Industrial PC

Yocto Linux OS on STM32MP257F User Manual

For STM32MP257F Products

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Yocto Linux OS

Yocto Linux (OpenSTLinux) on STM32MP257F User Manual

This is the software manual for STM32MP257F Chipsee industrial PC. If you've never developed on this hardware with a Yocto Linux OS, this manual can get you started quickly.

Supported Chipsee PCs: all Chipsee STM32MP257F based industrial PCs, including but not limited to:

- PPC-A35-070 (PN: CS10600-STMP25-070P)
- PPC-A35-101 (PN: CS12800-STMP25-101P)
- PPC-A35-133 (PN: CS19108-STMP25-133P)
- PPC-A35-156 (PN: CS19108-STMP25-156P)

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.

> **Note**
>
> Unless specified, all commands are executed with **root** priviledge in this document. Default user is *weston*, you can type *su* to switch to root user.

System Information

Out of Box System

	Description
Kernel	6.1
Uboot	u-boot 2022.10
OS	aarch64 GNU/Linux
GCC	N/A
QT	6.5.3
username/password	root / no password
Window Manager	Wayland Weston
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

- For products with a screen of 7" and BOX product, a power adapter between 9V ~ 30V DC output is required.
- For products with a screen of 10.1" or larger, you need a DC adapter with output between 15V ~ 30V.

For example, you can use a switching power DC adapter; or use a laptop adapter with proper voltage such as 18.5V, 19V etc when developing; or use a 12V power adapter from a used router for small screen products when developing.

To connect to the Chipsee industrial PC from your workstation, you can use:

1. A USB to serial cable (if you need serial debug, i.e. connect to RS232 serial debug port).
2. 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.
3. A USB type-C cable (if you want to flash a new OS or backup your OS image).

Prepare the Software

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.
2. To flash OS firmware image to the product, you need STM32CubeProgrammer software: https://www.st.com/en/development-tools/stm32cubeprog.html. It supports Windows, Linux and macOS. It has both GUI and CLI mode.

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: username is **root**, **no** password, pin is **RS232_2**]

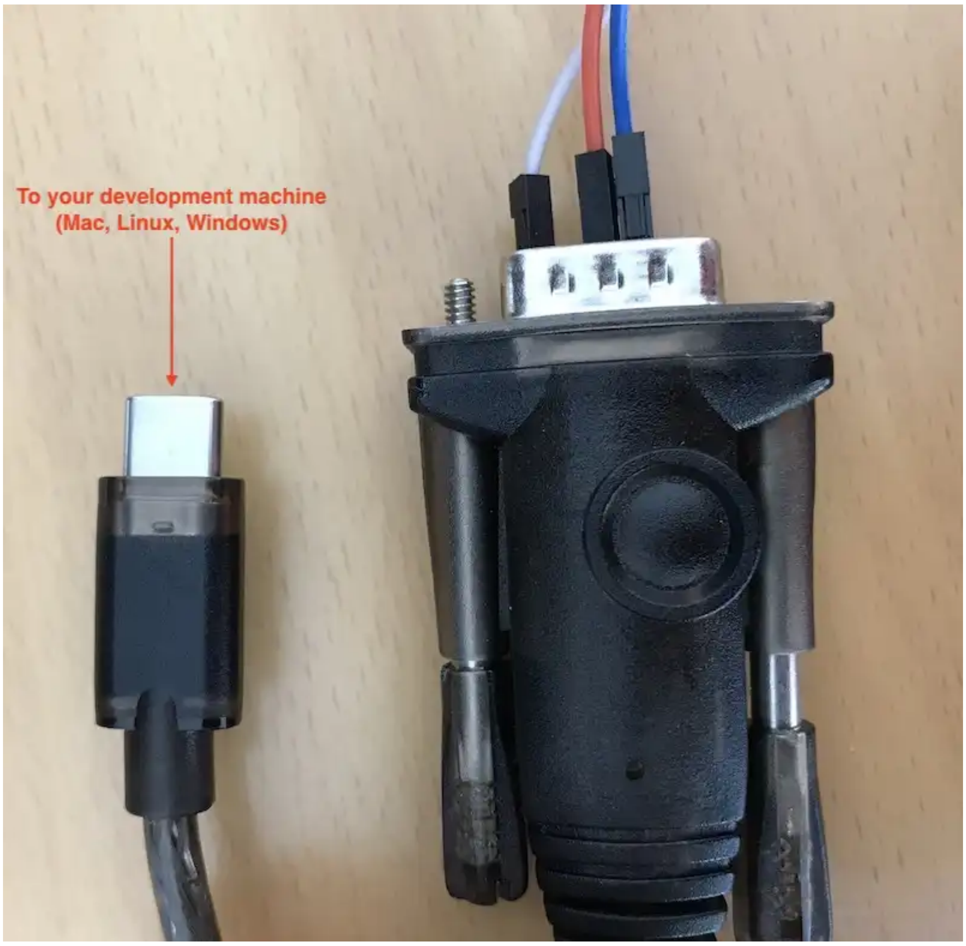
By default serial debug is enabled, you don't have to do anything to use the RS232_2 as a serial debug port.

Connect the Wire

In our pre-built Yocto Linux OS, the RS232_2 serves as a serial debug port. We can connect a RS232 cable between the Chipsee industrial PC and 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 GND and RS232_2 (RX and TX) pins of my Chipsee industrial PC.

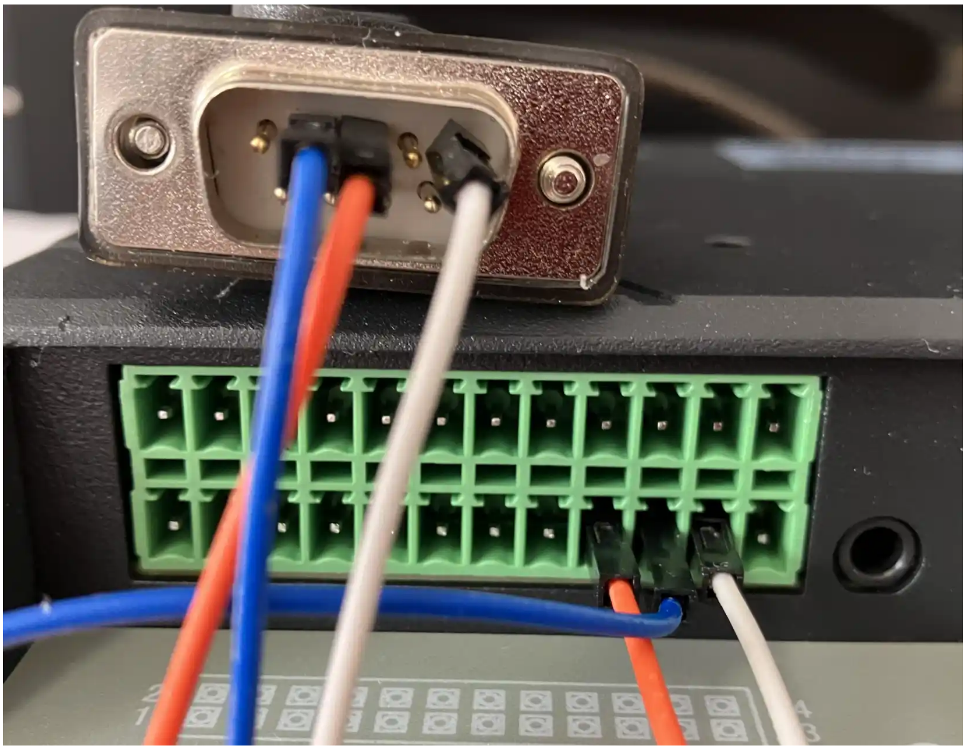


Use a USB to Serial Cable to Connect the Chipsee Industrial PC with Your Workstation

Take a look at the image below, this is the 10.1” 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.

> **Note**
>
> Each hardware doc has a “RS232/RS485/CAN” section, it lists which is the RS232_2 TX and RX in the image and the table of their respective docs. Find your model here (Industrial PCs Powered by STMicroelectronics) and scroll to the “RS232/RS485/CAN” section to check out.

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 (or with a phoenix connector)

Linux and MacOS

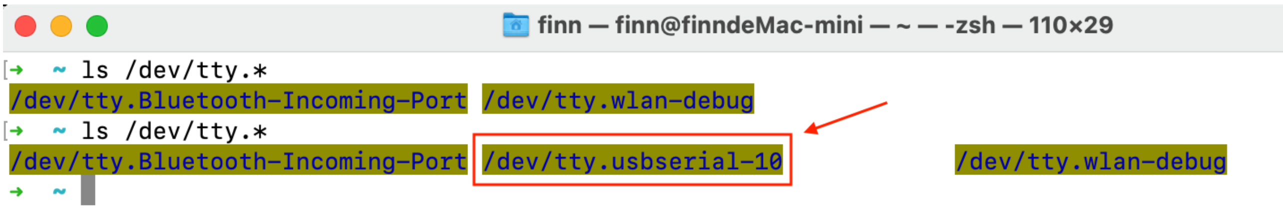
1. For **MacOS and Linux** users, you will need a program called **screen**. It should be already installed on most MacOS and Linux distributions(if the screen program is not installed on your computer, you can search how to install it, for example, “apt install screen” on Debian). Open your terminal 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)

2. 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.

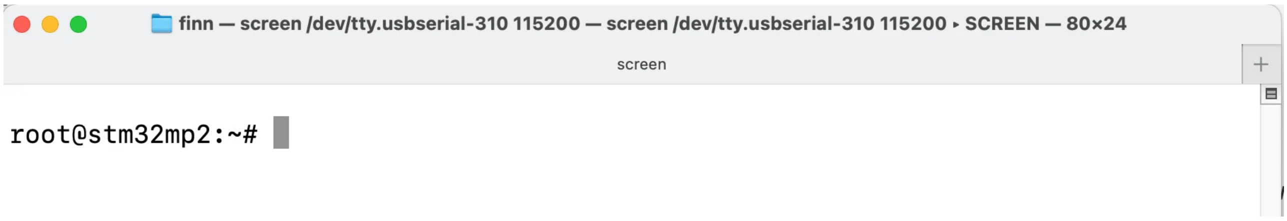


Find Out Which Device is Your USB to Serial Cable

1. 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
```

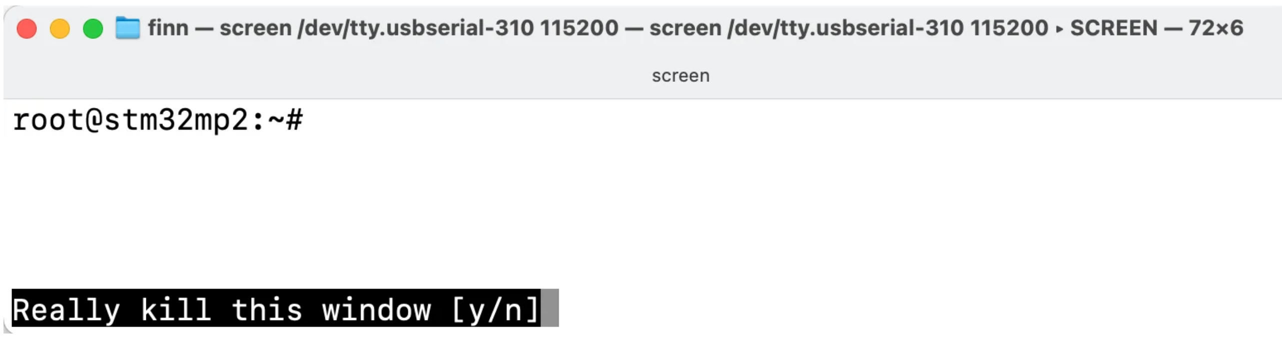
2. You will see a blank screen, press Enter, you will be logged in with root.



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

3. 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

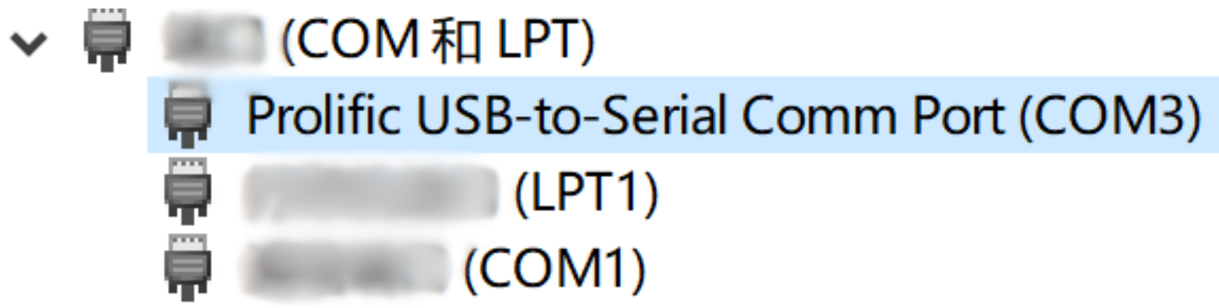
Windows

1. For **Windows** users, you don't need to install a 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.

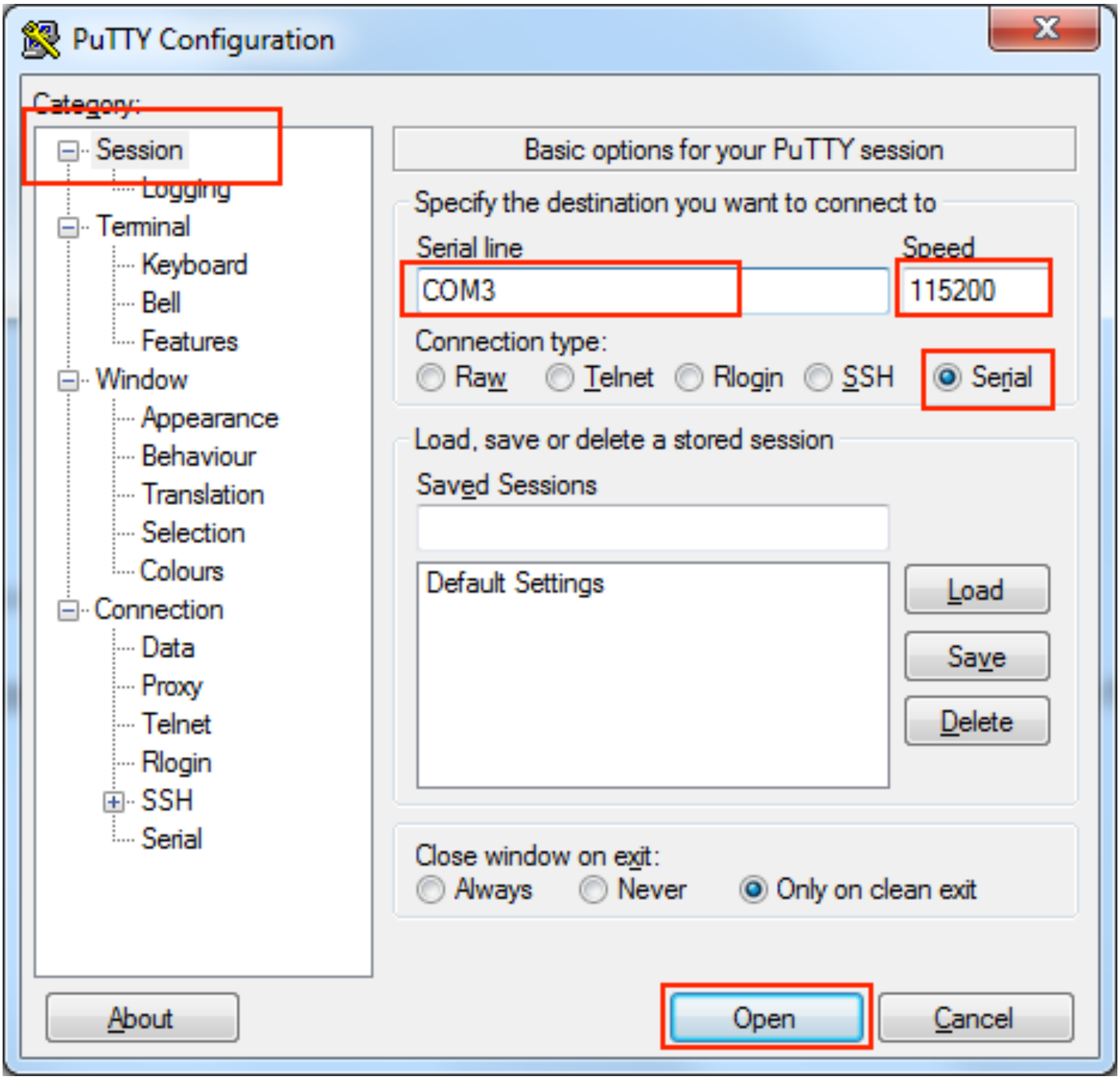
2. You could install a program called **PuTTY** (or XShell etc), here is a link to download the software: https://www.putty.org/. If you're comfortable with other clients other than PuTTY, you can use those as well.

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 hit Enter, then you should be logged in with root user:

```
root@stm32mp2:~#
```

Connect From Network (SSH)

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

By default SSH is enabled.

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**, Ethernet is **endX**, in the image below, it's **end1** (on 10.1" or larger variants is end1, on 7" variant is end1/end2):

```
→  ~ ssh root@192.168.50.123
root@stm32mp2:~# ifconfig
end1      Link encap:Ethernet  HWaddr 5A:B9:32:40:FD:B8
          inet addr:192.168.50.123  Bcast:192.168.50.255  Mask:255.255.255.0
          inet6 addr: fe80::58b9:32ff:fe40:fdb8/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1095 errors:0 dropped:157 overruns:0 frame:0
          TX packets:143 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:193587 (189.0 KiB)  TX bytes:19438 (18.9 KiB)
          Interrupt:69 Base address:0x8000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:96 errors:0 dropped:0 overruns:0 frame:0
          TX packets:96 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:8605 (8.4 KiB)  TX bytes:8605 (8.4 KiB)

usb0      Link encap:Ethernet  HWaddr B2:9E:A0:2A:B8:37
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

wlan0     Link encap:Ethernet  HWaddr 14:5D:34:F2:E9:AA
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

root@stm32mp2:~#
```

Check IP with ifconfig

```
root@stm32mp2:~# ifconfig
end1      Link encap:Ethernet  HWaddr 5A:B9:32:40:FD:B8
          inet addr:192.168.50.123  Bcast:192.168.50.255  Mask:255.255.255.0
          inet6 addr: fe80::58b9:32ff:fe40:fdb8/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1095 errors:0 dropped:157 overruns:0 frame:0
          TX packets:143 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:193587 (189.0 KiB)  TX bytes:19438 (18.9 KiB)
          Interrupt:69 Base address:0x8000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:96 errors:0 dropped:0 overruns:0 frame:0
          TX packets:96 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:8605 (8.4 KiB)  TX bytes:8605 (8.4 KiB)

usb0      Link encap:Ethernet  HWaddr B2:9E:A0:2A:B8:37
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

wlan0     Link encap:Ethernet  HWaddr 14:5D:34:F2:E9:AA
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```

Your-ip of end1(wired) and wlan0(wireless) will be displayed. In the case above the IP address is 192.168.50.123 through **end1**.

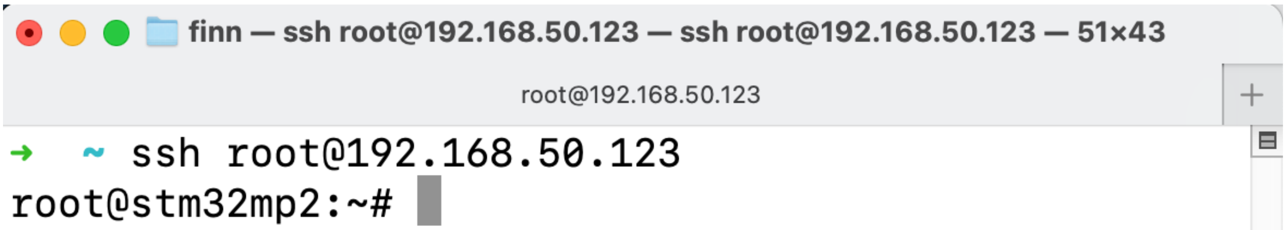
Then we can ssh from our workstation with this IP address.

Linux / MacOS

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

```
ssh root@your-ip
# In our case, your-ip is 192.168.50.123
ssh root@192.168.50.123
```

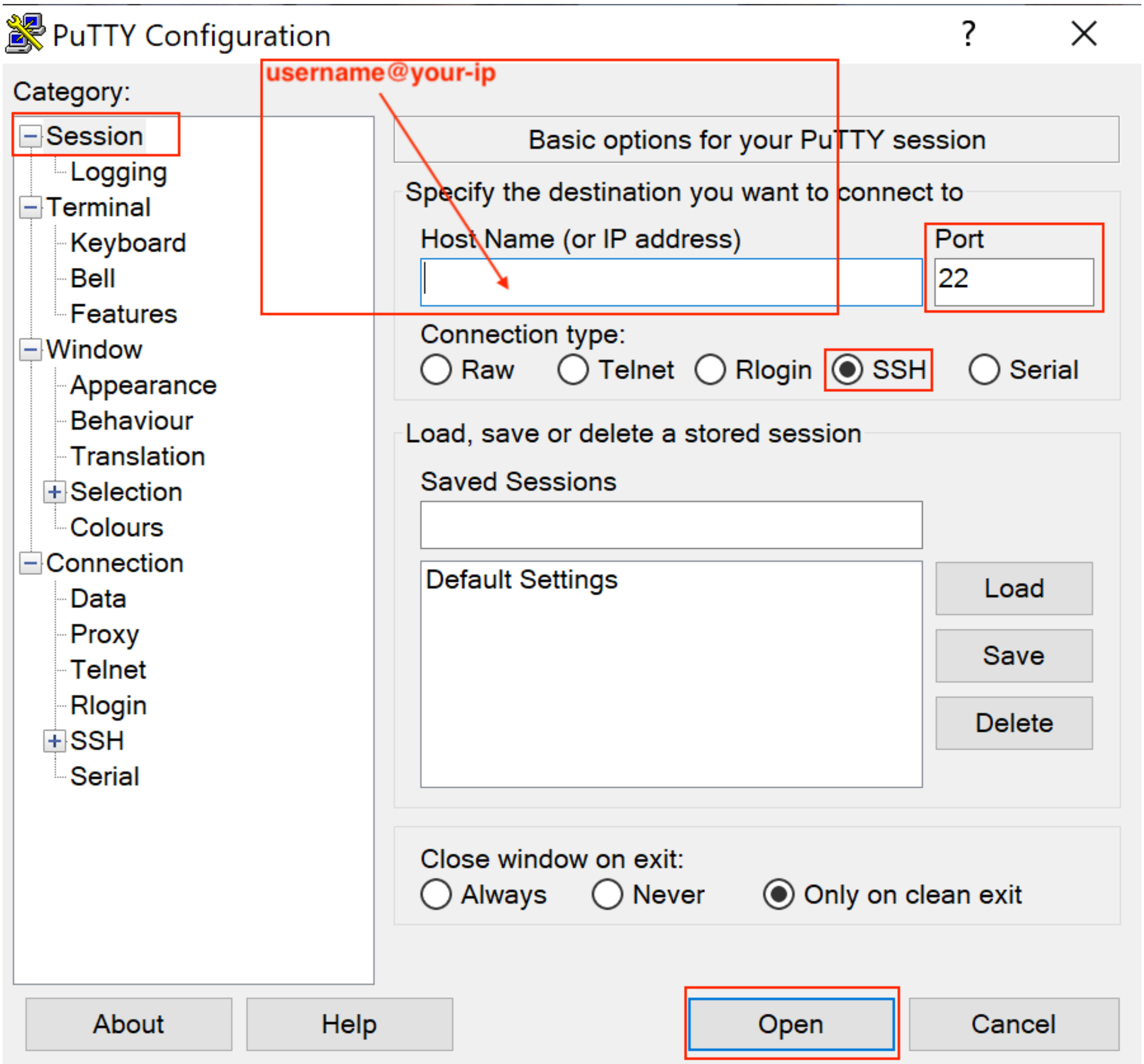
The username is root, and no password.



