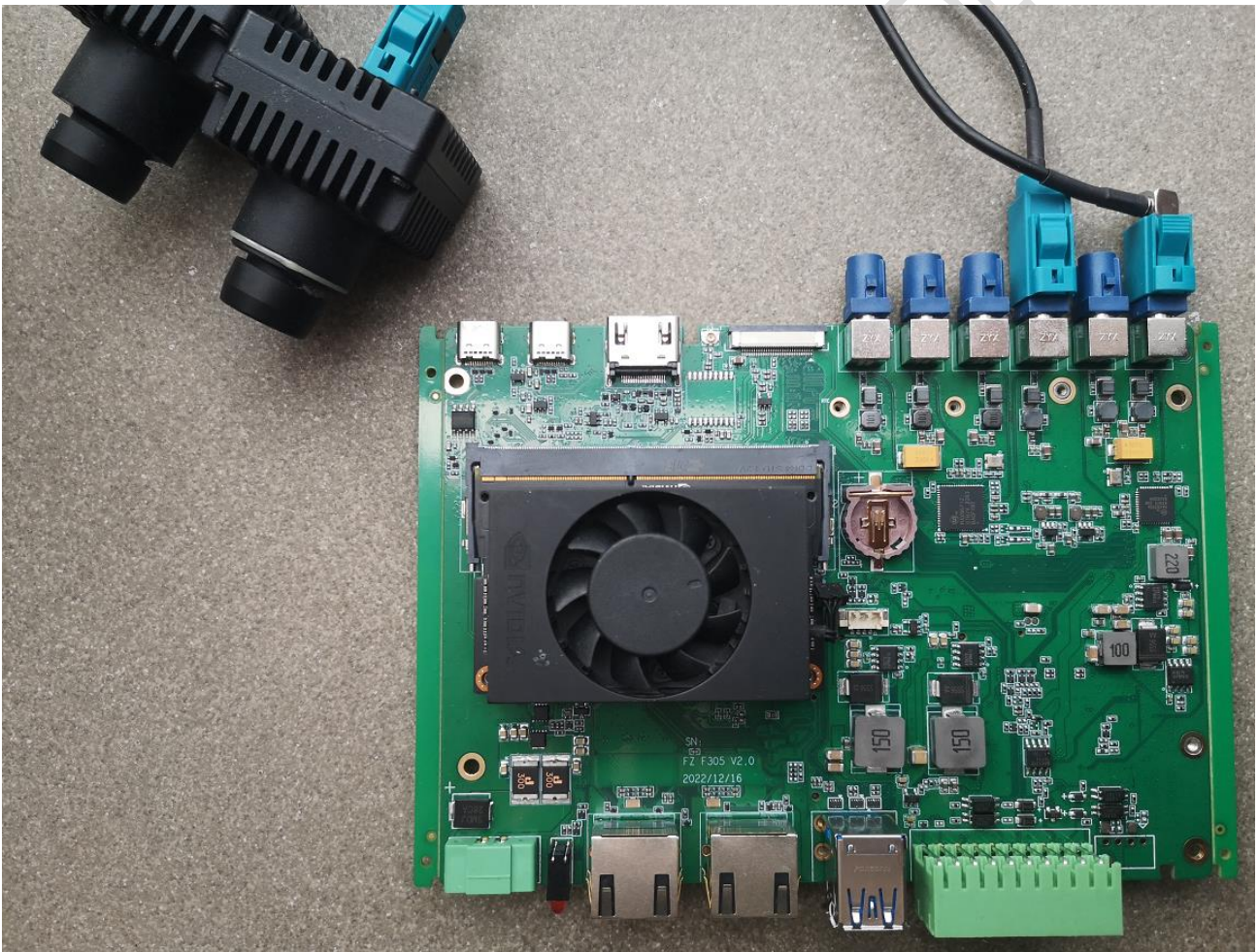




Fangzhu Technology(Shenzhen) Co.,Ltd.

F305 Carrier board user manual

CONFIDENTIAL



Fangzhu Technology (ShenZhen) Co. Ltd

Table of contents

Document Revision Table of Contents	1
FZ-F305 brief introduction.....	4
FZ-F305 specifications.....	5
FZ-F305 interfaces	7
Front interfaces	7
Back interfaces	8
Side view interface.....	9
FZ-F305 Application Description	10
Network port application	10
GMSL camera application.....	12
GMSL Quick Verification and Reference Code.....	12
5G applicatoin	15
WIFI application	16
20Pin Multifunctional interface	16
FAN.....	19
TF card application.....	19
M.2 SSD Solid State Drive Applications	19
NVIDIA JetPack SDK Installation	25

Document Revision Table of Contents

Document version

Version	Date	Content
V1.0	2023/01/10	Initial Release

Fangzhu Technology CONFIDENTIAL

Perface

Before using this manual, please read the following license agreement carefully. Only when you agree to the following license agreement can you use the products introduced in this manual.

Copyright Notice

Fangzhu Technology (Shenzhen) Co., Ltd. reserves the right of final interpretation and modification of this document and this statement. Any text descriptions, document formats, illustrations, photos, methods, processes, etc. appearing in this document, unless otherwise specified, its copyright or other related rights belong to Fangzhu Technology (Shenzhen) Co., Ltd. Without the written consent of Fangzhu Technology (Shenzhen) Co., Ltd., no one may reproduce, extract, back up, modify, disseminate, translate into other languages, or use all or part of this manual in any way or form. business use.

Disclaimer

This document is based on current information and its content is subject to change without prior notice. Fangzhu Technology (Shenzhen) Co., Ltd. has tried its best to ensure that the content of this document is accurate and reliable when writing this document. However, Fangzhu Technology (Shenzhen) Co., Ltd. is not responsible for the losses and damages caused by omissions, inaccuracies, or errors in this document. Take responsibility.

Technical Support

If you encounter problems when using our products, or you think our products have certain functional defects, you can visit the company website: www.fangzhutech.com to contact our customer service, and we will solve the problems and provide feedback for you; or if you need technical support Support guidance and have any valuable comments, please also contact us through the company website or telephone.

Warranty

Warranty period: The warranty period of Fangzhu Technology equipment is one year from the date of purchase. Warranty regulations: If the product fails due to non-human damage during the warranty period, Fangzhu Technology will provide free warranty. Please contact the purchase platform customer service or telephone to obtain warranty assistance (for details, please refer to the warranty regulations of Fangzhu Technology (Shenzhen) Co., Ltd.).

Fangzhu Technology (Shenzhen) Co., Ltd. Contact information:

Contact: Cyrus Xiao

Mobile: 18611588103

Website: www.fangzhutech.com

Address: Room 602, Runji Building, Baicai Technology Park, Xin'an Street, Bao'an District, Shenzhen, China

Safety Warnings and Precautions for Use

- Safety instructions

Before using this product, you must first read this document to have a preliminary knowledge and understanding of the product, and you must abide by the safety instructions in the manual of this product to ensure your personal safety and avoid damage to the equipment. If blind operation causes losses or Injury, the manufacturer is not responsible for any problems of equipment and personal life and property safety caused by its wrong operation

- Voltage

FG96-8CH GMSL camera adaptation supports input power: 12V DC; current: above 2A

- Environmental requirements

Working temperature: -20°C - 65°C

Ventilation requirements: There must be good ventilation conditions around the installation of the computing platform.

- Grounding requirements

The power supply of the power adapter must be well grounded. In special scenarios, a grounding screw must be installed to connect it to the earth.

- Static Protection 

Electronic components and circuits are very sensitive to electrostatic discharge. Although our company will design anti-static protection for the main interfaces on the board when designing circuit board products, it is difficult to implement anti-static safety protection for all components and circuits. It is therefore recommended to observe anti-static safety precautions when handling any circuit board assembly. Anti-static safety protection measures include, but are not limited to the following points:

- ◆ The box should be placed in an anti-static bag during transportation and storage, and the device should not be taken out until installation and deployment;
- ◆ Before the body touches the box, the static electricity stored in the body should be discharged: wear a discharge grounding wrist strap;
- ◆ Circuit boards can only be handled in anti-static safe areas (including anti-static floors, anti-static wrist strap workbench, anti-static work clothes, etc.);

Avoid moving this equipment in carpeted areas.

FZ-F305 brief introduction

FZ-F305 is a product designed for NVIDIA® Jetson Xavier/Orin NX™. The computing platform carrier designed with series modules is also compatible with accessing TX2-NX™、Nano™ SOM core module, F305 has rich interfaces, including 6-way GMSL interface (supporting GMSL2/1), 2-way Gigabit RJ-45, mini PCIe expandable 4G, M.2 Key-B can access 5G module, 2-way CAN bus, 2-way USB3.0 compatible 2.0, etc. It has ultra-long MTBF stable operation ability and is widely used in industries such as low-speed autonomous driving controllers, logistics, security, transportation, etc. The terminal product form is rich and can be applied to robots, drones, unmanned delivery vehicles, etc. Unmanned ships, intelligent law enforcement equipment, etc.

