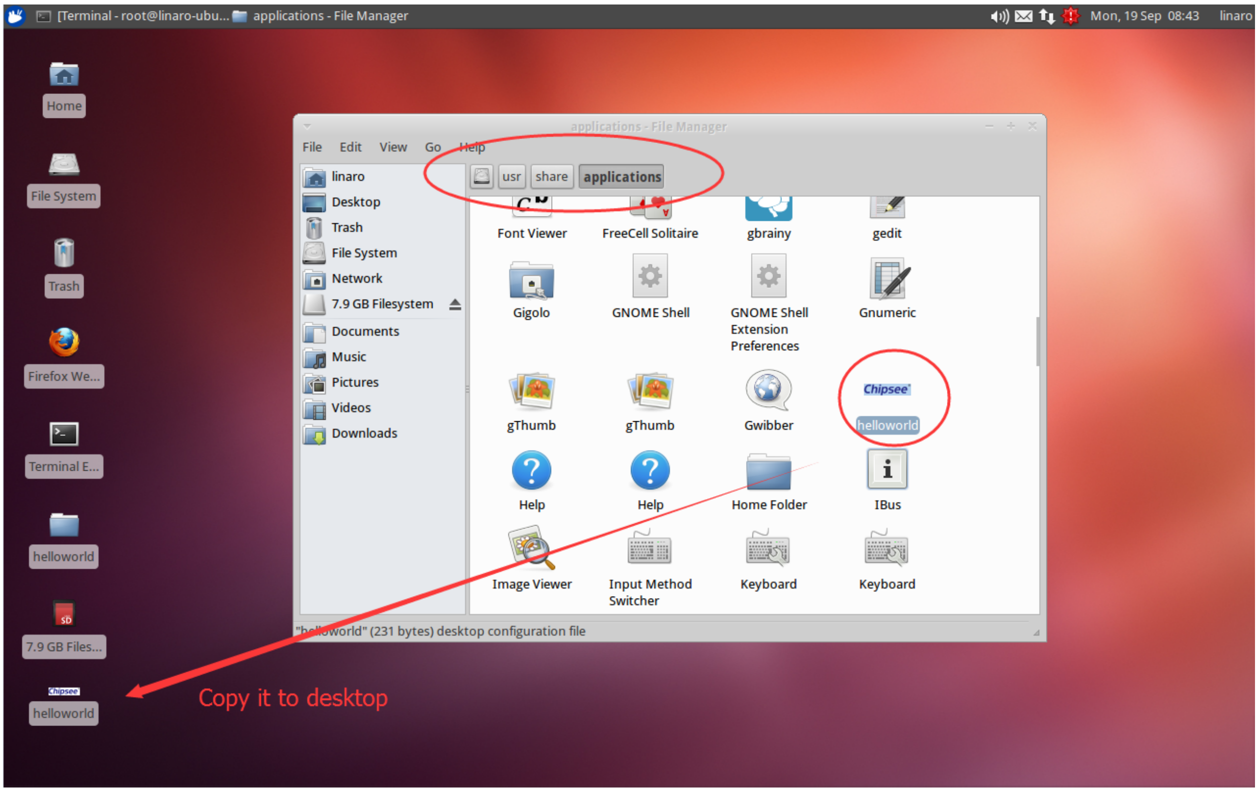


Figure 290: *Copy app icon*

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