SSH with your-ip

Windows

For Windows users using PuTTY, you can choose Session, input **username@your-ip** (in our case *root@192.168.50.123*, 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 by default.



Input username@your-ip in the Host Name field, in our case root@192.168.50.123

Now you have connected to the device through the network.

System Resources

SD Card

When a micro SD card (TF card) is inserted to the device, it will appear as **mmcblk0**, you can check it by **lsblk**, note the last line **mmcblk0 179:96 0 29.7G 0 disk** is the 32GB SD card:

```
root@stm32mp2:~# lsblk

// Before insertion
root@stm32mp2:~# lsblk
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
mmcblk1      179:0    0 14.6G  0 disk
|-mmcblk1p1  179:1    0  512K  0 part
|-mmcblk1p2  179:2    0  512K  0 part
|-mmcblk1p3  179:3    0    4M  0 part
|-mmcblk1p4  179:4    0    4M  0 part
|-mmcblk1p5  179:5    0  512K  0 part
|-mmcblk1p6  179:6    0   64M  0 part /boot
|-mmcblk1p7  179:7    0  183M  0 part /vendor
|-mmcblk1p8  179:8    0    3G  0 part /
`-mmcblk1p9  179:9    0 11.3G  0 part /usr/local
mmcblk1boot0 179:32   0    4M  1 disk
mmcblk1boot1 179:64   0    4M  1 disk

// After insertion
root@stm32mp2:~# lsblk
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
mmcblk1      179:0    0 14.6G  0 disk
|-mmcblk1p1  179:1    0  512K  0 part
|-mmcblk1p2  179:2    0  512K  0 part
|-mmcblk1p3  179:3    0    4M  0 part
|-mmcblk1p4  179:4    0    4M  0 part
|-mmcblk1p5  179:5    0  512K  0 part
|-mmcblk1p6  179:6    0   64M  0 part /boot
|-mmcblk1p7  179:7    0  183M  0 part /vendor
|-mmcblk1p8  179:8    0    3G  0 part /
`-mmcblk1p9  179:9    0 11.3G  0 part /usr/local
mmcblk1boot0 179:32   0    4M  1 disk
mmcblk1boot1 179:64   0    4M  1 disk
mmcblk0      179:96   0 29.7G  0 disk
`-mmcblk0p1  179:97   0 29.7G  0 part
```

Or with **fdisk -l**, the 32GB TF card appears as “Disk /dev/mmcblk0: 29.72 GiB”:

```
root@stm32mp2:~# fdisk -l
Disk /dev/mmcblk1: 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: gpt
Disk identifier: FFB7903C-C81B-4767-976F-351B3853256D

Device             Start      End  Sectors  Size Type
/dev/mmcblk1p1      1024     2047     1024  512K unknown
/dev/mmcblk1p2      2048     3071     1024  512K unknown
/dev/mmcblk1p3      3072    11263     8192    4M unknown
/dev/mmcblk1p4     11264    19455     8192    4M unknown
/dev/mmcblk1p5     19456    20479     1024  512K unknown
/dev/mmcblk1p6     20480   151551   131072   64M Linux filesystem
/dev/mmcblk1p7    151552   526335   374784  183M Linux filesystem
/dev/mmcblk1p8    526336  6817791  6291456    3G Linux filesystem
/dev/mmcblk1p9   6817792 30534655 23716864 11.3G Linux filesystem


Disk /dev/mmcblk1boot0: 4 MiB, 4194304 bytes, 8192 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


Disk /dev/mmcblk1boot1: 4 MiB, 4194304 bytes, 8192 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


Disk /dev/mmcblk0: 29.72 GiB, 31914983424 bytes, 62333952 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: 0xb585bdd7

Device          Boot Start      End  Sectors  Size Id Type
/dev/mmcblk0p1        8192 62333951 62325760 29.7G  c W95 FAT32 (LBA)
```

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

```
root@stm32mp2:~# mkdir /run/media/sd1 -p
root@stm32mp2:~# mount /dev/mmcblk0p1 /run/media/sd1
root@stm32mp2:~# lsblk
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
mmcblk1      179:0    0 14.6G  0 disk
|-mmcblk1p1  179:1    0  512K  0 part
|-mmcblk1p2  179:2    0  512K  0 part
|-mmcblk1p3  179:3    0    4M  0 part
|-mmcblk1p4  179:4    0    4M  0 part
|-mmcblk1p5  179:5    0  512K  0 part
|-mmcblk1p6  179:6    0   64M  0 part /boot
|-mmcblk1p7  179:7    0  183M  0 part /vendor
|-mmcblk1p8  179:8    0    3G  0 part /
```

```
`-mmcblk1p9  179:9    0 11.3G  0 part /usr/local
mmcblk1boot0 179:32   0    4M  1 disk
mmcblk1boot1 179:64   0    4M  1 disk
mmcblk0      179:96   0 29.7G  0 disk
`-mmcblk0p1  179:97   0 29.7G  0 part /run/media/sd1
```

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

```
root@stm32mp2:~# umount /run/media/sd1/
root@stm32mp2:~# lsblk
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
mmcblk1      179:0    0 14.6G  0 disk
|-mmcblk1p1  179:1    0  512K  0 part
|-mmcblk1p2  179:2    0  512K  0 part
|-mmcblk1p3  179:3    0    4M  0 part
|-mmcblk1p4  179:4    0    4M  0 part
|-mmcblk1p5  179:5    0  512K  0 part
|-mmcblk1p6  179:6    0   64M  0 part /boot
|-mmcblk1p7  179:7    0  183M  0 part /vendor
|-mmcblk1p8  179:8    0    3G  0 part /
`-mmcblk1p9  179:9    0 11.3G  0 part /usr/local
mmcblk1boot0 179:32   0    4M  1 disk
mmcblk1boot1 179:64   0    4M  1 disk
mmcblk0      179:96   0 29.7G  0 disk
`-mmcblk0p1  179:97   0 29.7G  0 part
```

Then you can eject the SD card physically.

USB Flash Drive

USB flash drive on the USB ports 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@stm32mp2:~# lsblk
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda            8:0    1   59G  0 disk
`-sda1         8:1    1   59G  0 part
mmcblk1      179:0    0 14.6G  0 disk
|-mmcblk1p1  179:1    0  512K  0 part
|-mmcblk1p2  179:2    0  512K  0 part
|-mmcblk1p3  179:3    0    4M  0 part
|-mmcblk1p4  179:4    0    4M  0 part
|-mmcblk1p5  179:5    0  512K  0 part
|-mmcblk1p6  179:6    0   64M  0 part /boot
|-mmcblk1p7  179:7    0  183M  0 part /vendor
|-mmcblk1p8  179:8    0    3G  0 part /
`-mmcblk1p9  179:9    0 11.3G  0 part /usr/local
mmcblk1boot0 179:32   0    4M  1 disk
mmcblk1boot1 179:64   0    4M  1 disk
```

In the example above, the USB drive is detected on /dev/sda.

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

```
root@stm32mp2:~# fdisk -l
Disk /dev/mmcblk1: 14.56 GiB, 15634268160 bytes, 30535680 sectors
...

Disk /dev/sda: 58.98 GiB, 63333990400 bytes, 123699200 sectors
Disk model: USB Flash Drive
...

Device     Boot Start       End   Sectors Size Id Type
/dev/sda1  *       64 123699199 123699136  59G  c W95 FAT32 (LBA)


Disk /dev/sdb: 28.65 GiB, 30765219840 bytes, 60088320 sectors
Disk model:  SanDisk 3.2Gen1
...

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: 58.98 GiB” is a 64GB usb flash drive; “Disk /dev/sdb: 28.65 GiB” is a 32GB usb flash drive; “Disk /dev/mmcblk1: 14.56 GiB” is the internal eMMC storage.

Backlight

You can use the following commands to turn on / turn off the backlight:

- **Turn on backlight:**

```
echo 1 > /dev/brightness
```

- **Turn off backlight (screen goes black):**

```
echo 0 > /dev/brightness
```

> **Warning**
>
> This product only supports to trun on / trun off the backlight, doesn't support to use PWM to control it.

LED

There is a red LED beside power input port, you can control the LED by writing a file:

```
# Turn on the red LED
echo 1 > /sys/class/leds/red:heartbeat/brightness
cat /sys/class/leds/red:heartbeat/brightness
1

# Turn off the red LED
echo 0 > /sys/class/leds/red:heartbeat/brightness
cat /sys/class/leds/red:heartbeat/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/red:heartbeat/brightness** file.

Buzzer

The Chipsee industrial PC has one buzzer.

Refer to the tables below for a detailed port definition:

Definition	GPIO	GPIOD Chip	GPIOD Line
Buzzer	PJ10	9	10

Buzzer Device Node

You can control it with *gpiod* as follows:

```
gpioset PJ10=1    # enable buzzer (be careful, it's really loud!)

gpioset PJ10=0    # disable buzzer

gpioset -t 500ms -c gpiochip9 10=active    # toggle the buzzer every 0.5 second
```

We can also cross-compile *toggle_buzzer_value_V2.c* on Ubuntu 20.04 or any other Linux X86_64 system and execute the *toggle_buzzer_value_V2* 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/st/stm32mp2/4.2.4-snapshot/environment-setup-cortexa35-ostl-linux

$ echo ${CC}

$ wget -c https://chipsee-tmp.s3.amazonaws.com/SourcesArchives/HARDWARETEST/
toggle_buzzer_value_V2.c

$ ${CC} toggle_buzzer_value_V2.c -o toggle_buzzer_value_V2 -lgpiod
```

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

```
root@stm32mp2:~# ./toggle_buzzer_value_V2
```

Serial Port RS232 and RS485

Check the table below of the RS232/RS485 pin definition to wire your ports:

7 inch / Box products

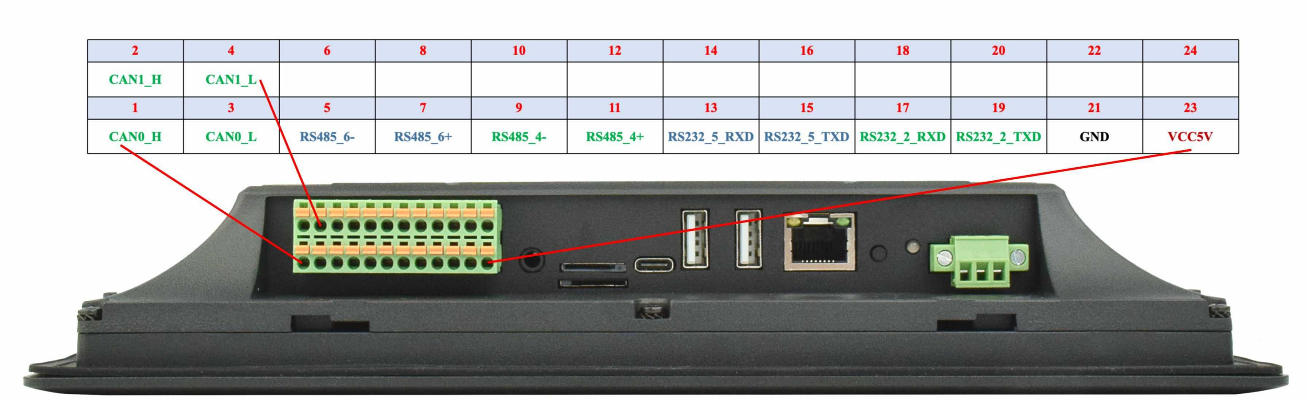
- PPC-A35-070 (PN: CS10600-STMP25-070P)

Pin Number	**Definition**	**Description**	OS Node
Pin 16	CAN1_H	CPU CAN1 H signal	
Pin 15	CAN1_L	CPU CAN1 L signal	CAN1
Pin 14	CAN0_H	CPU CAN0 H signal	
Pin 13	CAN0_L	CPU CAN0 L signal	CAN0
Pin 12	RS485_7-	CPU UART7 RS485 –(B) signal	
Pin 11	RS485_7+	CPU UART7 RS485 +(A) signal	/dev/ttySTM4
Pin 10	RS485_6-	CPU UART6 RS485 –(B) signal	
Pin 9	RS485_6+	CPU UART6 RS485 +(A) signal	/dev/ttySTM3
Pin 8	RS485_4-	CPU UART4 RS485 –(B) signal	
Pin 7	RS485_4+	CPU UART4 RS485 +(A) signal	/dev/ttySTM2
Pin 6	RS232_5_RXD	CPU UART5 RS232 RXD signal	
Pin 5	RS232_5_TXD	CPU UART5 RS232 TXD signal	/dev/ttySTM1
Pin 4	RS232_2_RXD	CPU UART2 RS232 RXD signal, Debug Port	
Pin 3	RS232_2_TXD	CPU UART2 RS232 TXD signal, Debug Port	/dev/ttySTM0
Pin 2	GND	System Ground	
Pin 1	+5V	System +5V Power Output, No more than 1A Current output	

RS232 / RS485 / CAN Pin Definition for 7inch/Box products

10.1 inch and above products

- PPC-A35-101 (PN: CS12800-STMP25-101P)
- PPC-A35-133 (PN: CS19108-STMP25-133P)
- PPC-A35-156 (PN: CS19108-STMP25-156P)



Pin Number	**Definition**	**Description**	OS Node
2	CAN1_H	CPU CAN1 H signal	
4	CAN1_L	CPU CAN1 L signal	CAN1
1	CAN0_H	CPU CAN0 H signal	
3	CAN0_L	CPU CAN0 L signal	CAN0
5	RS485_6-	CPU UART6 RS485 –(B) signal	
7	RS485_6+	CPU UART6 RS485 +(A) signal	/dev/ttySTM3
9	RS485_4-	CPU UART4 RS485 –(B) signal	
11	RS485_4+	CPU UART4 RS485 +(A) signal	/dev/ttySTM2
13	RS232_5_RXD	CPU UART5 RS232 RXD signal	
15	RS232_5_TXD	CPU UART5 RS232 TXD signal	/dev/ttySTM1
17	RS232_2_RXD	CPU UART2 RS232 RXD signal, Debug Port	
19	RS232_2_TXD	CPU UART2 RS232 TXD signal, Debug Port	/dev/ttySTM0
21	GND	System Ground	
23	+5V	System +5V Power Output, No more than 1A Current output	

RS232 / RS485 / CAN Pin Definition for 10.1 inch and above products

The 120 Ohm match resistor is **NOT** mounted on the RS485 port.

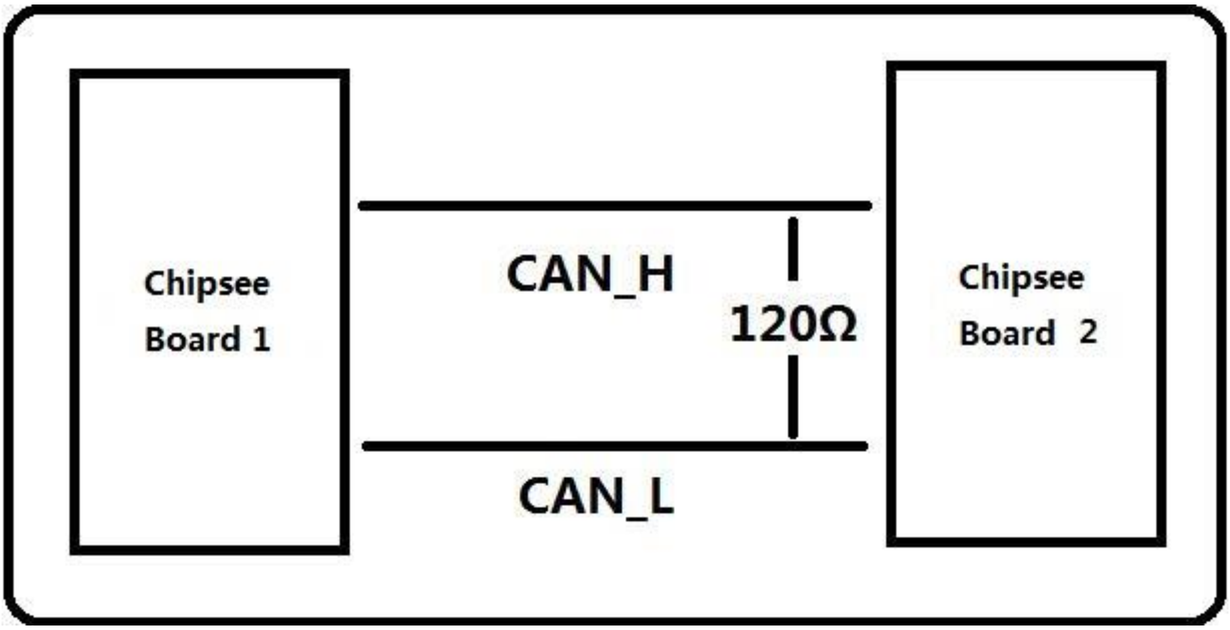
RS485 ports are half-duplex, the hardware can switch the Tx/Rx direction automatically.
RS232 ports are full-duplex.

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.



Connecting CAN

7 inch product

- PPC-A35-070 (PN: CS10600-STMP25-070P)

Pin Number	**Definition**	**Description**	OS Node
Pin 16	CAN1_H	CPU CAN1 H signal	
Pin 15	CAN1_L	CPU CAN1 L signal	CAN1
Pin 14	CAN0_H	CPU CAN0 H signal	
Pin 13	CAN0_L	CPU CAN0 L signal	CAN0

CAN for **7 inch** product

10.1+ inch products

- PPC-A35-101 (PN: CS12800-STMP25-101P)
- PPC-A35-133 (PN: CS19108-STMP25-133P)

- PPC-A35-156 (PN: CS19108-STMP25-156P)

Pin Number	Definition	Description	OS Node
2	CAN1_H	CPU CAN1 H signal	
4	CAN1_L	CPU CAN1 L signal	CAN1
1	CAN0_H	CPU CAN0 H signal	
3	CAN0_L	CPU CAN0 L signal	CAN0

CAN for **10.1+ inch** products

To check the CAN devices status with *ip link*, on the 10.1 inch device, there are two CAN devices (can0 and can1):

```
root@stm32mp2:~# ip link
...
3: can0: <NOARP,ECHO> mtu 16 qdisc noop state DOWN mode DEFAULT group default
qlen 10
    link/can
4: can1: <NOARP,ECHO> mtu 16 qdisc noop state DOWN mode DEFAULT group default
qlen 10
    link/can
...
```

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

Set the bit-rate to **1Mbits/sec** using the following command:

```
ip link set can0 down
ip link set can0 type can bitrate 1000000
```

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

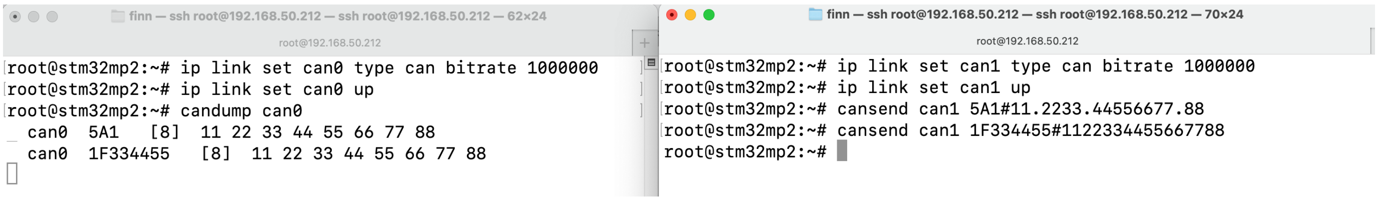
```
candump can0
```

Bring down the device

```
ip link set can0 down
```

If your product has 2 CAN ports CAN0 and CAN1, you can test CAN by letting them talk to each other:

```
// CAN0 console
root@stm32mp2:~# candump can0
// CAN1 console
root@stm32mp2:~# cansend can1 5A1#11.2233.44556677.88
root@stm32mp2:~# cansend can1 1F334455#1122334455667788
// CAN0 console
can0  5A1   [8]  11 22 33 44 55 66 77 88
can0  1F334455   [8]  11 22 33 44 55 66 77 88
```



CAN0 and CAN1 Talk to Each Other

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: PPC-A35-070 (PN: CS10600-STMP25-070P)
- **10.1+ inch products:**
    - PPC-A35-101 (PN: CS12800-STMP25-101P)
    - PPC-A35-133 (PN: CS19108-STMP25-133P)
    - PPC-A35-156 (PN: CS19108-STMP25-156P)

Refer to the tables below for a detailed port definition:

Definition	GPIO	GPIOD Chip	GPIOD Line
OUT1	PZ6	11	6
OUT2	PZ7	11	7
OUT3	PZ8	11	8
OUT4	PZ9	11	9
IN1	PZ5	11	5
IN2	PZ4	11	4
IN3	PZ3	11	3
IN4	PZ2	11	2

GPIO Device Node

To set GPIO out to high with **gpiod**:

```
# Set OUT1 to High (use "gpioinfo" to check GPIOD Chip and Line)
gpioset --chip 11 6=1

# Set OUT3 and OUT4 (PZ8 PZ9) to Low
gpioset PZ8=0 PZ9=0
```

To get GPIO input:

```
# Get the IN4 (PZ2) status:
gpioget PZ2
```

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

```
root@stm32mp2:~# gpioget PZ2
"PZ2"=inactive
root@stm32mp2:~# gpiomon PZ2
# Apply OUT1 to IN1 with a dupont wire ...
2441.458788046 rising   "PZ2"
2442.808019966 falling  "PZ2"
2444.466110745 rising   "PZ2"
2446.080942714 falling  "PZ2"
2446.082569984 rising   "PZ2"
2446.083678586 falling  "PZ2"
2446.083739979 rising   "PZ2"
2446.083874839 falling  "PZ2"
2446.083894112 rising   "PZ2"
2446.084150884 falling  "PZ2"
```

We can also cross-compile *set_get_line_value_V2.c* on Ubuntu 20.04 or any other Linux X86_64 system and execute the *set_get_line_value_V2* 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/st/stm32mp2/4.2.4-snapshot/environment-setup-cortexa35-ostl-linux

$ echo ${CC}

$ wget -c https://chipsee-tmp.s3.amazonaws.com/SourcesArchives/HARDWARETEST/
set_get_line_value_V2.c

$ ${CC} set_get_line_value_V2.c -o set_get_line_value_V2 -lgpiod
```

Then put the *set_get_line_value_V2* to target Chipsee ARM board over ssh or other solutions you like. We use OUT1 and IN1 to demostrate it, we need to feed power 12V~24V between *GND_ISO* and *VDD_ISO* , then short *OUT1* and *IN1* to test.