Overview of FZ-F305 edge computing Platform

- Embedded NVIDIA® Jetson Xavier/Orin NX™ (Compatible with TX2-NX™/ Nano™)
- Support M.2 KEY M 2280 (PCIe4 NVMe SSD or computing rod)
- Supports 6-way GMSL cameras (compatible with GMSL1 and GMSL2)
- Support M.2 KeyB extension interface for accessing 5G modules
- Supporting mini PCIe extension interface for accessing 4G modules
- Supporting dual gigabit RJ45 network interfaces
- Supports dual band WIFI with optional GPS support
- Support multiple interfaces (such as USB/serial/CAN/GPIO, etc.)
- Compatible with installing different versions of NVIDIA JetPack SDK

FZ-F305 specifications

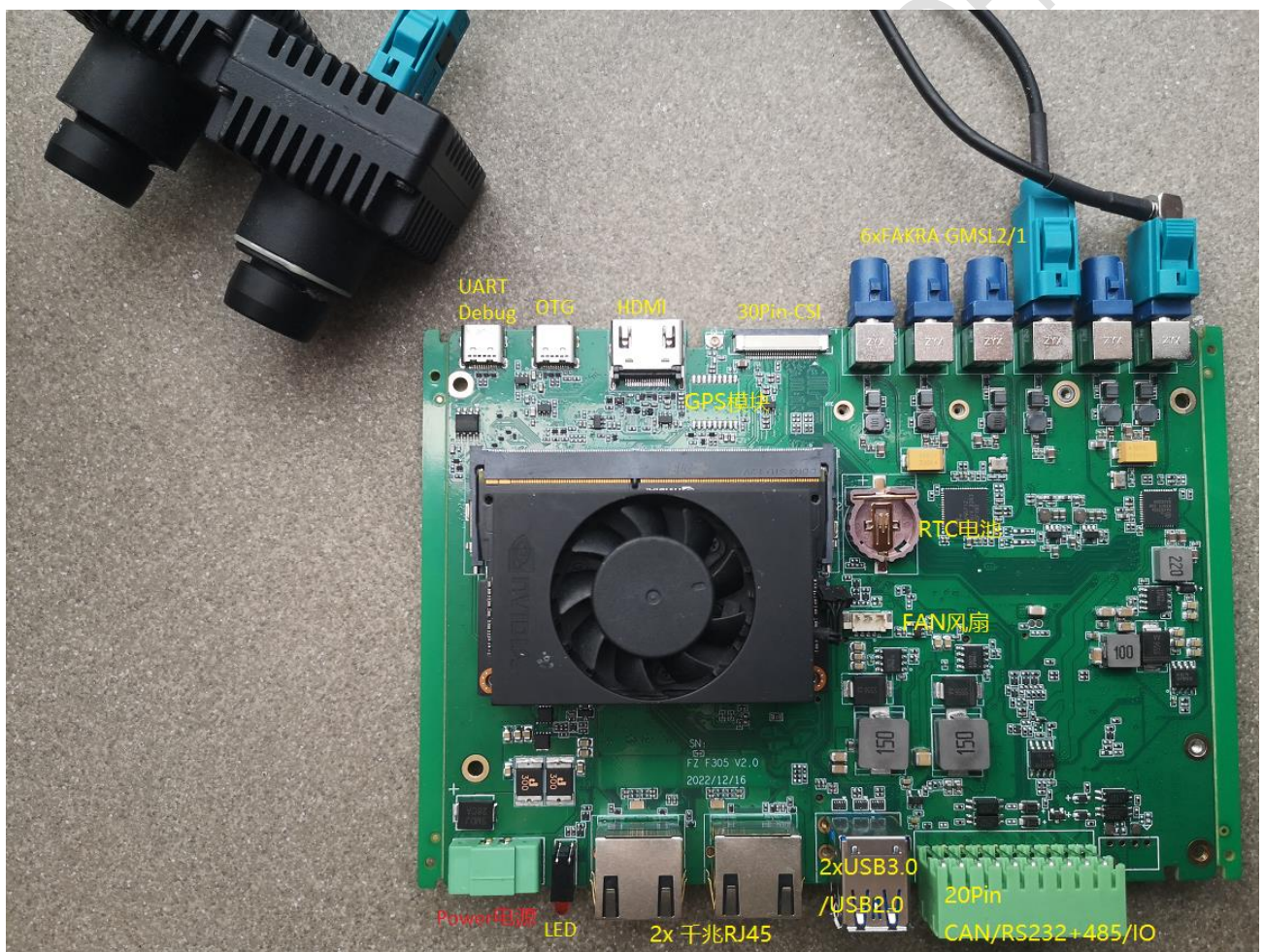
Fangzhu Technology - F305 Carrier Board Product Definition			
Type	Items	Description	Comment
SOM	processor	NVIDIA Jetson Xavier NX (21TOPS)	
		NVIDIA Jetson Orin NX (100TOPS)	
		NVIDIA Jetson TX2-NX/Nano	
	LPDDR	8GB/16GB LPDDR5	
HDD	Xavier NX built-in 16G eMMC 5.1 Orin NX no built-in eMMC can use SSD		
network interface	wired network	Supports 1x Gigabit RJ45	RJ45
		Supports 1x Gigabit RJ45	PCIe to network card
	WIFI	WIFI 2.4G/5GHz compatible with BT	Bilian: BL_M8822CU
	4G	Compatible with Quectel EC20(mini-PCIe)	USB2.0
	5G	Compatible with Quectel RM500U-CN(M.2 Key B)	USB3.0
	GNSS	L76K module support GPS/ Beidou - 2.0M Precision	UART(This module is not available by default)
functional interface	M.2	Support M.2-Key M SSD, length 2280	Support up to 1TB
	USB	2xUSB3.0 compatible with 2.0 TYPE-A 1xOTG USB2.0 TYPE-C (download) 1xUSB2.0 TYPE-C Debug (USB to UART Debug)	Each port supports USB 5V/1.5A, 2xUSB3.0 Hub RTS5411 The TYPE-C Debug interface can be connected to the computer to view device UART Debug information
	Camera	2 GMSL FAKRA (1 MAX9296)	Compatible with multiple serial devices such as GMSL2/GMSL1
		4 GMSL FAKRA (1 MAX96712)	Compatible with multiple serial devices such as GMSL2/GMSL1

	Supports a set of 4Lane CSI interfaces	30Pin ZIF connector	
20Pin Header	2xDI 3.3V TTL 2xDO 3.3V TTL 2x CAN_H/L (With isolation) 1x RS232 1x RS485 1x synchronization signal (input to GMSL)	2x10Pin 2mm Pitch	
TF card	TF card interface, does not support hot swapping	3.3V@1A (If Orin NX is used, this T card interface is not supported)	
RTC	1x RTC	3mAh 6.8mm X 2.1mm	
FAN	4-Pin fan connector	Support PWM regulation (original fan) 5V power supply	
display interface	HDMI2.0	horizontal type	
Buttons	Reset	Hardware reset button	
	Recover	For download mode	
LED	Power	Red indicator light	
	Status led	Green indicator light, providing API for control	
SIM card	Push-pull	side	
Power supply specifications	Power on	Power on and self start	Powered on by MCU control
	Power off	Does not support delayed shutdown after power outage	
	Power supply	12~30V DC	
	consumption	≤30W	Depending on the external device situation, there may be changes
Overall configuration	Size	Length * width * height	155x124x24.5mm
	radiating	Supports active cooling	Fully compatible with NX kit fans
Temperature and humidity	Working temperature	-20°C ~ +65°C	

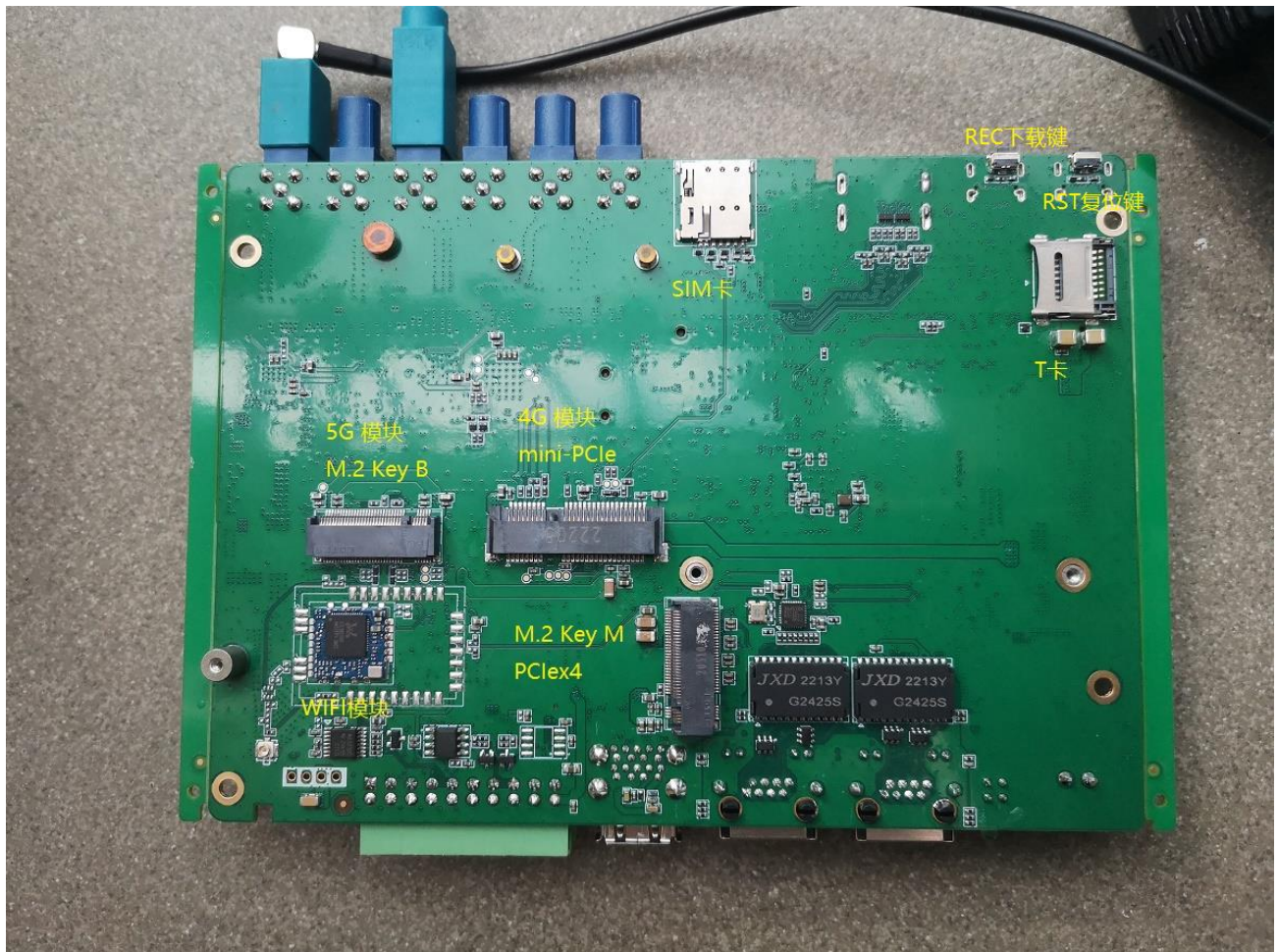
storage temperature	-40°C ~ +85°C	
Working humidity		

