Chipsee

Industrial PC

Yocto Linux Qt 6.3 OS on i.MX8MP User Manual

For i.MX8MP Products

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Yocto Linux Qt 6.3 OS

Yocto Linux Qt 6.3 OS on i.MX8MP User Manual

This is the software manual for i.MX8MP Chipsee industrial PC. If you've never developed on this hardware with a Yocto Linux Qt 6.3 OS, this manual can get you started quickly.

Supported Chipsee PCs: all Chipsee i.MX8MP based industrial PCs, including but not limited to:

- PPC-A53-070 (PN: CS10600-IMX8MP-070P)
- CS-A53-BOX (PN: CS-IMX8MP-BOX)

When you develop software on the Chipsee industrial PC, you can open the hardware manual beside this software manual, to aid you in wiring your devices.

In this manual, main topics are:

- How to connect to the device from your workstation.
- How to use the hardware resources such as RS232, RS485, CAN and GPIO, etc.
- How to play, record an audio, how to play a video.
- How to connect and set WiFi/Ethernet network; how to connect Bluetooth.
- How to flash OS firmware.

System Information

Out of Box System

	Description
Kernel	5.15.52
Bootloader	2022.04-lf_v2022.04
OS	aarch64 GNU/Linux
GCC	11.3.0
QT	6.3
username/password	root / no password
Window Manager	Wayland
Desktop Environment	Weston

Prepare for Developing

To get started, you first need to power on the Chipsee industrial PC, then you may want to connect to this PC from your own laptop or computer to control it. Let's prepare some hardware and software to start developing.

Prepare the Hardware

To power on and connect to Chipsee industrial PC, we need:

1. A power adapter. For products with a screen of 7 inch and below, a power adapter with 6V ~ 36V DC output is required; for 10.1 inch and above products, you need one with 12V ~ 36V. For example: a switching mode power supply (SMPS), a laptop power adapter (such as Dell or Intel NUC's 19V adapter), a router's power adapter (such as ASUS router's 12V power adapter), etc.
2. A USB to serial cable (if you need serial debug).
3. An Ethernet cable (if you want to SSH into the Chipsee industrial PC). You may also use WiFi if your Chipsee industrial PC supports WiFi, in this case you don't need the Ethernet cable.

Prepare the Software

Thanks to Linux OS, developing on Chipsee industrial PC isn't really different from developing on any other PCs, you can use any developer software you're comfortable with.

The software listed below are not mandatory, they're recommendations because we find them easy to use:

1. To SSH into a Chipsee industrial PC, you may find **PuTTY** on Windows handy; for Linux and macOS users, a terminal app should come with your OS out of box, like **Terminal/ iTerm2** on macOS and **xterm** on Linux.

Connect to the Device

There are 2 ways to connect to the device from your workstation:

1. From **Serial** RS232 port
2. From **Ethernet** or **Wi-Fi** (SSH)

Let's take a look at these connecting methods one by one.

Connect From Serial Port

[Cheatsheet for experienced developers: RS232_2, username is root, no password]

In our prebuilt Yocto Linux Qt 6.3 OS, the **RS232_2** serves as a serial debug port on the i.MX8MP products. We can connect a RS232 cable from the Chipsee industrial PC to our workstation, allowing us to control the Chipsee industrial PC from our workstation.

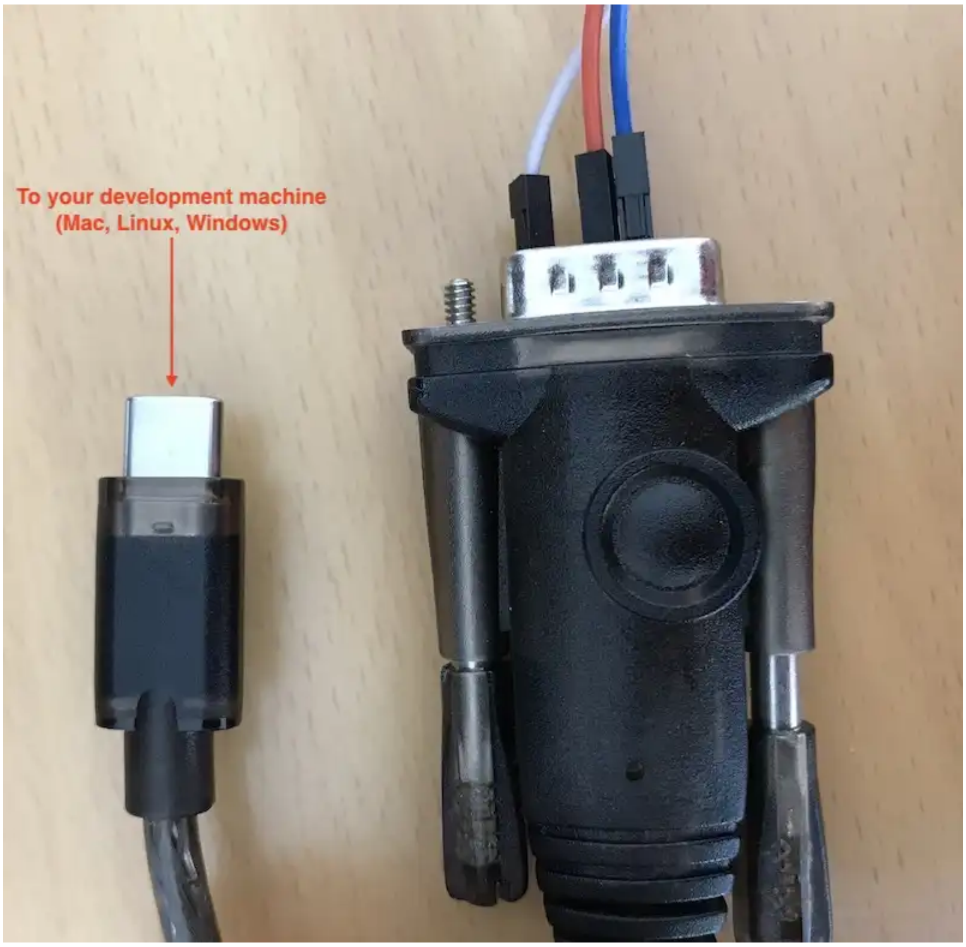
To get started, you need a USB to serial cable, we will use a USB Type-C to DB-9 cable as an example, you can use a USB-A cable as well, you need to plug the USB end to your workstation, and the serial end to the Chipsee device.

I will plug the USB Type-C port to a Mac (Windows and Linux work fine too), and then I would use three female to female dupont wires, to connect 3 of the DB-9 pins to my Chipsee industrial PC 's GND and RS232_2 (RX and TX) pins.

Take a look at the image below, this is the 7-inch product, if your product has a different screen size, check out the hardware document to find out which pins are RS232_2 TX and RX, each hardware doc has a "RS232+RS485+xxx" section, you should be able to find which is the RS232_2 of that model in the image and table of that doc.

You should connect the DB-9's RX to the device's TX, and DB-9's TX to the device's RX, you should also connect their GNDs (the white wire).

Connect 3 Pins with Dupont Wires



Use a USB to Serial Cable to Connect the Chipsee Industrial PC with Your Workstation

Linux and MacOS

1. For **MacOS and Linux** users, you will need a program called **screen**. It should be already installed on most MacOS and Linux distributions(if the screen program is not installed on your computer, you can search how to install it, for example, “apt install screen” on Debian). Open your terminal and type *screen -v* . If the *screen* program is already installed in your computer, you should see a version number, like that in the image below:

Confirm You Have the Screen Program (MacOS & Linux)

1. Because the USB end of the cable is plugged into our workstation, we need to know which USB device it is in Linux/MacOS. We can find it out by testing:

```
ls /dev/tty*
```

You might see many *tty* devices listed in your terminal, and cannot decide which is your USB to RS232 cable. Here is a tip: you can unplug the cable first, type the command to see what is listed in the OS. Then you plug it back in, and test again, to see what has recently appeared. The difference between the two should be your cable. In the image below, we found the */dev/tty.usbserial-10* is our USB to RS232 cable.

Find Out Which Device is Your USB to Serial Cable

2. You can put the device name you found to the screen program as an argument. To connect to the device (115200 is the default baud rate of the device):

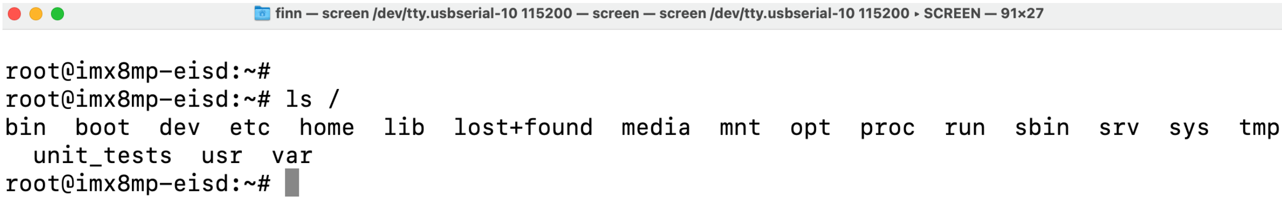
```
screen /dev/tty.usbserial-10 115200
```

3. When the prompt asks you to login, type the user name **root**, it doesn’t have a password:

```
imx8mp-eisd login: root
root@imx8mp-eisd:~# ls /
bin   dev  home  lost+found  mnt  proc  sbin  sys  unit_tests  var
```

```
boot   etc   lib   media       opt   run   srv   tmp   usr
root@imx8mp-eisd:~#
```

4. If there is a blank/white screen, you can hit Enter or type some commands to see if you can interact with the device. In the image below, the device responds to my *ls* command.



The Screen Program Connects Your Workstation to the Industrial PC's Android Console

5. If you want to **exit** the screen program, you can press *Ctrl+A* then press *K* .

   The program will ask you if you want to kill this window, then press *y* to exit the program.

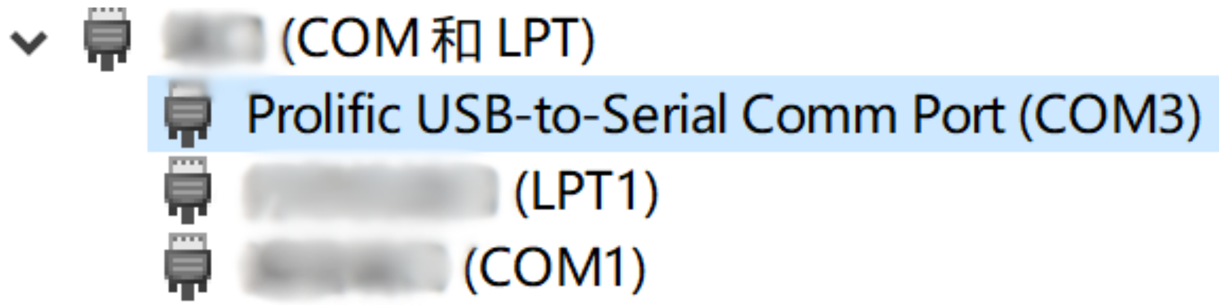
Press "Ctrl + A" Follow by a "K" to Exit the Program

Windows

1. For **Windows** users, you don't need to install specific "driver" kind of thing for Windows to recognize a Chipsee PC, but before proceeding, you should see a COM port appear/disappear when plug/unplug your USB to serial cable in Windows. Most USB to serial cables don't require driver installation on Windows10/11. But if you find your cable isn't recognizable by Windows, try checking the cable's manufacturer's website to learn more about it. Most of the time, simply doing a Windows update should do the trick, Windows can detect the cable's USB driver and install it for you.

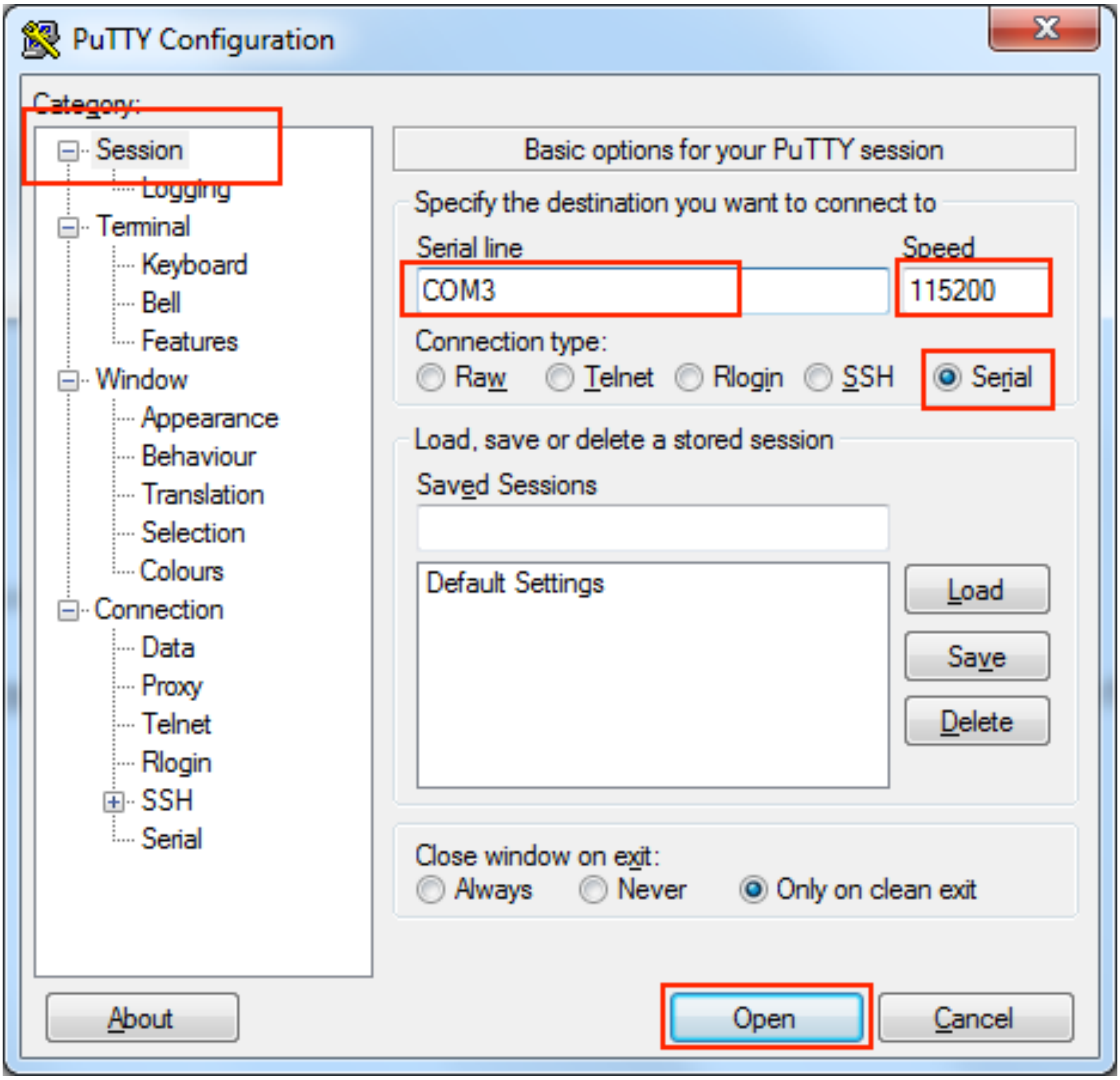
2. You should install a program called **PuTTY**, here is a link to download the software: https://www.putty.org/. If you're comfortable with other clients other than PuTTY, you can use those as well.

3. With PuTTY in your belt, let's find out which COM port your USB to RS232 cable is using. One tip is to check the *Microsoft Windows Device Manager* (right click Windows icon, select Device Manager). Check which COM port appears/disappears when you plug/unplug the USB to serial cable. And that COM port device should be your USB to RS232 cable. Keep a note of the COM port your serial cable is using, let's say it's "your-com", or "COM3" in this example.



COM3 is the USB to Serial Cable

4. Open the PuTTY program, select **Session**, choose **Serial** in the radio buttons, and fill the COM port(your-com, or **COM3** in this example) you found in the Microsoft Windows Device Manager, and choose **115200** as baud rate, then click **Open**.



Input your-com in the Serial Line field, in our case COM3

5. Now you should be able to connect from your workstation to the device through the serial port. You can try to hit Enter, or type some commands, like `ls` , to see if the device replies to your commands. If the prompt asks you to login, type the user name **root**, it doesn't have a password:

```
imx8mp-eisd login: root
root@imx8mp-eisd:~# ls /
bin   dev  home  lost+found  mnt  proc  sbin  sys  unit_tests  var
boot  etc  lib   media       opt  run   srv   tmp  usr
root@imx8mp-eisd:~#
```

Connect From Network (SSH)

[Cheatsheet for experienced developers: username: root, no password]

You can SSH to the device when it's connected to the network, either through Wi-Fi or Ethernet.

First make sure you're connected through WiFi or Ethernet (to learn how, jump to the Network section below. Ethernet can be automatically detected, WiFi needs some configuration).

Then you can check the IP address with **ifconfig**, to type this command, you can use a mouse and keyboard temporarily and type it, or through serial debug port:

```
 1 root@imx8mp-eisd:~# ifconfig
 2 eth0: flags=-28669<UP,BROADCAST,MULTICAST,DYNAMIC>  mtu 1500
 3         ether be:ec:6e:3a:f4:18  txqueuelen 1000  (Ethernet)
 4         RX packets 0  bytes 0 (0.0 B)
 5         RX errors 0  dropped 0  overruns 0  frame 0
 6         TX packets 0  bytes 0 (0.0 B)
 7         TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
 8
 9 eth1: flags=-28669<UP,BROADCAST,MULTICAST,DYNAMIC>  mtu 1500
10         ether be:ed:6e:3a:f4:18  txqueuelen 1000  (Ethernet)
11         RX packets 0  bytes 0 (0.0 B)
12         RX errors 0  dropped 0  overruns 0  frame 0
13         TX packets 0  bytes 0 (0.0 B)
14         TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
15         device interrupt 52
16
17 wlan0: flags=-28605<UP,BROADCAST,RUNNING,MULTICAST,DYNAMIC>  mtu 1500
18         inet 192.168.50.150  netmask 255.255.255.0  broadcast 192.168.50.255
19         ether 2c:c3:e6:41:46:b2  txqueuelen 1000  (Ethernet)
20         RX packets 244  bytes 57010 (55.6 KiB)
21         RX errors 0  dropped 3  overruns 0  frame 0
22         TX packets 54  bytes 9715 (9.4 KiB)
23         TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

The **inet** line contains **your-ip**. In the case above the IP address is 192.168.50.150 through **wlan0**.

If you're using Ethernet, it should be one of eth0(line 2) and eth1(line 9), depending on your device model. For example, on the dual-lan 7 inch product, LAN0 port is eth0, LAN1 port is eth1.

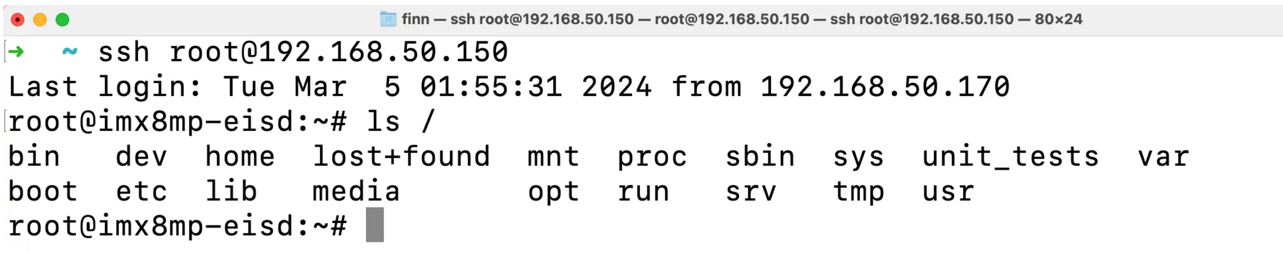
Then we can ssh from our workstation with this IP address.

Linux / MacOS

For Linux and MacOS users, you can use your terminal and type:

```
ssh root@your-ip
# In our case, your-ip is 192.168.50.150
ssh root@192.168.50.150
```

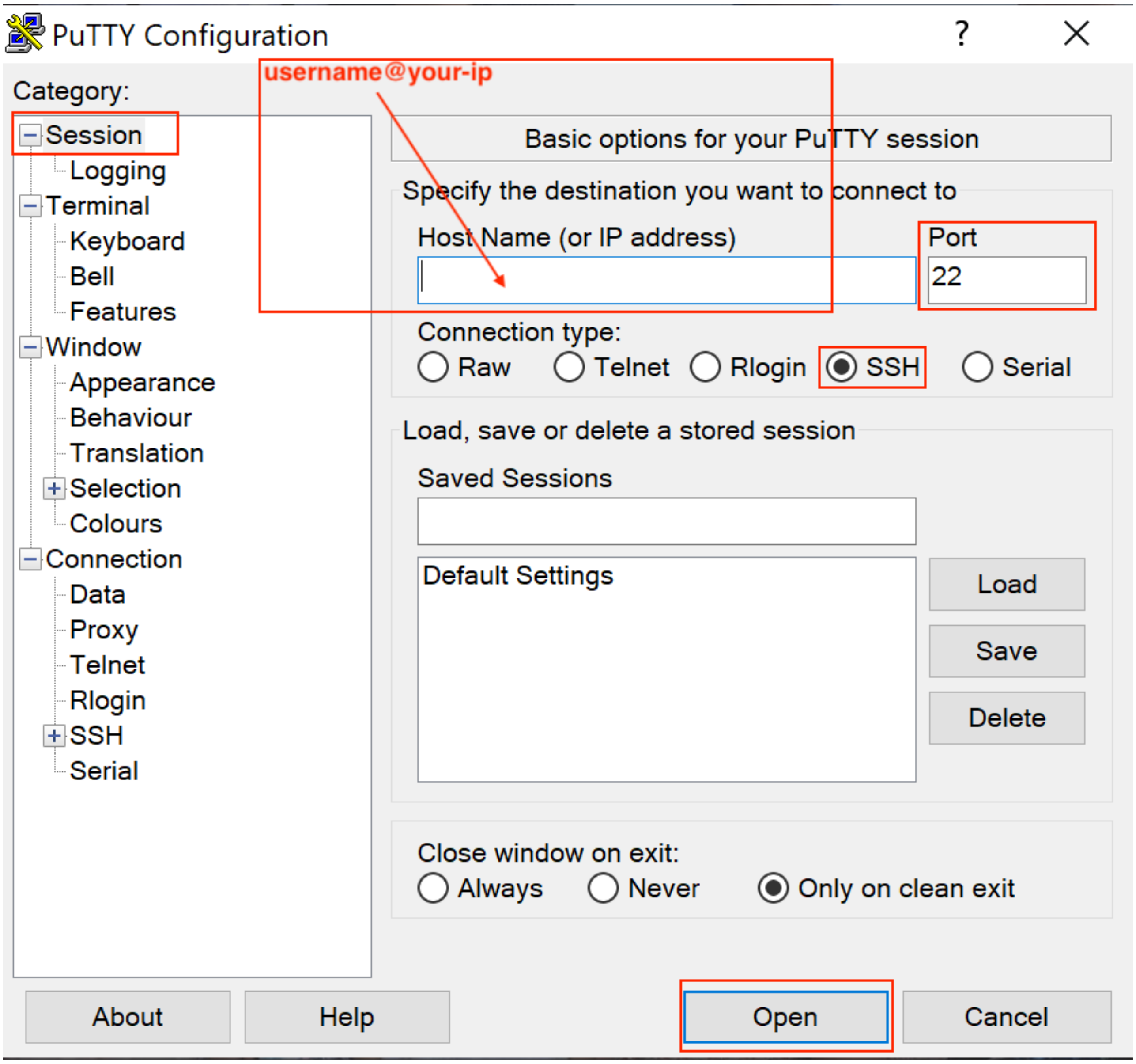
The username is root, and there is no password.



SSH with your-ip

Windows

For Windows users using PuTTY, you can choose Session, input **username@your-ip** (in our case *root@192.168.50.150*, yours should be different) in the Host Name field. Port Number should remain 22, choose SSH as the connection type in the radio buttons, click “Open”. There is **no password** for **root** user.



Input username@your-ip in the Host Name field, in our case root@192.168.50.150

Now you have connected to the device through the network.

System Resources

SD Card

When an micro SD card (TF card) is inserted to the device, it will appear as **mmcblk1**, you can check it by **lsblk**, note the last line **mmcblk1 179:96 0 58.2G 0 disk** is the 64GB SD card:

```
root@imx8mp-eisd:~# lsblk

// Before insertion
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
mmcblk2      179:0    0 14.6G  0 disk
|-mmcblk2p1  179:1    0 83.2M  0 part /run/media/mmcblk2p1
`-mmcblk2p2  179:2    0 14.5G  0 part /
mmcblk2boot0 179:32   0    4M  1 disk
mmcblk2boot1 179:64   0    4M  1 disk

// After insertion
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
mmcblk2      179:0    0 14.6G  0 disk
|-mmcblk2p1  179:1    0 83.2M  0 part /run/media/mmcblk2p1
`-mmcblk2p2  179:2    0 14.5G  0 part /
mmcblk2boot0 179:32   0    4M  1 disk
mmcblk2boot1 179:64   0    4M  1 disk
mmcblk1      179:96   0 58.2G  0 disk
```

Or with **fdisk -l**, the 64GB TF card appears as “Disk /dev/mmcblk1: 58.22 GiB”:

```
root@imx8mp-eisd:~# fdisk -l
Disk /dev/mmcblk2: 14.56 GiB, 15634268160 bytes, 30535680 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xeda0e0c7

Device          Boot  Start      End  Sectors  Size Id Type
/dev/mmcblk2p1        16384   186775   170392 83.2M  c W95 FAT32 (LBA)
/dev/mmcblk2p2       196608 30535679 30339072 14.5G 83 Linux

Disk /dev/mmcblk1: 58.22 GiB, 62511906816 bytes, 122093568 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
```

You can mount the SD card to /run/media/sd1 with **mount** command:

```
root@imx8mp-eisd:~# mkdir /run/media/sd1
```

```
root@imx8mp-eisd:~# mount --source /dev/mmcblk1 --target /run/media/sd1
root@imx8mp-eisd:~# lsblk
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
mmcblk2      179:0    0 14.6G  0 disk
|-mmcblk2p1  179:1    0 83.2M  0 part /run/media/mmcblk2p1
`-mmcblk2p2  179:2    0 14.5G  0 part /
mmcblk2boot0 179:32   0    4M  1 disk
mmcblk2boot1 179:64   0    4M  1 disk
mmcblk1      179:96   0 58.2G  0 disk /run/media/sd1
```

To unmount the SD card, use **umount** command:

```
root@imx8mp-eisd:~# cd /run/media/sd1/
root@imx8mp-eisd:/run/media/sd1# umount /run/media/sd1/
umount: /run/media/sd1/: target is busy.

root@imx8mp-eisd:/run/media/sd1# cd /
root@imx8mp-eisd:/# umount /run/media/sd1/

root@imx8mp-eisd:/# lsblk
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
mmcblk2      179:0    0 14.6G  0 disk
|-mmcblk2p1  179:1    0 83.2M  0 part /run/media/mmcblk2p1
`-mmcblk2p2  179:2    0 14.5G  0 part /
mmcblk2boot0 179:32   0    4M  1 disk
mmcblk2boot1 179:64   0    4M  1 disk
mmcblk1      179:96   0 58.2G  0 disk
```

Then you can eject the SD card physically.

USB Flash Drive

USB flash drive on the USB3.0 port or USB2.0 port will be automatically detected on **/dev/sdX** (X is the usually a/b, e.g. /dev/sda or /dev/sdb, depending on the order it is inserted), you can check it with **lsblk**:

```
root@imx8mp-eisd:/# lsblk

// Before insertion
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
mmcblk2      179:0    0 14.6G  0 disk
|-mmcblk2p1  179:1    0 83.2M  0 part /run/media/mmcblk2p1
`-mmcblk2p2  179:2    0 14.5G  0 part /
mmcblk2boot0 179:32   0    4M  1 disk
mmcblk2boot1 179:64   0    4M  1 disk

// After insertion
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda            8:0    1  7.3G  0 disk
|-sda1         8:1    1  3.6G  0 part
|-sda2         8:2    1  4.1M  0 part /run/media/ESP-sda2
|-sda3         8:3    1  300K  0 part
`-sda4         8:4    1  3.7G  0 part /run/media/writable-sda4
mmcblk2      179:0    0 14.6G  0 disk
|-mmcblk2p1  179:1    0 83.2M  0 part /run/media/mmcblk2p1
`-mmcblk2p2  179:2    0 14.5G  0 part /
mmcblk2boot0 179:32   0    4M  1 disk
mmcblk2boot1 179:64   0    4M  1 disk
```

In the example above, the USB drive is detected on /dev/sda, it has 4 partitions, two partitions are **automatically mounted** (sda2 and sda4).

With two USB flash drive plugged in to the device, they will be detected on /dev/sda and /dev/sdb:

```
root@imx8mp-eisd:/# fdisk -l
Disk /dev/mmcblk2: 14.56 GiB, 15634268160 bytes, 30535680 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xeda0e0c7

Device          Boot  Start      End  Sectors  Size Id Type
/dev/mmcblk2p1        16384   186775   170392 83.2M  c W95 FAT32 (LBA)
/dev/mmcblk2p2       196608 30535679 30339072 14.5G 83 Linux

Disk /dev/sda: 7.26 GiB, 7794589696 bytes, 15223808 sectors
```

```
Disk model: Cruzer Blade
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: 9240A165-D190-4AB6-8A10-46DC207B42EE

Device       Start      End Sectors  Size Type
/dev/sda1       64  7465119 7465056  3.6G Microsoft basic data
/dev/sda2  7465120  7473615    8496  4.1M EFI System
/dev/sda3  7473616  7474215     600  300K Microsoft basic data
/dev/sda4  7475200 15223744 7748545  3.7G Linux filesystem

Disk /dev/sdb: 28.65 GiB, 30765219840 bytes, 60088320 sectors
Disk model:  SanDisk 3.2Gen1
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xcad4ebea

Device     Boot Start      End  Sectors  Size Id Type
/dev/sdb4  *      256 60088319 60088064 28.7G  c W95 FAT32 (LBA)
```

Note that the “Disk /dev/sda: 7.26 GiB” is a 8GB usb flash drive and the “Disk /dev/sdb: 28.65 GiB” is a 32GB USB flash drive.

Backlight

We use one PWM to control the backlight of i.MX8MP boards, You can use the following commands:

- **Get the supported max brightness:**

```
cat /sys/class/backlight/backlight/max_brightness
```

- **Get the current brightness:**

```
cat /sys/class/backlight/backlight/actual_brightness
```

- **Set brightness:**

```
echo 50 > /sys/class/backlight/backlight/brightness
```

LED

There is a red LED beside PROG button, you can control the LED by writing a file:

```
# Turn on the red LED
root@imx8mp-eisd:/# echo 1 > /sys/class/leds/work/brightness
root@imx8mp-eisd:/# cat /sys/class/leds/work/brightness
1

# Turn off the red LED
root@imx8mp-eisd:/# echo 0 > /sys/class/leds/work/brightness
root@imx8mp-eisd:/# cat /sys/class/leds/work/brightness
0
```

You can use your programming language to control it as well. Simply use the file (IO) system library to write this **/sys/class/leds/work/brightness** file.

Buzzer

The Chipsee industrial PC has one buzzer. You can control it with *gpiod* as follows:

```
gpioset 2 22=1    # enable buzzer (be careful, it's really loud!)

gpioset 2 22=0    # disable buzzer
```

Serial Port

The i.MX8MP based Chipsee industrial PC supports RS232 and RS485, here are the mapping from the port name to the system tree device:

5 inch product

- PPC-A53-050 (PN: CS12720-IMX8MP-050P)

Name	Node	Protocol
RS232_0	/dev/ttymxc1	RS232, Serial Debug
RS232_2	/dev/ttymxc3	RS232
RS485_3	/dev/ttymxc2	RS485
RS485_5	/dev/ttyUSB0	RS485

Table 121 RS232/485 for **5 inch** product

7 inch product and Box product

- PPC-A53-070 (PN: CS10600-IMX8MP-070P)
- CS-A53-BOX (PN: CS-IMX8MP-BOX)

Name	Node	Protocol
RS232_0	/dev/ttymxc3	RS232
RS232_2	/dev/ttymxc1	RS232, Serial Debug
RS485_3	/dev/ttymxc2	RS485
RS485_4	/dev/ttyUSB0	RS485
RS485_5	/dev/ttyUSB1	RS485

Table 122 RS232/485 for **7 inch** product and **box** product

10.1+ inch products

- PPC-A53-101 (PN: CS12800-IMX8MP-101P)

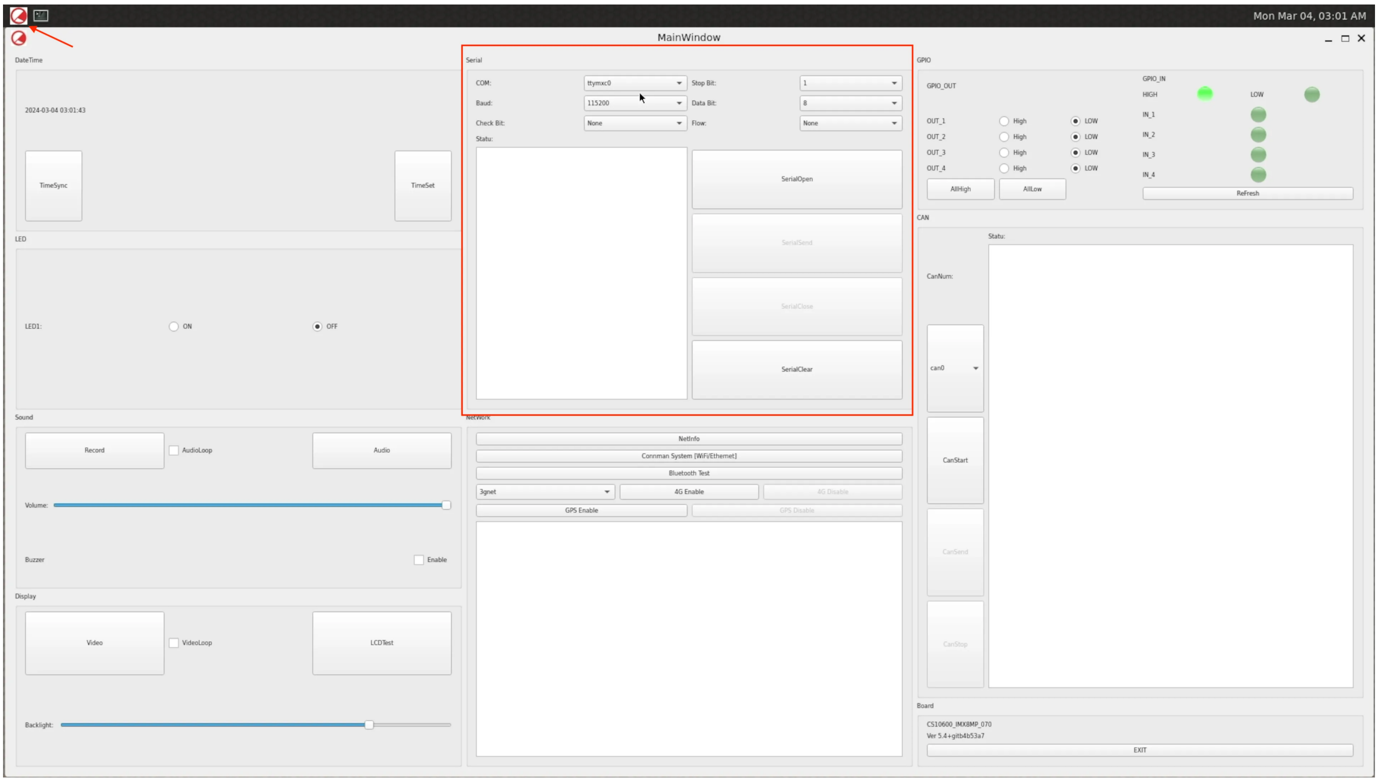
Name	Node	Protocol
RS232_0	/dev/ttymxc3	RS232
RS232_2	/dev/ttymxc1	RS232, Serial Debug
RS485_3	/dev/ttymxc2	RS485
RS485_4	/dev/ttyUSB0	RS485

Table 123 RS232/485 for **10.1+ inch** products

The 120 Ohm match resistor is already mounted on the RS485 port. RS485 ports are half-duplex, the hardware can switch the Tx/Rx direction automatically. RS232 ports are full-duplex.

You can use the pre-installed HardwareTest program developed by Chipsee to test serial ports, for example, you've wired the serial cable on the RS232_0_RX, RS232_0_TX on the 7 inch product, then you can select "ttymxc3" in "COM", click "SerialOpen", then you can use your workstation or another Chipsee PC to communicate with this 7 inch product.

For example, you can use a program called COMTool which can be downloaded from Github on your workstation, or use any of your favorite serial port debug tools. Select the same baudrate and bits as in HardwareTest program, click SerialSend to send from Chipsee industrial PC, or send ASCII from your workstation and receive it on the Chipsee industrial PC.



Testing Serial Port in HardwareTest Program

GPIO

There are 8 GPIOs, 4 Output, and 4 Input, they are all optical isolated. You can control the output or input pin voltage by feeding the VDD_ISO voltage. The pin voltage should be from 5V to 24V. You should use an external reliable power supply for the VDD_ISO and GND_ISO.

We **don't** recommend testing GPIO with the onboard +5V/GND (wiring the +5V to VDD_ISO and wiring GND to GND_ISO), in most cases we recommend using an external power source for VDD_ISO and GND_ISO.

For:

- 7 inch product and box product: PPC-A53-070 (PN: CS10600-IMX8MP-070P), CS-A53-BOX (PN: CS-IMX8MP-BOX)
- 10.1+ inch products: PPC-A53-101 (PN: CS12800-IMX8MP-101P)

Refer to the tables below for a detailed port definition:

Function	CPU IO	IO Num
OUT1	GPIO1_IO08	8
OUT2	GPIO1_IO14	14
OUT3	GPIO1_IO13	13
OUT4	GPIO1_IO12	12
IN1	GPIO1_IO11	11
IN2	GPIO1_IO07	7
IN3	GPIO1_IO06	6
IN4	GPIO1_IO05	5

Table 124 GPIO Device Node

The GPIO1 is gpiochip0 in gpiod. To set GPIO out to high with **gpiod**:

```
# Set OUT1 and OUT2 (GPIO1_IO08 and GPIO1_IO14) to High
gpioset 0 8=1 14=1

# Set OUT3 and OUT4 (GPIO1_IO13 and GPIO1_IO12) to Low
gpioset 0 13=0 12=0
```

To get GPIO input:

```
# Get the IN4 (GPIO1_IO05) status:
gpioget 0 5
```

To detect GPIO event (rising edge and falling edge), e.g. on IN4:

```
root@imx8mp-eisd:~# gpiomon 0 5
// Give IN4 a high voltage:
event:  RISING EDGE offset: 5 timestamp: [    1397.277364125]
// Remove the IN4 external high voltage:
event: FALLING EDGE offset: 5 timestamp: [    1398.535609500]
event:  RISING EDGE offset: 5 timestamp: [    1398.535796125]
// Above are bounces
event: FALLING EDGE offset: 5 timestamp: [    1398.536035125]
```

You can also use a programming language like C, which has libgpiod support to control the GPIOs.

```
# Get the libgpiod dev packages(run the following commands on the Chipsee target ARM board):
wget -c https://chipsee-tmp.s3.amazonaws.com/SourcesArchives/HARDWARETEST/8MP/libgpiod.tar.gz
tar zxmvf libgpiod.tar.gz -C /

# Get the gpiotest.c file
# The gpiotest.c will setting OUT1 IO as one output pins and drive high/low in every 1 second
wget -c https://chipsee-tmp.s3.amazonaws.com/SourcesArchives/HARDWARETEST/8MP/gpiotest.c

# Compile and run it
gcc gpiotest.c -o gpiotest -lgpiod
./gpiotest
```

We can also cross-compile *gpiotest.c* on Ubuntu 20.04 or any other Linux X86_64 system and execute the *gpiotest* on the target Chipsee ARM board. In doing so, there's no requirement to install the *libgpiod* development packages on the target Chipsee ARM board system. However, we do need to install the SDK and configure the environment accordingly. Refer to Development chapter to install SDK.

```
$ source /opt/fsl-imx-xwayland/5.15-kirkstone/environment-setup-armv8a-poky-linux
$ echo ${CC}
$ ${CC} gpiotest.c -o gpiotest -lgpiod
```

Then put the gpiotest to target Chipsee ARM board over ssh or other solutions you like.

```
$ scp gpiotest root@xxx.xxx.xxx.xxx
```

Controller Area Network (CAN)

To use CAN, you must add one 120Ω resistor between CAN_H and CAN_L on one of the two devices, as shown in the figure below.

> **Note**
>
> The Chipsee industrial PC **doesn't** mount the 120Ω matched resistor on all CAN signals by default.

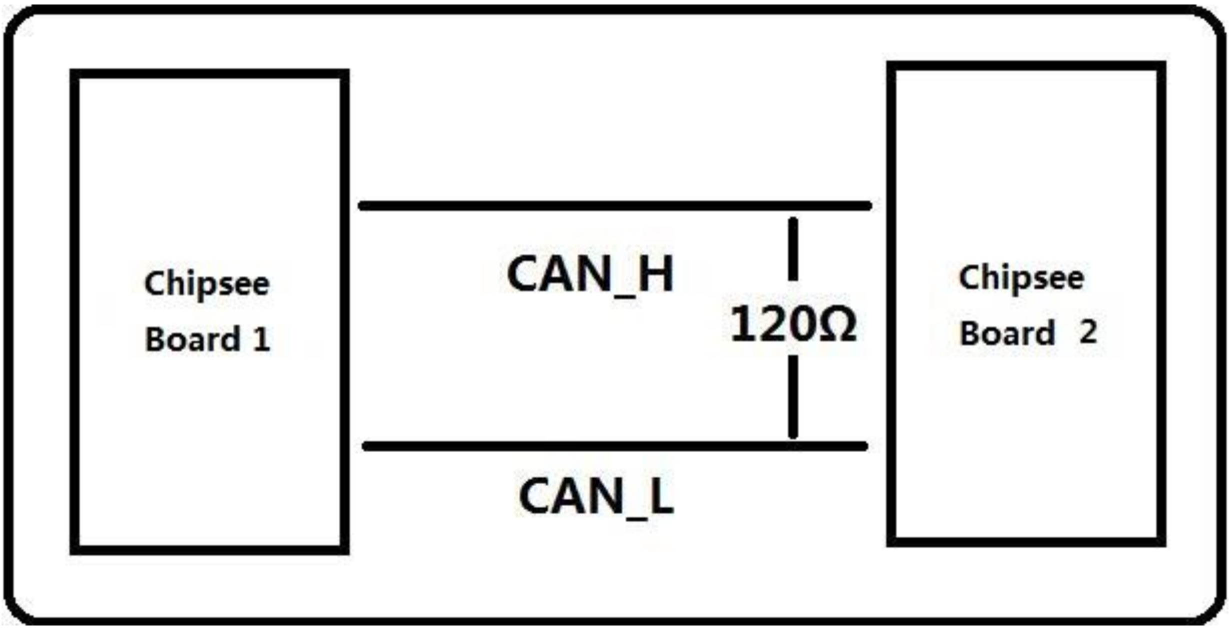


Figure 403: *Connecting CAN*

5 inch product

- PPC-A53-050 (PN: CS12720-IMX8MP-050P)

Pin Name	Software Node
CAN1_H, CAN1_L	CAN0

Table 125 CAN for **5 inch** product

7 inch product and Box product

- PPC-A53-070 (PN: CS10600-IMX8MP-070P)
- CS-A53-BOX (PN: CS-IMX8MP-BOX)

Pin Name	Software Node
CAN0_H, CAN0_L	CAN0
CAN1_H, CAN1_L	CAN1

Table 126 CAN for **7 inch** product and **box** product

10.1+ inch products

- PPC-A53-101 (PN: CS12800-IMX8MP-101P)

Pin Name	Software Node
CAN0_H, CAN0_L	CAN0
CAN1_H, CAN1_L	CAN1

Table 127 CAN for **10.1+ inch** products

To check the CAN devices status with *ip link*, on the 7 inch device, there are two CAN devices (can0 and can1):

```
root@imx8mp-eisd:~# ip link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT
group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc mq state DOWN mode
DEFAULT group default qlen 1000
    link/ether be:ec:6e:3a:f4:18 brd ff:ff:ff:ff:ff:ff
3: eth1: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc mq state DOWN mode
DEFAULT group default qlen 1000
    link/ether be:ed:6e:3a:f4:18 brd ff:ff:ff:ff:ff:ff
4: can0: <NOARP,ECHO> mtu 16 qdisc noop state DOWN mode DEFAULT group default
qlen 10
    link/can
5: can1: <NOARP,ECHO> mtu 16 qdisc noop state DOWN mode DEFAULT group default
qlen 10
    link/can
6: wlan0: <BROADCAST,MULTICAST,DYNAMIC,UP,LOWER_UP> mtu 1500 qdisc mq state UP
mode DORMANT group default qlen 1000
    link/ether 2c:c3:e6:41:46:b2 brd ff:ff:ff:ff:ff:ff
7: wwan0: <BROADCAST,MULTICAST,NOARP> mtu 1500 qdisc noop state DOWN mode DEFAULT
group default qlen 1000
    link/ether 8e:85:1a:07:2b:5e brd ff:ff:ff:ff:ff:ff
```

Here are a few examples to test CAN using CAN utils.

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

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

Bring up the device using the command:

```
ip link set can0 up
```

Transfer packets

```
cansend can0 5A1#11.2233.44556677.88
```

Receive data from CAN bus

```
candump can0
```

Bring down the device

```
ip link set can0 down
```

If you’re new to CAN, you can use two Chipsee devices to test with each other. On both device_A and device_B you first set the CAN and bring up the CAN. Then on device_A you use *candump* to listen, on device_B you use *cansend* to send a message, at this moment, device_A should receive the message sent from device_B and show it in the terminal. For example:

```
// On device_A
root@imx8mp-eisd:~# candump can0
// On device_B
root@imx8mp-eisd:~# cansend can1 5A1#11.2233.44556677.88
root@imx8mp-eisd:~# cansend can1 1F334455#1122334455667788
// On device_A it shows
can0  5A1   [8]  11 22 33 44 55 66 77 88
can0  1F334455   [8]  11 22 33 44 55 66 77 88
```

Bluetooth

First check if Bluetooth is enabled:

```
root@imx8mp-eisd:~# connmanctl technologies
/net/connman/technology/bluetooth
  Name = Bluetooth
  Type = bluetooth
  Powered = False
  Connected = False
  Tethering = False
  TetheringFreq = 2412
```

If not you can power on Bluetooth with **connmanctl**:

```
root@imx8mp-eisd:~# connmanctl enable bluetooth
Enabled bluetooth
root@imx8mp-eisd:~# connmanctl technologies
/net/connman/technology/bluetooth
  Name = Bluetooth
  Type = bluetooth
  Powered = True
  Connected = False
  Tethering = False
  TetheringFreq = 2412
```

Use **bluetoothctl** to control Bluetooth. Remember to change the “8C:D9:D6:62:79:FC” MAC address in the example to your phone’s MAC address.

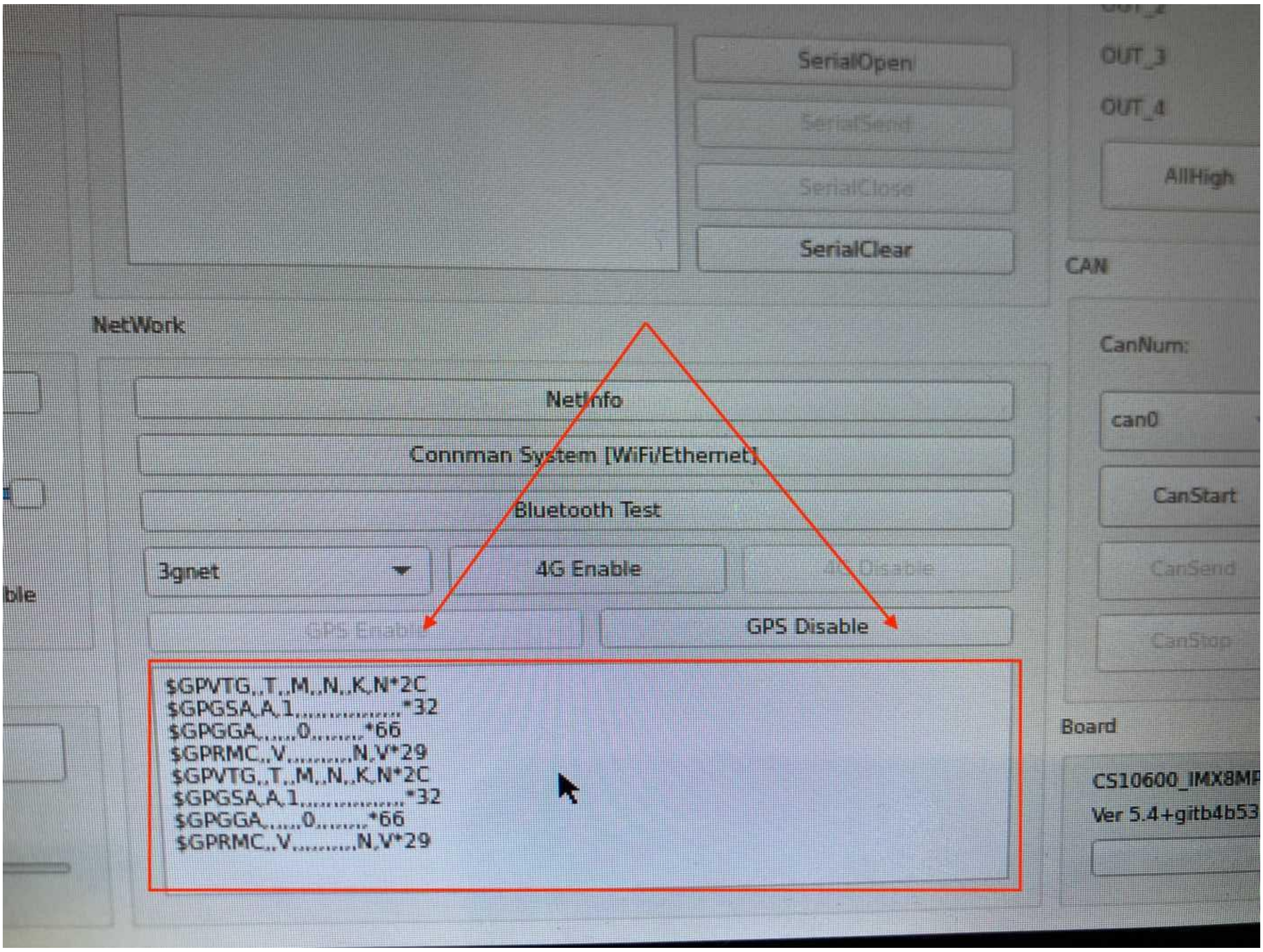
```
 root@imx8mp-eisd:~# bluetoothctl          // enter bluetoothctl
 [bluetooth] power on
 [bluetooth] agent on
 [bluetooth] default-agent
 [bluetooth] discoverable on
 [bluetooth] pairable on
 [bluetooth] scan on                       // Scan other BT devices
 [bluetooth] pair 8C:D9:D6:62:79:FC         // Pair with the device, confirm on
your phone
                                            // You may need to type "yes" to
confirm
 [bluetooth] trust 8C:D9:D6:62:79:FC        // Trust the device
 [bluetooth] connect 8C:D9:D6:62:79:FC      // Connect the device
 [bluetooth] remove 8C:D9:D6:62:79:FC       // Remove the device
```

When your phone is connected to the device, you can play a music on your phone, and the device’s speaker will play the music. You can use other devices to connect to Bluetooth and use other software to achieve other purposes as well.

GPS

If your product shipped with a GPS module, and a GPS antenna, you can enable the GPS function.

You can check the Chipsee *hardware test* program, click **GPS Enable** button, you should see some random code(GPS information) in the text box.



Click GPS Enable Button in Hardware Test

You can also use GPS from command line.

Test the GPS function as follows, first, you listen to the GPS info serial port (/dev/ttyUSB5), then, you send AT commands to AT serial port (/dev/ttyUSB6). Finally, GPS information should appear on the info port. This means you will need two terminals opened, one for listening and the other for sending.

GPS Port: /dev/ttyUSB5

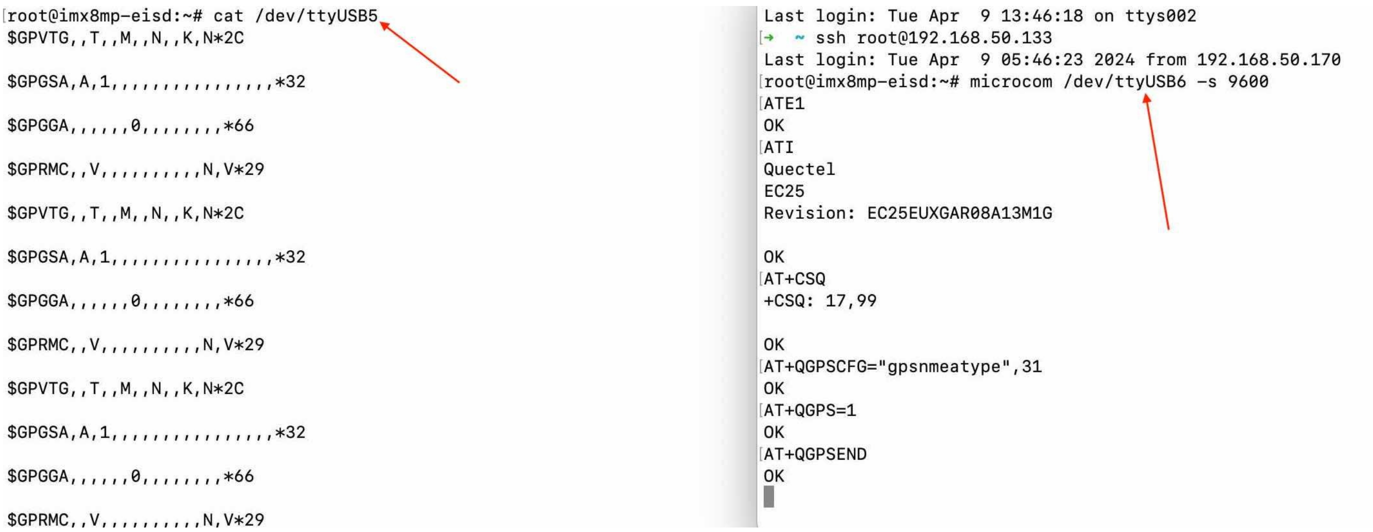
AT port: /dev/ttyUSB6

In the first terminal, we use **cat** to listen for GPS info:

```
cat /dev/ttyUSB5
# hit Enter, the port will keep listening
# until any information comes to the port(after you send AT command to AT port)
```

In the second terminal, we send AT commands with microcom, you can also use other programs to send serial commands:

```
microcom /dev/ttyUSB6 -s 9600

ATE1 # Enable displaying. Hit Enter after you type ATE1
ATI # Print product info
AT+CSQ # Query Signal Level, return [+CSQ: current signal strength, channel bit error rate] e.g.: +CSQ: 19,99 means strength 19 with rate 99
AT+QGPSCFG="gpsnmeatype",31 # Turn on all output type, GGA/RMC/GSV/GSA/VTG, this setting will be saved to NVRAM, persists after reboot
AT+QGPS=1 # enable GPS, wait some minutes, you can get data from terminal.
AT+QGPSEND # disable GPS
```



Left: /dev/ttyUSB5 GPS Port, Right: /dev/ttyUSB6 AT Port

Audio

Audio Card in OS

We will use **aplay** and **arecord** to play or record audio, but first we need to check which audio card we need to use.

The audio card in the device is **imx8mpnau8822**, first check it with **aplay -l** (lower case "l"):

```
root@imx8mp-eisd:~# aplay -l
  **** List of PLAYBACK Hardware Devices ****
card 0: audiohdmi [audio-hdmi], device 0: i.MX HDMI i2s-hifi-0 [i.MX HDMI i2s-hifi-0]
```

```
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 1: btscoaudio [bt-sco-audio], device 0: 30c20000.sai-bt-sco-pcm-wb bt-sco-pcm-wb-0 [30c20000.sai-bt-sco-pcm-wb bt-sco-pcm-wb-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 2: imx8mpnau8822 [imx8mp-nau8822], device 0: 30c30000.sai-nau8822-hifi nau8822-hifi-0 [30c30000.sai-nau8822-hifi nau8822-hifi-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
```

In the example, **card 2:imx8mpnau8822** is our audio card. We will need its **Subdevice #0**. It means we need to select **card 2** hardware's **subdevice 0**. It is **hw:2,0** in aplay or arecord.

But the order of these audio cards can change after each boot, so we'd better use its audio card name instead of its order.

We can check with **aplay -L** (upper case "L"):

```
root@imx8mp-eisd:~# aplay -L
null
    Discard all samples (playback) or generate zero samples (capture)
pulse
    PulseAudio Sound Server
sysdefault:CARD=btscoaudio
    bt-sco-audio, 30c20000.sai-bt-sco-pcm-wb bt-sco-pcm-wb-0
    Default Audio Device
sysdefault:CARD=imx8mpnau8822
    imx8mp-nau8822, 30c30000.sai-nau8822-hifi nau8822-hifi-0
    Default Audio Device
sysdefault:CARD=audiohdmi
    audio-hdmi, i.MX HDMI i2s-hifi-0
    Default Audio Device
```

The audio card is **sysdefault:CARD=imx8mpnau8822** in this case.

Audio Playing

By default the device plays audio from its integrated speaker. To play an audio file:

```
# name based
aplay -D sysdefault:CARD=imx8mpnau8822 /usr/hardwaretest/WavTest.wav
# order based
aplay -D hw:2,0 /usr/hardwaretest/WavTest.wav
```

If a headphone is plugged into the audio jack, it will play audio from the headphone instead of its speaker.

To set the volume:

```
# Set volume to 50% (0~100%)
pactl set-sink-volume @DEFAULT_SINK@ 50%
```

It will set volume for both speaker and headphone, and persists after reboot.

To set the volume up or down a little bit:

```
root@imx8mp-eisd:/# pactl get-sink-volume @DEFAULT_SINK@
Volume: front-left: 65536 / 100% / 0.00 dB,   front-right: 65536 / 100% / 0.00 dB
        balance 0.00
root@imx8mp-eisd:/# pactl set-sink-volume @DEFAULT_SINK@ -17%
root@imx8mp-eisd:/# pactl set-sink-volume @DEFAULT_SINK@ -17%
root@imx8mp-eisd:/# pactl get-sink-volume @DEFAULT_SINK@
Volume: front-left: 43252 /  66% / -10.83 dB,   front-right: 43252 /  66% / -10.83 dB
        balance 0.00
root@imx8mp-eisd:/# pactl set-sink-volume @DEFAULT_SINK@ +47%
root@imx8mp-eisd:/# pactl get-sink-volume @DEFAULT_SINK@
Volume: front-left: 74053 / 113% / 3.18 dB,   front-right: 74053 / 113% / 3.18 dB
        balance 0.00
root@imx8mp-eisd:/#
```

Audio Recording

To record an audio, you need an external microphone, such as a headphone which integrates a mic with 3.5mm audio jack. Or just a mic. *The device doesn't have a microphone on the board.*

We will need to use **arecord** to record an audio.

As described in the previous section (Audio Card in OS), first we need to specify the CAPTURE hardware devices, it can be either a name based or an order based audio card, for example, I've plugged in a USB Blue Yeti microphone, and the list looks like this:

```
root@imx8mp-eisd:~# arecord -L
null
    Discard all samples (playback) or generate zero samples (capture)
pulse
    PulseAudio Sound Server
sysdefault:CARD=btscoaudio
    bt-sco-audio, 30c20000.sai-bt-sco-pcm-wb bt-sco-pcm-wb-0
    Default Audio Device
sysdefault:CARD=imx8mpnau8822
    imx8mp-nau8822, 30c30000.sai-nau8822-hifi nau8822-hifi-0
    Default Audio Device
sysdefault:CARD=Microphone
    Yeti Stereo Microphone, USB Audio
    Default Audio Device
```

```
front:CARD=Microphone,DEV=0
    Yeti Stereo Microphone, USB Audio
    Front output / input
root@imx8mp-eisd:~# arecord -l
**** List of CAPTURE Hardware Devices ****
card 0: btscoaudio [bt-sco-audio], device 0: 30c20000.sai-bt-sco-pcm-wb bt-sco-pcm-wb-0 [30c20000.sai-bt-sco-pcm-wb bt-sco-pcm-wb-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 1: imx8mpnau8822 [imx8mp-nau8822], device 0: 30c30000.sai-nau8822-hifi nau8822-hifi-0 [30c30000.sai-nau8822-hifi nau8822-hifi-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 3: Microphone [Yeti Stereo Microphone], device 0: USB Audio [USB Audio]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
```

The Yeti microphone can be named after **sysdefault:CARD=Microphone** or **hw:3,0**

```
# You can learn more about the options of arecord with
arecord -h

# specify capture device by name
arecord -D sysdefault:CARD=Microphone -V stereo -c 2 -f S16_LE -r 48000 -t wav mic.wav

# specify capture device by order
arecord -D hw:1,0 -V mono -c 1 -f S16_LE -r 48000 -t wav mic.wav

# to play the audio you just recorded
aplay -D sysdefault:CARD=imx8mpnau8822 mic.wav

# If you need to post process mono to stereo, you can use sox
sox mic.wav -c 2 mic_stereo.wav
```

Now you should be able to record an audio with your capture device.

Video

To play a video:

```
# gst-play-1.0 path-to-your-video-file
# volume is from 0.0~1.0, 0.0 is silent, 1.0 is unchanged
gst-play-1.0 /usr/hardwaretest/h264.mp4 --volume=0.5
```

Network

WiFi(Command Line)

This operating system uses *connmanctl* to set WiFi.

1. Enabling and disabling WiFi

   To check if WiFi is enabled you can run *connmanctl technologies* and check for the line that says *Powered: True/False* .

   To power the WiFi on you can run *connmanctl enable wifi* or if you need to disable it you can run *connmanctl disable wifi* .

```
root@imx8mp-eisd:~# connmanctl technologies
/net/connman/technology/p2p
    Name = P2P
    Type = p2p
    Powered = False
    Connected = False
    Tethering = False
    TetheringFreq = 2412
/net/connman/technology/ethernet
    Name = Wired
    Type = ethernet
    Powered = True
    Connected = False
    Tethering = False
    TetheringFreq = 2412
/net/connman/technology/bluetooth
    Name = Bluetooth
    Type = bluetooth
    Powered = False
    Connected = False
    Tethering = False
    TetheringFreq = 2412
/net/connman/technology/wifi
    Name = WiFi
    Type = wifi
    Powered = True
    Connected = True
    Tethering = False
    TetheringFreq = 2412
```

2. Connecting to an open access point

   To scan for nearby Wi-Fi networks: *connmanctl scan wifi* .

   To list the available networks found after a scan run (example output):

```
root@imx8mp-eisd:~# connmanctl services
*AR Wired                ethernet_beec6e3af418_cable
*A  chipsee              wifi_2cc3e64146b2_6a686f6d652d3032_managed_psk
    chipsee-5G           wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk
    13301                wifi_2cc3e64146b2_333031_managed_psk
    too                  wifi_2cc3e64146b2_7463746f6f6f_managed_psk
```

To connect to an open network, use the second field beginning with *wifi_* (**tip: network names can be tab-completed.**):

```
connmanctl connect wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk
```

You should now be connected to the network. Check using *connmanctl state* or *ip addr* .

3. Connecting to a protected access point

   For protected access points you will need to provide some information to the ConnMan daemon, at the very least a password or a passphrase.

   The commands in this section show how to run *connmanctl* in interactive mode, it is required for running the agent command. To start interactive mode simply type:

```
$ connmanctl
```

   You then proceed almost as above, first scan for any Wi-Fi technologies:

```
connmanctl> scan wifi
```

   To list services:

```
connmanctl> services
```

   Now you need to register the agent to handle user requests. The command is:

```
connmanctl> agent on
```

   You now need to connect to one of the protected services. To do this easily, just use tab completion for the wifi service. If you were connecting to Chipsee-5G in the example above you would type:

```
connmanctl> connect wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk
```

   The agent will then ask you to provide any information the daemon needs to complete the connection. The information requested will vary depending on the type of network you are connecting to. The agent will also print additional data about the information it needs as shown in the example below.