```
root@stm32mp2:~# ./set_get_line_value_V2
```

Bluetooth

For more information check the official OpenSTLinux Wiki: https://wiki.st.com/stm32mpu/wiki/Category:Bluetooth

First check if Bluetooth is enabled:

```
root@stm32mp2:~# hciconfig -a
hci0: Type: Primary  Bus: UART
    BD Address: 14:5D:34:F2:E9:AB  ACL MTU: 1021:8  SCO MTU: 255:12
    UP RUNNING
    RX bytes:2026 acl:0 sco:0 events:50 errors:0
    TX bytes:3023 acl:0 sco:0 commands:52 errors:0
    Features: 0xff 0xff 0xff 0xfa 0xdb 0xbd 0x7b 0x87
    Packet type: DM1 DM3 DM5 DH1 DH3 DH5 HV1 HV2 HV3
    Link policy: RSWITCH HOLD SNIFF PARK
    Link mode: PERIPHERAL ACCEPT
    Name: 'stm32mp2'
    Class: 0x0c0000
    Service Classes: Rendering, Capturing
    Device Class: Miscellaneous,
    HCI Version: 4.1 (0x7)  Revision: 0xbc6
    LMP Version: 4.1 (0x7)  Subversion: 0xd607
    Manufacturer: Realtek Semiconductor Corporation (93)
```

If you see Bluetooth is “Down”, to bring it up:

```
root@stm32mp2:~# hciconfig hci0 down
root@stm32mp2:~# hciconfig -a
hci0: Type: Primary  Bus: UART
  BD Address: 14:5D:34:F2:E9:AB  ACL MTU: 1021:8  SCO MTU: 255:12
  DOWN
  ...

root@stm32mp2:~# hciconfig hci0 up
root@stm32mp2:~# hciconfig -a
hci0: Type: Primary  Bus: UART
  BD Address: 14:5D:34:F2:E9:AB  ACL MTU: 1021:8  SCO MTU: 255:12
  UP RUNNING
  ...
```

Scan for Bluetooth device:

```
root@stm32mp2:~# hcitool scan
Scanning ...
```

Systemd provides a tool for Bluetooth management: bluetoothctl. Example session with bluetoothclt for scanning, pairing, connecting with a Bose QC35 headphone:

```
root@stm32mp2:~# bluetoothctl

Agent registered
[CHG] Controller 14:5D:34:F2:E9:AB Pairable: yes

[bluetooth]# power on
Changing power on succeeded

[bluetooth]# agent on
Agent is already registered

[bluetooth]# default-agent
Default agent request successful

[bluetooth]# scan on
Discovery started
[CHG] Controller 14:5D:34:F2:E9:AB Discovering: yes
[NEW] Device 60:AB:D2:3D:E1:C3 Bose QC35 II
[CHG] Device 60:AB:D2:3D:E1:C3 TxPower: -10
...

[bluetooth]# scan off
Discovery stopped
...

[bluetooth]# pair 60:AB:D2:3D:E1:C3
Attempting to pair with 60:AB:D2:3D:E1:C3
[CHG] Device 60:AB:D2:3D:E1:C3 Connected: yes
[CHG] Device 60:AB:D2:3D:E1:C3 Bonded: yes
...
[CHG] Device 60:AB:D2:3D:E1:C3 Paired: yes
Pairing successful

[Bose QC35 II]# connect 60:AB:D2:3D:E1:C3
Attempting to connect to 60:AB:D2:3D:E1:C3
[NEW] Endpoint /org/bluez/hci0/dev_60_AB_D2_3D_E1_C3/sep3
...
Connection successful
[NEW] Player /org/bluez/hci0/dev_60_AB_D2_3D_E1_C3/player0 [default]
[CHG] Transport /org/bluez/hci0/dev_60_AB_D2_3D_E1_C3/sep3/fd0 Volume: 0x0037 (55)

[Bose QC35 II]# quit
```

Then your Bluetooth headphone is connected, you can test it by playing a video or music, there is a Video Playback Demo preinstalled in the ST Demo program.

For more information, check the official ST Wiki: https://wiki.st.com/stm32mpu/wiki/How_to_scan_Bluetooth_devices

Scan for Bluetooth LE device:

```
root@stm32mp2:~# hcitool lescan
LE Scan ...
60:09:C3:AE:9A:01 (unknown)
C9:C8:8C:B1:E6:B3 (unknown)
60:AB:D2:3D:E1:C3 LE-Bose QC35 II
```

For more information, check the official ST Wiki: https://wiki.st.com/stm32mpu/wiki/How_to_scan_BLE_devices

GPS

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

You can use GPS from command line.

Test the GPS function as follows, first, you listen to the GPS info serial port (/dev/ttyUSB1), then, you send AT commands to AT serial port (/dev/ttyUSB2). 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/ttyUSB1

AT port: /dev/ttyUSB2

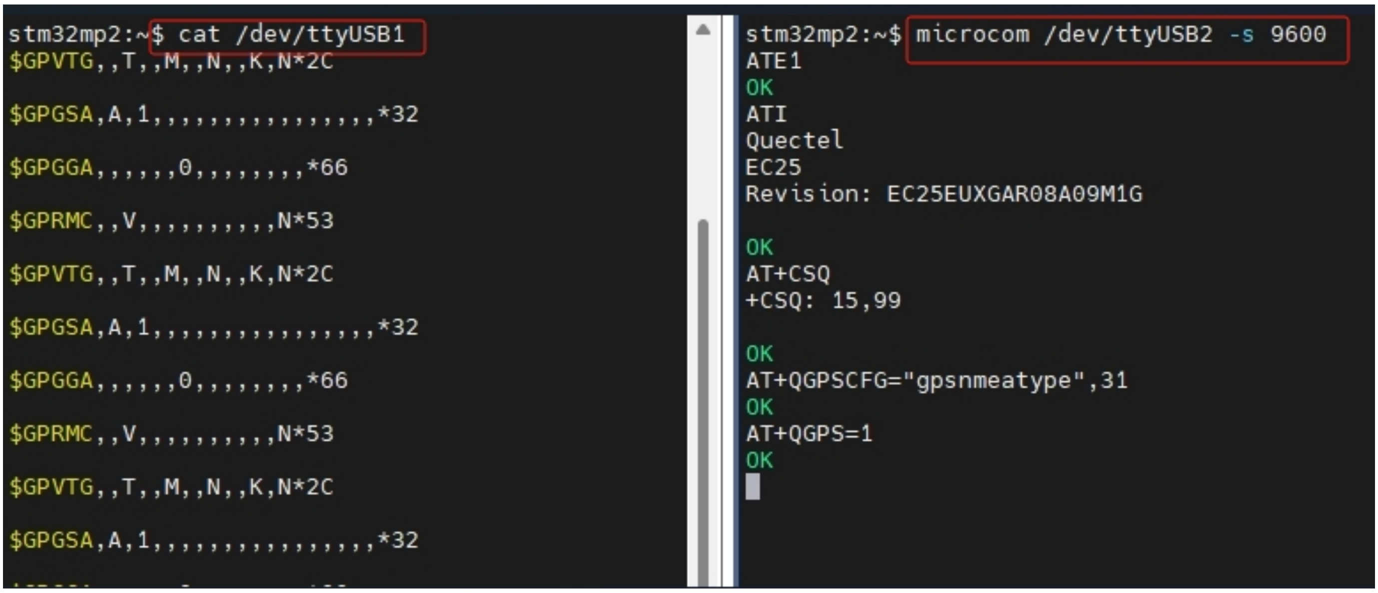
In the first terminal, we use **cat** to listen for GPS info:

```
cat /dev/ttyUSB1
# 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/ttyUSB2 -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/ttyUSB1 GPS Port, Right: /dev/ttyUSB2 AT Port

Audio

Audio Card in OS

We will use **aplay** to play audio, first we need to check which audio card we need to use.

The audio card in the device is **ES8388**, first check it with **aplay -l** (lower case “l”):

```
root@stm32mp2:~# aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: ES8388 [ES8388], device 0: 400b0000.audio-controller-ES8323 HiFi ES8323 HiFi-0 [400b0000.audio-controller-ES8323 HiFi ES8323 HiFi-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
```

In the example, **card 0: ES8388 [ES8388]** is our audio card. We will need its **Subdevice #0**. It means we need to select **card 0** hardware’s **subdevice 0**. It is **hw:0,0** in aplay.

But the order of audio cards (if there are more than 1 audio cards) might change after each boot, so we’d better use its audio card name instead of its order.

The audio card is **sysdefault:CARD=ES8388** 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=ES8388 /opt/hardware/test/multimedias/AudioTest.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@stm32mp2:~# pactl get-sink-volume @DEFAULT_SINK@
Volume: front-left: 45875 /  70% / -9.29 dB,   front-right: 45875 /  70% / -9.29 dB
        balance 0.00
root@stm32mp2:~# pactl set-sink-volume @DEFAULT_SINK@ -17%
root@stm32mp2:~# pactl set-sink-volume @DEFAULT_SINK@ -17%
root@stm32mp2:~# pactl get-sink-volume @DEFAULT_SINK@
Volume: front-left: 23591 /  36% / -26.62 dB,   front-right: 23591 /  36% / -26.62 dB
        balance 0.00
root@stm32mp2:~# pactl set-sink-volume @DEFAULT_SINK@ +47%
root@stm32mp2:~# pactl get-sink-volume @DEFAULT_SINK@
Volume: front-left: 54392 /  83% / -4.86 dB,   front-right: 54392 /  83% / -4.86 dB
        balance 0.00
```

Audio Recording

You can use the 3.5mm audio jack to connect an external microphone for audio recording.

The default recording device is **sysdefault:CARD=ES8388**

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

# specify capture device by name
arecord -D sysdefault:CARD=ES8388 -f cd -V stereo -d 18 mic.wav

# to play the audio you just recorded
aplay -D sysdefault:CARD=ES8388 mic.wav
```

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 /opt/hardware/test/multimedias/VideoTest.mp4 --volume=0.5

# A quick way to play it full screen
gst-launch-1.0 playbin uri=file:///opt/hardware/test/multimedias/VideoTest.mp4
video-sink="waylandsink fullscreen=true" volume=0.5
```

Network

You can refer to the official ST wiki to learn more about setting up:

- WiFi: https://wiki.st.com/stm32mpu/wiki/WLAN_overview
- Ethernet: https://wiki.st.com/stm32mpu/wiki/How_to_configure_ethernet_interface

WiFi

Scan WiFi SSID manually *iw dev wlan0 scan | grep SSID* :

```
root@stm32mp2:~# ifconfig wlan0 up
root@stm32mp2:~# iw dev wlan0 scan | grep SSID
        SSID: chipsee_wifi
        SSID:
```

Auto connect WiFi that persists across reboot:

All the network configurations are stored on **/lib/systemd/network**, create the file dedicated to wireless interface “/lib/systemd/network/51-wireless.network”:

Firstly,

```
echo "[Match]" > /lib/systemd/network/51-wireless.network
echo "Name=wlan0" >> /lib/systemd/network/51-wireless.network
echo "[Network]" >> /lib/systemd/network/51-wireless.network
echo "DHCP=ipv4" >>/lib/systemd/network/51-wireless.network
```

Secondly,

```
mkdir -p /etc/wpa_supplicant/
echo "ctrl_interface=/var/run/wpa_supplicant" > /etc/wpa_supplicant/
wpa_supplicant-wlan0.conf
echo "eapol_version=1" >> /etc/wpa_supplicant/wpa_supplicant-wlan0.conf
echo "ap_scan=1" >> /etc/wpa_supplicant/wpa_supplicant-wlan0.conf
echo "fast_reauth=1" >> /etc/wpa_supplicant/wpa_supplicant-wlan0.conf
echo "" >> /etc/wpa_supplicant/wpa_supplicant-wlan0.conf
wpa_passphrase SSID_OF_NETWORK PASSWORD_OF_NETWORK >> /etc/wpa_supplicant/
wpa_supplicant-wlan0.conf
```

Where **SSID_OF_NETWORK PASSWORD_OF_NETWORK** correspond to the SSID and password of wireless network.

Finally, to enable and start the wireless configuration:

```
systemctl enable wpa_supplicant@wlan0.service
systemctl restart systemd-networkd.service
systemctl restart wpa_supplicant@wlan0.service
```

To check the WiFi status:

```
root@stm32mp2:/lib/systemd/network# iw wlan0 link

Connected to 04:42:1a:65:b3:10 (on wlan0)
        SSID: chipsee
        freq: 2457
        RX: 252469 bytes (696 packets)
        TX: 13808 bytes (75 packets)
        signal: -60 dBm
        rx bitrate: 65.0 MBit/s VHT-MCS 7 VHT-NSS 1
        tx bitrate: 58.5 MBit/s VHT-MCS 6 VHT-NSS 1
```

To disable WiFi with **rfkill**, persists across reboot:

```
root@stm32mp2:~# rfkill list
0: phy0: Wireless LAN
   Soft blocked: no
   Hard blocked: no
1: hci0: Bluetooth
   Soft blocked: no
   Hard blocked: no

root@stm32mp2:~# rfkill block 0

root@stm32mp2:~# rfkill list
0: phy0: Wireless LAN
   Soft blocked: yes
   Hard blocked: no
1: hci0: Bluetooth
   Soft blocked: no
   Hard blocked: no

root@stm32mp2:~# rfkill unblock 0

root@stm32mp2:~# rfkill list
0: phy0: Wireless LAN
   Soft blocked: no
   Hard blocked: no
1: hci0: Bluetooth
   Soft blocked: no
   Hard blocked: no
```

Ethernet

When Ethernet cable is plugged in, it will be automatically configured for use, it will obtain an IP automatically from DHCP.

end1 is the interface of 10.1+ inch products.

end1, **end2** are the interfaces of 7 inch product.

To change the configuration, edit **/lib/systemd/network/80-wired.network**.

```
root@stm32mp2:~# cat /lib/systemd/network/80-wired.network
[Match]
Type=ether
Name=!veth*
KernelCommandLine=!nfsroot
KernelCommandLine=!ip

[Network]
DHCP=yes

[DHCP]
UseMTU=yes
RouteMetric=10
ClientIdentifier=mac
```

Check the logs of **systemd-networkd** with:

```
journalctl -u systemd-networkd
```

Setting Static IP

WiFi

If you are using WiFi with the **/lib/systemd/network/51-wireless.network** file as configuration file, open it, update it to:

```
[Match]
Name=wlan0
[Network]
DNS=192.168.50.1
Address=192.168.50.212/24
Gateway=192.168.50.1
```

DNS, Address, Gateway should be different from yours, set them to the values you need it to be.

Then,

```
systemctl restart systemd-networkd.service
```

Ethernet

If you are using Ethernet with the **/lib/systemd/network/80-wired.network** file as configuration file, open it, remove [DHCP] section, update the [network] section, like:

```
[Match]
Type=ether
Name=!veth*
KernelCommandLine=!nfsroot
KernelCommandLine=!ip

[Network]
DNS=192.168.50.1
Address=192.168.50.213/24
Gateway=192.168.50.1
```

DNS, Address, Gateway should be different from yours, set them to the values you need it to be.

Then,

```
systemctl restart systemd-networkd.service
```

Revert to DHCP

To reverse to using **DHCP**:

WiFi - /lib/systemd/network/51-wireless.network:

```
[Match]
Name=wlan0
[Network]
DHCP=ipv4
```

Ethernet - /lib/systemd/network/80-wired.network:

```
[Match]
Type=ether
Name=!veth*
KernelCommandLine=!nfsroot
KernelCommandLine=!ip

[Network]
DHCP=yes

[DHCP]
UseMTU=yes
RouteMetric=10
ClientIdentifier=mac
```

For more info, check the ST wiki.

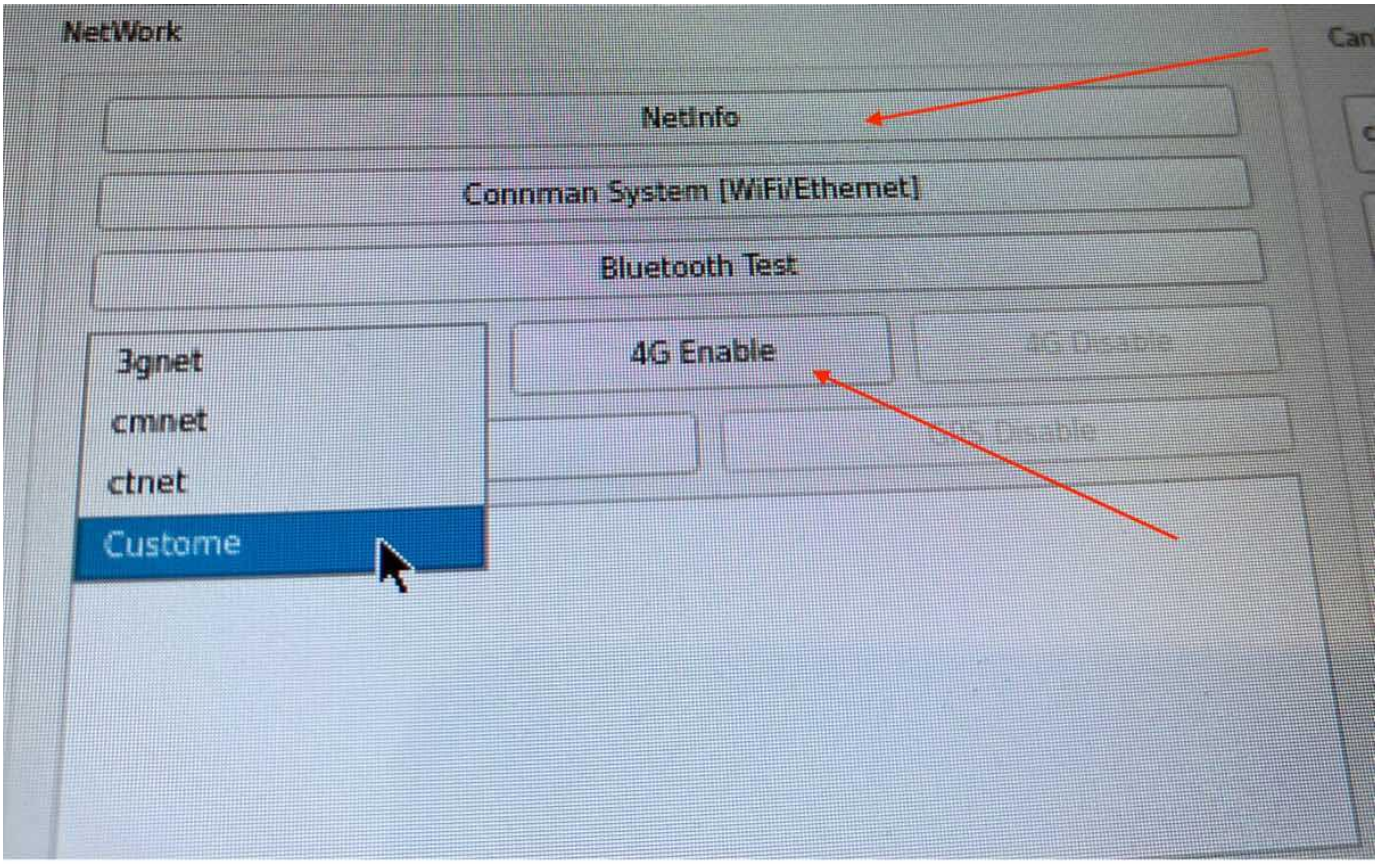
4G/LTE

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.: 3gnet

```
quectel-CM -s 3gnet
```

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

```
root@stm32mp2:~#
root@stm32mp2:~# quectel-CM -s 3gnet
[07-04_11:52:00:512] Quectel_QConnectManager_Linux_V1.5.5
[07-04_11:52:00:514] Find /sys/bus/usb/devices/1-1.2 idVendor=0x2c7c idProduct=0x125
[07-04_11:52:00:514] Auto find qmichannel = /dev/cdc-wdm0
[07-04_11:52:00:514] Auto find usbnet_adapter = wwan0
[07-04_11:52:00:514] Modem works in QMI mode
[07-04_11:52:00:537] cdc_wdm_fd = 7
[07-04_11:52:00:622] Get clientWDS = 5
[07-04_11:52:00:654] Get clientDMS = 1
[07-04_11:52:00:686] Get clientNAS = 2
[07-04_11:52:00:718] Get clientUIM = 1
[07-04_11:52:00:750] Get clientWDA = 1
[07-04_11:52:00:782] requestBaseBandVersion EC25EUXGAR08A09M1G
[07-04_11:52:00:910] requestGetSIMStatus SIMStatus: SIM_READY
[07-04_11:52:00:910] requestSetProfile[1] 3gnet///0
[07-04_11:52:00:973] requestGetProfile[1] 3gnet///0
[07-04_11:52:01:006] requestRegistrationState2 MCC: 460, MNC: 1, PS: Attached, DataCap: LTE
[07-04_11:52:01:038] requestQueryDataCall IPv4ConnectionStatus: DISCONNECTED
[07-04_11:52:01:038] ifconfig wwan0 down
[07-04_11:52:01:044] ifconfig wwan0 0.0.0.0
[07-04_11:52:01:103] requestSetupDataCall WdsConnectionIPv4Handle: 0xe1816600
[07-04_11:52:01:231] ifconfig wwan0 up
[07-04_11:52:01:238] busybox udhcpc -f -n -q -t 5 -i wwan0
udhcpc: started, v1.36.1
Dropped protocol specifier '.udhcpc' from 'wwan0.udhcpc'. Using 'wwan0' (ifindex=8).
udhcpc: broadcasting discover
udhcpc: broadcasting discover
udhcpc: broadcasting discover
udhcpc: broadcasting discover
udhcpc: broadcasting discover
udhcpc: no lease, failing
[07-04_11:52:16:536] File:ql_raw_ip_mode_check Line:105 udhcpc fail to get ip address, try next:
[07-04_11:52:16:536] ifconfig wwan0 down
[07-04_11:52:16:548] echo Y > /sys/class/net/wwan0/qmi/raw_ip
[07-04_11:52:16:551] ifconfig wwan0 up
[07-04_11:52:16:559] busybox udhcpc -f -n -q -t 5 -i wwan0
udhcpc: started, v1.36.1
Dropped protocol specifier '.udhcpc' from 'wwan0.udhcpc'. Using 'wwan0' (ifindex=8).
udhcpc: broadcasting discover
udhcpc: broadcasting select for 10.216.210.212, server 10.216.210.213
udhcpc: lease of 10.216.210.212 obtained from 10.216.210.213, lease time 7200
[07-04_11:52:16:777] /etc/udhcpc.d/50default: Adding DNS 123.123.123.123
[07-04_11:52:16:778] /etc/udhcpc.d/50default: Adding DNS 123.123.123.124
Dropped protocol specifier '.udhcpc' from 'wwan0.udhcpc'. Using 'wwan0' (ifindex=8).
```

Connecting 4G/LTE Through Command Line

You can then ping an IP address to check you're connected, such as ping the chipsee.com:

```
root@stm32mp2:~#
root@stm32mp2:~# ifconfig wwan0
wwan0     Link encap:UNSPEC  HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
          inet addr:10.216.210.212  P-t-P:10.216.210.212  Mask:255.255.255.248
          inet6 addr: fe80::651a:ce0e:be9e:69ba/64 Scope:Link
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1500  Metric:1
          RX packets:43 errors:0 dropped:0 overruns:0 frame:0
          TX packets:210 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:4963 (4.8 KiB)  TX bytes:24975 (24.3 KiB)

root@stm32mp2:~#
root@stm32mp2:~# ping chipsee.com
PING chipsee.com (162.159.134.42) 56(84) bytes of data.
64 bytes from 162.159.134.42 (162.159.134.42): icmp_seq=1 ttl=53 time=210 ms
64 bytes from 162.159.134.42 (162.159.134.42): icmp_seq=2 ttl=53 time=307 ms
64 bytes from 162.159.134.42 (162.159.134.42): icmp_seq=3 ttl=53 time=267 ms
```

Ping an IP to Test Connectivity

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 STM32MP25 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/st-image-qt-openstlinux-weston-stm32mp2-x86_64-toolchain-4.2.4-snapshot.sh
$ chmod a+x st-image-qt-openstlinux-weston-stm32mp2-x86_64-toolchain-4.2.4-snapshot.sh
$ ./st-image-qt-openstlinux-weston-stm32mp2-x86_64-toolchain-4.2.4-snapshot.sh
```

The default install directory is *`/opt/st/stm32mp2/4.2.4-snapshot/`* .