FZ-F305 interfaces

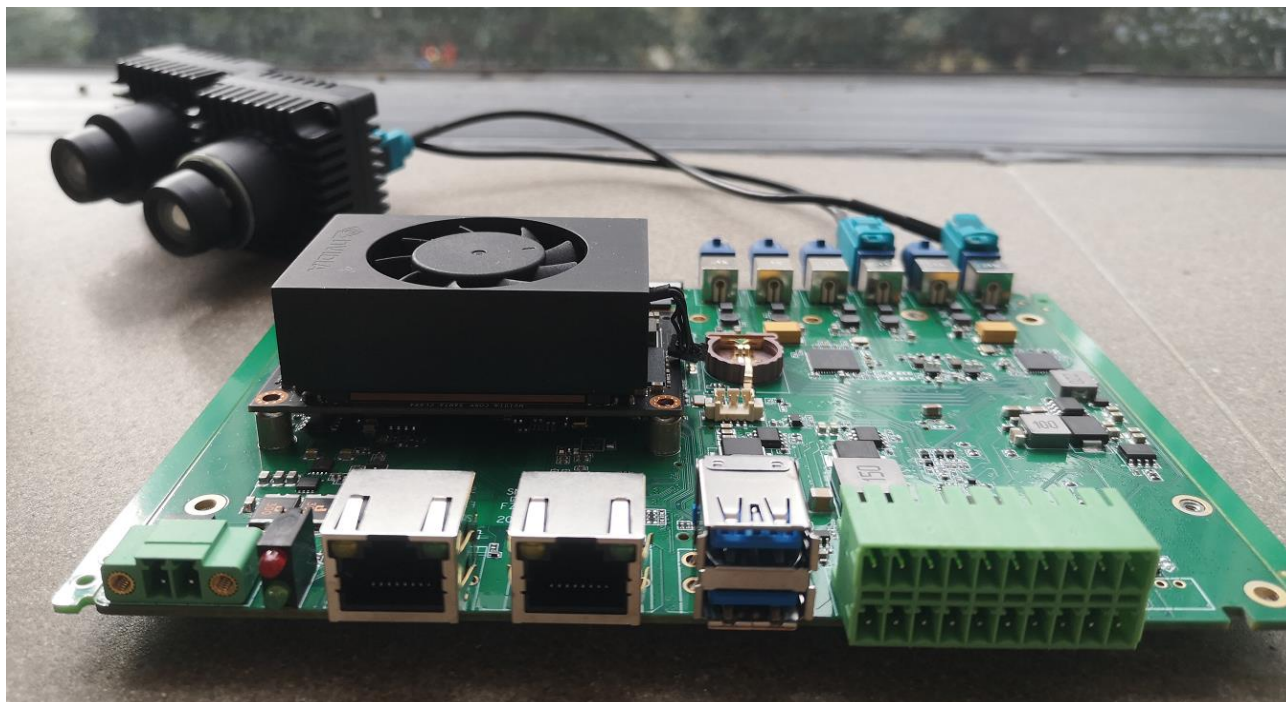
Front interfaces



Back interfaces



Side view interface



FZ-F305 Application Description

Network port application

1. The F305 has two gigabit RJ45 network interfaces, one of which is the built-in gigabit network of the core module, and the other is an extension of PCIe1 using Realtek RTL8111 cores
2. Network bandwidth and packet loss, etc

Testing tools: iperf or iperf3 (Windows or Linux)

sudo apt-get install iperf

1) Test network bandwidth, stable operation bandwidth can reach 940Mbits/sec

PC (IP: 192.168.1.195)

F305 device (IP: 192.168.1.159)

PC running as a server: iperf -s -i 2 -w 2m (IP: 192.168.1.2)

F305 runs as a client device end: iperf -c 192.168.1.2 -i 2 -w 2m -t 60

```
-----  
Server listening on TCP port 5001  
TCP window size: 416 KByte (WARNING: requested 1.91 MByte)  
-----  
[ 4] local 192.168.1.195 port 5001 connected with 192.168.1.159 port 48826  
[ ID] Interval      Transfer      Bandwidth  
[ 4] 0.0- 2.0 sec    224 MBytes    941 Mbits/sec  
[ 4] 2.0- 4.0 sec    224 MBytes    942 Mbits/sec  
[ 4] 4.0- 6.0 sec    224 MBytes    942 Mbits/sec  
[ 4] 6.0- 8.0 sec    224 MBytes    942 Mbits/sec  
[ 4] 8.0-10.0 sec    224 MBytes    942 Mbits/sec  
[ 4] 10.0-12.0 sec   224 MBytes    942 Mbits/sec  
[ 4] 12.0-14.0 sec   224 MBytes    942 Mbits/sec
```

```
nvidia@nvidia-desktop:~$ iperf -c 192.168.1.195 -i 2 -w 2m -t 60  
-----  
Client connecting to 192.168.1.195, TCP port 5001  
TCP window size: 416 KByte (WARNING: requested 1.91 MByte)  
-----  
[ 3] local 192.168.1.159 port 48826 connected with 192.168.1.195 port 5001  
[ ID] Interval      Transfer      Bandwidth  
[ 3] 0.0- 2.0 sec    225 MBytes    943 Mbits/sec  
[ 3] 2.0- 4.0 sec    225 MBytes    942 Mbits/sec  
[ 3] 4.0- 6.0 sec    224 MBytes    941 Mbits/sec  
[ 3] 6.0- 8.0 sec    224 MBytes    941 Mbits/sec  
[ 3] 8.0-10.0 sec    224 MBytes    941 Mbits/sec  
[ 3] 10.0-12.0 sec   224 MBytes    942 Mbits/sec  
[ 3] 12.0-14.0 sec   224 MBytes    942 Mbits/sec
```

F305 runs as a server: iperf -s -i 2 -w 2m (IP: 192.168.1.159)

PC runs as a client device: iperf -c 192.168.1.159 -i 2 -w 2m -t 60

```
nvidia@nvidia-desktop:~$ iperf -s -i 2 -w 2m
-----
Server listening on TCP port 5001
TCP window size: 416 KByte (WARNING: requested 1.91 MByte)
-----
[ 4] local 192.168.1.159 port 5001 connected with 192.168.1.195 port 59080
[ ID] Interval      Transfer      Bandwidth
[ 4] 0.0- 2.0 sec   224 MBytes    939 Mbits/sec
[ 4] 2.0- 4.0 sec   224 MBytes    941 Mbits/sec
[ 4] 4.0- 6.0 sec   224 MBytes    940 Mbits/sec
[ 4] 6.0- 8.0 sec   224 MBytes    941 Mbits/sec
[ 4] 8.0-10.0 sec   224 MBytes    941 Mbits/sec
[ 4] 10.0-12.0 sec  224 MBytes    940 Mbits/sec
[ 4] 12.0-14.0 sec  224 MBytes    941 Mbits/sec
```

```
-----
Client connecting to 192.168.1.159, TCP port 5001
TCP window size: 416 KByte (WARNING: requested 1.91 MByte)
-----
[ 3] local 192.168.1.195 port 59080 connected with 192.168.1.159 port 5001
[ ID] Interval      Transfer      Bandwidth
[ 3] 0.0- 2.0 sec   223 MBytes    936 Mbits/sec
[ 3] 2.0- 4.0 sec   224 MBytes    941 Mbits/sec
[ 3] 4.0- 6.0 sec   224 MBytes    941 Mbits/sec
[ 3] 6.0- 8.0 sec   224 MBytes    942 Mbits/sec
[ 3] 8.0-10.0 sec   224 MBytes    941 Mbits/sec
[ 3] 10.0-12.0 sec  224 MBytes    941 Mbits/sec
[ 3] 12.0-14.0 sec  224 MBytes    942 Mbits/sec
```

2) Test jitter and packet loss rate

F305 runs as a server: iperf -s -u -i 2

PC runs as a client device: iperf -c 192.168.1.159 -i 2 -w 2m -u -b 200m -t 60

```
nvidia@nvidia-desktop:~$ iperf -s -u -i 2
-----
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size: 208 KByte (default)
-----
[ 3] local 192.168.1.159 port 5001 connected with 192.168.1.195 port 52831
[ ID] Interval      Transfer      Bandwidth      Jitter      Lost/Total Datagrams
[ 3] 0.0- 2.0 sec   47.8 MBytes    200 Mbits/sec    0.033 ms     0/34094 (0%)
[ 3] 2.0- 4.0 sec   47.7 MBytes    200 Mbits/sec    0.019 ms     0/34014 (0%)
[ 3] 4.0- 6.0 sec   47.7 MBytes    200 Mbits/sec    0.044 ms     0/34012 (0%)
[ 3] 6.0- 8.0 sec   47.7 MBytes    200 Mbits/sec    0.042 ms     0/34013 (0%)
[ 3] 8.0-10.0 sec   47.7 MBytes    200 Mbits/sec    0.055 ms     0/34015 (0%)
[ 3] 10.0-12.0 sec  47.7 MBytes    200 Mbits/sec    0.036 ms     0/34014 (0%)
[ 3] 12.0-14.0 sec  47.7 MBytes    200 Mbits/sec    0.023 ms     0/34014 (0%)
```

```

-----
Client connecting to 192.168.1.159, UDP port 5001
Sending 1470 byte datagrams, IPG target: 58.80 us (kalman adjust)
UDP buffer size: 416 KByte (WARNING: requested 1.91 MByte)
-----
[ 3] local 192.168.1.195 port 52831 connected with 192.168.1.159 port 5001
[ ID] Interval      Transfer      Bandwidth
[ 3] 0.0- 2.0 sec  47.7 MBytes  200 Mbits/sec
[ 3] 2.0- 4.0 sec  47.7 MBytes  200 Mbits/sec
[ 3] 4.0- 6.0 sec  47.7 MBytes  200 Mbits/sec
[ 3] 6.0- 8.0 sec  47.7 MBytes  200 Mbits/sec
[ 3] 8.0-10.0 sec  47.7 MBytes  200 Mbits/sec
[ 3] 10.0-12.0 sec 47.7 MBytes  200 Mbits/sec
[ 3] 12.0-14.0 sec 47.7 MBytes  200 Mbits/sec

```

GMSL camera application

The GMSL camera application interface developed by Fangzhu Technology is based on V4L2 (Video for Linux, abbreviated as the driver framework for Linux video capture related devices), providing a unified interface specification for drivers and application programs, facilitating application development.