```
Agent RequestInput wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk
   Passphrase = [ Type=psk, Requirement=mandatory ]
   Passphrase?
```

Provide the information requested, in this example the passphrase:

To enable autoconnect after reboot:

```
config wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk autoconnect on
```

And then type:

```
connmanctl> quit
```

If the information you provided is correct you should now be connected to the protected access point.

4. You can check the status with:

```
connmanctl services wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk
```

It should give you:

```
root@imx8mp-eisd:~# connmanctl services
wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk

/net/connman/service/wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk
  Type = wifi
  Security = [ psk, wps ]
  State = ready
  Strength = 48
  Favorite = True
  Immutable = False
  AutoConnect = True
  Name = chipsee-5G
  Ethernet = [ Method=auto, Interface=wlan0, Address=2C:C3:E6:41:46:B2,
MTU=1500 ]
  IPv4 = [ Method=dhcp, Address=192.168.50.133, Netmask=255.255.255.0 ]
  IPv4.Configuration = [ Method=dhcp ]
  IPv6 = [ Method=auto, Address=fd35:e01d:6481:2645:2ec3:e6ff:fe41:46b2,
PrefixLength=64, Privacy=disabled ]
  IPv6.Configuration = [ Method=auto, Privacy=disabled ]
  Nameservers = [ 8.8.8.8 192.168.50.1 ]
  Nameservers.Configuration = [  ]
  Timeservers = [  ]
  Timeservers.Configuration = [  ]
```

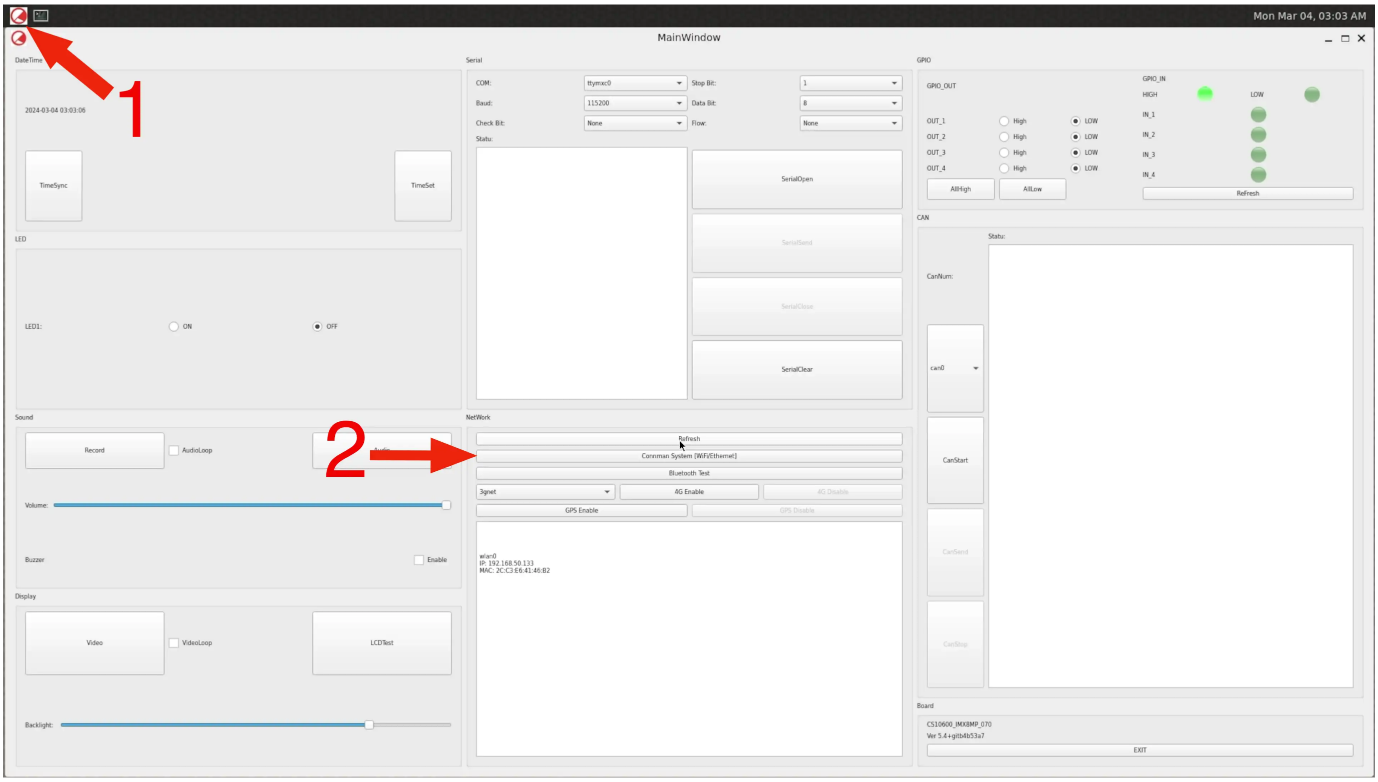
```
  Domains = [  ]
  Domains.Configuration = [  ]
  Proxy = [ Method=direct ]
  Proxy.Configuration = [  ]
  mDNS = False
  mDNS.Configuration = False
  Provider = [  ]
```

5. You should also be able to find a text config file of this WiFi's settings:

```
root@imx8mp-eisd:~# cat /var/lib/connman/
wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk/settings

[wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk]
Name=chipsee-5G
SSID=6a686f6d652d30325f3547
Frequency=5785
Favorite=true
AutoConnect=true
Modified=2024-03-05T08:51:16Z
Passphrase=password
IPv4.method=dhcp
IPv4.DHCP.LastAddress=192.168.50.133
IPv6.method=auto
IPv6.privacy=disabled
```

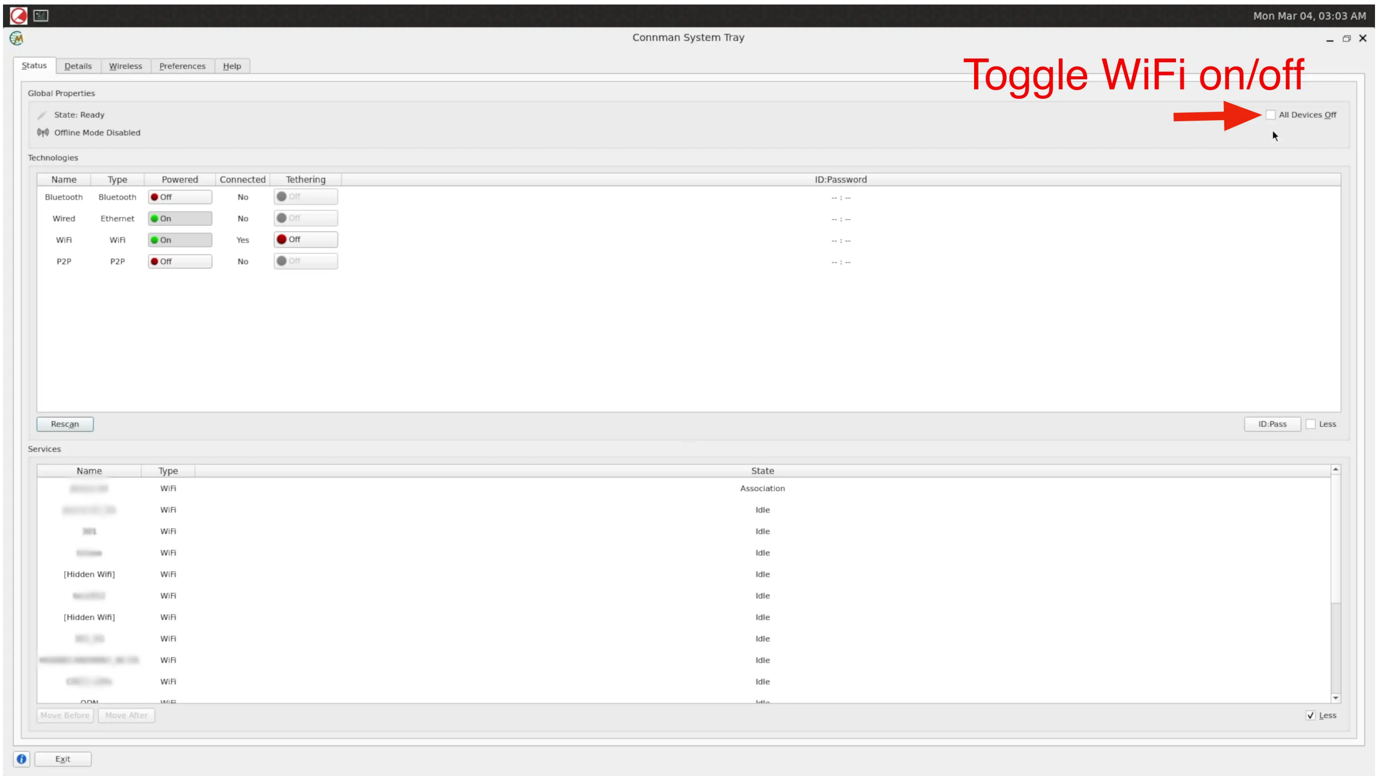
WiFi(GUI)

There is a “Hardware Test” Qt program (source code: https://github.com/Chipsee/hardwaretest) developed by Chipsee pre-installed on the device, you can use the Connmanctl GUI to set WiFi in this program. Click the icon (arrow 1) to open the program, in the program GUI, click the button (arrow 2) to open connman setting.



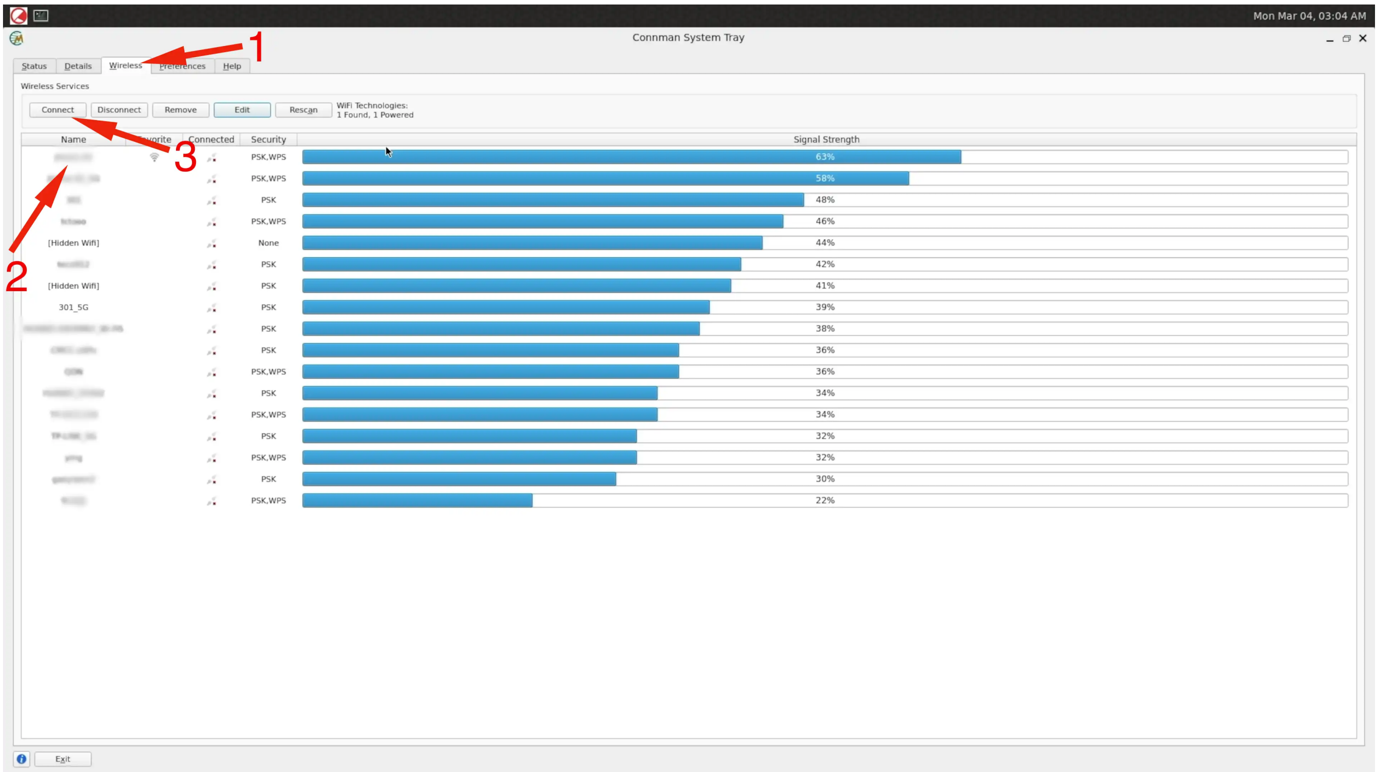
The Hardware Test Program: Click 1 to Open the Program, Click 2 to Open Connman Setting

In the Connman System Tray, you can toggle the WiFi/Ethernet/Bluetooth on / off by clicking a checkbox, or clicking the “Powered” column.



Switching On Off the Connections

Select the **Wireless** tab. Click the SSID you want to connect, then click **connect**, input your password to connect.



Connect to an Access Point

Now you should be connected to the SSID. The system will remember the option and try to auto connect when boot up next time.

Wired Ethernet

After plugging in the network cable, wired Ethernet should be connected automatically.

Setting Static IP

To set a static IP address with *connmanctl* , you can use the following command:

```
connmanctl config <service> --ipv4 manual <ip address> <netmask> <gateway>
connmanctl config <service> --nameservers <dns-addr>
```

For example:

```
connmanctl config wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk --ipv4
manual 192.168.50.151 255.255.255.0 192.168.50.1
connmanctl config wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk --
nameservers 8.8.8.8 4.4.4.4
```

The configuration will be saved in /var/lib/connman/
wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk/settings.

```
root@imx8mp-eisd:~# cat /var/lib/connman/
wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk/settings

[wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk]
Name=chipsee-5G
SSID=6a686f6d652d30325f3547
Frequency=5785
Favorite=true
AutoConnect=true
Modified=2024-03-05T08:51:16Z
Passphrase=password
IPv4.method=manual
IPv4.netmask_prefixlen=24
IPv4.local_address=192.168.50.151
IPv4.gateway=192.168.50.1
IPv6.method=auto
IPv6.privacy=disabled
Nameservers=8.8.8.8;4.4.4.4;
```

To set the manual IP mode back to DHCP:

```
connmanctl config wifi_2cc3e64146b2_6a686f6d652d30325f3547_managed_psk --ipv4
dhcp
```

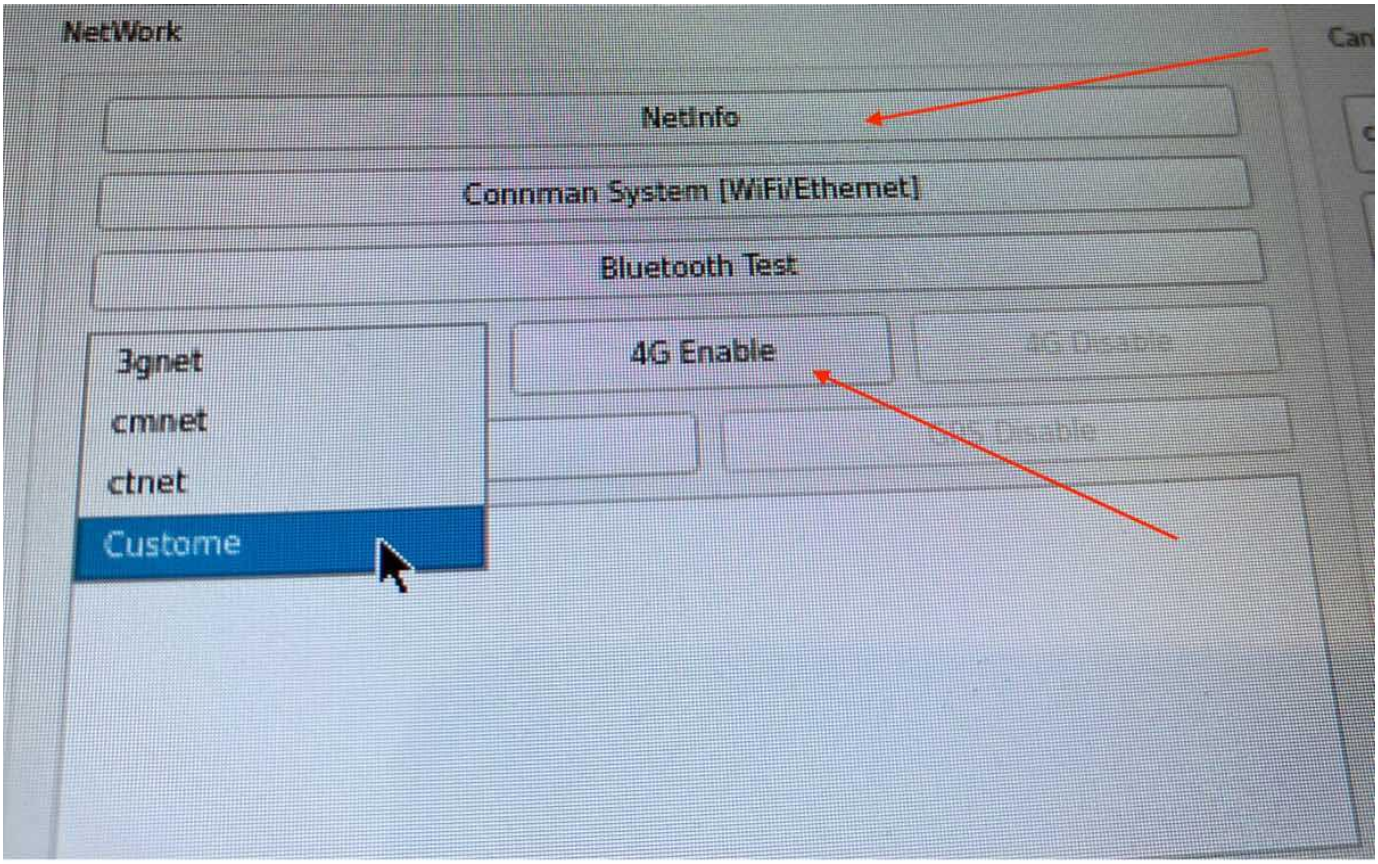
4G/LTE

For products shipped with a 4G/LTE module, you can use Chipsee *hardwaretest* program and the **quectel-CM** tool to configure 4G/LTE network.

> **Note**
>
> SIM card **does not** support hot plug, **power off** before inserting/removing SIM card.

In the Chipsee *hardware test* program, there is a **4G Enable** button, you can test the 4G function with this first. Then you can click "Netinfo" button, or "Refresh" button to check the 4G/LTE status.

To connect with an APN, there are 3 pre-configured APN profiles, 3gnet/ctnet/cmnet, and a "custom" that you can configure yourself.



4G/LTE Hardware Test Program

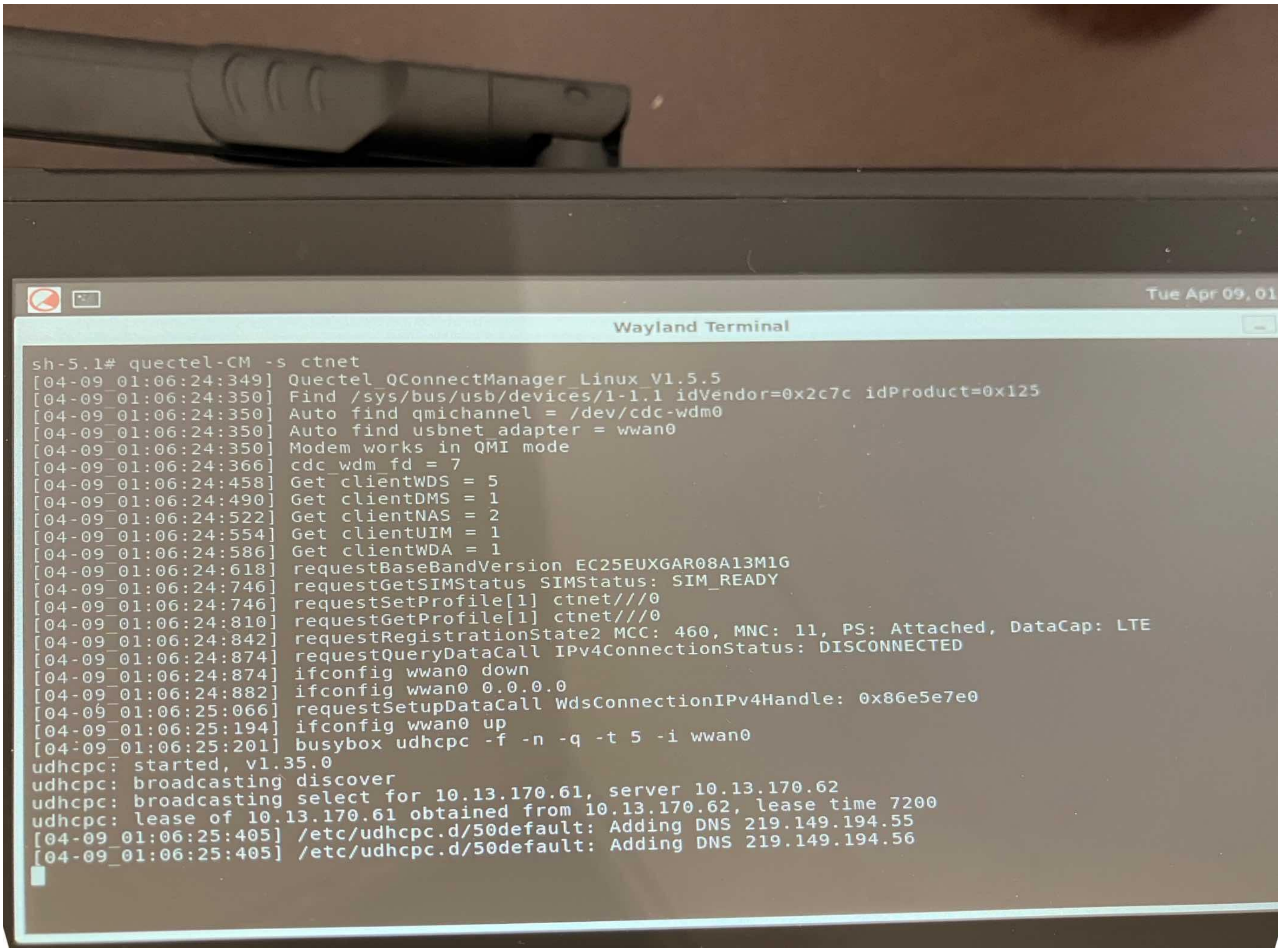
The Yocto Linux system pre-installed **quectel-CM** command, check available commands of **quectel-CM** and help:

```
quectel-CM --help
```

To connect to an APN, e.g.: ctnet

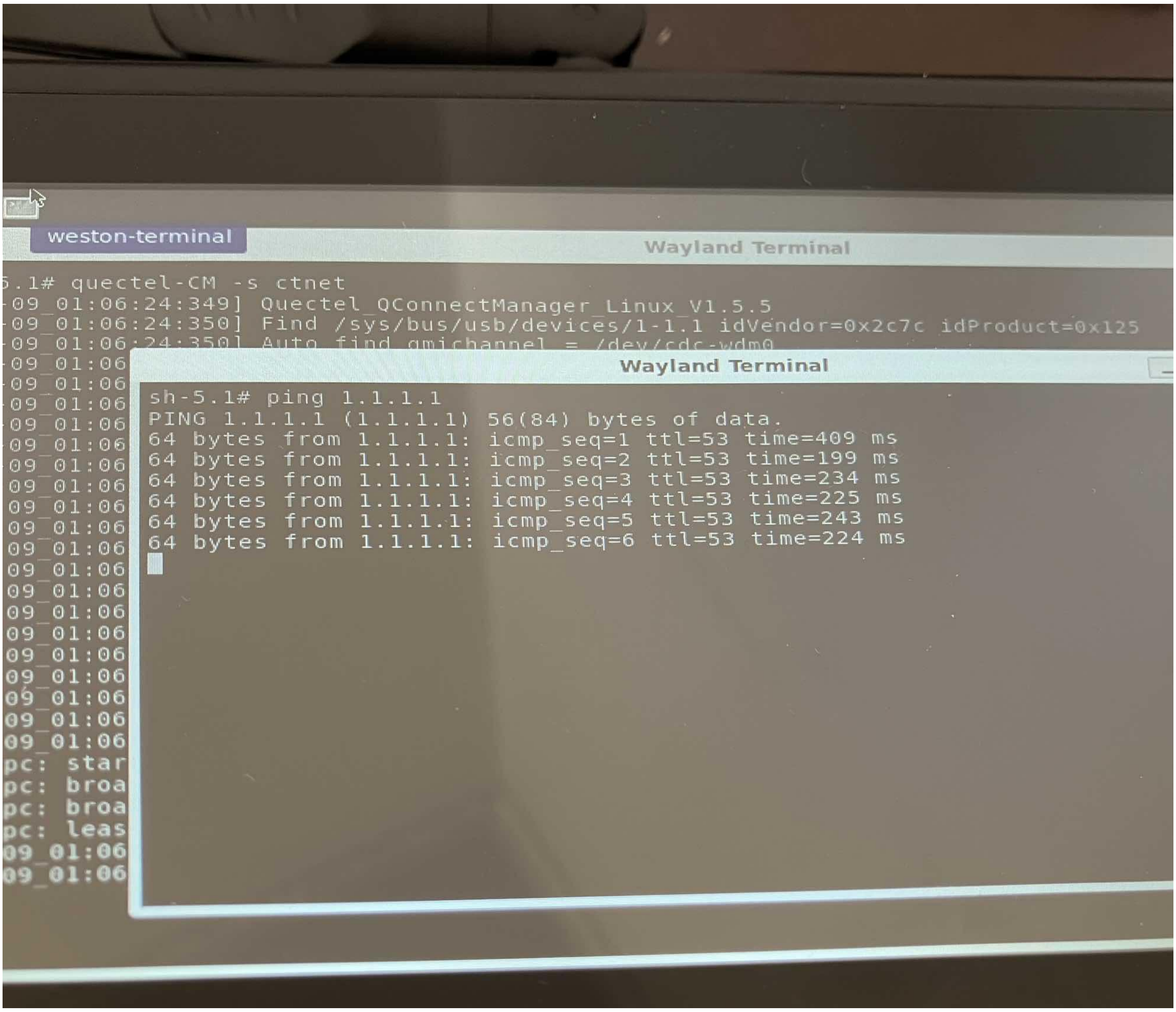
```
quectel-CM -s ctnet
```

The program should acquire an IP address from your carrier automatically.



Connecting 4G/LTE Through Command Line

You can then ping an IP address to check you're connected, such as ping the Cloudflare DNS:



Ping an IP to Test Connectivity

Next, you'll need to configure the DNS server for resolving DNS queries. Since the system employs ConnMan to handle network management, the DNS service is managed by ConnMan as well. However, this setup conflicts with **systemd-resolved.service**. When **quectel-CM** is utilized, it utilizes **systemd-resolved.service** to offer DNS resolution. Therefore, we need to switch the default DNS service to **systemd-resolved.service**.