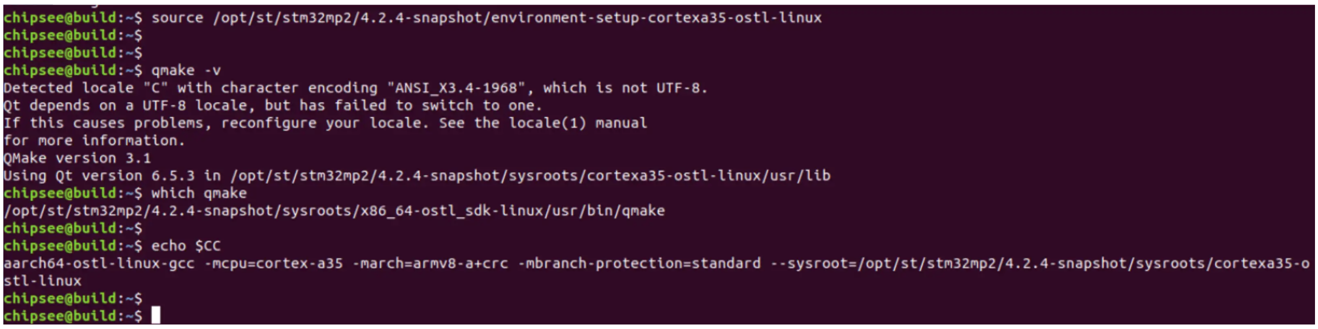
You can install it in this directory or you also can use another directory.

3. Use the following command to test SDK:

```
./st-image-qt-openstlinux-weston-stm32mp2-x86_64-toolchain-4.2.4-snapshot.sh
ST OpenSTLinux - Weston - (A Yocto Project Based Distro) SDK installer
version 4.2.4-snapshot
================================================================================
Enter target directory for SDK (default: /opt/st/stm32mp2/4.2.4-snapshot):
You are about to install the SDK to "/opt/st/stm32mp2/4.2.4-snapshot".
Proceed [Y/n]? y
```

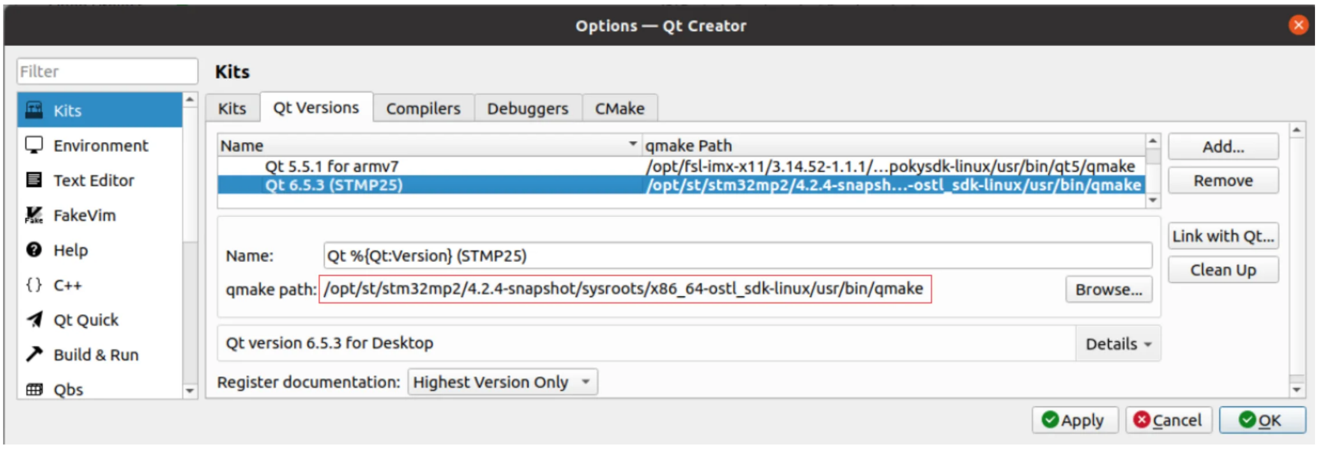
```
Extracting
SDK.................done
Setting it up...done
SDK has been successfully set up and is ready to be used.
Each time you wish to use the SDK in a new shell session, you need to source
the environment setup script e.g.
$ . /opt/st/stm32mp2/4.2.4-snapshot/environment-setup-cortexa35-ostl-linux
```

Check the installation status:

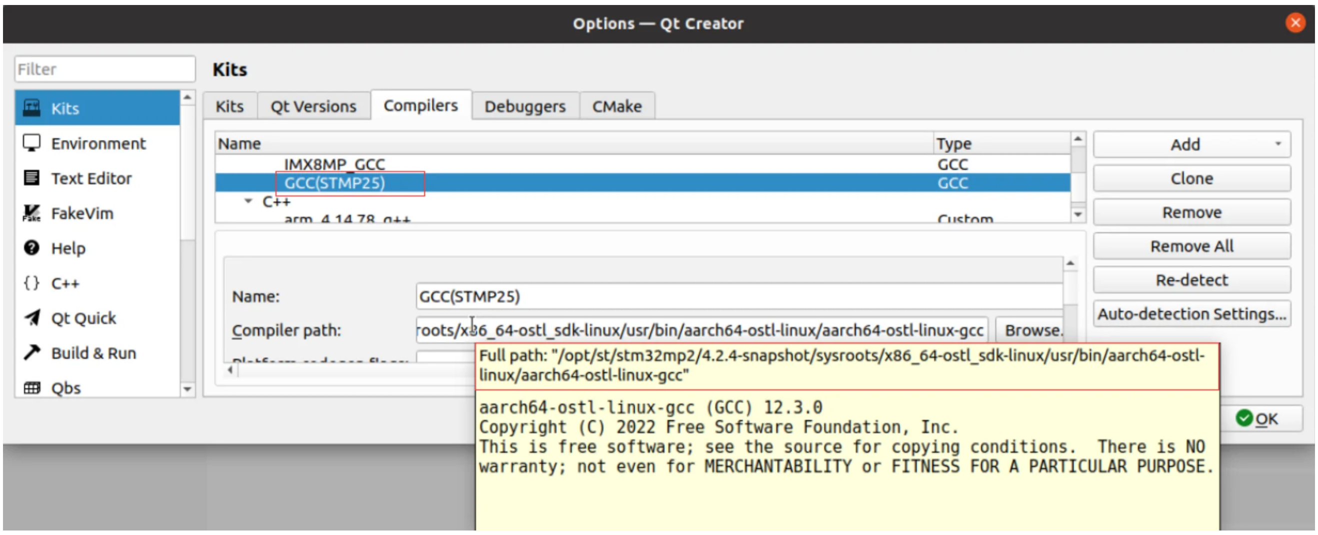


Check SDK Installation

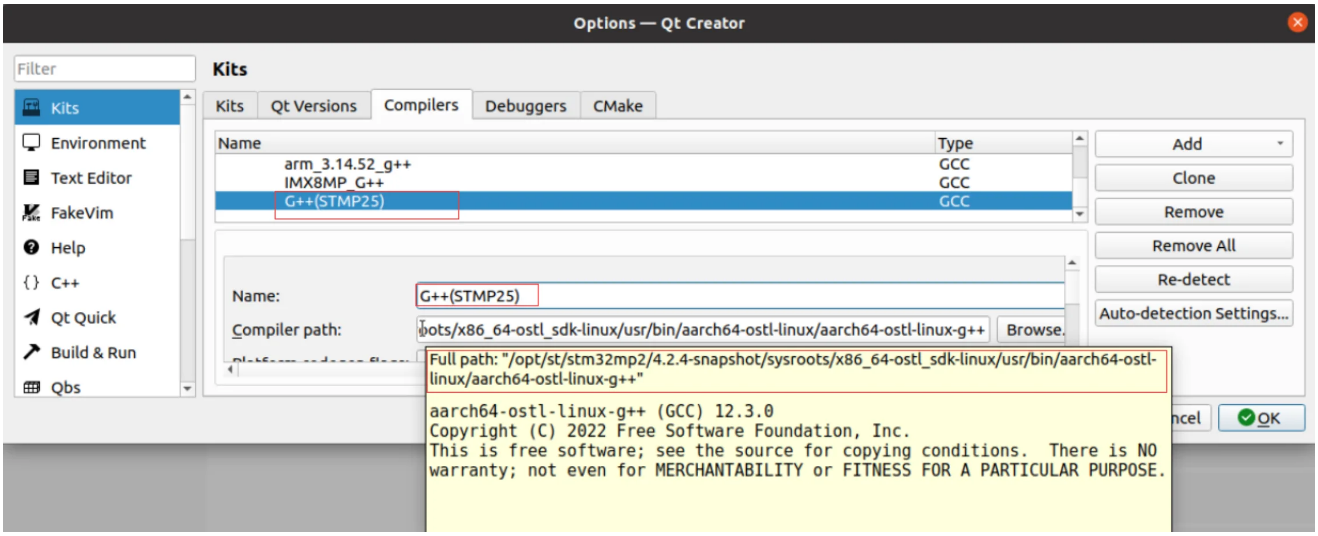
4. Open the QtCreator, then click the menu Edit->Preferences. Config the QtCreator as shown in the images below.