GMSL Physical Interface Characteristics

- Supporting signal transmission with up to 15 meters of coaxial cable
- Support cameras with different serial devices, and support cameras with output resolutions of 720p, 1080p, 4K, 8M, and other resolutions
- Please refer to the "FAKRA interface" section in the previous figure for the connection method

noun	explanation	notes
Self triggering	The camera is not controlled by trigger signals and outputs images when powered on	Generally, cameras support this mode. As long as there is no external trigger signal, it works in this mode.
Synchronous trigger	The camera is controlled by a trigger signal, which outputs an image and simultaneously triggers a shutter.	Camera firmware support is required. Please confirm with the manufacturer whether it is supported when purchasing a camera. At the same time, external triggering signals are required.

GMSL Quick Verification and Reference Code

You can use the Cheese tool under Linux to quickly verify whether the plot is normal.

- Confirm that the GMSL camera is connected correctly
- Open Cheese
- Confirm that the resolution setting is normal

- Select the device name corresponding to the Cheese camera. (such as video0)

Please note that due to Cheese not being able to format images, there may be color differences due to the camera output format not necessarily matching Cheese's default format. This is a problem with Cheese software.

1. Camera application code reference:

https://gitee.com/fangzhutech/jetson_cam_app.git

camera_v4l2_cuda : V4L2 SDK Demo Using ASIC for image format conversion with high efficiency (installing JetPack SDK)

camera_v4l2_opencv: V4L2 OpenCV Demo Directly use v4l and OpenCV to obtain camera images

2. The device supports using Gstreamer to output video streams. The methods for image acquisition and display are as follows:

8M camera: (3840x2160)

```
gst-launch-1.0 v4l2src device=/dev/video0 ! "video/x-raw, format=(string)UYVY, width=(int)3840, height=(int)2160" !
```

```
videoconvert ! fpsdisplaysink video-sink=xvimagesink sync=false
```

5M camera: (2880x1860)

```
gst-launch-1.0 v4l2src device=/dev/video0 ! "video/x-raw, format=(string)UYVY, width=(int)2880, height=(int)1860" !
```

```
videoconvert ! fpsdisplaysink video-sink=xvimagesink sync=false
```

2M camera: (1920x1080)

```
gst-launch-1.0 -ev v4l2src device=/dev/video0 ! "video/x-raw, format=(string)UYVY, width=(int)1920, height=(int)1080" !
```

```
fpsdisplaysink text-overlay=0 video-sink=fakesink sync=0
```

1M camera: (1280x720)

```
gst-launch-1.0 -ev v4l2src device=/dev/video0 ! "video/x-raw, format=(string)UYVY, width=(int)1280, height=(int)720" !
```

```
fpsdisplaysink text-overlay=0 video-sink=fakesink sync=0
```

Other resolution cameras can be set according to specific camera parameters

4G application

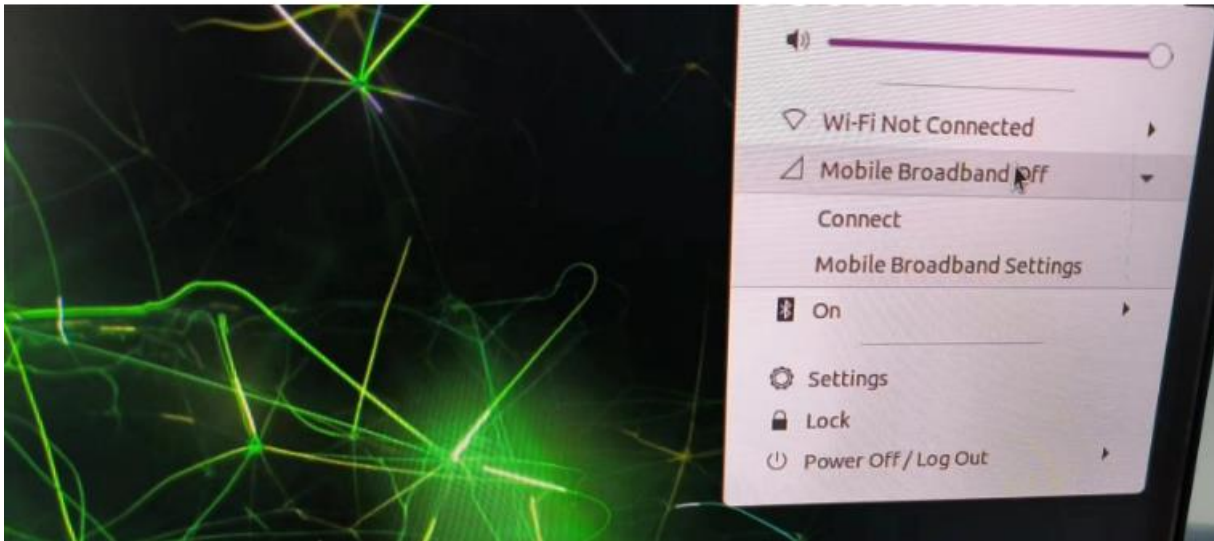
4G module (example: Quectel from EC20 module)

USB device number

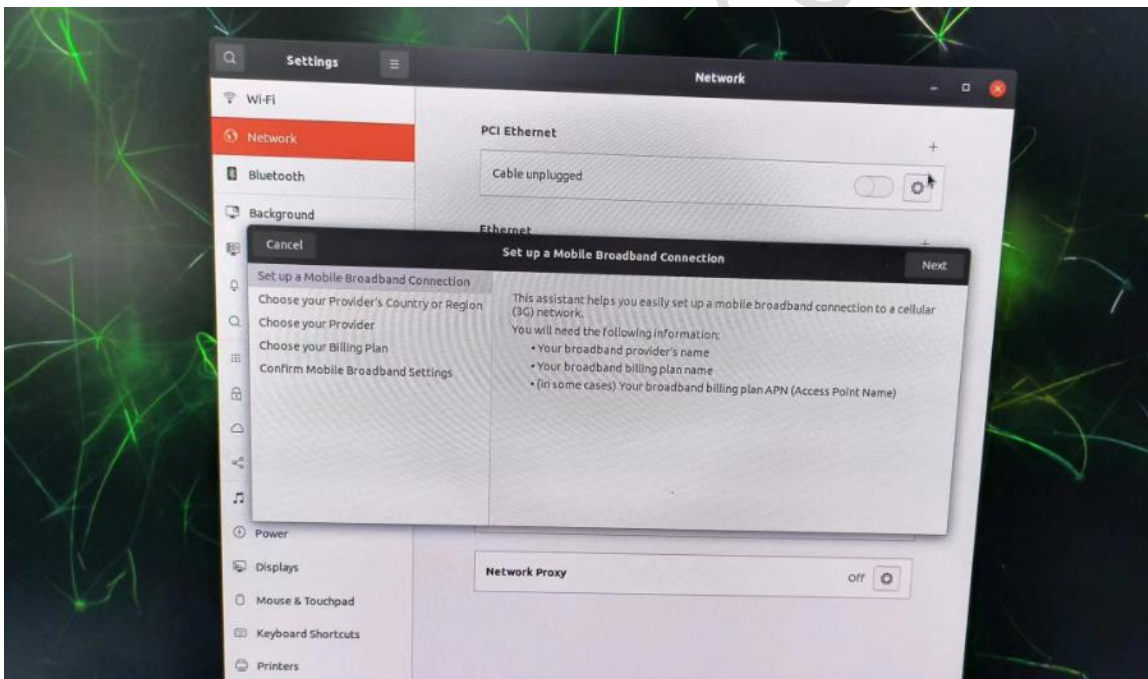
Bus 001 Device 005: ID 2c7c:0125

The 4G module adopts ppp0 dialing method, and dialing settings can be completed in the following order (interface format)

Insert 4G Module and 4G SIM card, click on Network Settings in the upper right corner of the Ubuntu desktop and the following will appear. Select Mobile Broadband off



Select 'connect', the following image will appear, and the installation prompt will appear. Select 'next' to continue and you will eventually see 'connect'.