```
ln -sf /etc/resolv-conf.systemd /etc/resolv.conf
```

Additionally, you may notice that upon using **quectel-CM** to establish a 4G connection, the functionality of WiFi, Bluetooth, and Ethernet ceases due to a conflict between the **connman.service** and **systemd-resolved.service**. Consequently, the **connman.service** becomes inactive while the **systemd-resolved.service** becomes active. Disabling the 4G connection restores the functionality of the **connman.service**.

```
ln -sf /etc/resolv-conf.connman /etc/resolv.conf
systemctl stop systemd-resolved.service
systemctl start connman.service
```

Development

In this chapter, you will learn how to set up a QT development environment, and develop the first QT application on the Chipsee industrial panel PCs.

Host system requirements

1. Ubuntu 20.04 LTS 64bit system should be installed on the host machine(your workstation).
2. Qtcreator 10.0.2 is a tested Qtcreator version, other versions should also be ok.

Preparation

1. Download Qtcreator 10.0.2 and install it on the Ubuntu 20.04 64bit Host PC. Other Qtcreator versions should also be ok.

   ```
   $ wget -c https://download.qt.io/archive/qtcreator/10.0/10.0.2/qt-creator-opensource-linux-x86_64-10.0.2.run
   $ chmod a+x qt-creator-opensource-linux-x86_64-10.0.2.run
   $ ./qt-creator-opensource-linux-x86_64-10.0.2.run
   ```

   The default install directory is *~/home/$USER/qtcreator-10.0.2~* .

   You can install it in this directory or use another directory.

2. Install Chipsee SDK for IMX8MP products. Download the SDK and install it with the following commands (on your workstation - Ubuntu 20.04 64bit Host PC):

   ```
   $ wget -c https://chipsee-tmp.s3.amazonaws.com/SDK/fsl-imx-xwayland-glibc-x86_64-meta-toolchain-qt6-armv8a-imx8mp-eisd-toolchain-5.15-kirkstone.sh.xz
   $ xz -d fsl-imx-xwayland-glibc-x86_64-meta-toolchain-qt6-armv8a-imx8mp-eisd-toolchain-5.15-kirkstone.sh.xz
   $ chmod +x fsl-imx-xwayland-glibc-x86_64-meta-toolchain-qt6-armv8a-imx8mp-eisd-toolchain-5.15-kirkstone.sh
   $ ./fsl-imx-xwayland-glibc-x86_64-meta-toolchain-qt6-armv8a-imx8mp-eisd-toolchain-5.15-kirkstone.sh
   ```

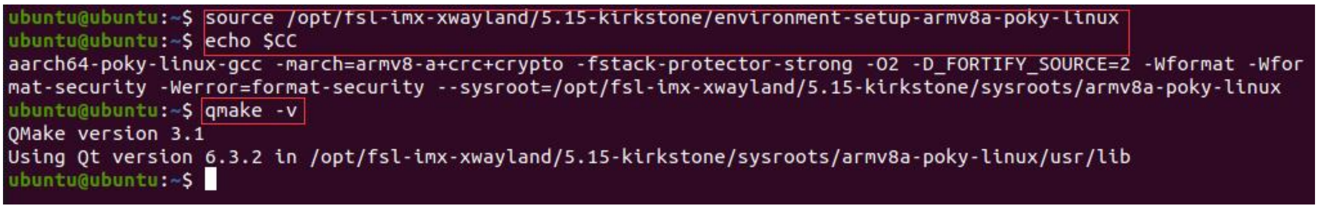
   The default install directory is */opt/fsl-imx-xwayland/5.15-kirkstone/* .

   You can install it in this directory or you also can use another directory.

3. Use the following command to test SDK:

```
$ source /opt/fsl-imx-xwayland/5.15-kirkstone/environment-setup-armv8a-poky-linux
$ echo ${CC}
$ qmake -v
```

Such as:

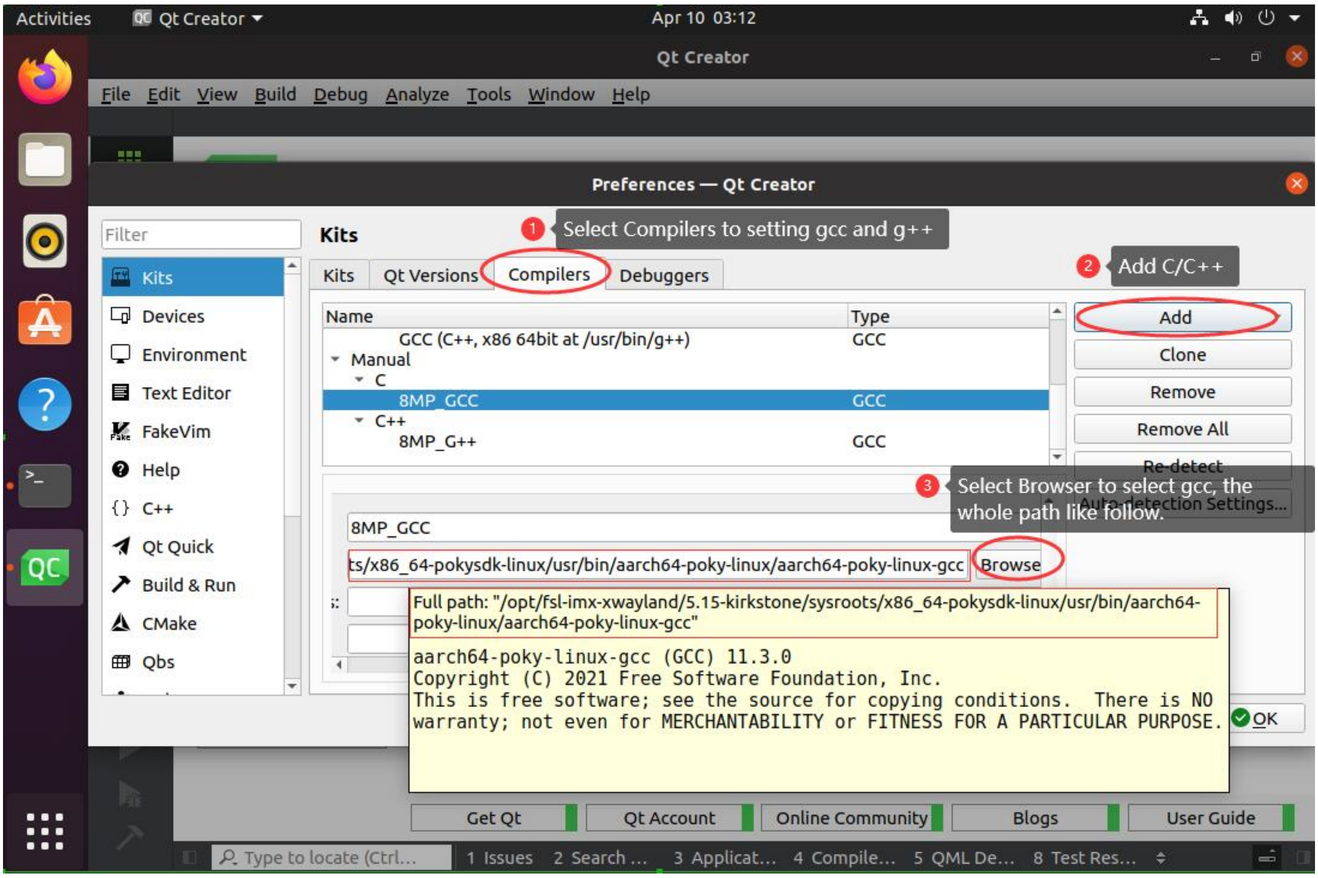


Setting SDK Environment

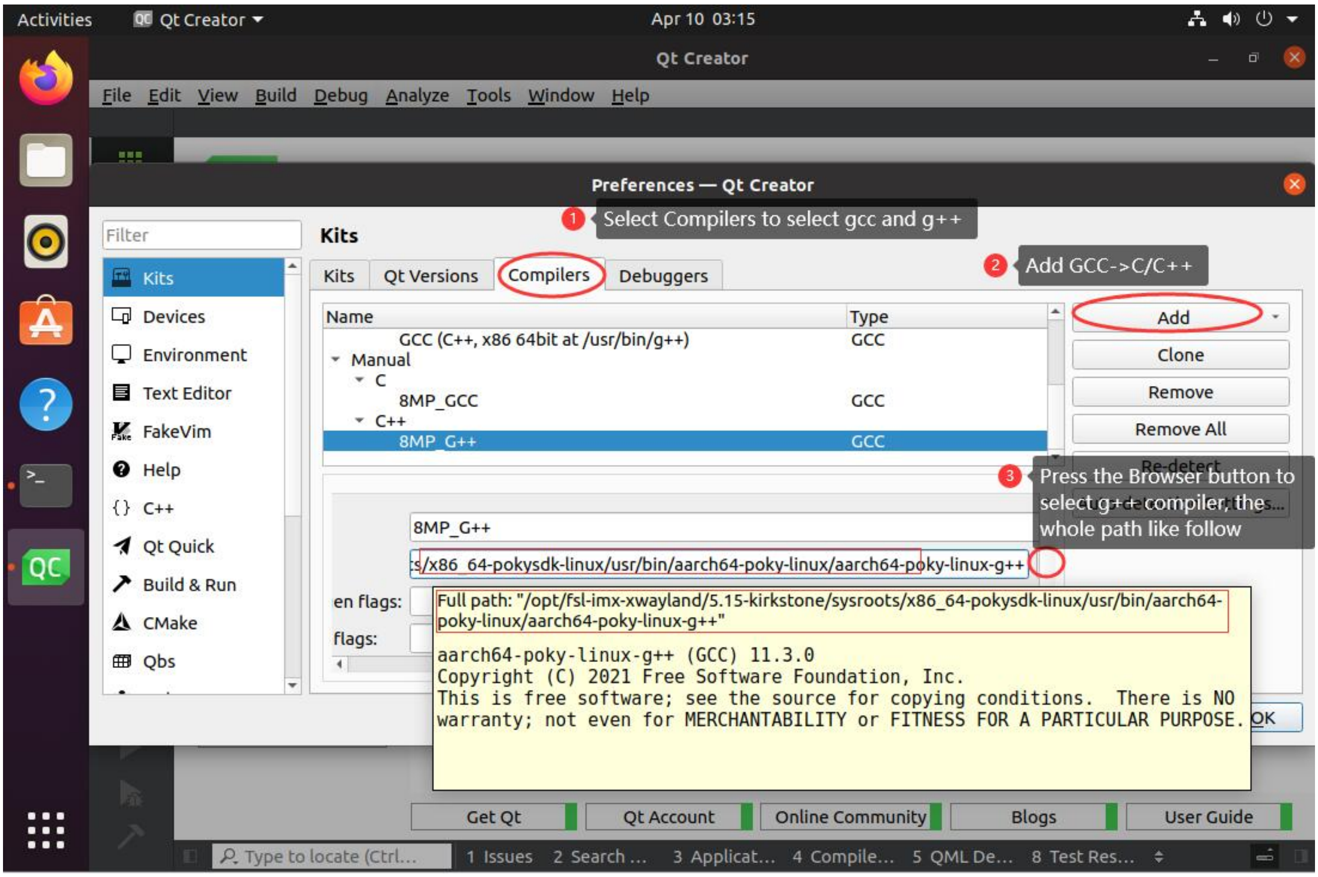
4. Refer to the following image to open the Qt Creator.

Qt Creator

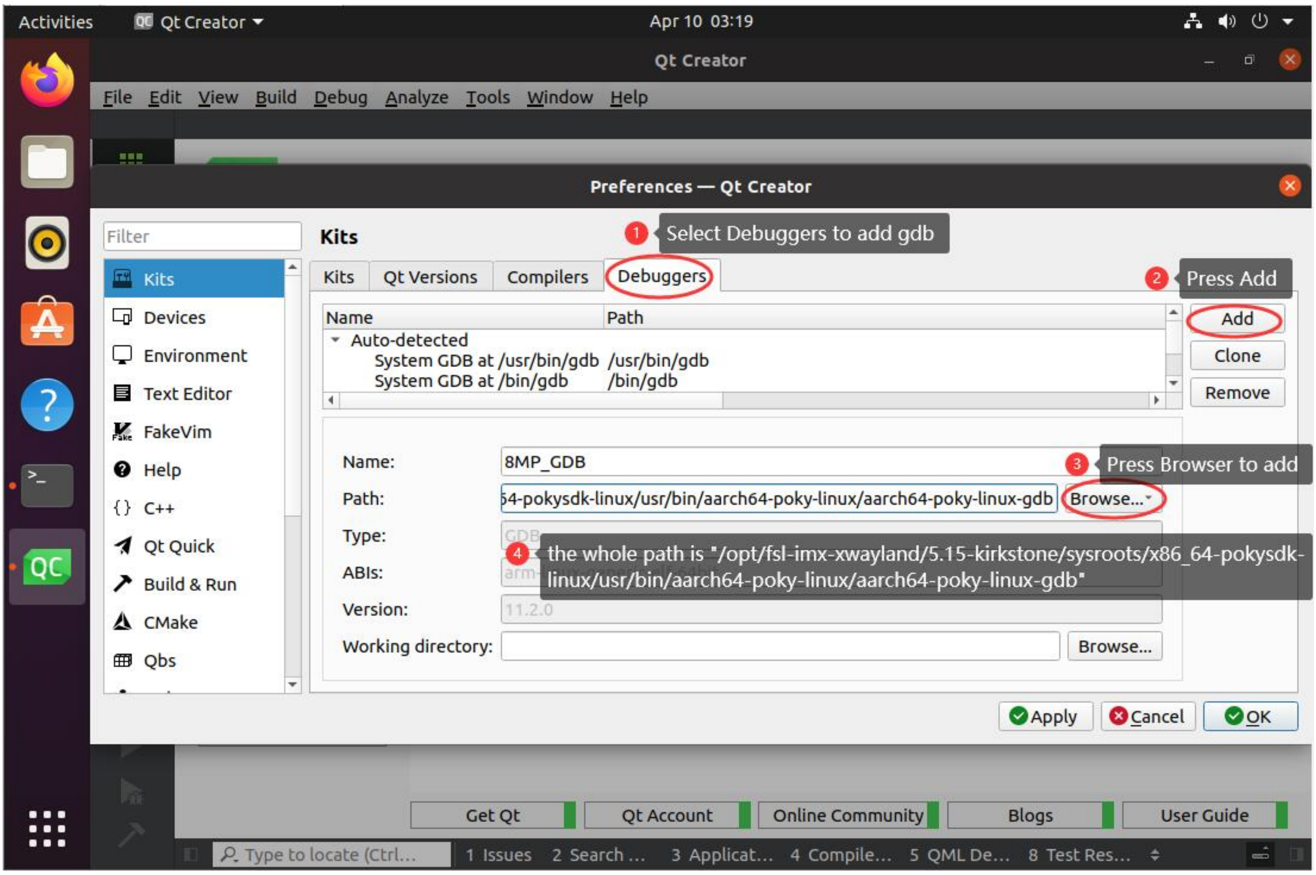
5. Open the QtCreator, then click the menu Edit->Preferences. Config the Compilers/Debuggers/Qt Versions/Devices/Kits as shown in the images below.



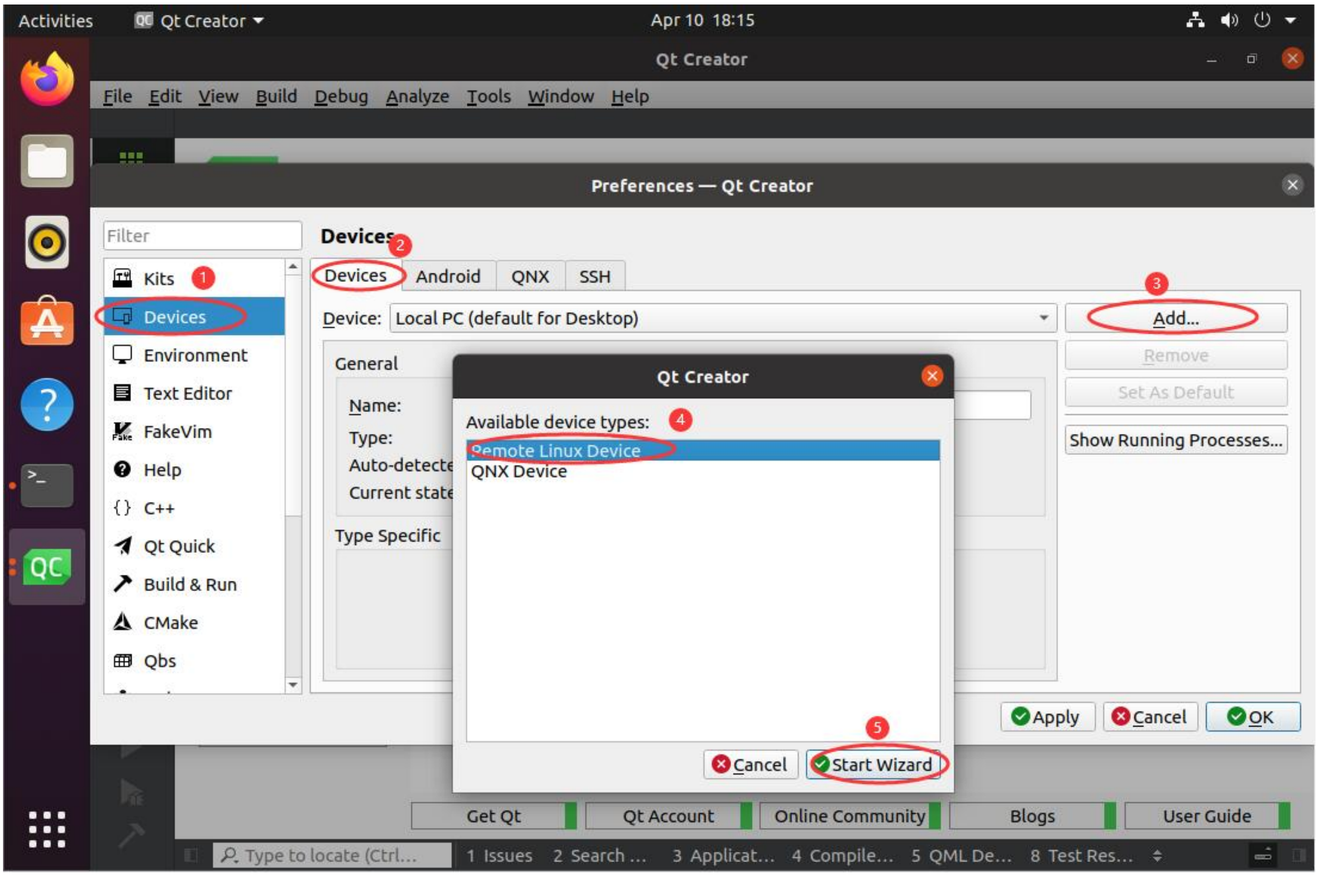
Compilers -gcc



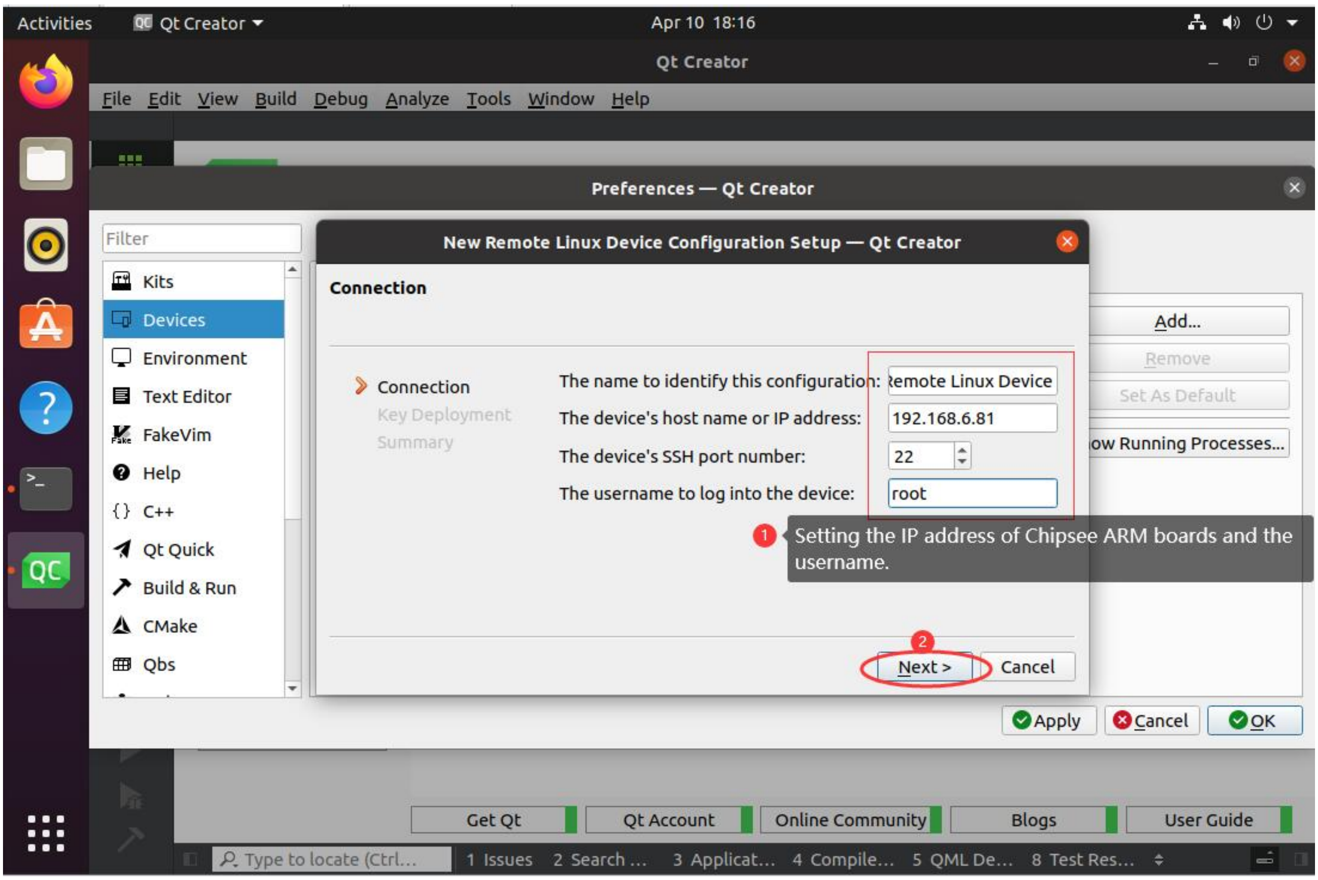
Compilers -g++



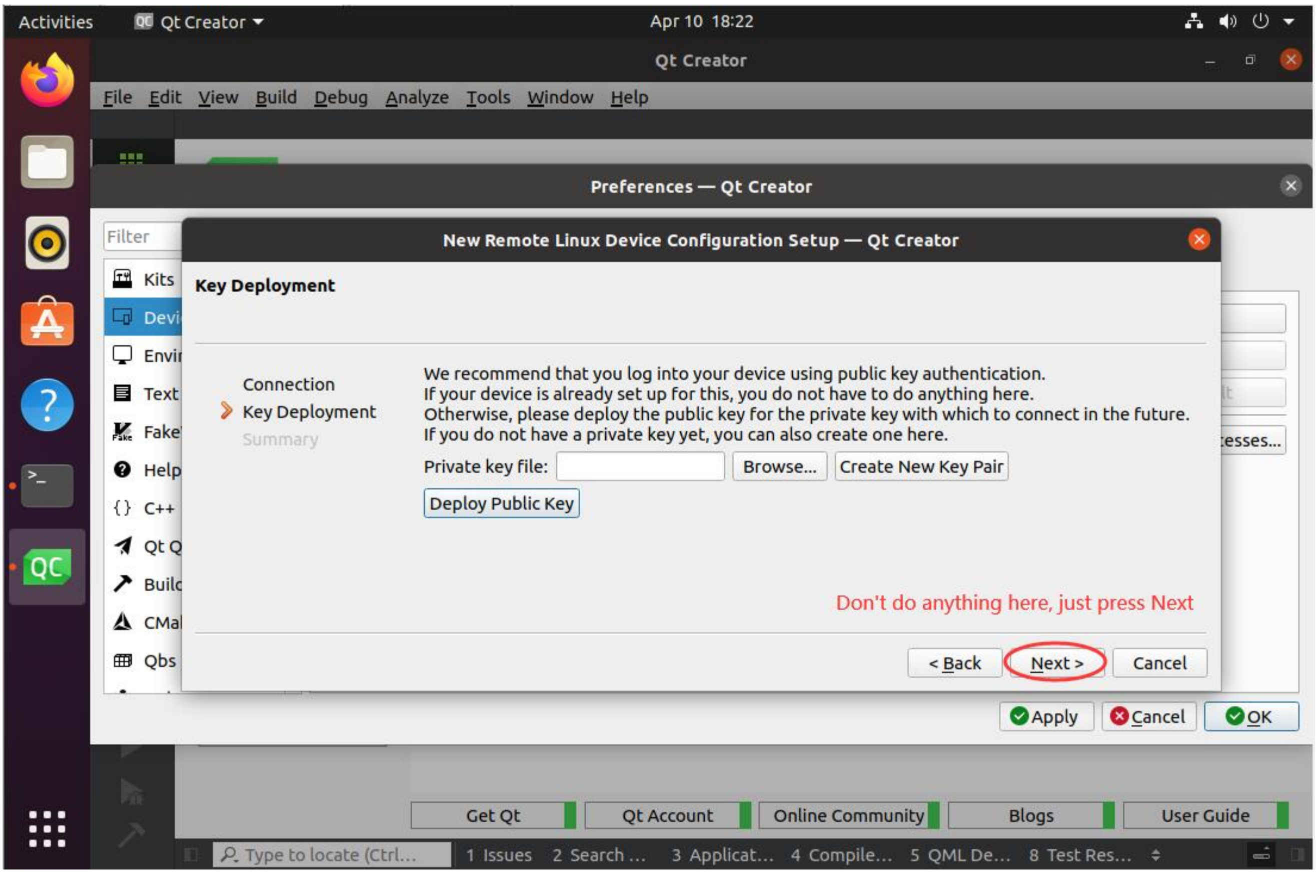
Debuggers



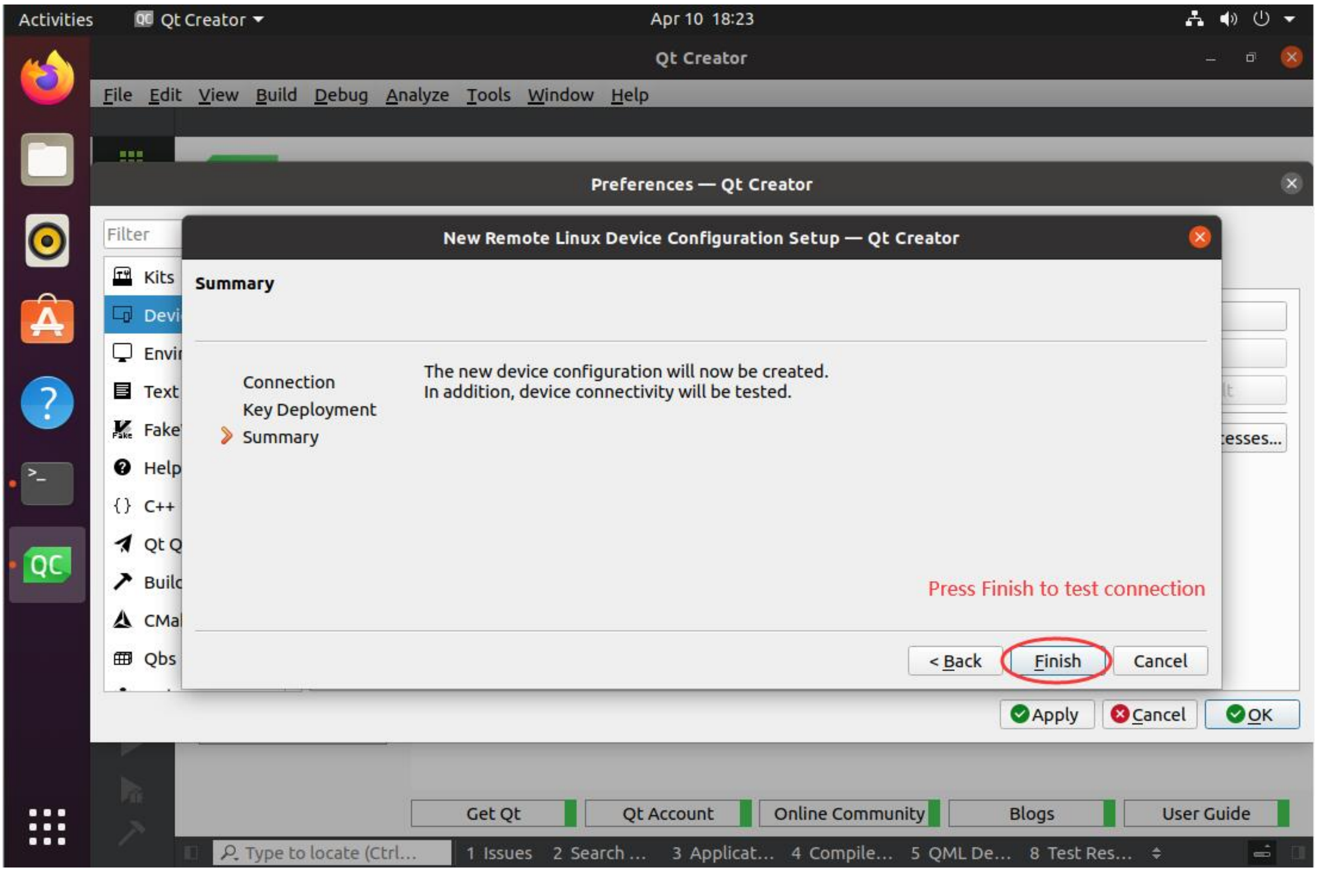
Devices_1



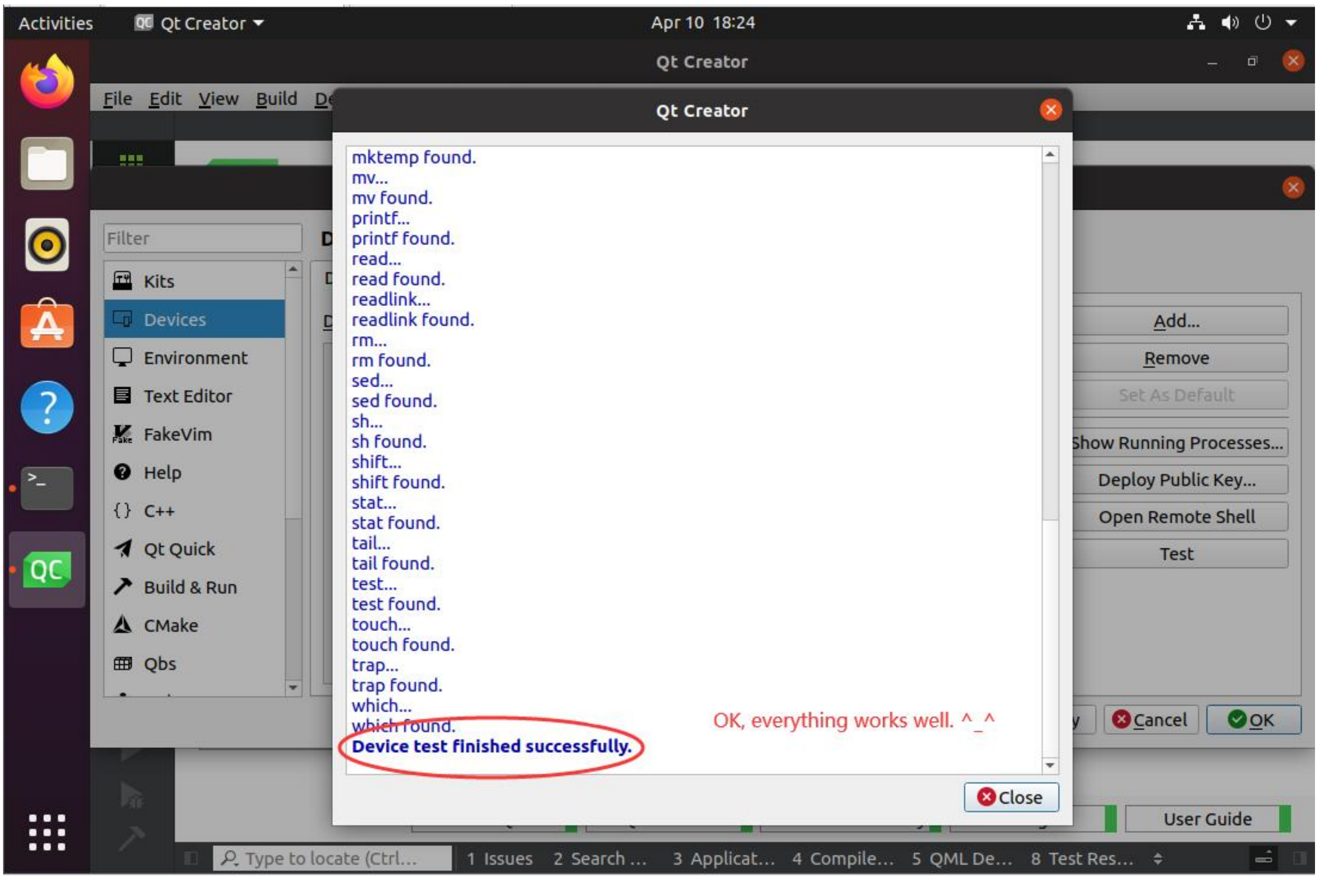
Devices_2



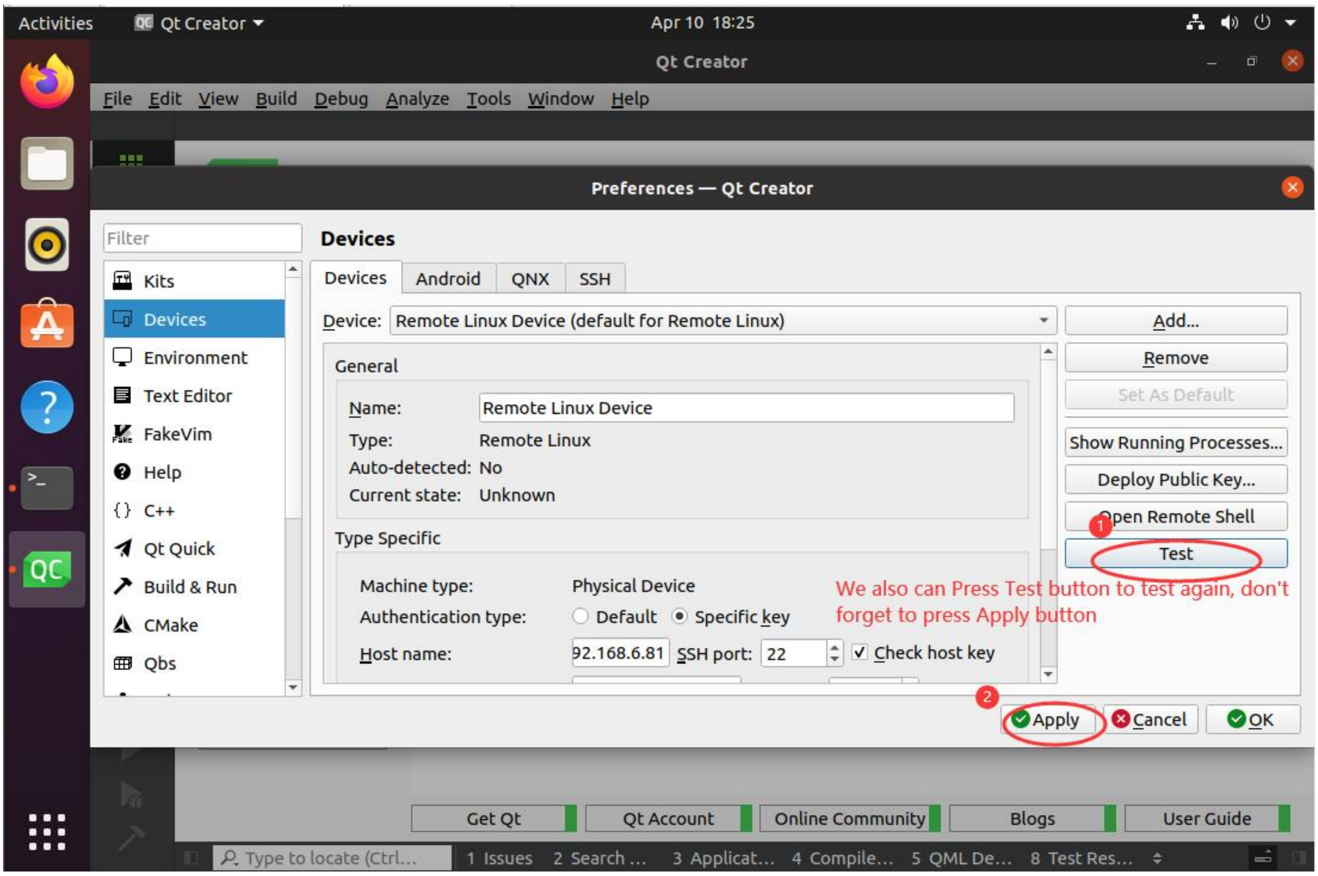
Devices_3



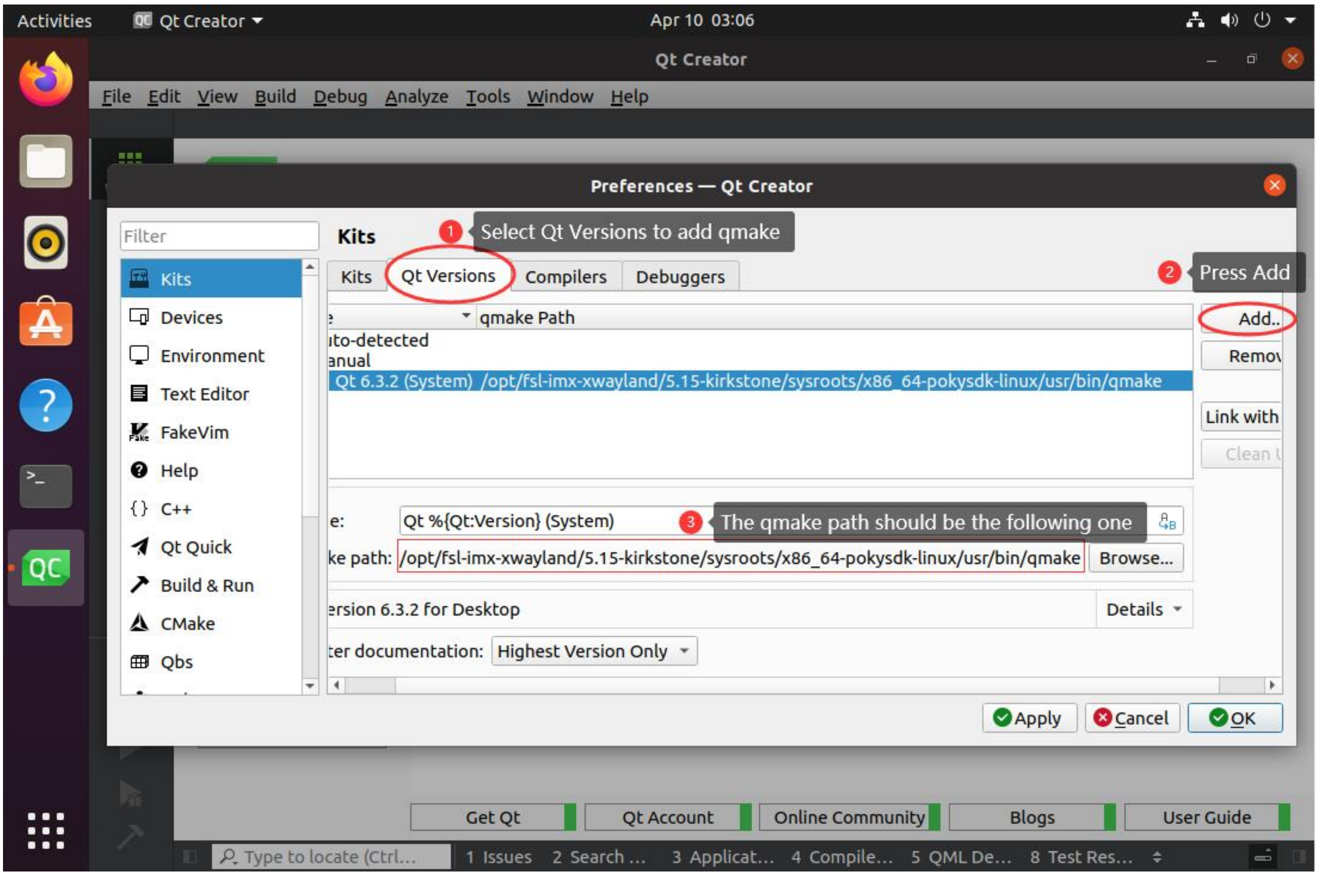
Devices_4



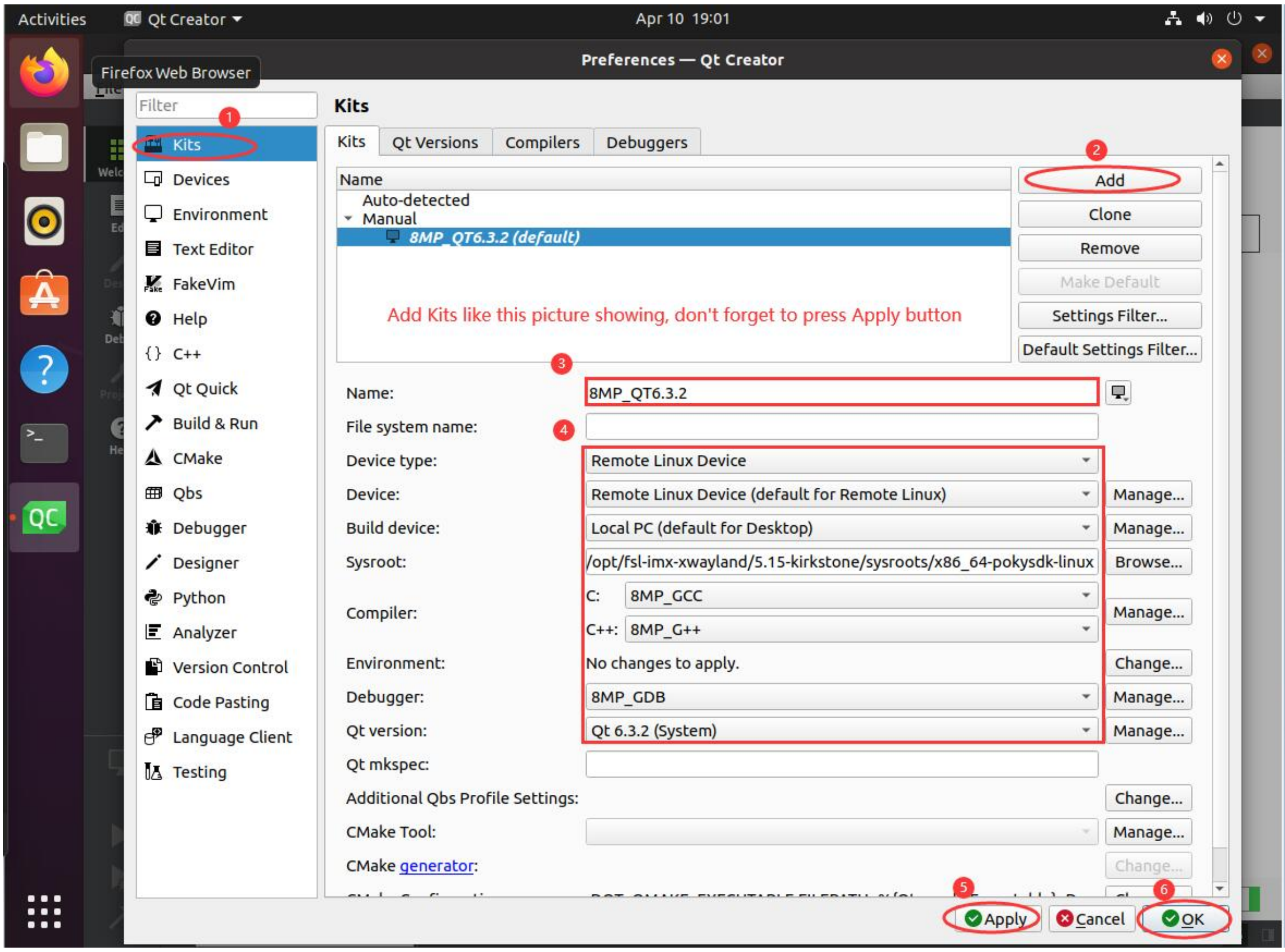
Devices_5



Devices_6



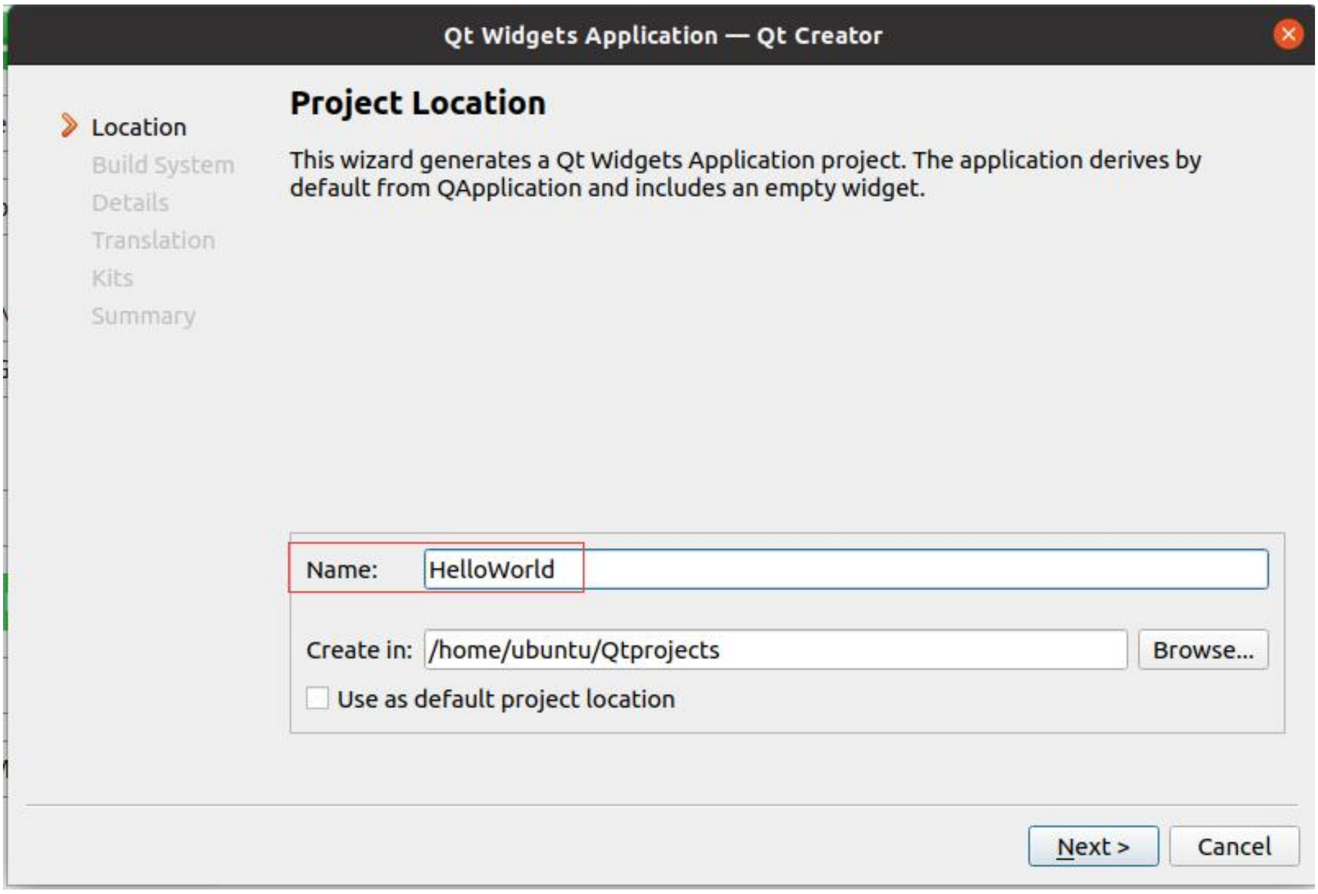
Qt Versions


Activities
Qt Creator
Apr 10 19:01
Preferences — Qt Creator
Firefox Web Browser
Filter
Kits
Devices
Environment
Text Editor
FakeVim
Help
C++
Qt Quick
Build & Run
CMake
Qbs
Debugger
Designer
Python
Analyzer
Version Control
Code Pasting
Language Client
Testing
Kits
Qt Versions
Compilers
Debuggers
Name
Auto-detected
Manual
8MP_QT6.3.2 (default)
Add
Clone
Remove
Make Default
Settings Filter...
Default Settings Filter...
Add Kits like this picture showing, don't forget to press Apply button
Name:
8MP_QT6.3.2
File system name:
Device type:
Remote Linux Device
Device:
Remote Linux Device (default for Remote Linux)
Build device:
Local PC (default for Desktop)
Sysroot:
/opt/fsl-imx-xwayland/5.15-kirkstone/sysroots/x86_64-pokysdk-linux
Compiler:
C: 8MP_GCC
C++: 8MP_G++
Environment:
No changes to apply.
Debugger:
8MP_GDB
Qt version:
Qt 6.3.2 (System)
Qt mkspec:
Additional Qbs Profile Settings:
CMake Tool:
CMake generator:
Manage...
Browse...
Change...
Apply
Cancel
OK
1
2
3
4
5
6

Kits

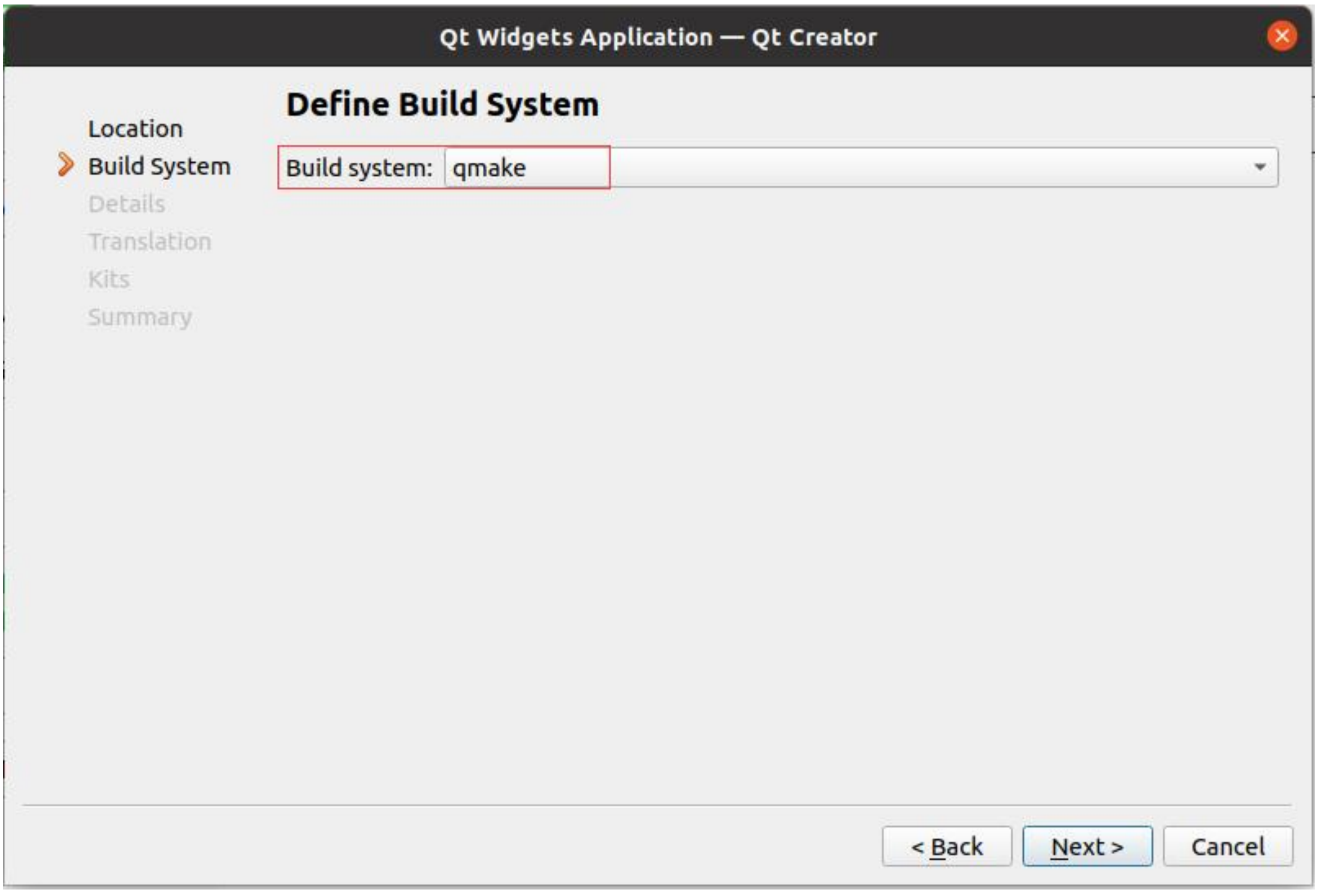
Example — Develop a HelloWorld Program

1. Use QtCreator to create a new Qt Widgets Application, named `HelloWorld`, as shown in the image below.



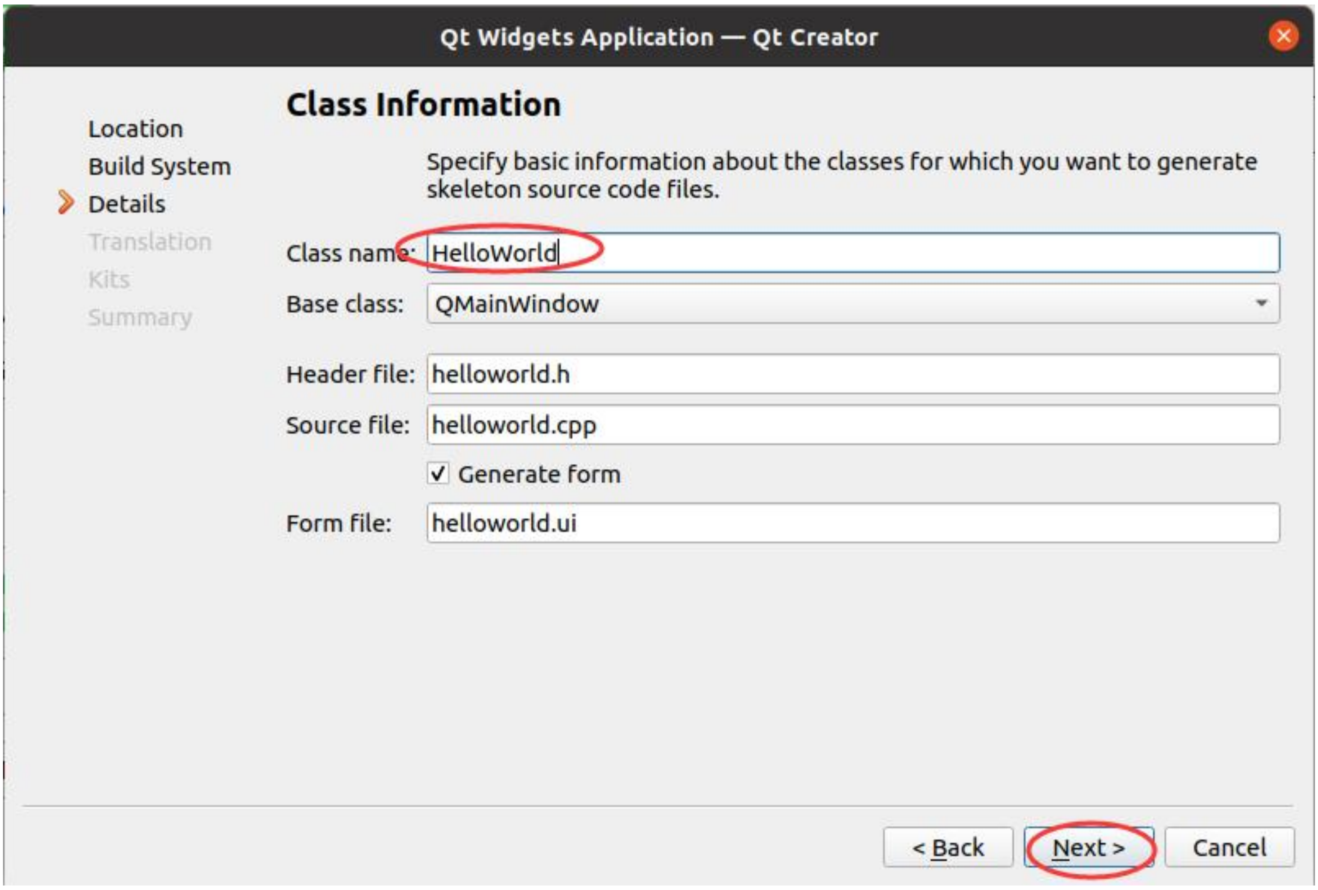
Qt Widgets Application

2. Use qmake to build the application.



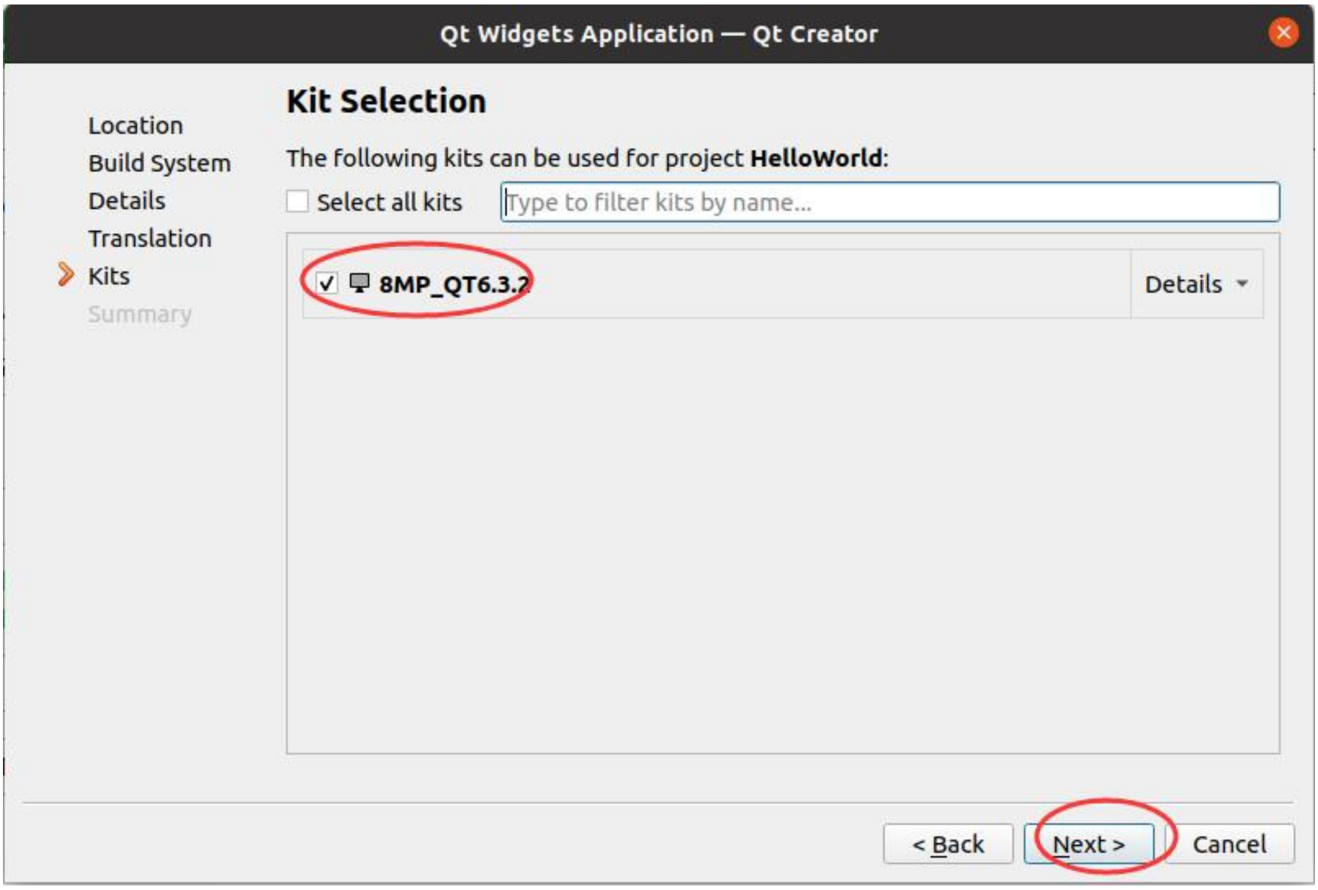
qmake to build Qt

3. Set the Class Name, as shown in the image below.



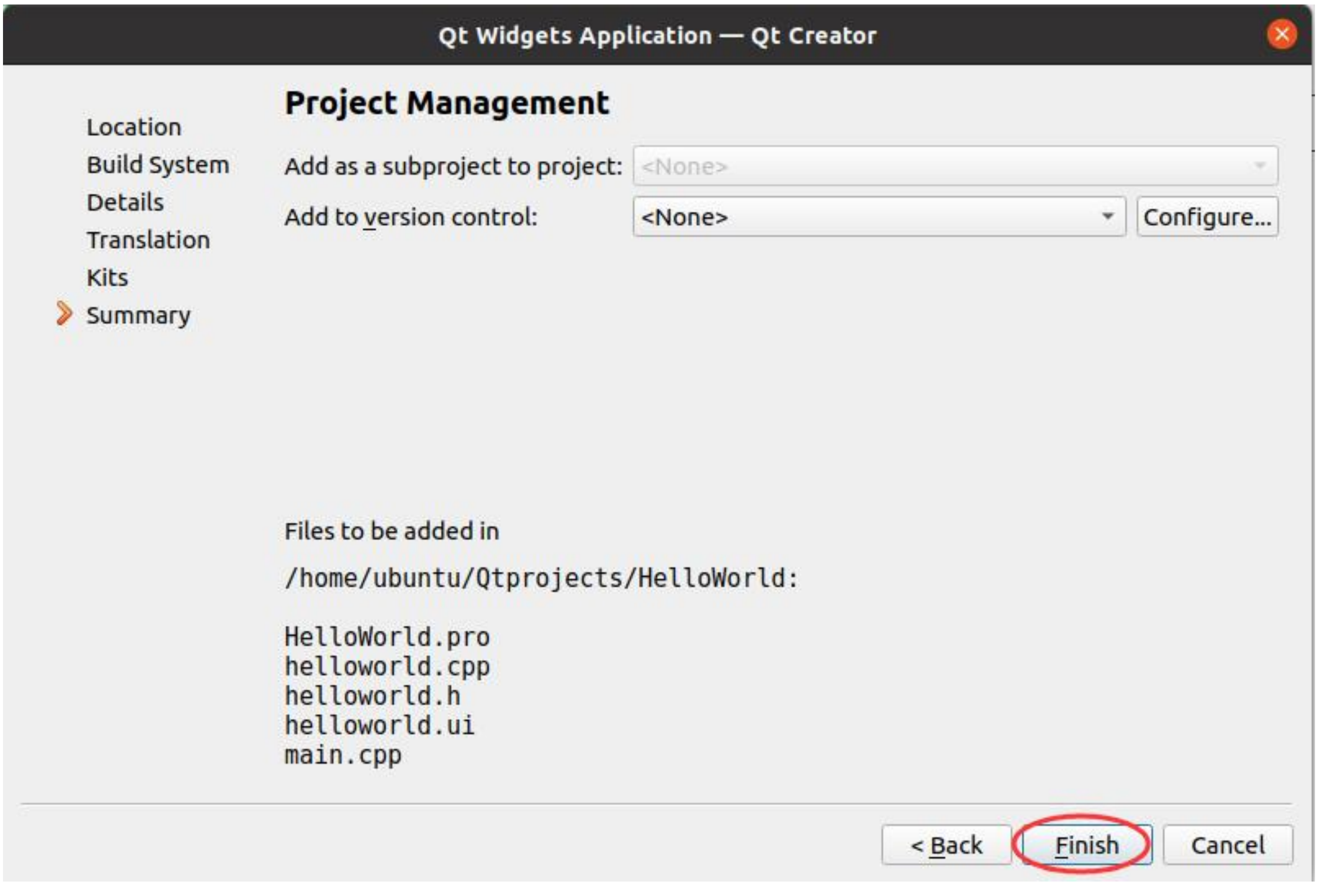
Class Name

4. Select 8MP_QT6.3.2 kits, as shown in the image below.



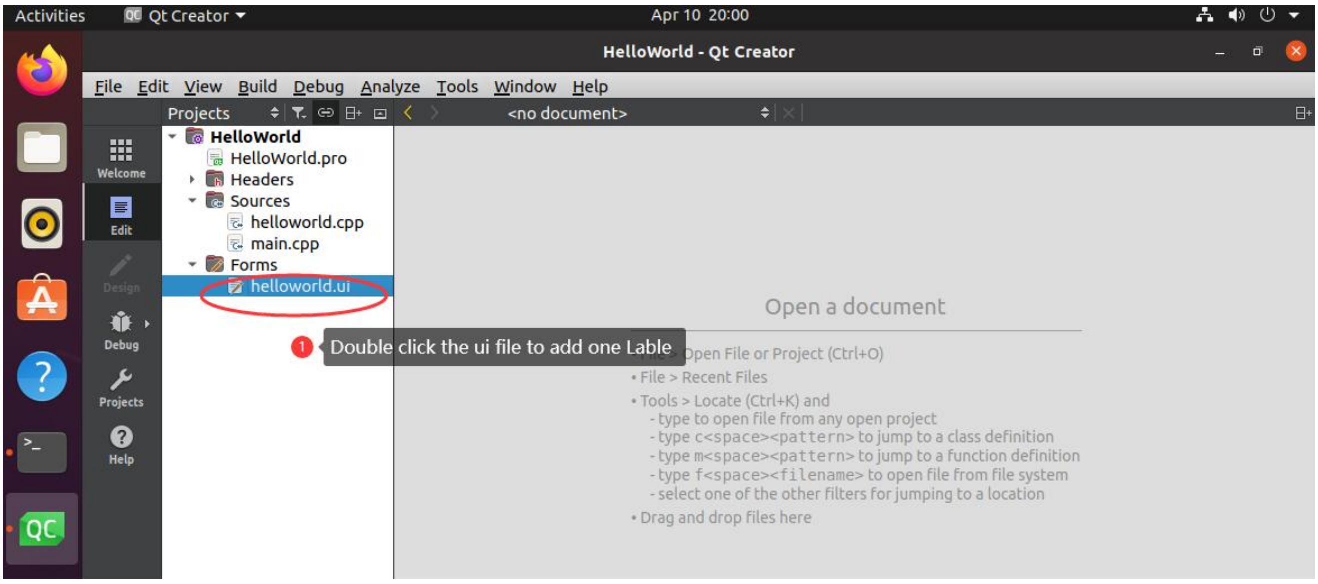
Kit Selection

5. Press finish to complete the Qt project, as shown in the image below.

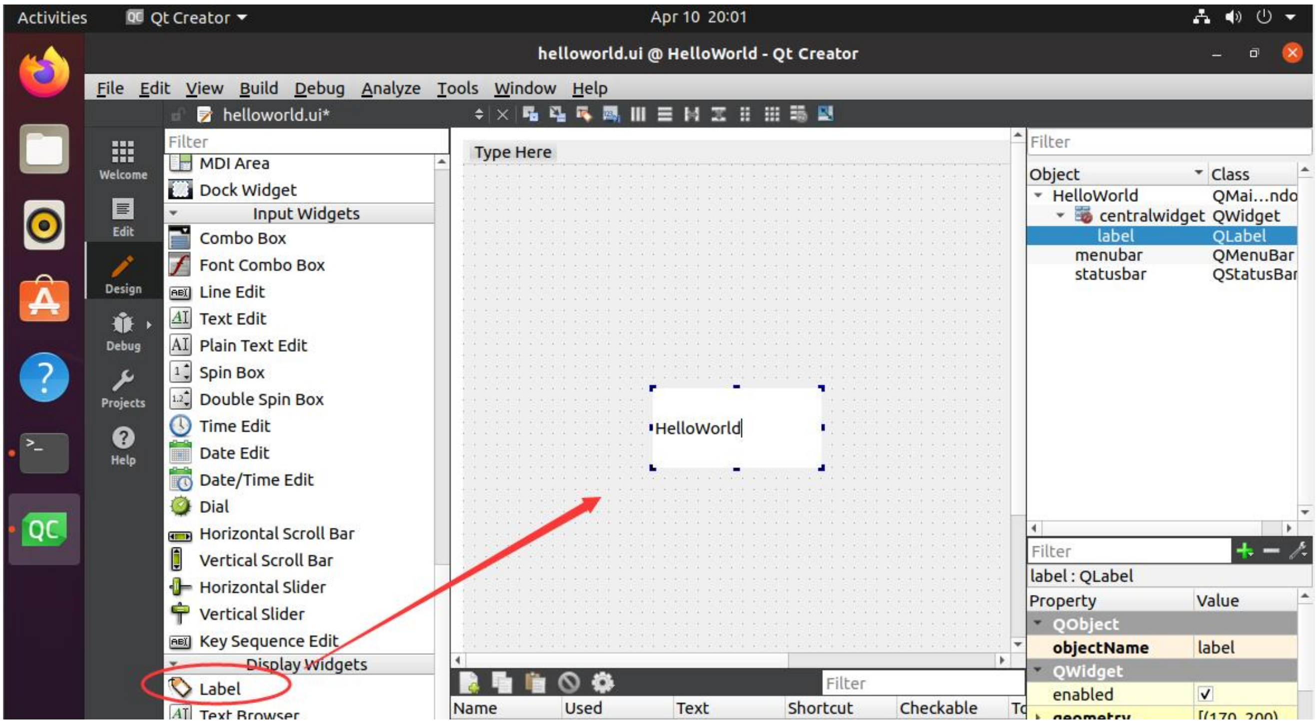


Finish project setup

6. Double click the helloworld.ui file to add one label widget, as shown in the image below.

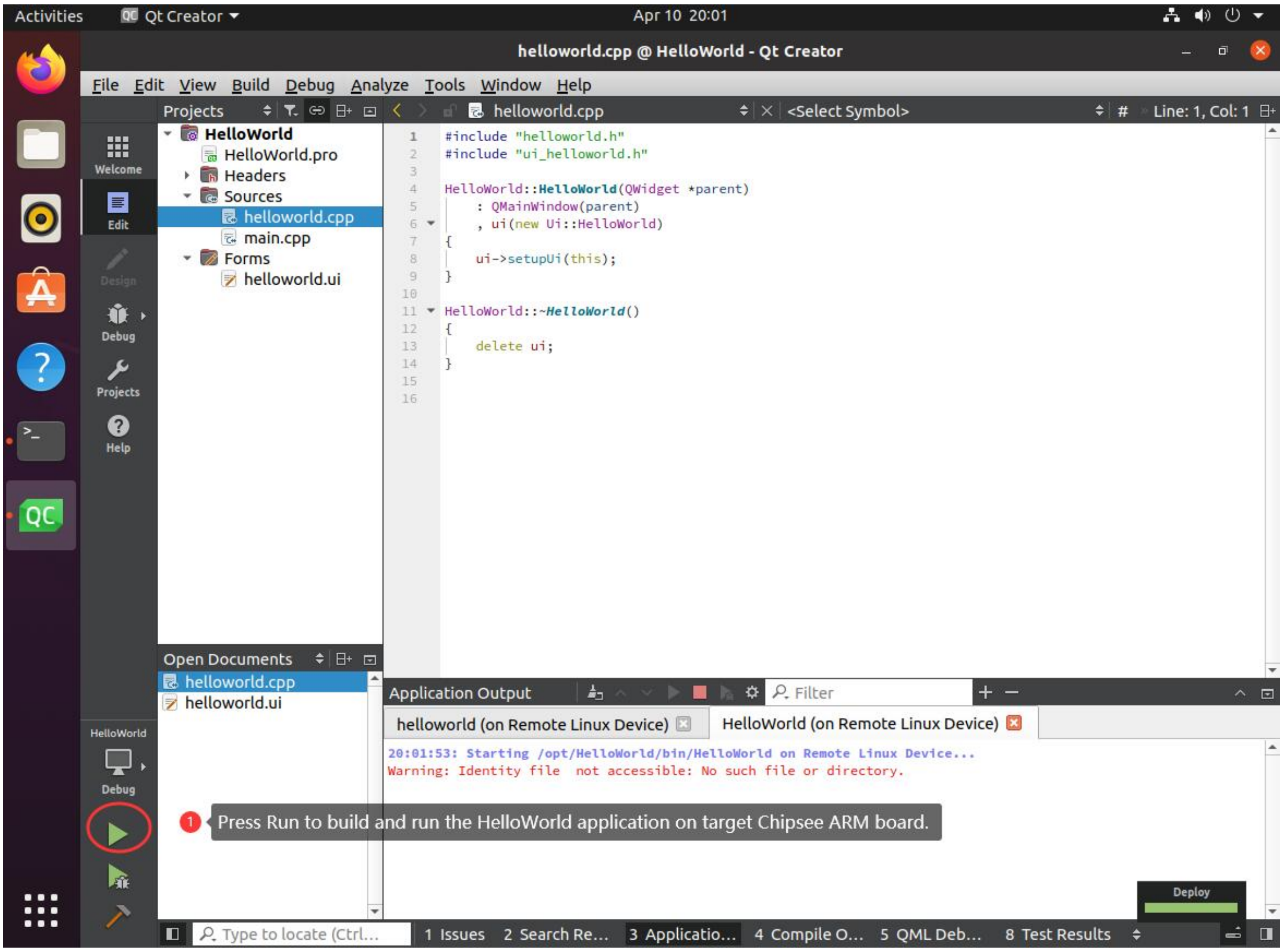


Double click ui file



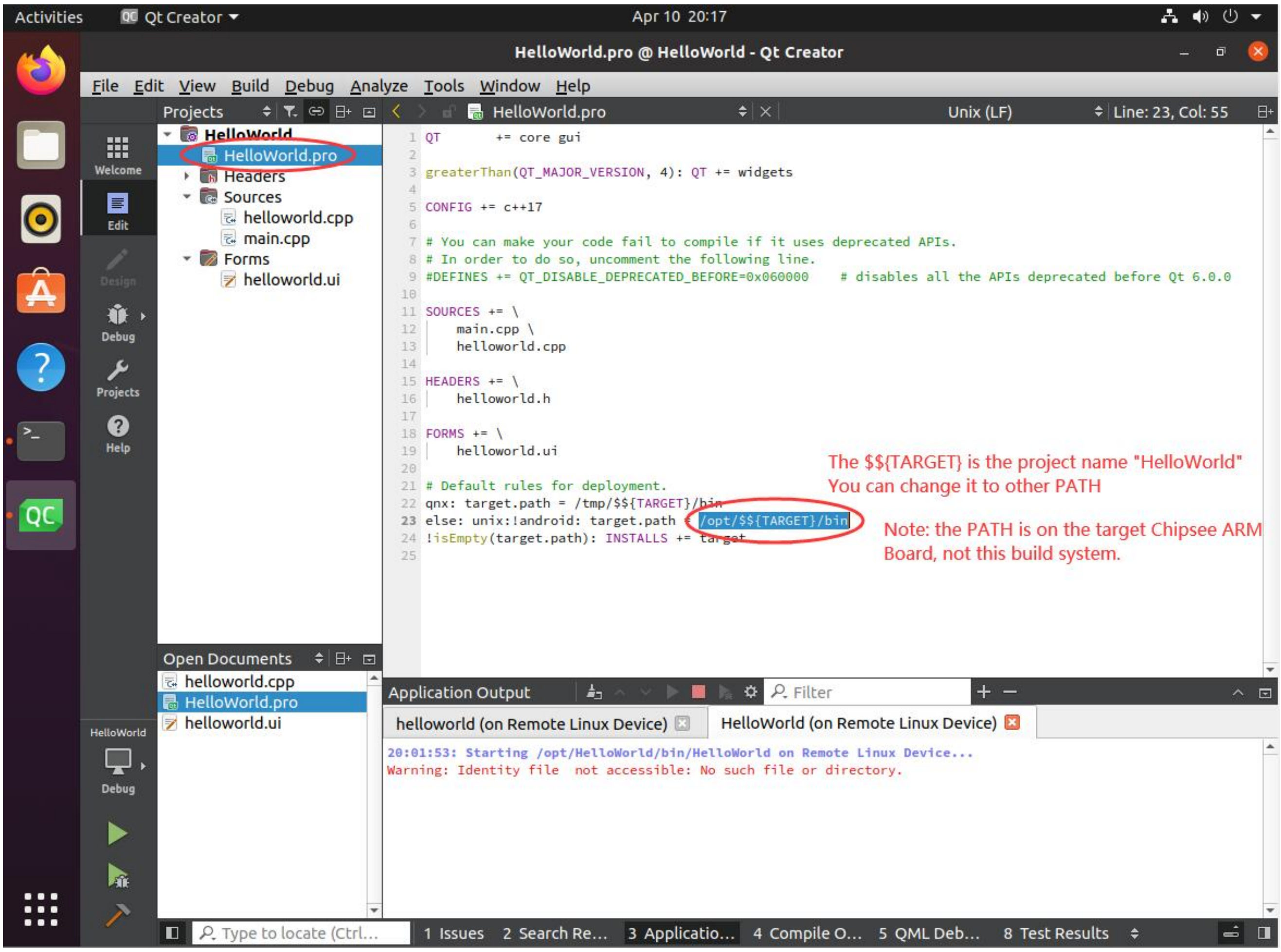
Add Label Widget

7. Click the **Build and Run** icon to build and run the app, as shown in the image below.



Build and Run App

8. The binary file will be copied to /opt/HelloWorld/bin/HelloWorld on the target Chipsee ARM board, it can be changed in the .pro file.



Binary Path

9. You also can run the HelloWorld manually on the target Chipsee ARM board.