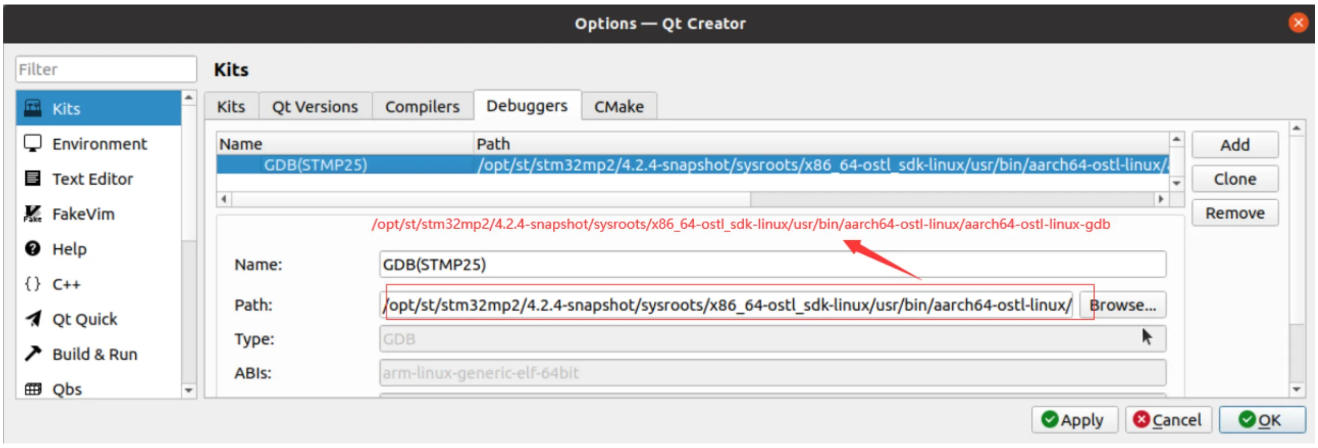
Config QtCreator 1



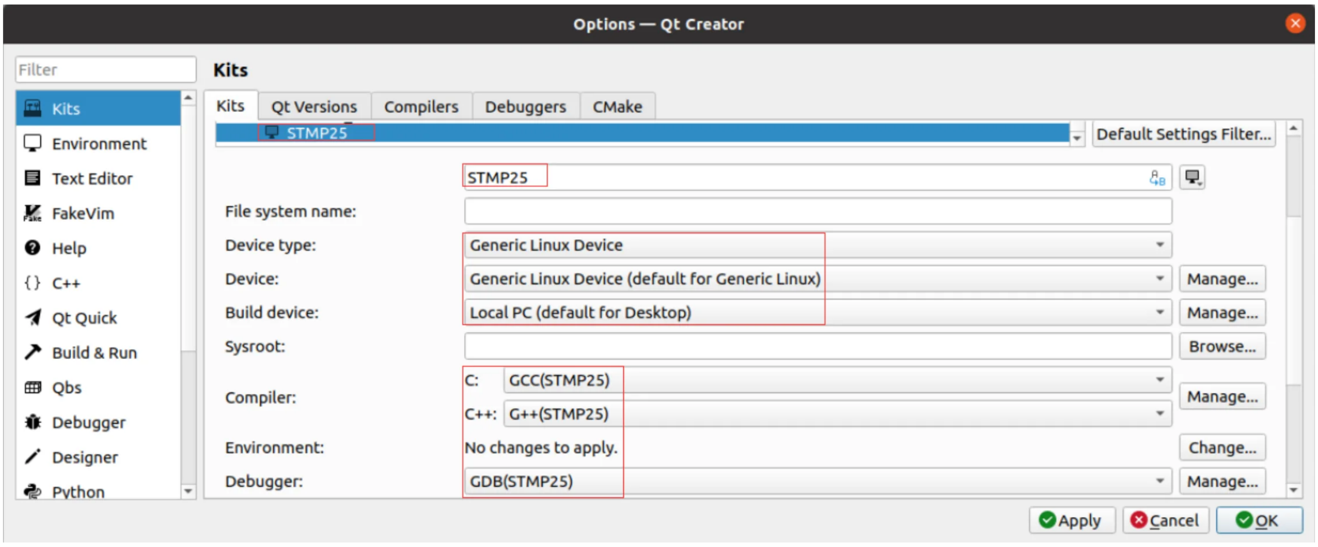
Config QtCreator 2



Config QtCreator 3

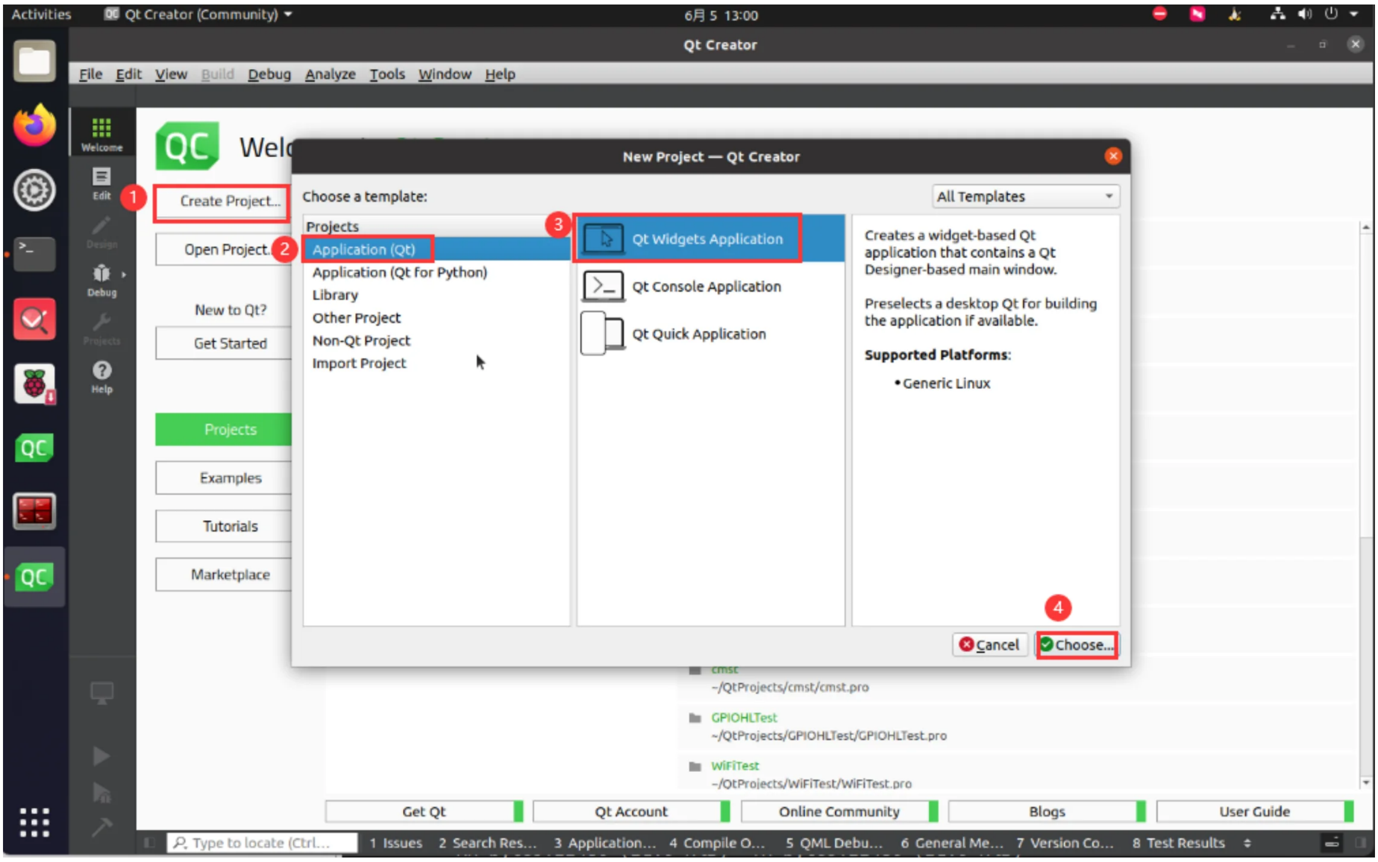


Config QtCreator 4

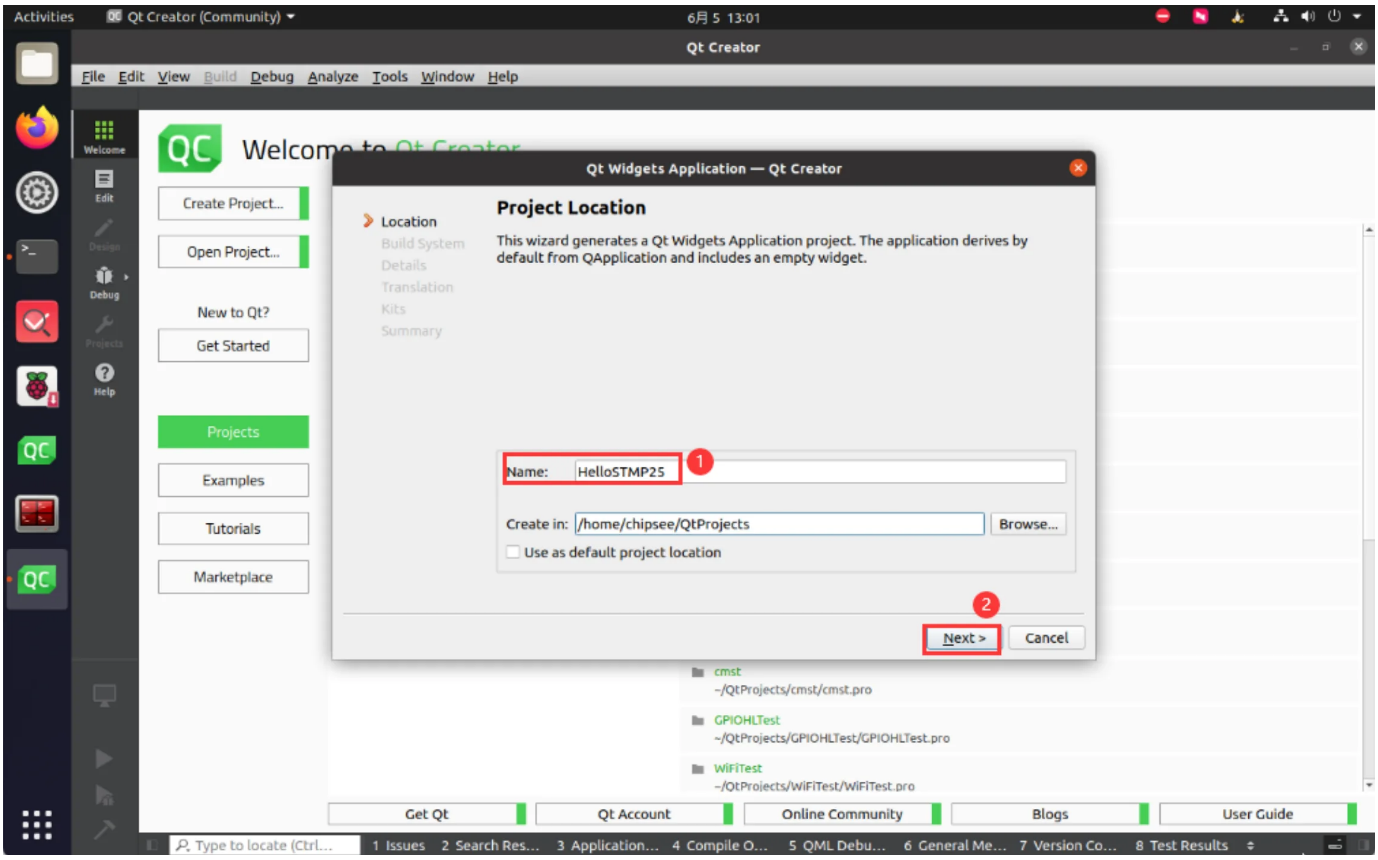


Config QtCreator 5

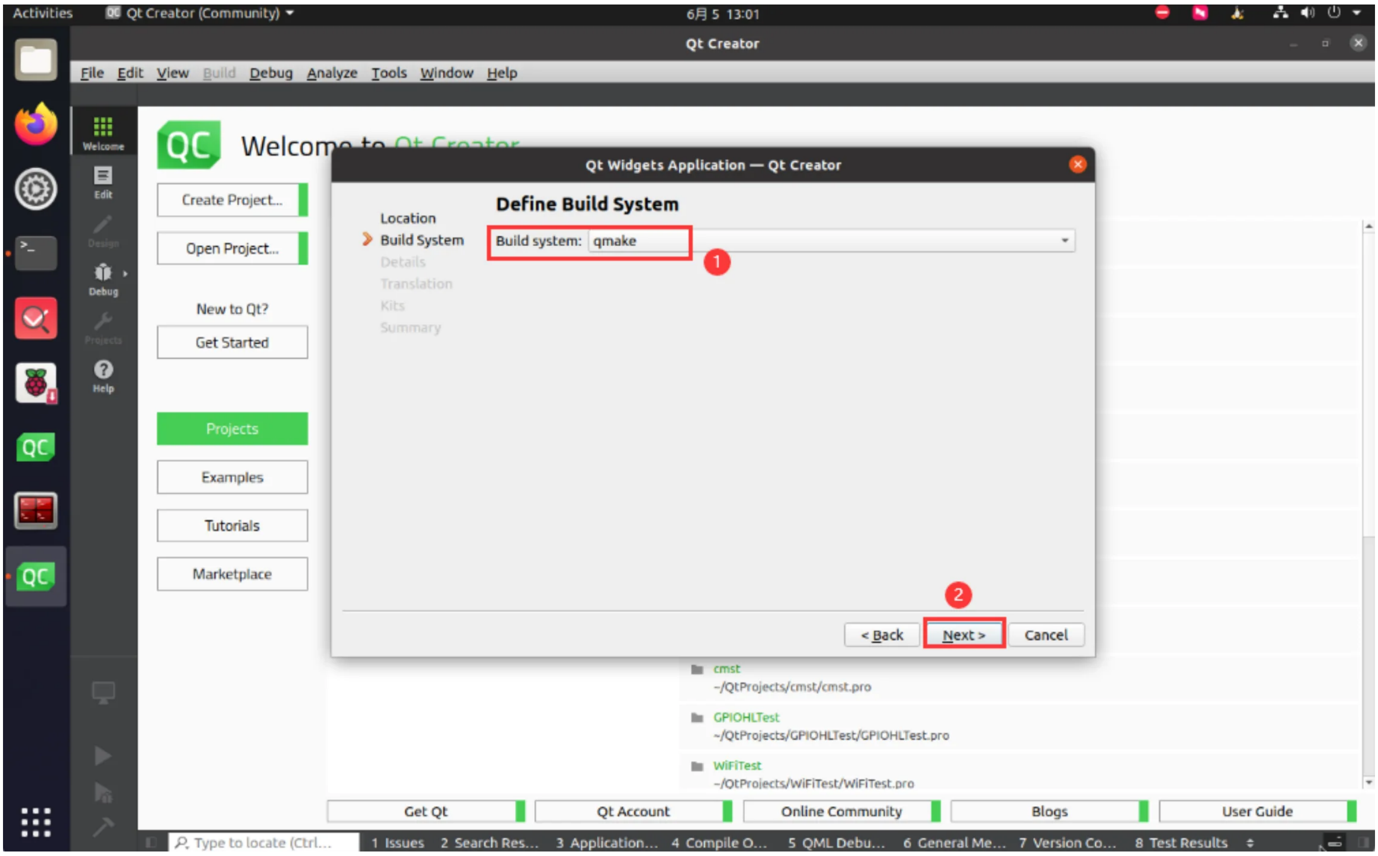
Example — Develop a HelloWorld Program



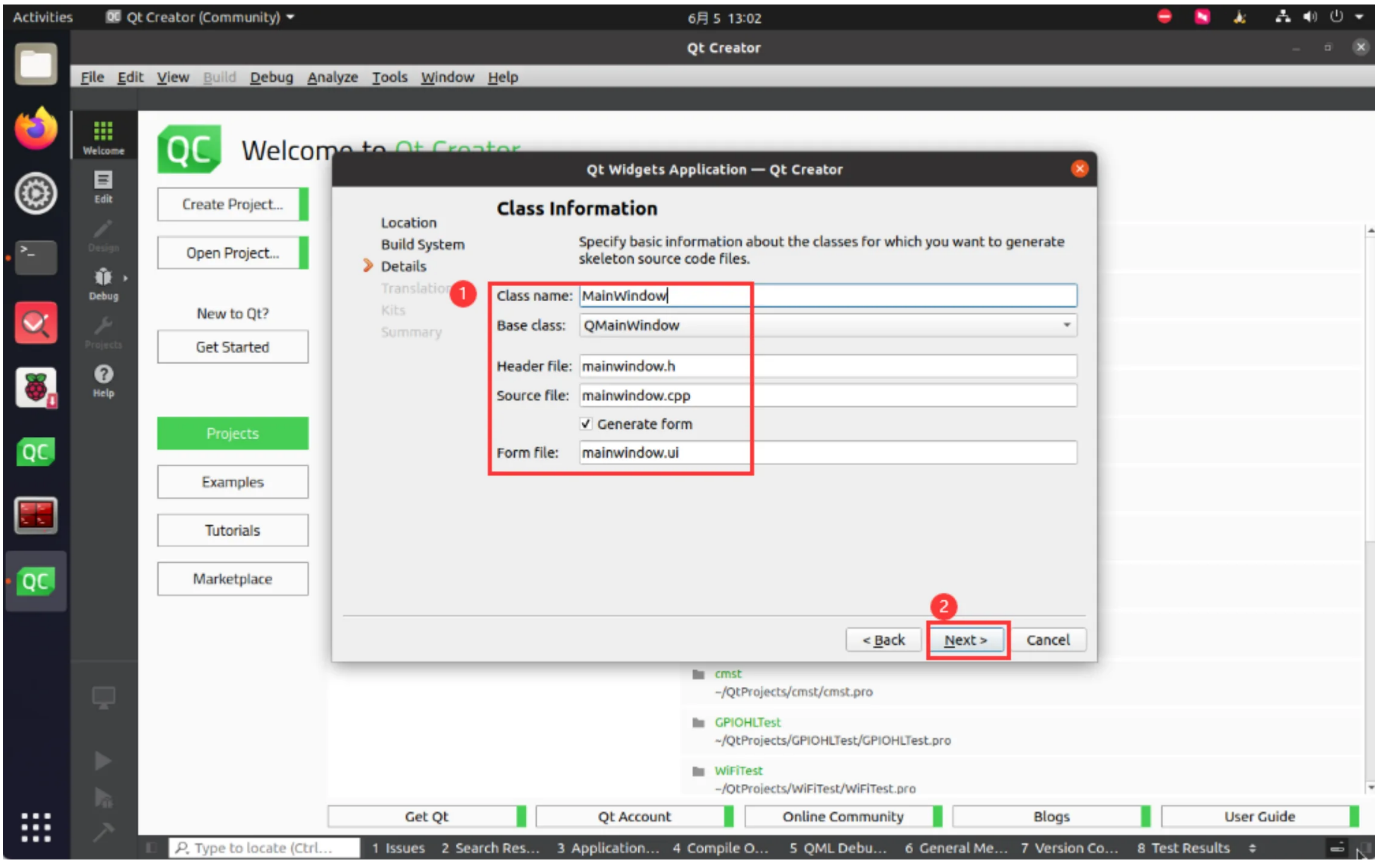
Qt Widgets Application



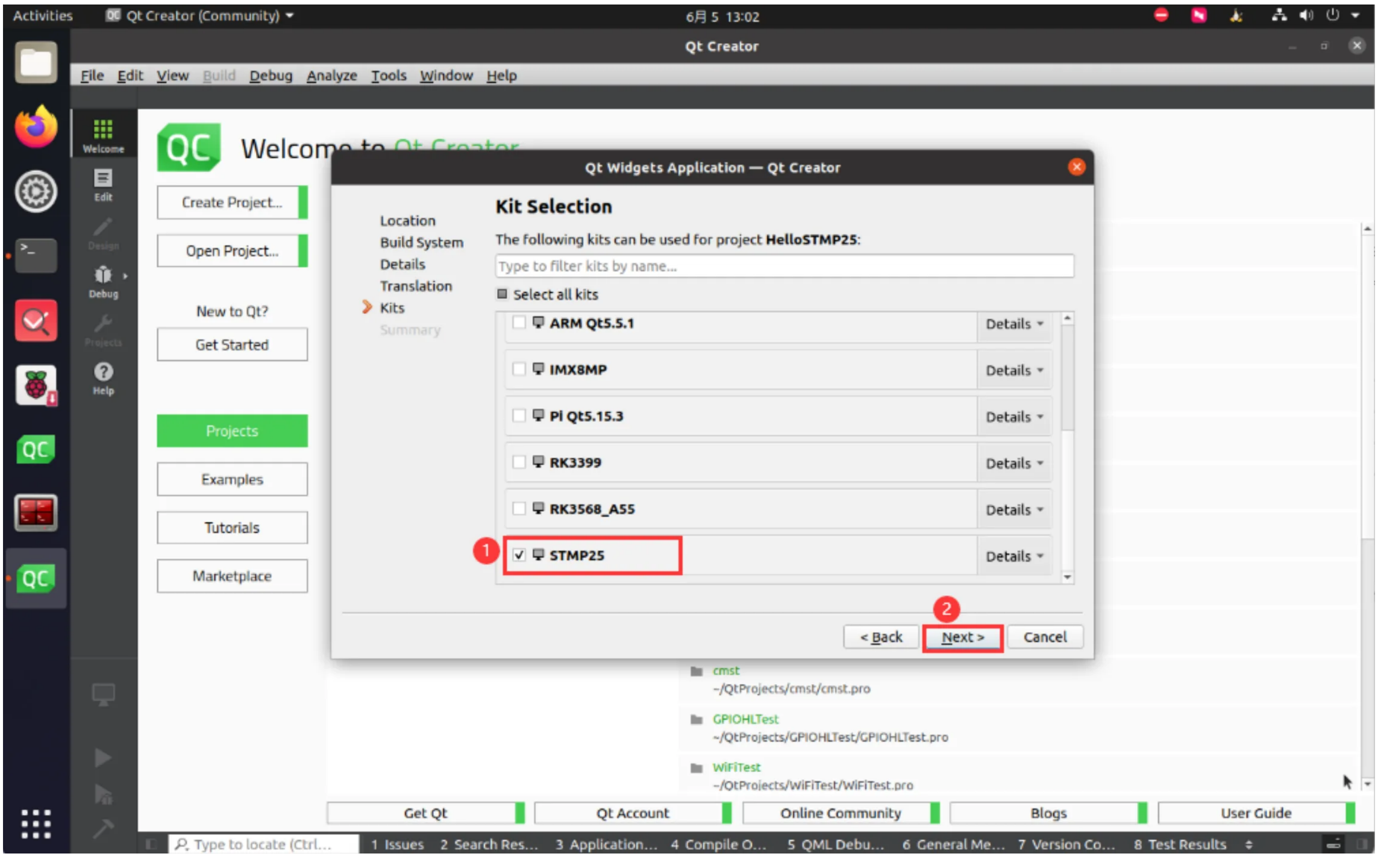
Name



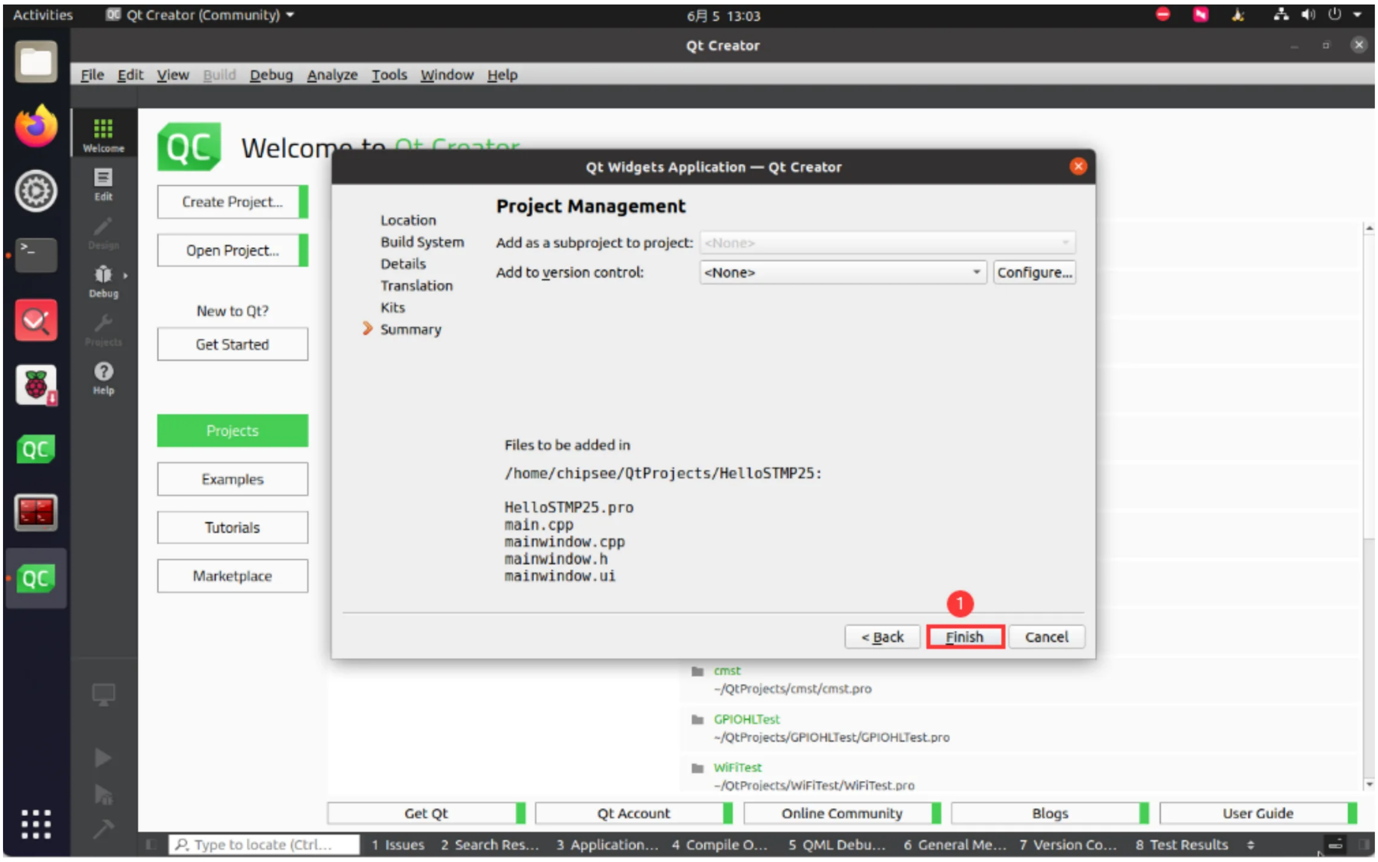
Build System



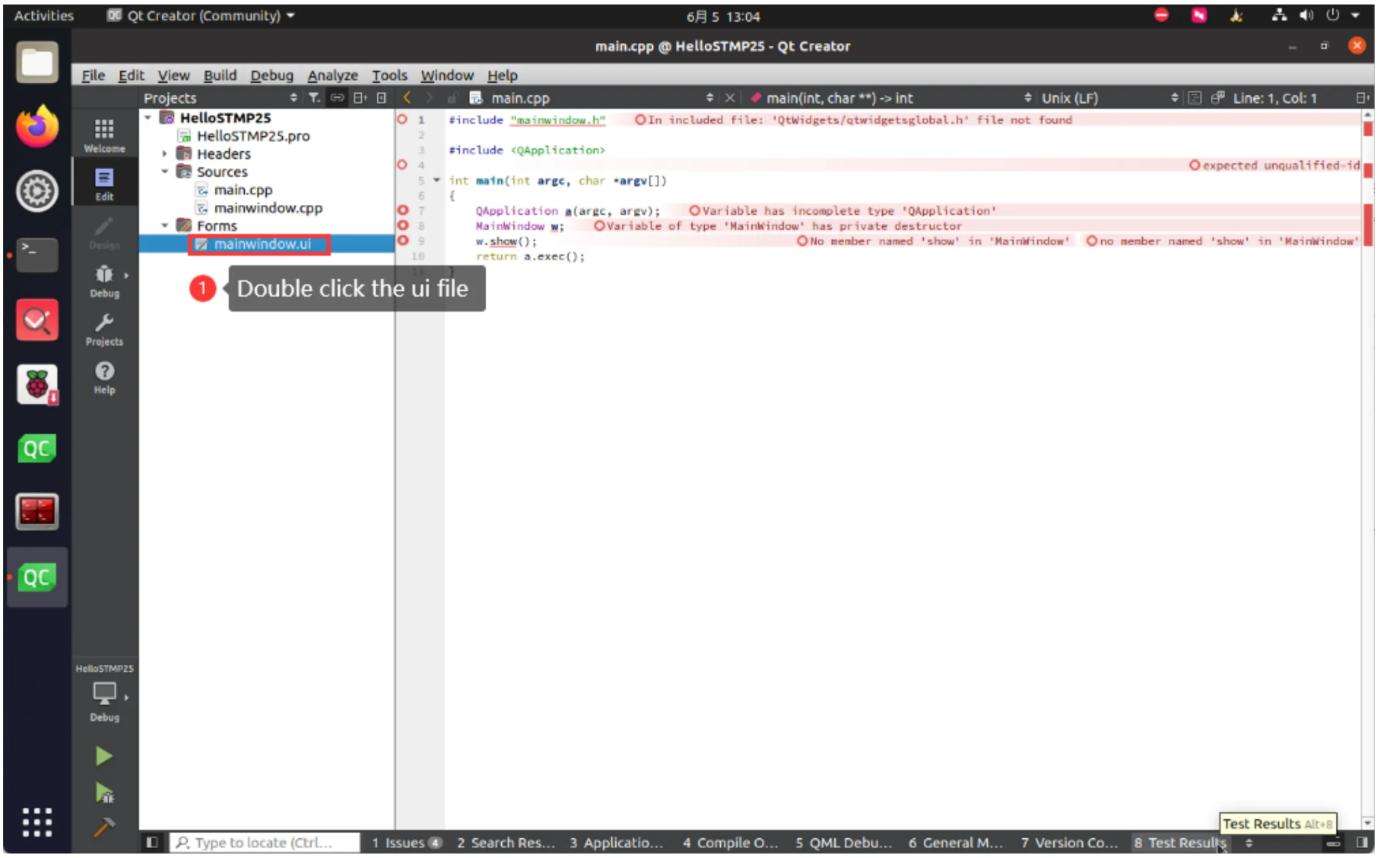
Class



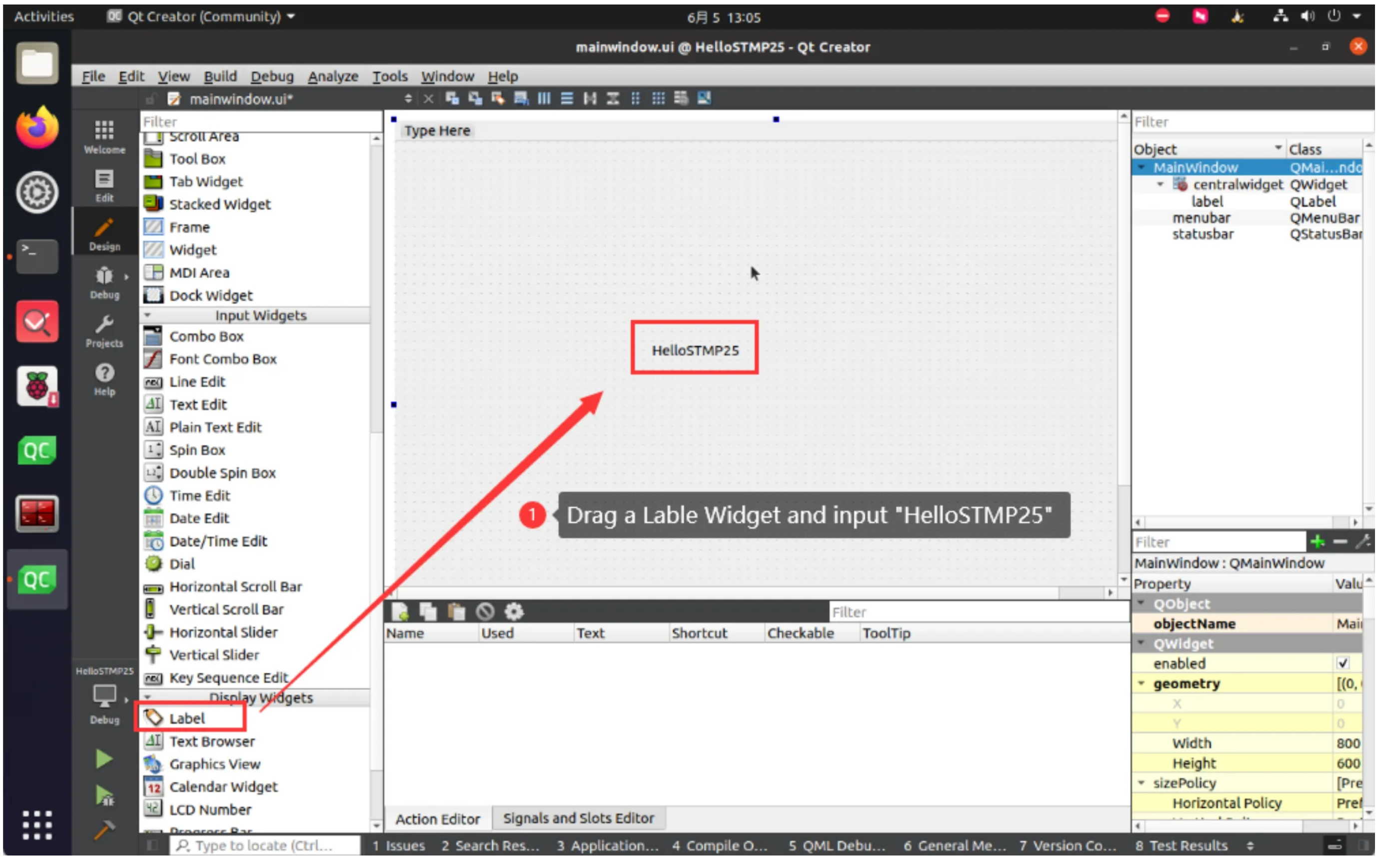
Kit Selection



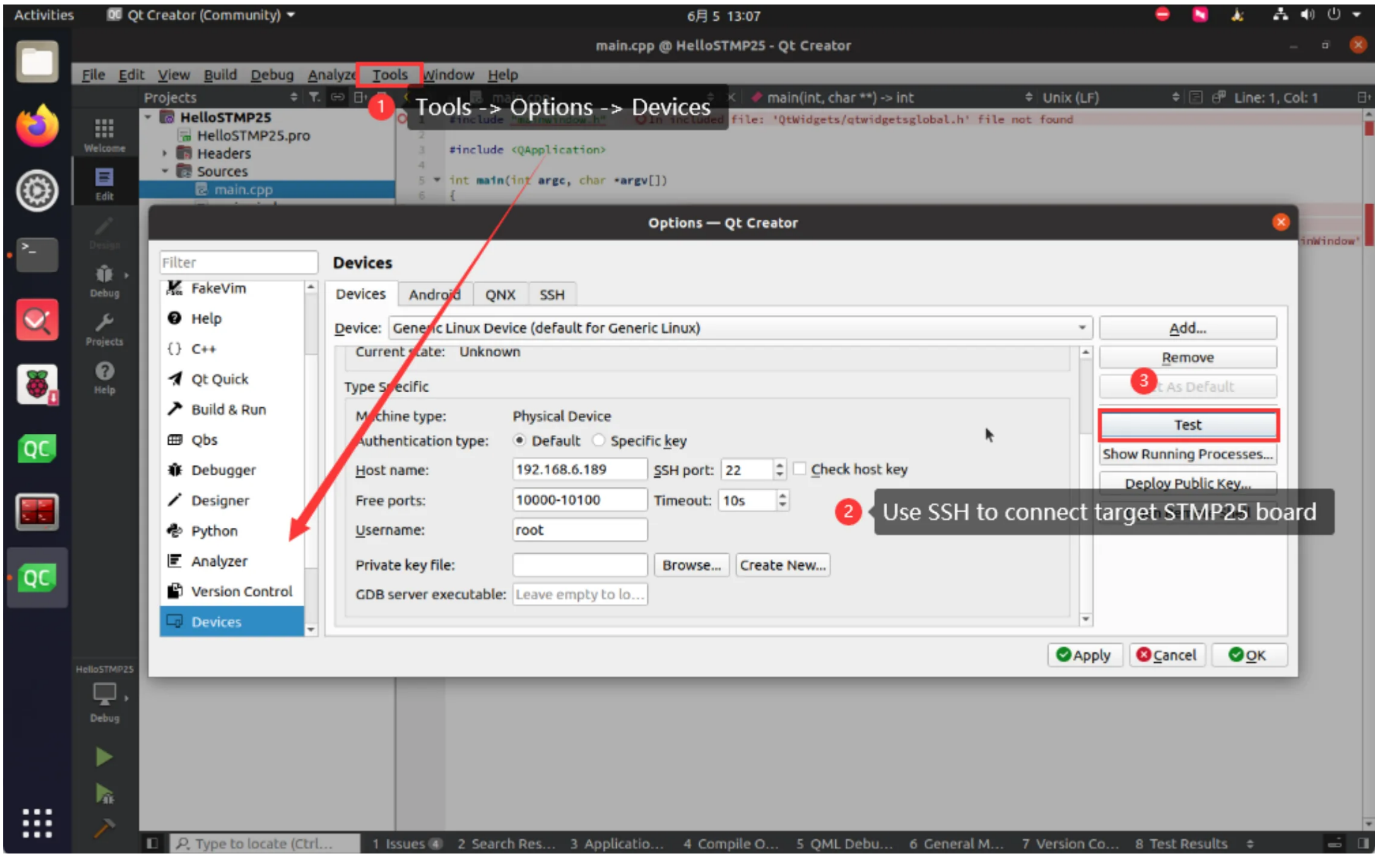
Finish



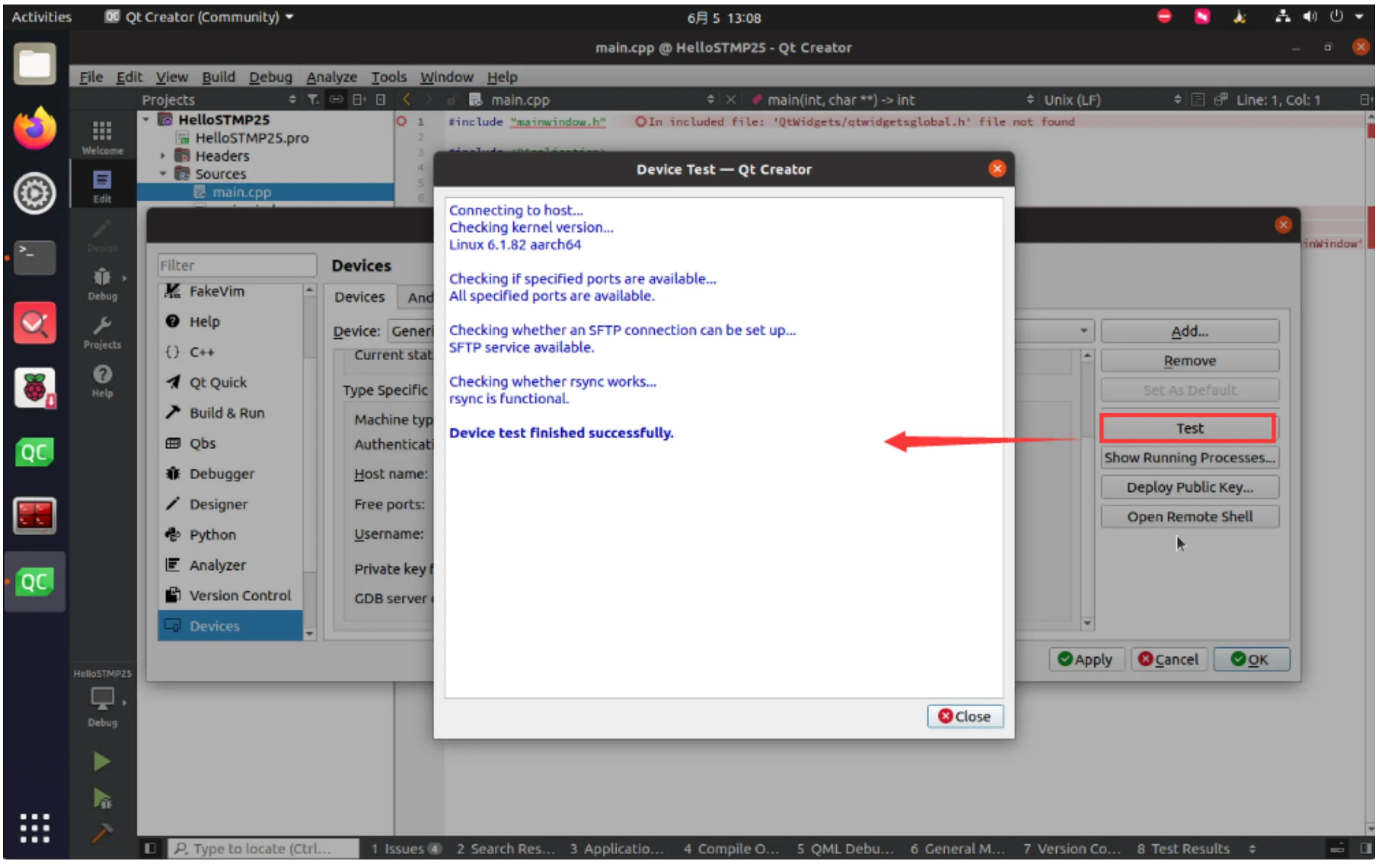
Double Click UI File



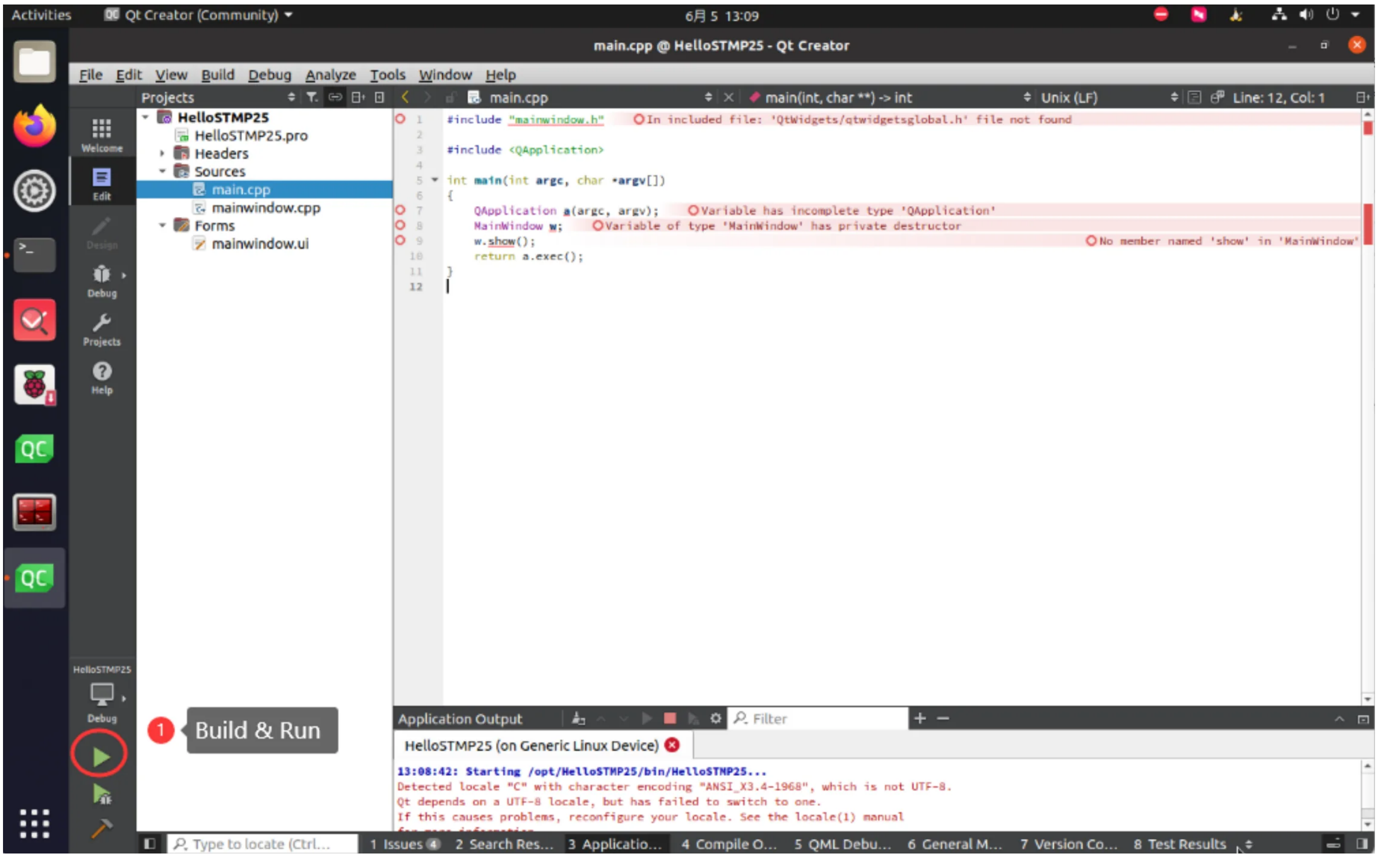
Add Label Widget



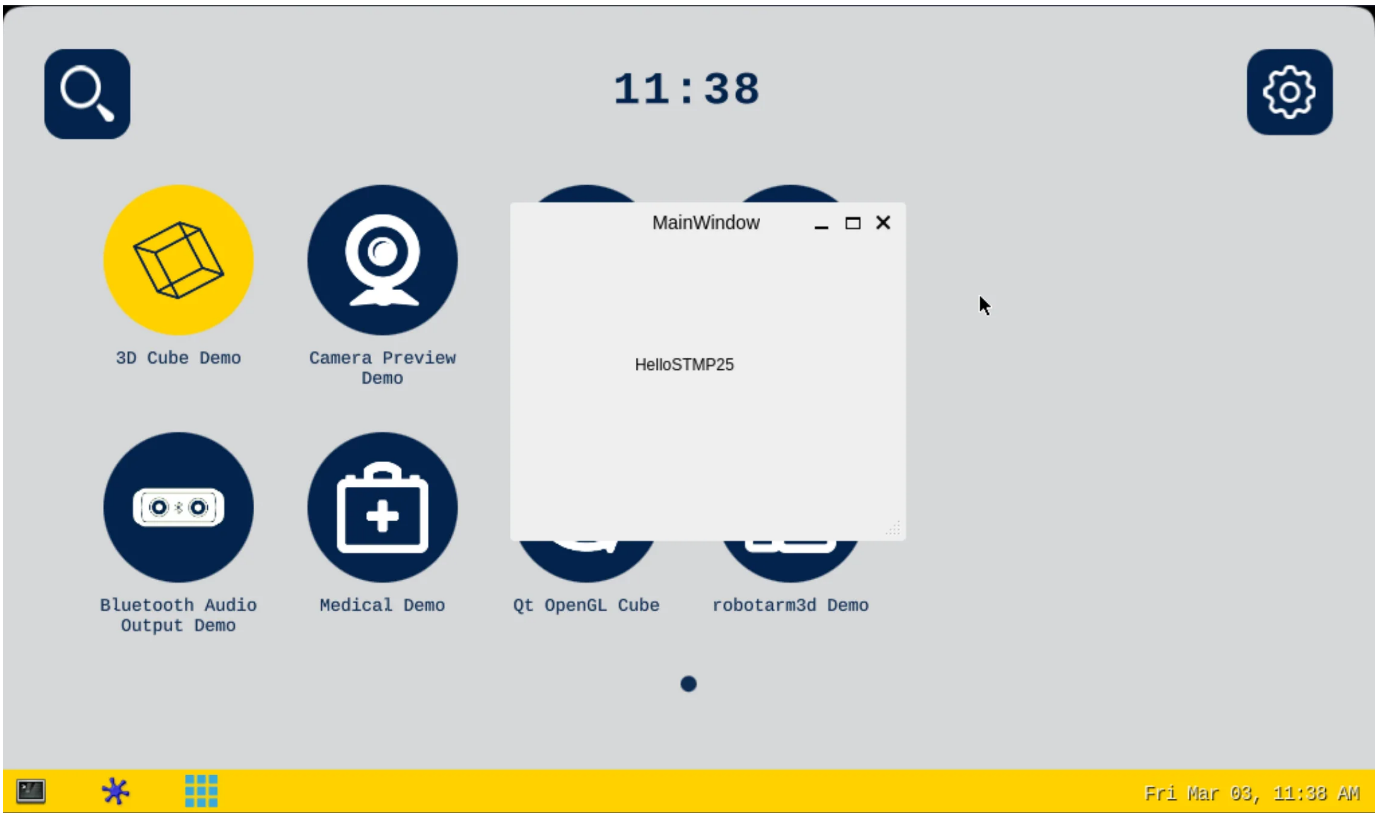
Connect Device



Test Device



Build and Run App



Done

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

Compile Qt Program with CMAKE

```
# Setup the environment of SDK
source /opt/st/stm32mp2/4.2.4-snapshot/environment-setup-cortexa35-ostl-linux
# Get the source code of KDBoatDemo
mkdir -p /opt/st/demos/Qt
cd /opt/st/demos/Qt
git clone https://github.com/KDABLabs/KDBoatDemo.git -b qt6
# Build the demo example
cd KDBoatDemo
cmake -S . -B config_default
cmake --build config_default --target all
# Copy the Example's binary into the connected board:
scp config_default/KDABBoatDemo root@192.168.7.1:/home/root/
# Connect to the running board:
ssh root@192.168.7.1