On the command line, you can use `ifconfig` to obtain the following figure: `ppp0` has successfully allocated an IP and can proceed with online operations

```

TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
  inet 127.0.0.1 netmask 255.0.0.0
  inet6 ::1 prefixlen 128 scopeid 0x10<host>
  loop txqueuelen 1000 (Local Loopback)
  RX packets 407 bytes 34771 (34.7 KB)
  RX errors 0 dropped 0 overruns 0 frame 0
  TX packets 407 bytes 34771 (34.7 KB)
  TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ppp0: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST> mtu 1500
  inet 10.43.241.91 netmask 255.255.255.255 destination 0.0.0.0
  ppp txqueuelen 3 (Point-to-Point Protocol)
  RX packets 225 bytes 149405 (149.4 KB)
  RX errors 0 dropped 0 overruns 0 frame 0
  TX packets 362 bytes 25478 (25.4 KB)
  TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

rndis0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500

```

5G applicatoin

5G module (example: Quectel RM500U-CN module far)

USB device number

Bus 002 Device 004: ID 2c7c:0800

```

nvidia@nx:~$ lsusb
Bus 002 Device 004: ID 2c7c:0800
Bus 002 Device 003: ID 0bda:0411 Realtek Semiconductor Corp.
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 003: ID 0bda:c820 Realtek Semiconductor Corp.
Bus 001 Device 004: ID 1a86:7523 QinHeng Electronics HL-340 USB-Serial adapter
Bus 001 Device 002: ID 0bda:5411 Realtek Semiconductor Corp.
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
nvidia@nx:~$ lsusb -t
/: Bus 02.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/4p, 10000M
  |__ Port 3: Dev 3, If 0, Class=Hub, Driver=hub/4p, 5000M
     |__ Port 3: Dev 4, If 0, Class=Vendor Specific Class, Driver=option, 5000M
     |__ Port 3: Dev 4, If 1, Class=Vendor Specific Class, Driver=option, 5000M
     |__ Port 3: Dev 4, If 2, Class=Vendor Specific Class, Driver=option, 5000M
     |__ Port 3: Dev 4, If 3, Class=Vendor Specific Class, Driver=option, 5000M
     |__ Port 3: Dev 4, If 4, Class=Vendor Specific Class, Driver=qmi_wwan_q, 5000M
/: Bus 01.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/4p, 480M
  |__ Port 2: Dev 2, If 0, Class=Hub, Driver=hub/5p, 480M
     |__ Port 4: Dev 4, If 0, Class=Vendor Specific Class, Driver=ch341, 12M
     |__ Port 3: Dev 3, If 0, Class=Wireless, Driver=btusb, 480M
     |__ Port 3: Dev 3, If 1, Class=Wireless, Driver=btusb, 480M
     |__ Port 3: Dev 3, If 2, Class=Vendor Specific Class, Driver=rtl8821cu, 480M

```

The dial-up application uses the dial-up tool provided by Mobile (Quectel_QConnectManager_Linux_V1.6.4, which supports automatic replay after network interruption. If other modules are used, please contact the 5G supplier to provide relevant tools)

\$unzip Quectel_QConnectManager_Linux_V1.6.4.zip

\$cd Quectel_QConnectManager_Linux_V1.6.4

\$make

\$sudo ./ quectel-CM


WIFI application

The F305 carrier board has a built-in USB WIFI module (brand: Bilian). Bilian: BL8821CU uses the Realtek RTL8821CU chip or Bilian: BL8822CU uses the Realtek RTL8822CU chip. The specifications for these two WIFI modules can be obtained by contacting technical support

USB device number :

Bus 001 Device 003: ID 0bda:c820 Realtek Semiconductor Corp.

20Pin Multifunctional interface

Pins	Function		Pins	Function
Pin1	RS485A		Pin2	Isolation DO/460
Pin3	RS485B		Pin4	Isolation DO/459
Pin5	GND		Pin6	Isolation GND
Pin7	RS232_TX		Pin8	Isolation DI/465
Pin9	RS232_RX		Pin10	Isolation DI/458
Pin11	GND		Pin12	GND
Pin13	NX_CAN_L		Pin14	SPI_CAN_L
Pin15	NX_CAN_H		Pin16	SPI_CAN_H
Pin17	GPIO12		Pin18	GND
Pin19	GPIO13		Pin20	5V/non isolated

Serial RS232/RS485 signal definition

Interface Name	PHD2.0 Pin Number	signal definition	Interface Description
UART1 /dev/ttyTHS0	1	RS485_A	UAR0_TXD sends RS485 level
	3	RS485_B	UAR0_RXD receiving RS485 level
	5	GND	grounding
UART2 /dev/ttyUSB0	7	RS232_TX	RS232 transmission, USB to RS232
	9	RS232_RX	RS232 reception, USB to RS232 conversion
	11	GND	grounding

UART Interface Configuration Method

Open the corresponding device node under the /dev/ directory, set the baud rate, stop bit, parity bit, data bit, etc. You can use the STTY command to configure the baud rate, stop bit, parity bit, data bit, etc. of the serial port. Please refer to the STTY command description for details.

Command example, please modify the information in <> to the serial port node number you want to adjust. For specific correspondence, please refer to the [Interface Description] section

```
Sudo stty - F/dev/ttyTHS<XXX>speed 115200 cs8- parenb - cstopb - echo
```

Output Data Test

```
Sudo echo "fz uart debug">/dev/ttyTHS<XXX>
```

Open a new terminal and use the following command to receive input data

```
Sudo cat/dev/ttyTHS<XXX>
```

Camera Sync IO synchronization signal definition

Interface Name	PHD2.0 Pin Number	signal definition	Interface Description
Sync in1 synchronization interface	17	GPIO13(NO: 419)	9296 Sync in signal
Sync in2 synchronization interface	19	GPIO12 (NO: 321)	96712 Sync in signal

Can input a fixed frequency signal to trigger GMSL

CAN Interface signal definition

Interface Name	PHD2.0 Pin Number	signal definition	Interface Description
CANL	13	NX_CAN_L	NX_CAN_L port
CANH	15	NX_CAN_H	NX_CAN_H port
CAN_L	14	CAN_FD_L	SPI 转 CAN_FD_L port
CAN_H	16	CAN_FD_H	SPI 转 CAN_FD_H port
Common GND	5/11/12/18	GND	Ground signal

Note:

CANL/H is the NX module with its own CAN controller

CAN_L/H for SPI to CAN controller (chip MCP2518FD) supporting CAN FD

For specific usage methods of CAN devices, please refer to <https://github.com/linux-can/can-utils> Cansend. c and candump. c in

Shell Script Test Command:

```
$sudo modprobe can
```

```
$sudo modprobe can_raw
```

```
$sudo modprobe mttcan
```

```
$ sudo insmod /lib/modules/ $(uname -r)/kernel/drivers/net/can/spi/mcp25xxfd.ko
```

```
$sudo ip link set can0 type can bitrate 200000 sjw 4 berr-reporting on loopback off
```

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

```
$sudo cansend can0 12345#abcdeabcde
$sudo candump can0
$sudo ip -details -statistics link show can0
```

How to use CAN FD configuration :

```
$sudo modprobe can
$sudo modprobe can_raw
$sudo modprobe mttcan
$ sudo insmod /lib/modules/ $(uname -r)/kernel/drivers/net/can/spi/mcp25xxfd.ko
$sudo ip link set can0 type can bitrate 200000 sjw 4 dbitrate 1000000 dsjw 4 berr-reporting on fd on
$sudo ip link set up can0
$sudo cansend can0 321##011
```

Differences between CAN FD and CAN 2.0:

1)

```
$sudo ip link set can0 type can bitrate 200000 dbitrate 1000000 berr-reporting on fd on
```

Where bitrate is the baud rate in can2.0 mode; Dbitrate is the baud rate in can fd mode. According to official documentation, this value can be configured to a maximum of 5M, and it is best to use 2M for general applications;

2)

```
$sudo cansend can0 321##011
```

In the sending command, there is an additional # between the id and data, and the first byte (0) after the ## is canfd_ The value of frame. flags, ranging from 0 to F; Canfd_ The byte (11) after frame. flags is the first data, and a maximum of 64 bytes can be transmitted at a time

GPIO interface signal definition

The GPIO of F305 adopts an isolated power supply method, with 2 channels only used for input IO (Pin2/Pin4) and 2 channels used for output IO (Pin8/Pin10)

Interface Name	PHD2.0 Pin Number	signal definition	Interface Description
GPIO_222_3V3	2	GPIO222_3V3	GPIO0222(gpio460)
GPIO_220_3V3	4	GPIO220_3V3	GPIO0220(gpio459)
GPIO_197_3V3	8	GPIO197_3V3	GPIO0197(gpio465)
GPIO_226_3V3	10	GPIO226_3V3	GPIO226(gpio458)

The example of using the GPIO interface is as follows. Please modify the information in<xxx>to the GPIO node code you want to adjust:

```
# Switch to root user
sudo su -
cd /sys/class/gpio
echo gpio_num > export
```

Note: On JetPack5. x, `exprot gpio_ Num` generates a `yyyy` name instead of the `gpioum` form before JetPack4. x

```
# Set to high level (DO)
echo 1 > /sys/class/gpio/xxxx/value
# Set to low level (DO)
echo 0 > /sys/class/gpio/xxx/value
# read data (DI)
cat /sys/class/gpio/xxxx/value

# Set input/output direction (DIRECTION)
$echo in > /sys/class/gpio/xxxx/direction
$echo out > /sys/class/gpio/xxx/direction
```

If you need to keep the configuration after shutting down, you can write the above commands to `/etc/rc.local` file

FAN

Fan (compatible with Xavier NX original fan), with automatic speed adjustment based on temperature

TF card application

```
nvidia@nvidia:~$ sudo fdisk -l /dev/mmcblk1
Disk /dev/mmcblk1: 29.7 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: gpt
Disk identifier: 989E7D2A-8190-4E93-95A0-3A822C6D2CC0

Device            Start      End  Sectors  Size Type
/dev/mmcblk1p1    870400    28321791 27451392 13.1G Linux filesystem

ls /dev/mmcblk*
nvidia@nvidia:~$ ls /dev/mmcblk*
mmcblk0  mmcblk0boot1  mmcblk0p10  mmcblk0p2  mmcblk0p4  mmcblk0p6  mmcblk0p8  mmcblk0rmb  mmcblk1p1  mmcblk1p11  mmcblk1p3  mmcblk1p5  mmcblk1p7  mmcblk1p9
mmcblk0boot0  mmcblk0p1  mmcblk0p11  mmcblk0p3  mmcblk0p5  mmcblk0p7  mmcblk0p9  mmcblk1  mmcblk1p10  mmcblk1p2  mmcblk1p4  mmcblk1p6  mmcblk1p8
```