```
/opt/HelloWorld/bin/HelloWorld
```

Now you should be able to create, build and execute a Qt program on the Chipsee industrial panel PC.

Flashing OS

If you accidentally “bricked” the operating system, you can reinstall the OS of the device.

To reinstall the OS, you will need to prepare a TF card (micro SD card) to copy the OS firmware on the card. Then plug it into the device to flash the OS to the eMMC (the device’s internal storage).

Prepare For Flashing

You need to prepare the following:

- 16GB or larger micro SD card (TF card).
- SD card reader (to be used on your HOST PC).

- A (**X86 or X86_64**) Linux Host PC or virtual machine to make a bootable SD card.
- Chipsee prebuilt image, all IMX8MP models share the same prebuilt OS image file.

Copy Firmware to SD Card

1. Plug in the SD card to your X86 Linux host PC (or virtual machine), then check which **sdX** device is your SD card:

```
root@pve:~# lsblk
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda            8:0    1 14.9G  0 disk
├─sda1         8:1    1  200M  0 part
└─sda2         8:2    1 14.7G  0 part
zd0          230:0    0  333M  0 disk
├─zd0p1      230:1    0   32M  0 part
└─zd0p2      230:2    0  300M  0 part
nvme0n1      259:0    0 57.6G  0 disk
├─nvme0n1p1 259:1    0 1007K  0 part
├─nvme0n1p2 259:2    0  512M  0 part
└─nvme0n1p3 259:3    0 57.1G  0 part
```

   In the example above my SD card is **/dev/sda**, yours might be **different**.

2. Then extract the firmware you have downloaded from Chipsee to your Linux HOST PC (not into the SD card):

```
root@pve:~# ls
prebuilt-imx8mp-linuxqt63-emmc-20231030.tar.gz

root@pve:~# tar zxvf prebuilt-imx8mp-linuxqt63-emmc-20231030.tar.gz
root@pve:~# cd prebuilt-imx8mp-linuxqt63-emmc-20231030/

root@pve:~/prebuilt-imx8mp-linuxqt63-emmc-20231030# ls
boot  emmc-flash  filesystem  mksdcard.sh  README
```

3. Generate OS image to the SD card.

> **Note**
>
> For different screen sizes of Chipsee IMX8MP products, you need to specify your display resolution in the next command. Here is a quick look up table:
>
> - 7 Inch: 1024600
>
> In the next command, you need to change “your-display-resolution” to the actual resolution of your device, for example, for 7 inch device, the command should be *‘./mksdcard.sh –device /dev/sda –display 1024600’*.

```
# Remember to change /dev/sdX to your actual sdX
# Remember to change your-display-resolution to your actual resolution
```

```
./mksdcard.sh --device /dev/sdX --display your-display-resolution
```

You should see something like this.

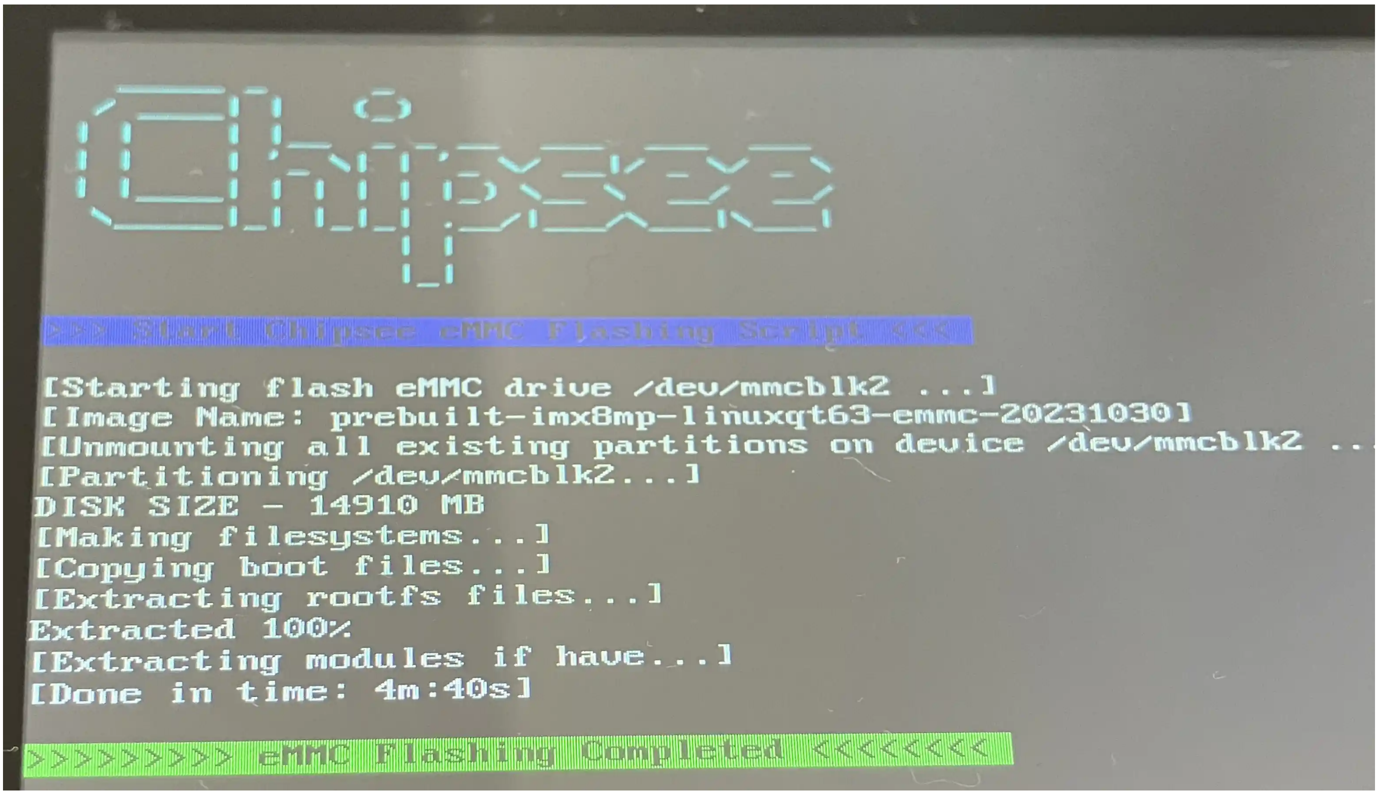
```
root@pve:~/prebuilt-imx8mp-linuxqt63-emmc-20231030# ./mksdcard.sh --device /dev/sda --display 1024600
************************************************************
*              Chipsee IPC eMMC Flashing Image             *
*          THIS WILL DELETE ALL THE DATA ON /dev/sda       *
*                                                          *
*          WARNING! Make sure your computer does not go    *
*                   in to idle mode while this script is   *
*                   running. The script will complete,     *
*                   but your SD card may be corrupted.     *
*                                                          *
*          Press <ENTER> to confirm....                    *
************************************************************

unmounting device '/dev/sda1'
unmounting device '/dev/sda2'
UBOOTBIN=boot/imx-boot-1024600
IMAGEBIN=boot/Image
DTBBIN=boot/imx8mp-eisd-1024600.dtb
ROOTFS=filesystem/core-image-base-imx8mp-eisd.tar.zst
FLASHFILE=filesystem/patchs/chipsee-flashemmc.sh
SERVICEFILE=filesystem/patchs/chipsee-flash.service
1+0 records in
1+0 records out
1024 bytes (1.0 kB, 1.0 KiB) copied, 0.0293429 s, 34.9 kB/s
Checking that no-one is using this disk right now ... OK

Disk /dev/sda: 14.88 GiB, 15978201088 bytes, 31207424 sectors
Disk model: Storage Device
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

>>> Created a new DOS (MBR) disklabel with disk identifier 0x0b6c1f7d.
/dev/sda1: Created a new partition 1 of type 'W95 FAT32 (LBA)' and of size 500 MiB.
/dev/sda2: Created a new partition 2 of type 'Linux' and of size 14.3 GiB.
/dev/sda3: Done.

New situation:
Disklabel type: dos
Disk identifier: 0x0b6c1f7d

Device     Boot   Start      End  Sectors  Size Id Type
/dev/sda1         20480  1044479  1024000  500M  c W95 FAT32 (LBA)
/dev/sda2       1228800 31207423 29978624 14.3G 83 Linux

The partition table has been altered.
Calling ioctl() to re-read partition table.
Syncing disks.
partition /dev/sda1...
mkfs.fat: Warning: lowercase labels might not work properly on some systems
partition /dev/sda2...
mke2fs 1.47.0 (5-Feb-2023)
Copying u-boot ...
16+0 records in
16+0 records out
16384 bytes (16 kB, 16 KiB) copied, 0.0296149 s, 553 kB/s
1955+1 records in
1955+1 records out
2002776 bytes (2.0 MB, 1.9 MiB) copied, 1.68249 s, 1.2 MB/s
Copying zImage/imx8mp-eisd.dtb on /dev/sda2 ...
Umounting /dev/sda1 ...
Extracting filesystem on /dev/sda2 ...
Extracted 100%
Patch filesystem to enable flash function...
Preparing eMMC content ...
Umounting /dev/sda2 ...
Done
root@pve:~/prebuilt-imx8mp-linuxqt63-emmc-20231030#
```

Successfully Flashed an SD Card to be Used Later

Flashing OS to eMMC

Plug in the SD card to the Chipsee IMX8MP device. We will flash the OS to the eMMC (device's internal storage).

1. Poweroff the device (unplug the power supply).
2. Insert the SD card to the card slot of the device (refer to hardware manual's picture for TF card insertion direction).
3. Push and hold the PROG button, in the meantime, power on the device, after around 10 seconds, you should see the system start to flash the OS automatically, then you can release the PROG button.
4. When the red LED stops blinking, and turns solid red, it means OS flashing is finished. You can also see a success message on the screen.
5. Now you can reboot the device, don't push the PROG button, the system should boot from eMMC automatically.
6. Don't forget to eject your SD card when everything works smoothly. (You might need to use a small-sized flathead screwdriver to aid ejecting SD card for enclosed panel PCs.)



Successfully Flashed OS to eMMC

Now your brand new OS is flashed successfully.

FAQ

1. How to use eglfs on Yocto Linux XWayland?

```
systemctl stop weston
export QT_QPA_EGLFS_KMS_CONFIG=/etc/eglfs.json
export QT_QPA_PLATFORM=eglfs
export QT_QPA_EGLFS_INTEGRATION=eglfs_viv
export QT_QPA_EGLFS_ALWAYS_SET_MODE=1
```

```
# eglfs.json file content for PPC-A55-070 (7 inch 1024x600 resolution):

{
   "device": "/dev/dri/card1",
   "outputs":[
      {"name": "DSI1","mode":"1024x600"}
   ]
}
```

2. How to set timezone?

```
timedatectl set-timezone Asia/Shanghai
hwclock -w

# OR

ln -sf /usr/share/zoneinfo/Asia/Shanghai /etc/localtime
```

3. The Hardware Test program does not open after I connect an external display?

   Remove this hardware test configuration file: **~/.config/Chipsee/hardwaretest.conf**, and test again.

Disclaimer

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