# Run the demo's example (windowed mode)
./KDABBoatDemo
# Run the demo's example (full screen mode)
./KDABBoatDemo --fullscreen
```

Flashing OS

To flash an operating system image for the Chipsee STMP257F device, you will need to download the prebuilt firmware image from Chipsee, download STM32CubeProgrammer program from ST, use a USB-C cable to connect the device with your workstation. Here is how:

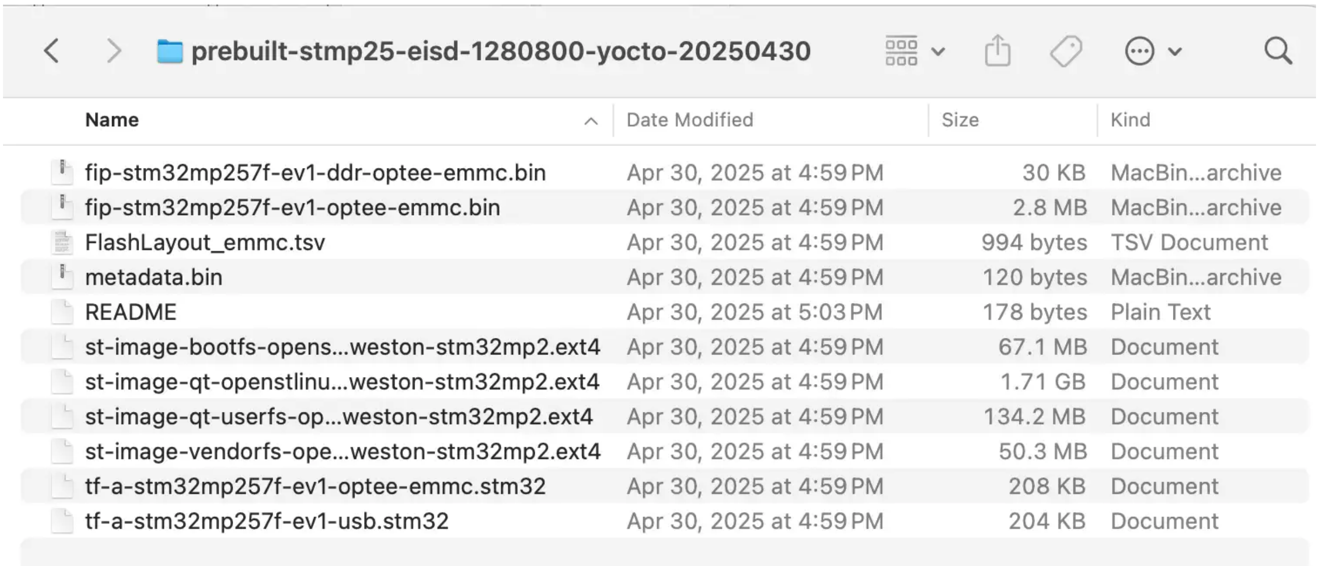
Prepare For Flashing

You need to prepare the following:

- A USB-C cable (at least one side is USB Type C)
- Chipsee prebuilt image for STM32MP257F products.
- A Windows/Linux/MacOS workstation.
- Download and install **STM32CubeProgrammer** from ST: https://www.st.com/en/development-tools/stm32cubeprog.html

Start Flashing

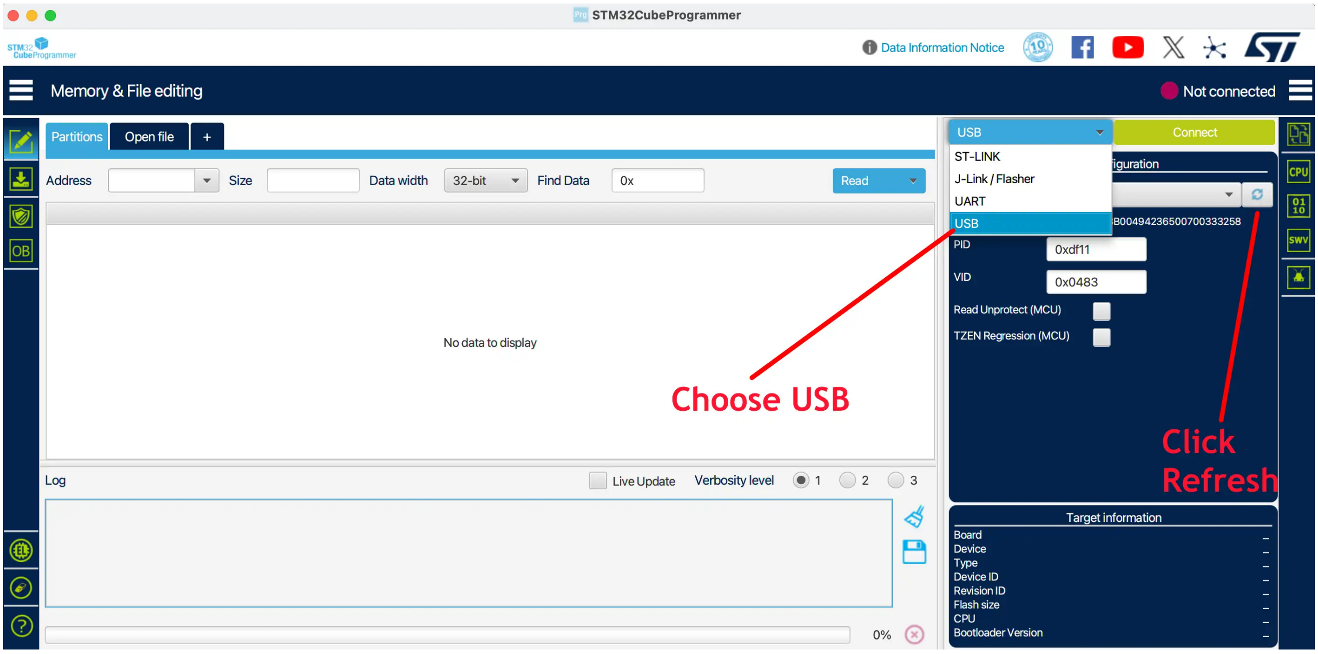
1. Poweroff the device (unplug the power supply).
2. Connect the USB-C cable, between the USB-C port on the device and your workstation.
3. Push and hold the PROG button (the small round button beside Ethernet port), in the meantime, power on the device, for around 5 seconds. You should see the green LED beside the PROG button is on, and the screen is black.
4. Decompress the Chipsee prebuilt firmware image, you should see a bunch of files:



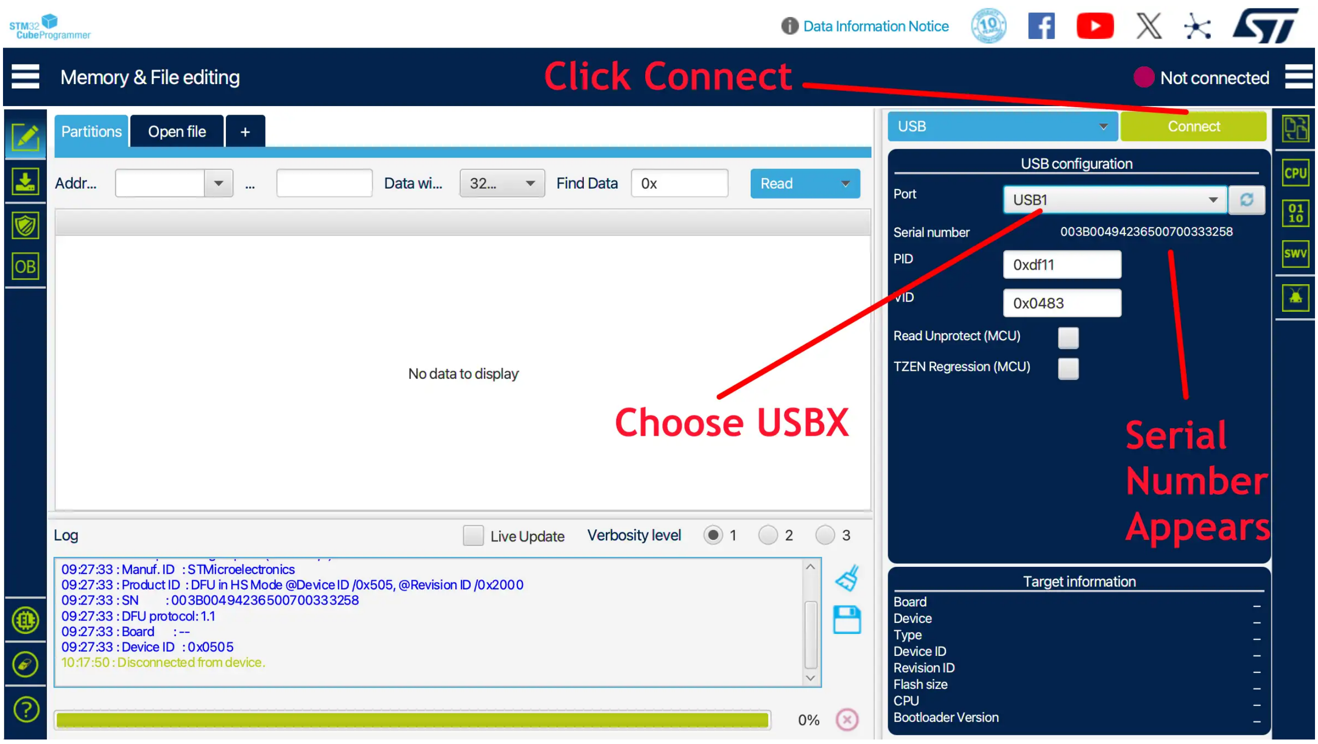
Decompress the Prebuilt Firmware Image

Flashing with GUI

1. Open STM32CubeProgrammer, choose **USB**, click the **refresh** button like the image below, then select **USBX** (USB1 in the image), you should see a serial number appear, then click **Connect**.