M.2 SSD Solid State Drive Applications

SSD adopts M.2 Key M interface NVMe (communication protocol is PCIe x4, and the interface is located on the back of the carrier board)

```
nvidia@nx:~$ lspci
0004:00:00.0 PCI bridge: NVIDIA Corporation Device 1ad1 (rev a1)
0004:01:00.0 Ethernet controller: Realtek Semiconductor Co., Ltd. RTL8111/8168/8411 PCI Express Gigabit Ethernet Controller (rev 06)
0005:00:00.0 PCI bridge: NVIDIA Corporation Device 1ad0 (rev a1)
0005:01:00.0 PCI bridge: Pericom Semiconductor PI7C9X2G608GP PCIe2 6-Port/8-Lane Packet Switch
0005:02:01.0 PCI bridge: Pericom Semiconductor PI7C9X2G608GP PCIe2 6-Port/8-Lane Packet Switch
0005:02:02.0 PCI bridge: Pericom Semiconductor PI7C9X2G608GP PCIe2 6-Port/8-Lane Packet Switch
0005:02:03.0 PCI bridge: Pericom Semiconductor PI7C9X2G608GP PCIe2 6-Port/8-Lane Packet Switch
0005:02:04.0 PCI bridge: Pericom Semiconductor PI7C9X2G608GP PCIe2 6-Port/8-Lane Packet Switch
0005:04:00.0 Non-Volatile memory controller: Device 1e95:9100 (rev 03)

nvidia@nvidia:~$ lspci
0004:00:00.0 PCI bridge: NVIDIA Corporation Device 1ad1 (rev a1)
0004:01:00.0 Ethernet controller: Realtek Semiconductor Co., Ltd. RTL8111/8168/8411 PCI Express Gigabit Ethernet Controller (rev 06)
0005:00:00.0 PCI bridge: NVIDIA Corporation Device 1ad0 (rev a1)
0005:01:00.0 Non-Volatile memory controller: Device 1e95:9100 (rev 03) NVMe PCIe 信息
nvidia@nvidia:~$ sudo fdisk -l /dev/nvme*
fdisk: cannot open /dev/nvme0: illegal seek 对NVMe 进行分区

Disk /dev/nvme0n1: 119.2 GiB, 128035676160 bytes, 250069680 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: BAAC9E37-3F9E-4433-B18A-990F8E381458

Device      Start      End      Sectors  Size Type
/dev/nvme0n1p1 2048 250068991 250066944 119.2G Linux filesystem
设备节点 NVMe容量大小

Disk /dev/nvme0n1p1: 119.2 GiB, 128034275328 bytes, 250066944 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
```

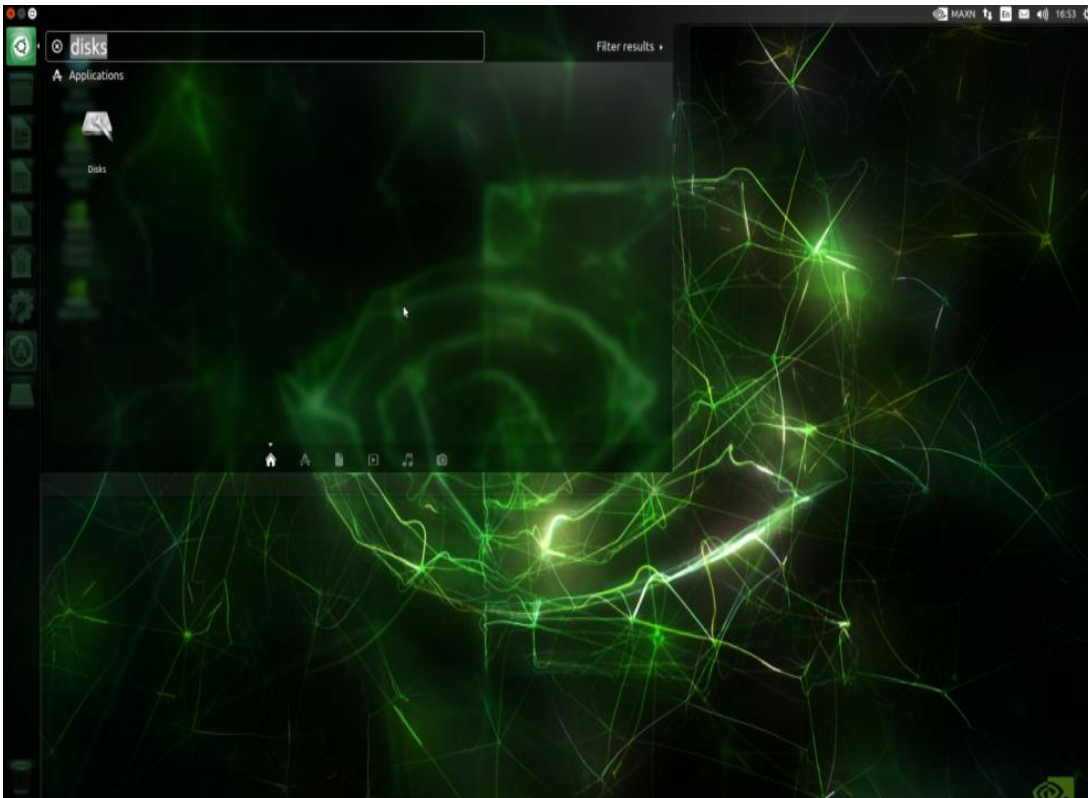
Set M.2 Key M SSD as File System Disk

This solution is a third-party solution, and Fangzhu Technology does not guarantee its percentage stability. The NVMe SSD hard disk can be used as a regular storage space or as a file system disk (rootfs and user area). After the system boots through EMMC (DTB and kernel image files are still stored in EMMC), the kernel, file system, installed third-party tools, and user data are stored on SSD by default.

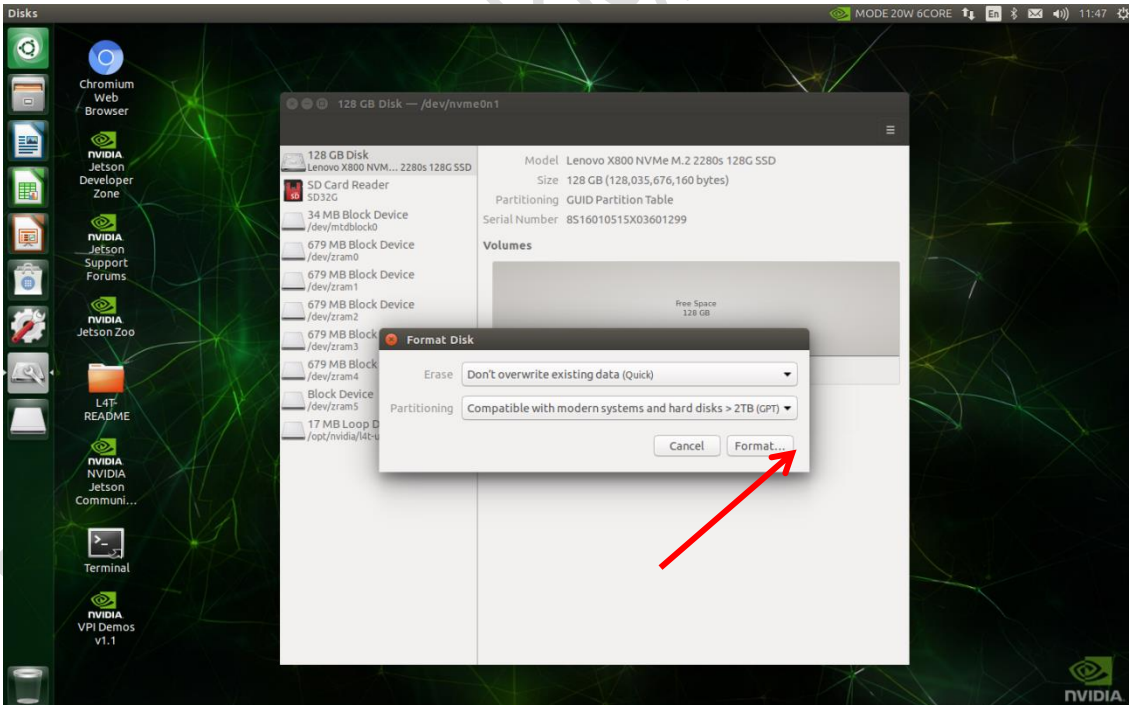
Step 1: Prepare the SSD and format it in GPT format

1. Prepare M.2 Key M SSD (size 2280)
2. Open the built-in Disks tool of Ubuntu 18.04, locate the SSD hard drive installed, and first press "Ctrl+F" to quickly format it,
3. Please refer to the following diagram for operation (follow the following steps to avoid errors that may prevent the device from entering the desktop system),