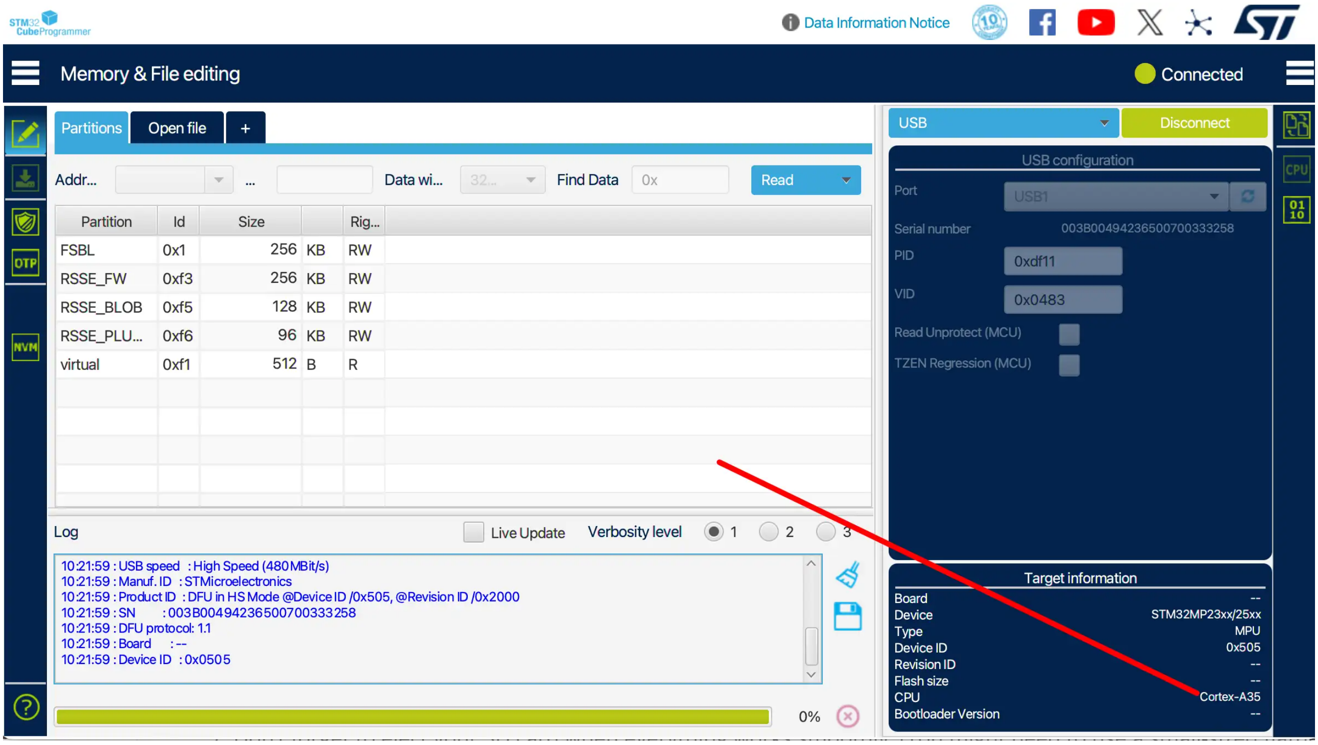


Connect by USB



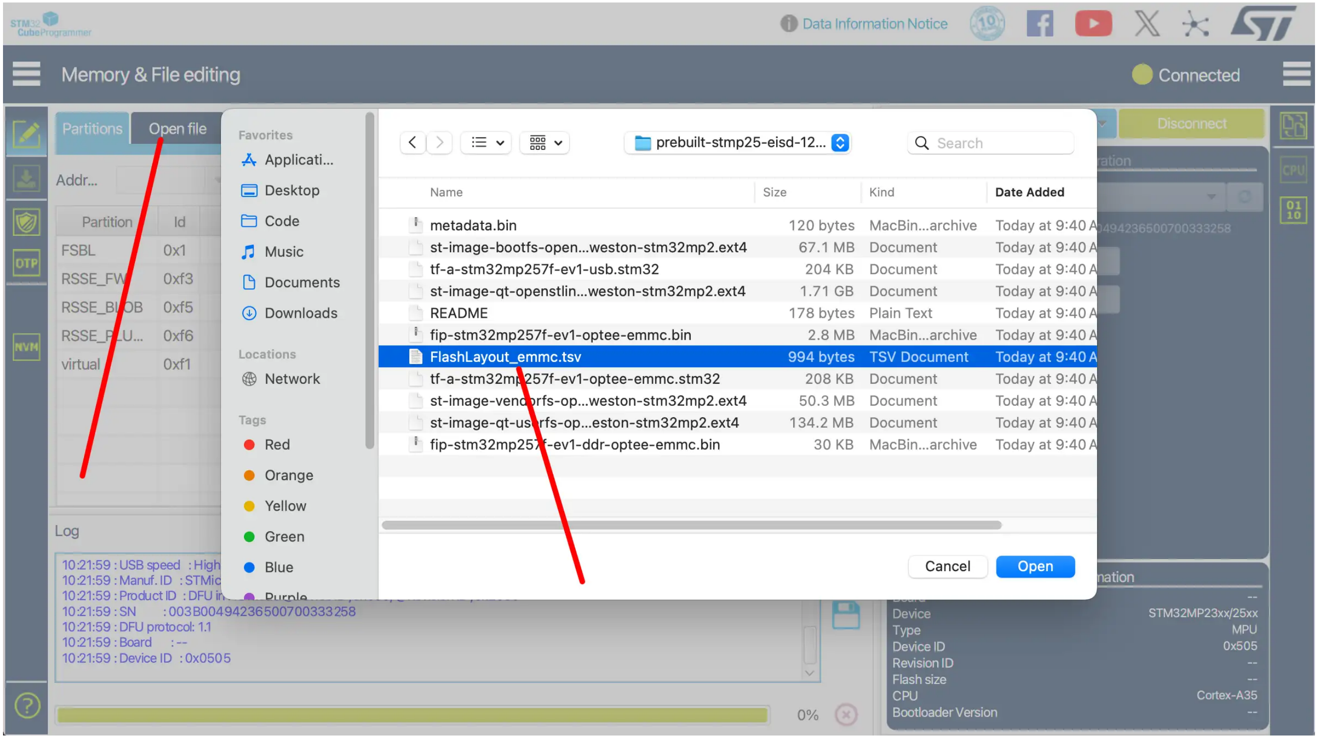
Choose USBX and Connect

2. STM32CubeProgrammer should show A35 MPU detected.



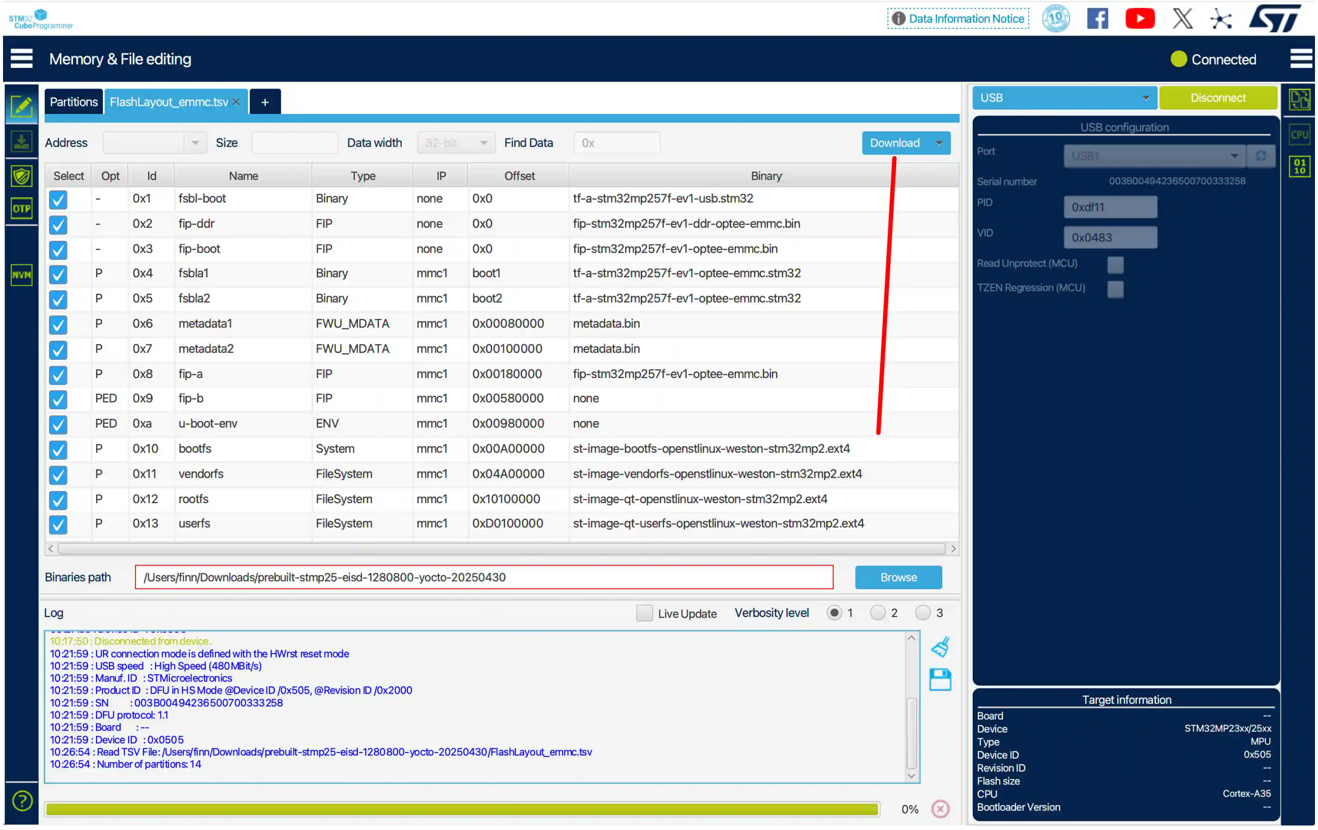
Displays A35 / STM32MP25 MPU

3. Click **Open File**, select **FlashLayout_emmc.tsv**:



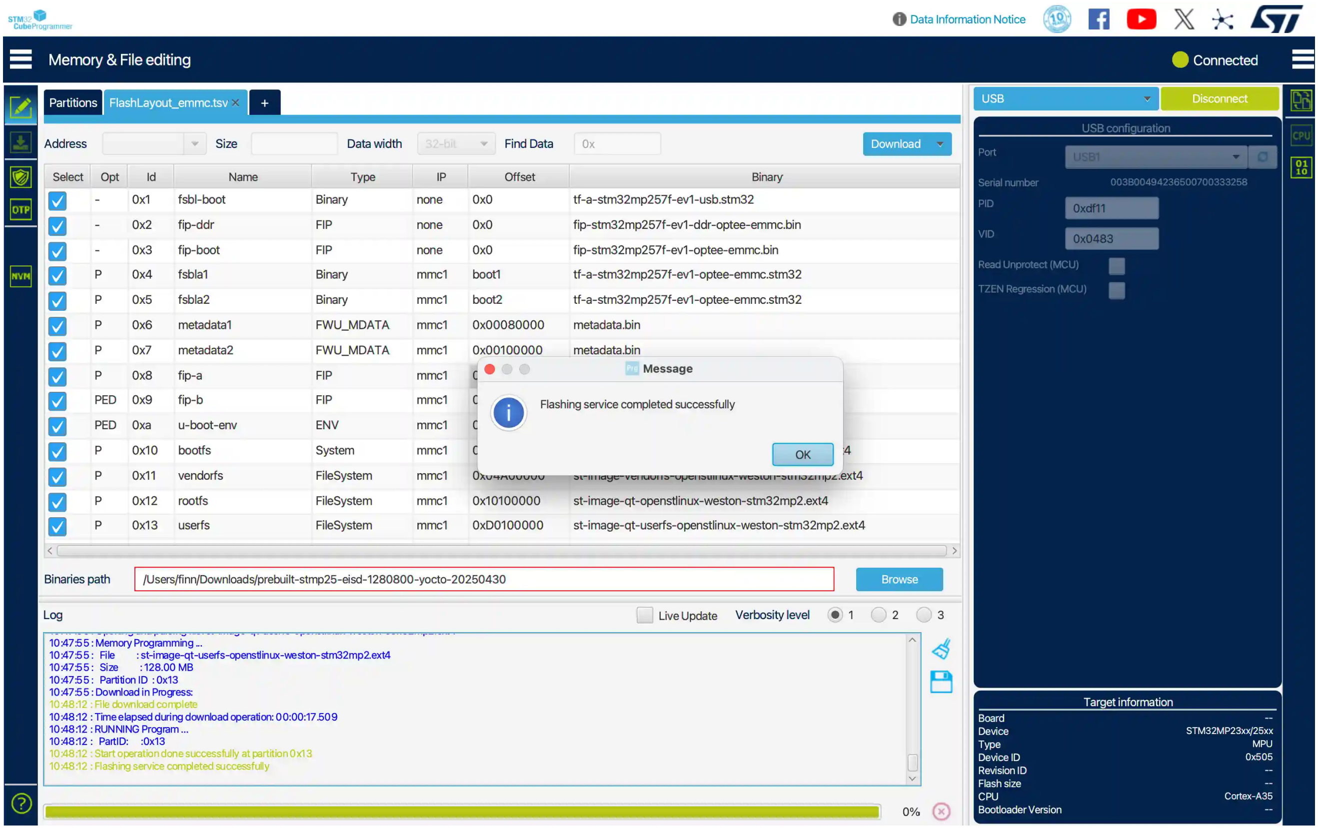
Select FlashLayout_emmc

4. You should see a bunch of partitions listed, click **Download** to start flashing OS image.



Start Downloading

5. Your screen will turn white background with some scrolling texts. After around 5 minutes, flashing should be finished.



Finish Downloading

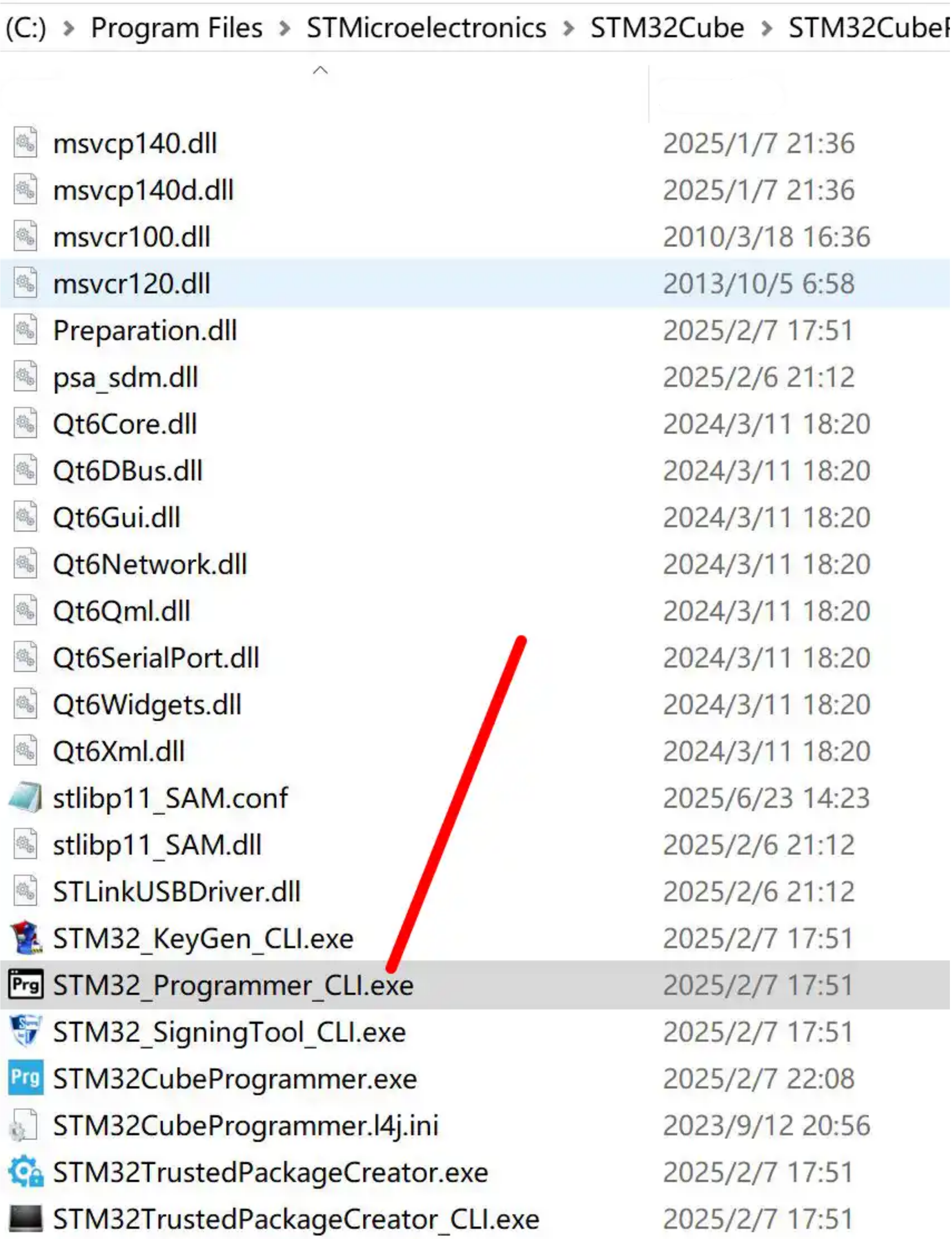
6. Now you can reboot the device, click **Disconnect** first, then unplug/plug the power supply to reboot the device, the system will boot from eMMC automatically.

Flashing with CLI on Windows

You can use Windows **PowerShell** to run the **STM32_Programmer_CLI** program.

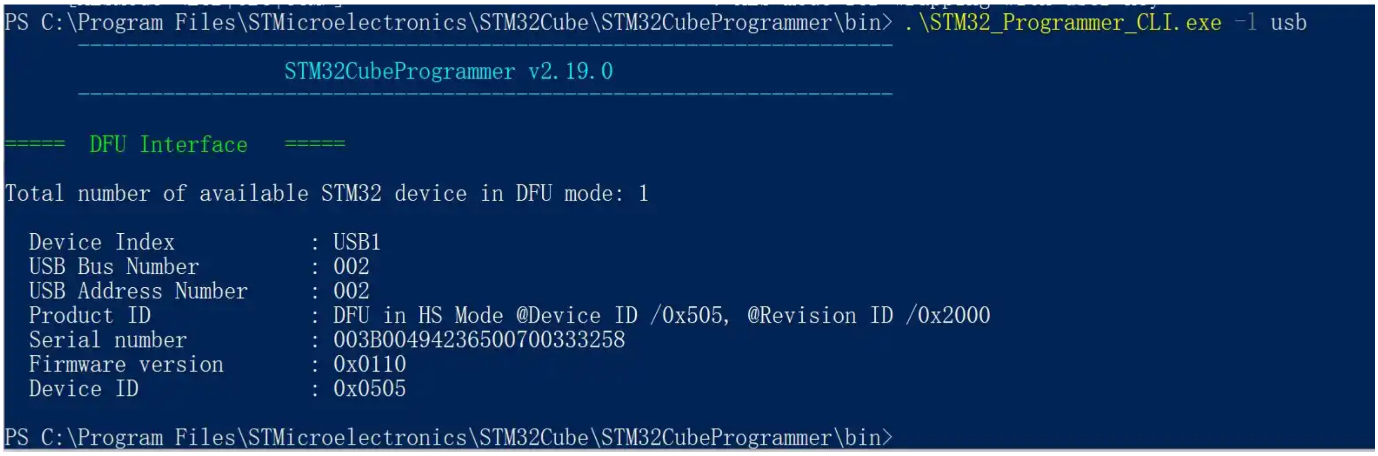
```
# In PowerShell
# Change the dir to where you install the STM32CubeProgrammer
cd 'C:\Program Files\STMicroelectronics\STM32Cube\STM32CubeProgrammer\bin'

# Check STM32_Programmer_CLI is available:
.\STM32_Programmer_CLI.exe -h
```



Check STM32_Programmer_CLI is Available

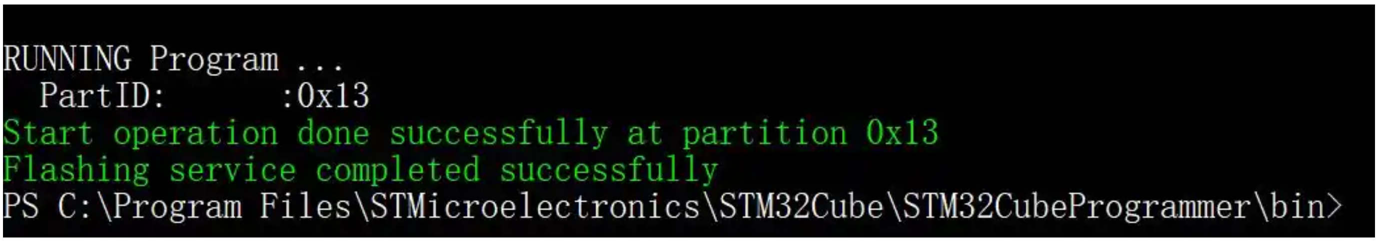
```
# Check ST device USB index:
.\STM32_Programmer_CLI.exe -l usb
# USB1 is what we need in the next step
```



Check Device USB Index (USB1 Here)

```
# Start flashing
# Remember to change the path to where you extracted the Chipsee prebuilt OS
firmware image's "FlashLayout_emmc.tsv"
# Change usb1 to what you got in the previous USB Index step
.\STM32_Programmer_CLI.exe -c port=usb1 -w your-path-to\prebuilt-stmp25-
eisd-1280800-yocto\FlashLayout_emmc.tsv
```

The flashing should be finished in a couple of minutes.



Finished Flashing

Now you can reboot the device, unplug/plug the power supply to reboot the device, the system will boot from eMMC automatically.