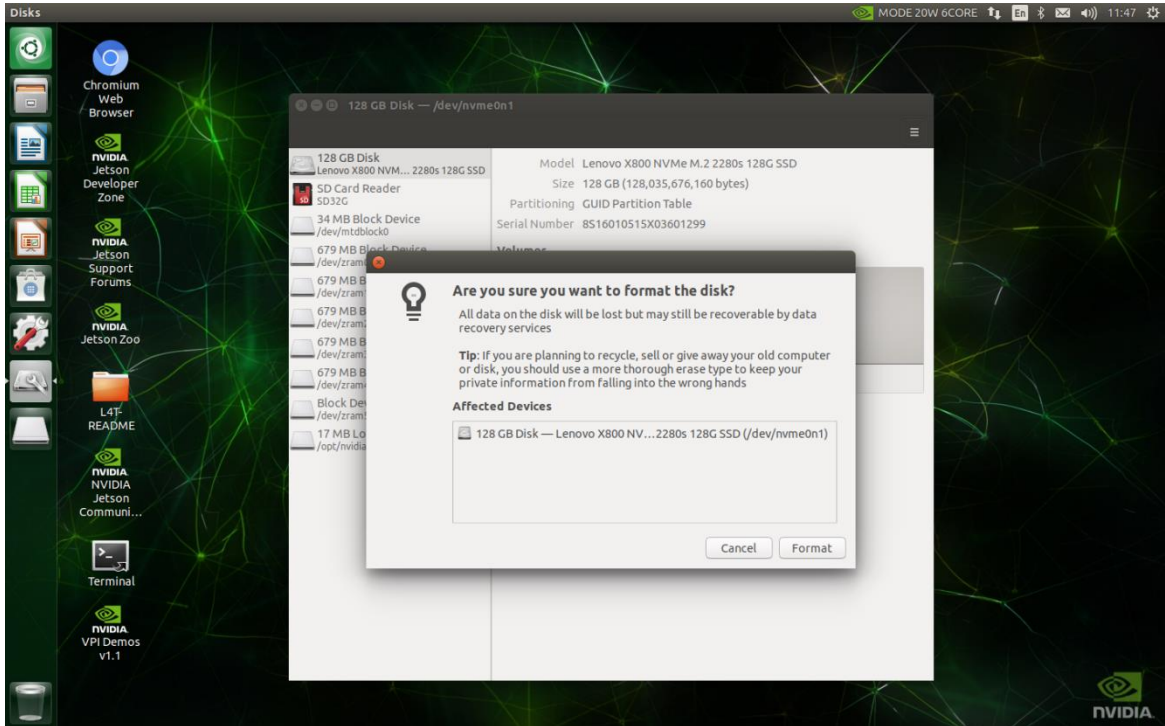
1) Open the Disks tool:



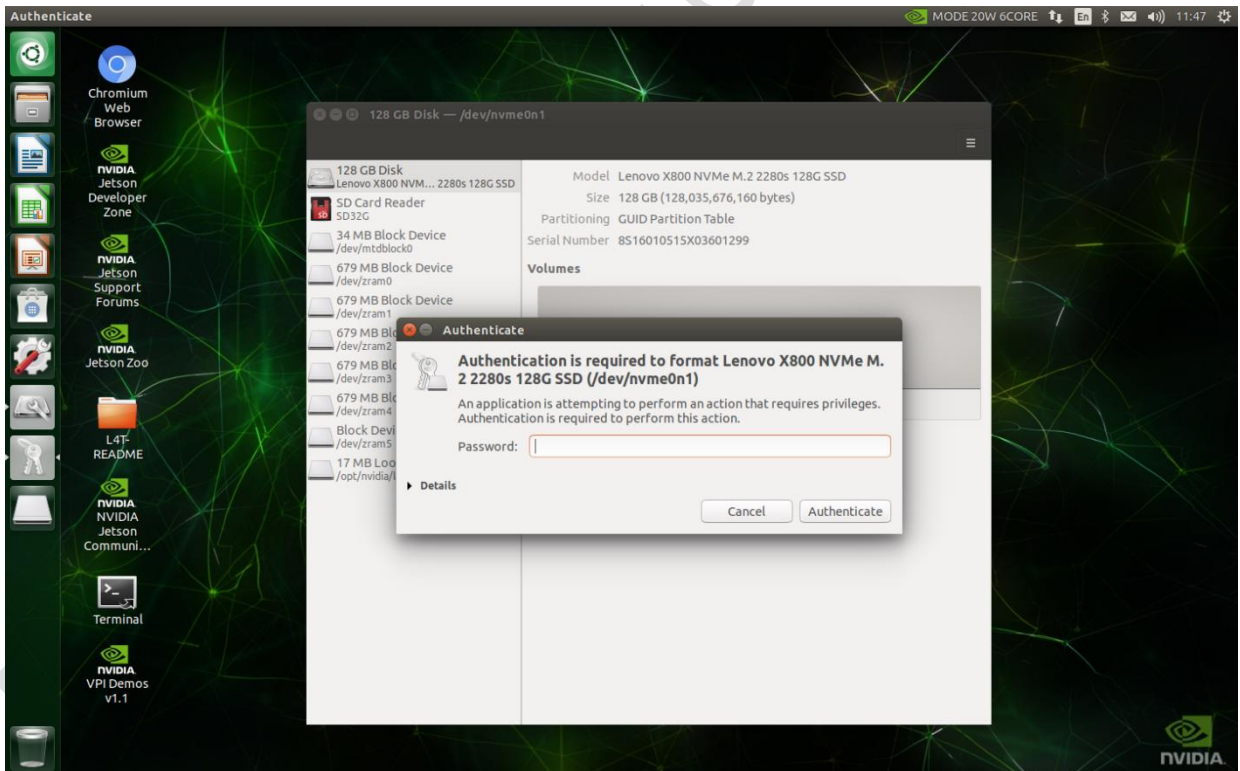
2) Enter Disks, locate the installed SSD, and then combine the keys "CTRL+F" to quickly format the hard drive. Click on Format;



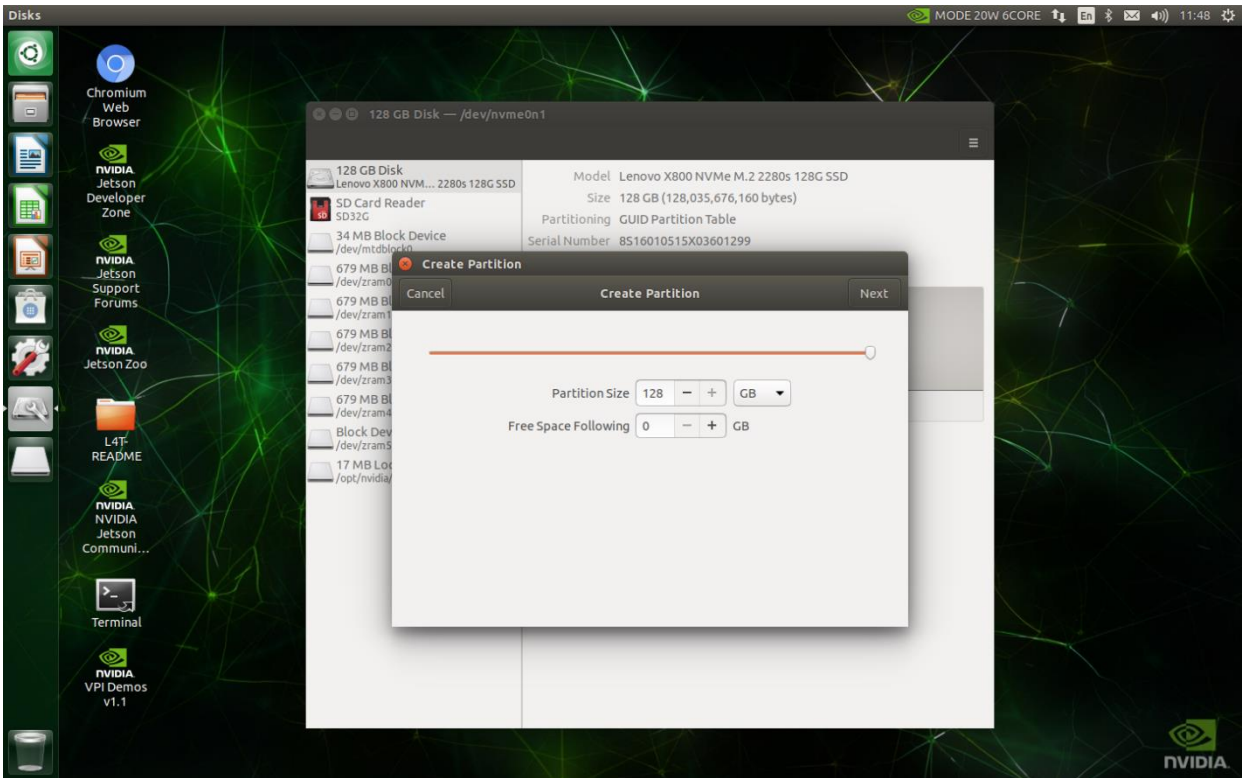
3) Continue clicking on Format



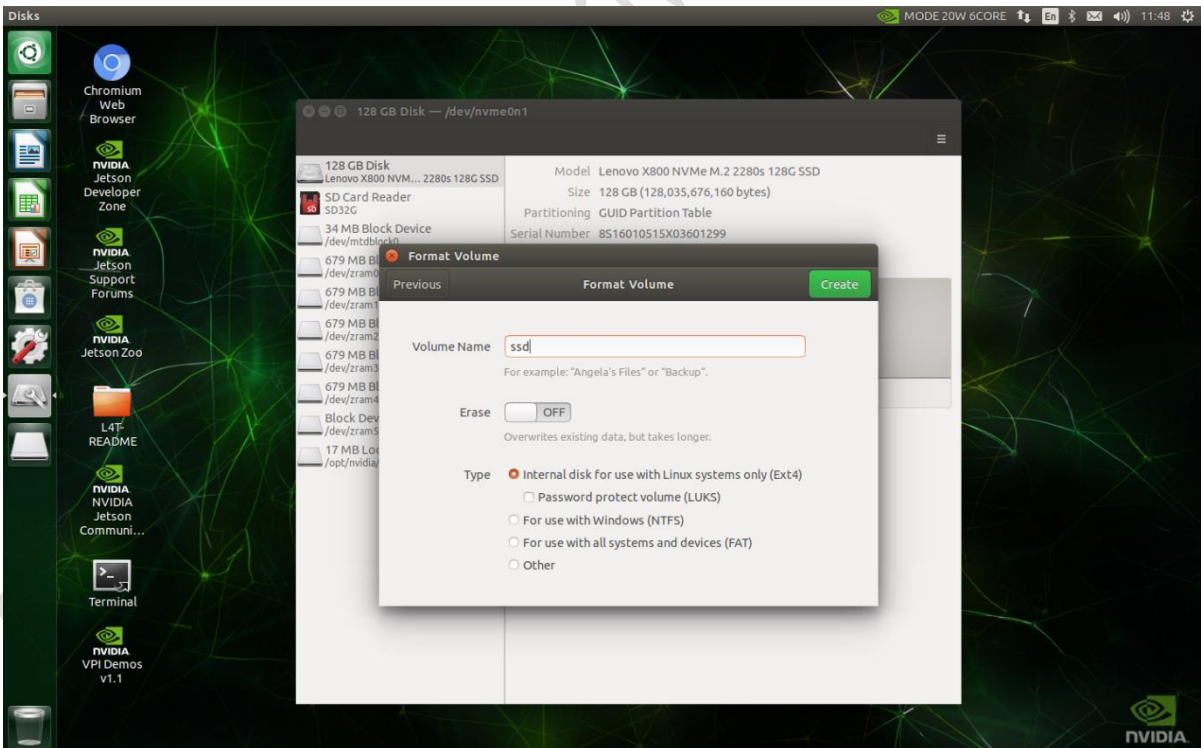
4) Enter the NX user password (pay attention to case)