Flashing with CLI on MacOS

```
# The CLI program is in the Contents of STM32CubeProgrammer.app, export the
binary:
export PATH="/Applications/STMicroelectronics/STM32Cube/STM32CubeProgrammer/
STM32CubeProgrammer.app/Contents/MacOs/bin:$PATH"
cd prebuilt-stmp25-eisd-1280800-yocto
# Check STM32_Programmer_CLI is available:
STM32_Programmer_CLI -h
```

```
→ prebuilt-stmp25-eisd-1280800-yocto-20250430 STM32_Programmer_CLI -h
      -------------------------------------------------------------------
                        STM32CubeProgrammer v2.19.0
      -------------------------------------------------------------------


Usage :
STM32_Programmer_CLI.exe [command_1] [Arguments_1][[command_2] [Arguments_2]...]

Generic commands:

 -?, -h, --help          : Show this help
 -c,     --connect       : Establish connection to the device
     <port=<PortName>    : Interface identifier. ex COM1, /dev/ttyS0, usb1,
                           JTAG, SWD, JLINK...)
    USB port optional parameters:
     [sn=<serialNumber>]    : Serial number of the usb dfu
     [PID=<Product ID>]     : Product ID. ex: 0xA38F, etc, default 0xDF11
     [VID=<Vendor ID>]      : Vendor ID. ex: 0x0389, etc, default x0483
```

Check STM32_Programmer_CLI is Available

```
# Check ST device USB index:
STM32_Programmer_CLI -l usb
# USB1 is what we need in the next step
```

```
→ prebuilt-stmp25-eisd-1280800-yocto-20250430 STM32_Programmer_CLI -l usb
      -------------------------------------------------------------------
                        STM32CubeProgrammer v2.19.0
      -------------------------------------------------------------------

=====  DFU Interface   =====

Total number of available STM32 device in DFU mode: 1

  Device Index           : USB1
  USB Bus Number         : 003
  USB Address Number     : 001
  Product ID             : DFU in HS Mode @Device ID /0x505, @Revision ID /0x2000
  Serial number          : 003B00494236500700333258
  Firmware version       : 0x0110
  Device ID              : 0x0505
```

Check Device USB Index (USB1 Here)

```
# Start flashing
# Change usb1 to what you got in the previous USB Index step

STM32_Programmer_CLI -c port=usb1 -w ./FlashLayout_emmc.tsv
```

```
➜  prebuilt-stmp25-eisd-1280800-yocto-20250430 STM32_Programmer_CLI -c port=usb1 -w ./FlashLayout_emmc.tsv
      -------------------------------------------------------------------
                        STM32CubeProgrammer v2.19.0
      -------------------------------------------------------------------



USB speed   : High Speed (480MBit/s)
Manuf. ID   : STMicroelectronics
Product ID  : DFU in HS Mode @Device ID /0x505, @Revision ID /0x2000
SN          : 003B00494236500700333258
DFU protocol: 1.1
Board       : --
Device ID   : 0x0505
Device name : STM32MP23xx/25xx
Device type : MPU
Revision ID : --
Device CPU  : Cortex-A35

Start Embedded Flashing service

Opening and parsing file: tf-a-stm32mp257f-ev1-usb.stm32


Memory Programming ...
  File          : tf-a-stm32mp257f-ev1-usb.stm32
  Size          : 198.86 KB
  Partition ID  : 0x01

Download in Progress:
[==================================================] 100%

File download complete
Time elapsed during download operation: 00:00:01.587

RUNNING Program ...
  PartID:      :0x01

Reconnecting the device ...

USB speed   : High Speed (480MBit/s)
Manuf. ID   : STMicroelectronics
```

Started Flashing

```
File download complete
Time elapsed during download operation: 00:03:41.476

RUNNING Program ...
  PartID:      :0x12
Start operation done successfully at partition 0x12
Opening and parsing file: st-image-qt-userfs-openstlinux-weston-stm32mp2.ext4


Memory Programming ...
  File          : st-image-qt-userfs-openstlinux-weston-stm32mp2.ext4
  Size          : 128.00 MB
  Partition ID  : 0x13

Download in Progress:
[==================================================] 100%

File download complete
Time elapsed during download operation: 00:00:16.552

RUNNING Program ...
  PartID:      :0x13
Start operation done successfully at partition 0x13
Flashing service completed successfully
➜  prebuilt-stmp25-eisd-1280800-yocto-20250430
```

Finished Flashing

Now you can reboot the device, unplug/plug the power supply to reboot the device, the system will boot from eMMC automatically.

Flashing with CLI on Linux

```
cd ~/STMicroelectronics/STM32Cube/STM32CubeProgrammer/bin/
# Check STM32_Programmer_CLI is available:
sudo ./STM32_Programmer_CLI -h
```

```
finn@ubuntu24:~/STMicroelectronics/STM32Cube/STM32CubeProgrammer/bin$ ls
DA_Default_Config  FlashLoader    libssl.so            platforms                 STM32CubeProgrammerLauncher
DA_OBkeyGen_xml    HSM            libstp11_SAM.so      PMIC_Data_Base            STM32_KeyGen_CLI
ExternalLoader     jre            libstp11_SAM.so.conf STM32CubeProgrammer       STM32_Programmer_CLI
FastROM_Data_Base  libcrypto.so   OBL                  STM32CubeProgrammer.l4j.ini STM32_Programmer.sh
finn@ubuntu24:~/STMicroelectronics/STM32Cube/STM32CubeProgrammer/bin$ STM32_Programmer_CLI -h
      -------------------------------------------------------------------
                        STM32CubeProgrammer v2.19.0
      -------------------------------------------------------------------


Usage :
STM32_Programmer_CLI.exe [command_1] [Arguments_1][[command_2] [Arguments_2]...]
```

Check STM32_Programmer_CLI is Available

```
# Check ST device USB index:
sudo ./STM32_Programmer_CLI -l usb
# USB1 is what we need in the next step
```

```
finn@ubuntu24:~/STMicroelectronics/STM32Cube/STM32CubeProgrammer/bin$ sudo ./STM32_Programmer_CLI -l usb
      -------------------------------------------------------------------
                        STM32CubeProgrammer v2.19.0
      -------------------------------------------------------------------

=====  DFU Interface   =====

Total number of available STM32 device in DFU mode: 1

  Device Index           : USB1
  USB Bus Number         : 005
  USB Address Number     : 002
  Product ID             : DFU in HS Mode @Device ID /0x505, @Revision ID /0x2000
  Serial number          : 003B00494236500700333258
  Firmware version       : 0x0110
  Device ID              : 0x0505

finn@ubuntu24:~/STMicroelectronics/STM32Cube/STM32CubeProgrammer/bin$
```

Check Device USB Index (USB1 Here)

```
# Start flashing
# Remember to change the path to where you extracted the Chipsee prebuilt OS
firmware image's "FlashLayout_emmc.tsv"
# Change usb1 to what you got in the previous USB Index step
sudo ./STM32_Programmer_CLI -c port=usb1 -w your-path-to/prebuilt-stmp25-
eisd-1280800-yocto/FlashLayout_emmc.tsv
```

```
finn@ubuntu24:~/STMicroelectronics/STM32Cube/STM32CubeProgrammer/bin$ sudo ./STM32_Programmer_CLI -c port=usb1 -w /home/finn/Downloads/prebuilt-stmp25-eisd-1280800-yocto-20250430/Flash
Layout_emmc.tsv
      -------------------------------------------------------------------
                        STM32CubeProgrammer v2.19.0
      -------------------------------------------------------------------



USB speed    : High Speed (480MBit/s)
Manuf. ID    : STMicroelectronics
Product ID   : DFU in HS Mode @Device ID /0x505, @Revision ID /0x2000
SN           : 003B00494236500700333258
DFU protocol: 1.1
Board        : --
Device ID    : 0x0505
Device name : STM32MP23xx/25xx
Device type : MPU
Revision ID : --
Device CPU   : Cortex-A35

Start Embedded Flashing service

Opening and parsing file: tf-a-stm32mp257f-ev1-usb.stm32
```

Started Flashing

```
File download complete
Time elapsed during download operation: 00:00:56.152

RUNNING Program ...
  PartID:      :0x13
Start operation done successfully at partition 0x13
Flashing service completed successfully
finn@ubuntu24:~/STMicroelectronics/STM32Cube/STM32CubeProgrammer/bin$
```

Finished Flashing

Now you can reboot the device, unplug/plug the power supply to reboot the device, the system will boot from eMMC automatically.

Backup OS Image

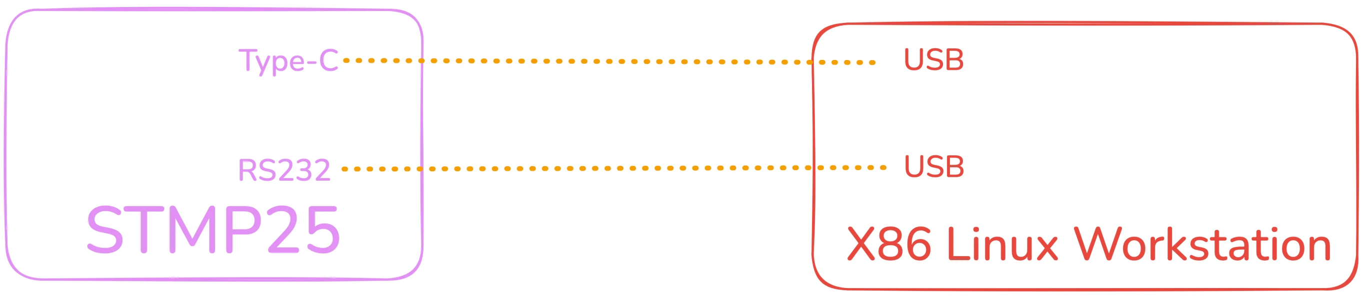
You can backup your OS image to clone it to other machines, in another word, after you've finished developing your software on one machine, you may want to copy everything of this machine to multiple other machines.

This chapter tells you how to backup your OS image and generate a prebuilt image file, then you can flash it to your other machines. Just like the prebuilt image we provide you when the product ships to you, except that now it is your own image with your configurations.

Prepare

1. Chipsee STMP25 device
2. A X86/X86_64 Linux Host PC, such as a Ubuntu system
3. A Type-C cable used to connect STMP25 and the Linux Host PC
4. USB to RS232 debug cable

Wire your cables like:



Wire the RS232 Cable and the Type-C Cable

You can refer to "Connect From Serial Port" section to connect the RS232 debug port, and **initiate the serial connection**.

Enter Uboot

While the product boots, press any key on your workstation to let the product enter uboot. You can hit any key 5~10 times while the system boots until you see the prompt:

```
I/TC: Platform stm32mp2: flavor PLATFORM_FLAVOR - DT stm32mp257f-ev1.dts
I/TC: OP-TEE ST profile: secure_and_system_services
I/TC: DTB enables console (non-secure)
[     0.000000] SCP-firmware 3.19.0-dev
[     0.000000]
[     0.000000] [FWK] Module initialization complete!
I/TC: Primary CPU switching to normal world boot
INFO:    BL31: Preparing for EL3 exit to normal world
INFO:    Entry point address = 0x84000000
INFO:    SPSR = 0x3c5


U-Boot 2022.10-stm32mp-r2 (Oct 03 2022 - 19:25:32 +0000)

CPU: STM32MP257FAI Rev.Y
Model: STMicroelectronics STM32MP257F-EV1 Evaluation Board
Board: stm32mp2 (st,stm32mp257f-ev1)
DRAM:  4 GiB
optee optee: OP-TEE: revision 3.19 (afacf356)
Core:  418 devices, 39 uclasses, devicetree: board
WDT:   Started watchdog with servicing (32s timeout)
NAND:  0 MiB
MMC:   STM32 SD/MMC: 0, STM32 SD/MMC: 1
Loading Environment from MMC... OK
In:    serial
Out:   serial
Err:   serial
invalid MAC address 0 in OTP 00:00:00:00:00:00
Net:
Error: eth1@482c0000 address not set.
No ethernet found.

MMC: no card present
No EFI system partition

Error: eth1@482c0000 address not set.
Hit any key to stop autoboot:  0
STM32MP>
STM32MP>
STM32MP>
```

Hit Any Key (Like Enter) While Booting

Now the screen should be all white.

Then let the eMMC be mounted as a USB mass storage by your workstation:

```
STM32MP>
STM32MP> ums 0 mmc 1
```

```
STM32MP>
STM32MP> ums 0 mmc 1
UMS: LUN 0, dev mmc 1, hwpart 0, sector 0x0, count 0x1d1f000
dwc3-generic-wrapper usb@48300000: configured in usb2 mode
\
```

Mount eMMC as USB Mass Storage to Workstation

Then you can find your workstation now has a few more partitions:

```
finn@ubuntu24:~$ ls -l /dev/disk/by-partlabel/
total 0
lrwxrwxrwx 1 root root 15 Jun 21  2025 'Basic\x20data\x20partition' -> ../../nvme0n1p3
lrwxrwxrwx 1 root root 15 Jun 21  2025 'EFI\x20system\x20partition' -> ../../nvme0n1p1
lrwxrwxrwx 1 root root 15 Jun 21  2025 'Microsoft\x20reserved\x20partition' -> ../../nvme0n1p2
```

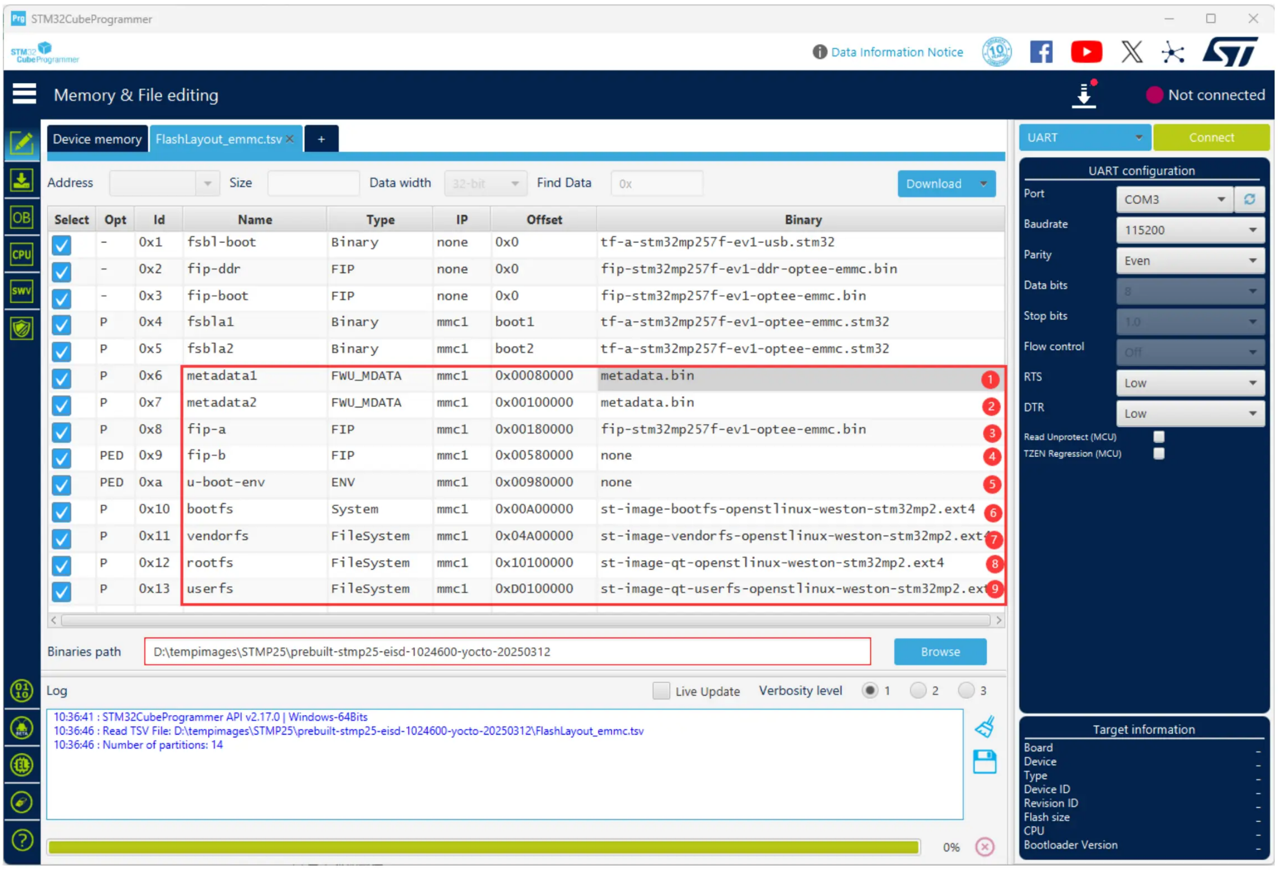
Before ums 0 mmc 1

```
finn@ubuntu24:~$ ls -l /dev/disk/by-partlabel/
total 0
lrwxrwxrwx 1 root root 15 Jun 21  2025 'Basic\x20data\x20partition' -> ../../nvme0n1p3
lrwxrwxrwx 1 root root 10 Jun 21 10:47  bootfs -> ../../sdb6
lrwxrwxrwx 1 root root 15 Jun 21  2025 'EFI\x20system\x20partition' -> ../../nvme0n1p1
lrwxrwxrwx 1 root root 10 Jun 21 10:47  fip-a -> ../../sdb3
lrwxrwxrwx 1 root root 10 Jun 21 10:47  fip-b -> ../../sdb4
lrwxrwxrwx 1 root root 10 Jun 21 10:47  metadata1 -> ../../sdb1
lrwxrwxrwx 1 root root 10 Jun 21 10:47  metadata2 -> ../../sdb2
lrwxrwxrwx 1 root root 15 Jun 21  2025 'Microsoft\x20reserved\x20partition' -> ../../nvme0n1p2
lrwxrwxrwx 1 root root 10 Jun 21 10:47  rootfs -> ../../sdb8
lrwxrwxrwx 1 root root 10 Jun 21 10:47  u-boot-env -> ../../sdb5
lrwxrwxrwx 1 root root 10 Jun 21 10:47  userfs -> ../../sdb9
lrwxrwxrwx 1 root root 10 Jun 21 10:47  vendorfs -> ../../sdb7
```

After ums 0 mmc 1

```
finn@ubuntu24:~$ ls -l /dev/disk/by-partlabel/
total 0
# lrwxrwxrwx 1 root root 15 Jun 21  2025 'Basic\x20data\x20partition' -> ../../nvme0n1p3
# lrwxrwxrwx 1 root root 15 Jun 21  2025 'EFI\x20system\x20partition' -> ../../nvme0n1p1
# lrwxrwxrwx 1 root root 15 Jun 21  2025 'Microsoft\x20reserved\x20partition' -> ../../nvme0n1p2
lrwxrwxrwx 1 root root 10 Jun 21 10:47  metadata1 -> ../../sdb1
lrwxrwxrwx 1 root root 10 Jun 21 10:47  metadata2 -> ../../sdb2
lrwxrwxrwx 1 root root 10 Jun 21 10:47  fip-a -> ../../sdb3
lrwxrwxrwx 1 root root 10 Jun 21 10:47  fip-b -> ../../sdb4
lrwxrwxrwx 1 root root 10 Jun 21 10:47  u-boot-env -> ../../sdb5
lrwxrwxrwx 1 root root 10 Jun 21 10:47  bootfs -> ../../sdb6
lrwxrwxrwx 1 root root 10 Jun 21 10:47  vendorfs -> ../../sdb7
lrwxrwxrwx 1 root root 10 Jun 21 10:47  rootfs -> ../../sdb8
lrwxrwxrwx 1 root root 10 Jun 21 10:47  userfs -> ../../sdb9
```

These **sdbx** corespond to the names of the prebuilt image:



Prebuilt Image Layout eMMC (for Reference)

User's data and configuration are in these four partitions, so we need to replace Chipsee's prebuilt OS image's data with your data:

Partition	File in Prebuilt-xxx
bootfs	st-image-bootfs-openstlinux-weston-stm32mp2.ext4
vendorfs	st-image-vendorfs-openstlinux-weston-stm32mp2.ext4
rootfs	st-image-qt-openstlinux-weston-stm32mp2.ext4
userfs	st-image-qt-userfs-openstlinux-weston-stm32mp2.ext4

User Data Partitions

mk-image.sh

We have a bash script called **mk-image.sh** to aid you copy the partitions to your workstation PC.

For example, if your ST product's eMMC is mounted as **/dev/sdb** (like the example above), your can backup **userfs** with:

```
# on your X86 Linux workstation
mkdir STMP25-Backup
cd STMP25-Backup
wget -c https://chipsee-tmp.s3.amazonaws.com/mksdcardfiles/STMP25/Tools/mk-
```

```
image.sh
./mk-image.sh userfs /dev/sdb # change /dev/sdb to YOUR /dev/sdX path
```

```
finn@ubuntu24:~/STMP25-Backup$ wget -c https://chipsee-tmp.s3.amazonaws.com/mksdcardfiles/STMP25/Tools/mk-image.sh
--2025-06-21 13:22:35--  https://chipsee-tmp.s3.amazonaws.com/mksdcardfiles/STMP25/Tools/mk-image.sh
Resolving chipsee-tmp.s3.amazonaws.com (chipsee-tmp.s3.amazonaws.com)... 198.18.14.22
Connecting to chipsee-tmp.s3.amazonaws.com (chipsee-tmp.s3.amazonaws.com)|198.18.14.22|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 2437 (2.4K) [text/x-sh]
Saving to: 'mk-image.sh'

mk-image.sh                   100%[=====================================================>]   2.38K  --.-KB/s


2025-06-21 13:22:37 (121 MB/s) - 'mk-image.sh' saved [2437/2437]

finn@ubuntu24:~/STMP25-Backup$ ./mk-image.sh userfs /dev/sdb
-bash: ./mk-image.sh: Permission denied
finn@ubuntu24:~/STMP25-Backup$ sudo ./mk-image.sh userfs /dev/sdb
[sudo] password for finn:
sudo: ./mk-image.sh: command not found
finn@ubuntu24:~/STMP25-Backup$ ls
mk-image.sh
finn@ubuntu24:~/STMP25-Backup$ chmod +x mk-image.sh
finn@ubuntu24:~/STMP25-Backup$ sudo ./mk-image.sh userfs /dev/sdb
Arguments 'userfs' and '/dev/sdb' are valid, proceeding...
Making rootfs!
0+0 records in
0+0 records out
0 bytes copied, 4.8962e-05 s, 0.0 kB/s
mke2fs 1.47.0 (5-Feb-2023)
Discarding device blocks: done
Creating filesystem with 22528 4k blocks and 22528 inodes

Allocating group tables: done
Writing inode tables: done
Creating journal (1024 blocks): done
Copying files into the device: done
Writing superblocks and filesystem accounting information: done

Rootfs Image: st-image-qt-userfs-openstlinux-weston-stm32mp2.ext4
Clean..
Clean done!
finn@ubuntu24:~/STMP25-Backup$ ls
mk-image.sh  st-image-qt-userfs-openstlinux-weston-stm32mp2.ext4
finn@ubuntu24:~/STMP25-Backup$
```

Example: Backup userfs

Then you can replace the userfs of the Chipsee prebuilt image with this one you get just now.

To backup other partitions other than userfs:

```
finn@ubuntu24:~/STMP25-Backup$ sudo ./mk-image.sh -h
Error: Two arguments are required!
Usage: ./mk-image.sh [bootfs|vendorfs|rootfs|userfs] [block_device]
Example: ./mk-image.sh rootfs /dev/sdd

# E.g:
# Change /dev/sdX to YOUR mount point
./mk-image.sh userfs /dev/sdX
./mk-image.sh vendorfs /dev/sdX
./mk-image.sh rootfs /dev/sdX
./mk-image.sh userfs /dev/sdX
```

And now you can replace the ones you need to the Chipsee prebuilt OS image, to generate your own backup OS image.

Exit

After you have finished backup the partitions, you can exit ST device's Uboot mode with:

```
Ctrl+C # stop mounting eMMC as USB mass storage
reset # reboot the device
Ctrl+A followed by "K" # close the serial connection of screen program
```

FAQ

1. How to set timezone?

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

# OR

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

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