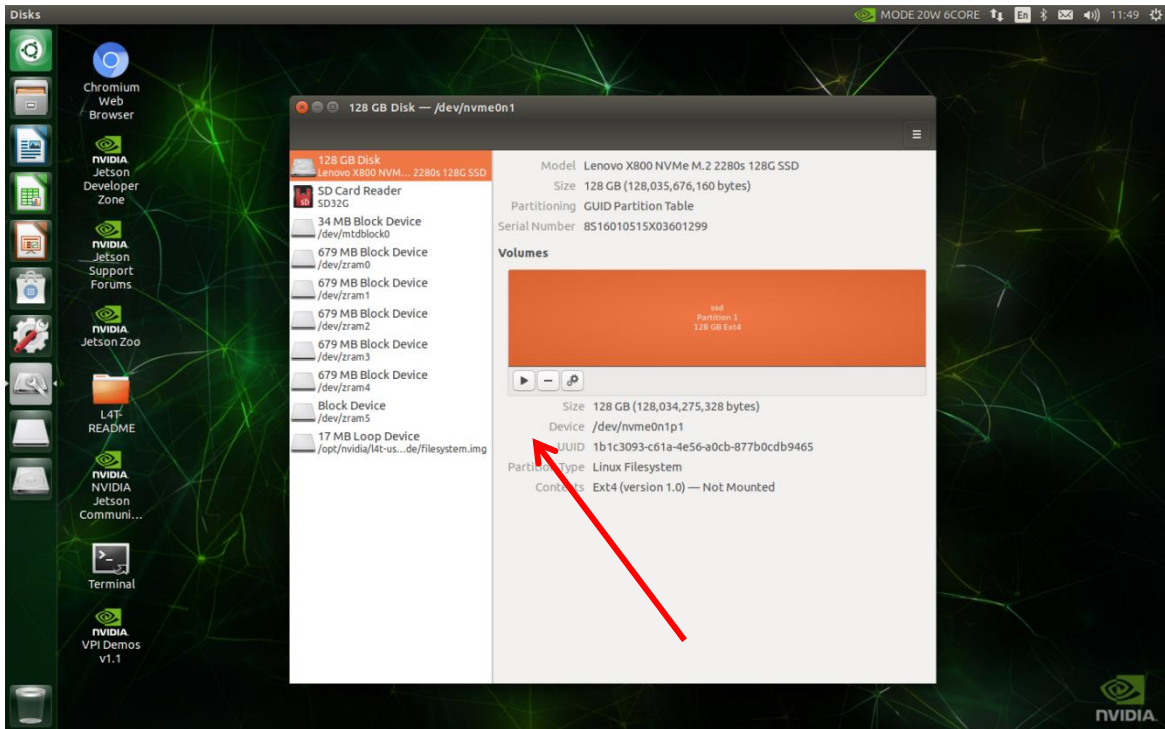
5) You can divide the size proportion yourself. The default maximum partition is shown in the figure below. Click Next



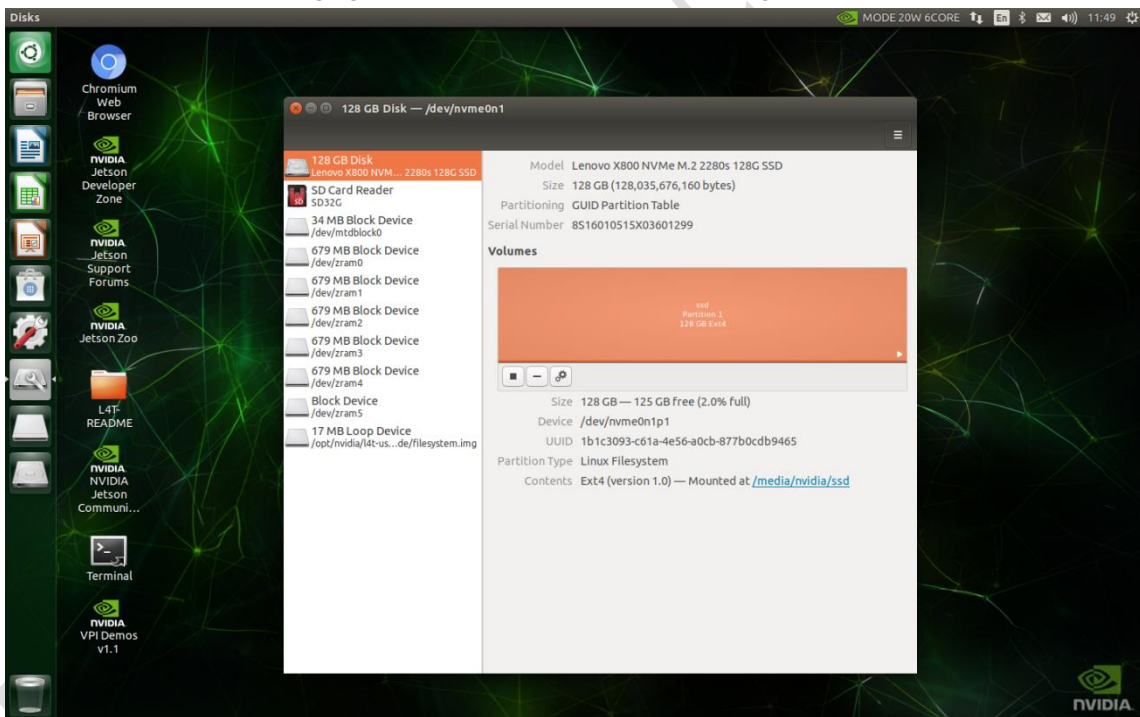
6) Give the partition a name, all other options are default and do not need to be modified, then click Create



7) The screen shown in the following figure appears, click on the triangle symbol to mount



8) As shown in the following figure, it indicates successful mounting



Step 2: (Convert the system disk to the EMMC built-in system)

```
$git clone https://github.com/jetsonhacks/rootOnNVMe.git
```

(If git fails, you can go to the website to download the compressed package and copy it to the device for decompression)

```
$cd rootOnNVMe
```

```
$/ Copy rootfs SSD.sh (This takes a long time, please be patient and wait for the execution to complete before
```

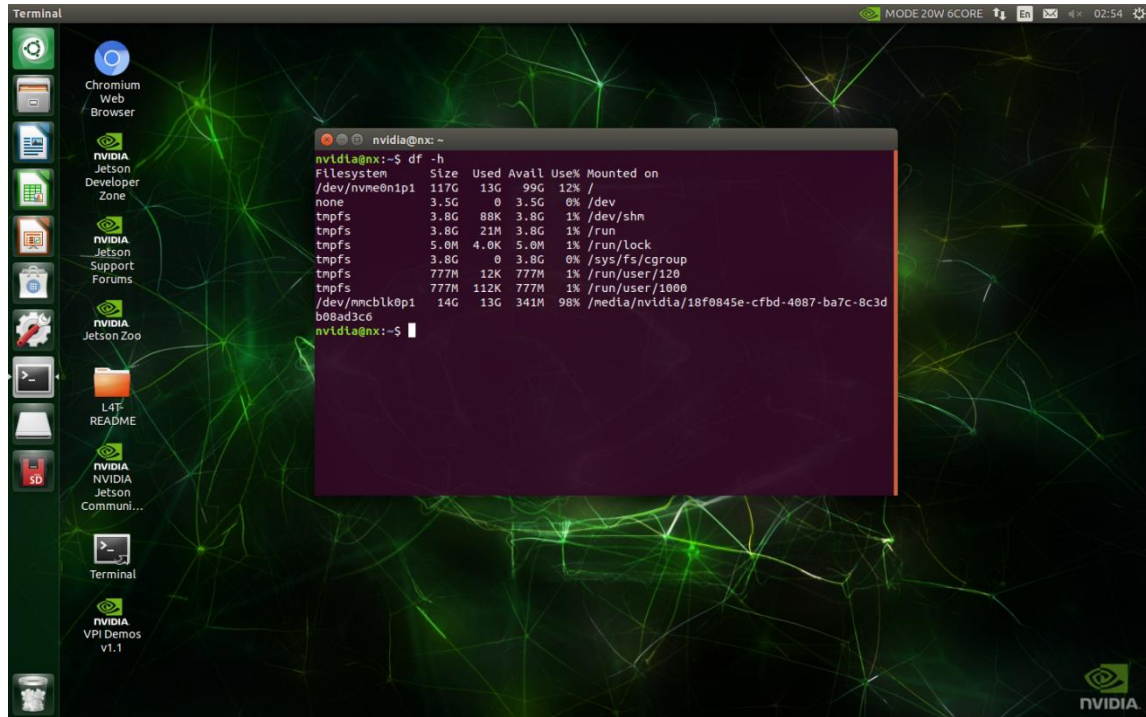
proceeding to the next step)

`$/ Setup service. sh`

`$/sudo reboot`

Step 3: Inspection

Restart the machine, open the terminal and enter `df -h` to check if the hard disk device `/dev/nvme0n1p1` is mounted on the `/root` directory. If not, please execute again



```
nvidia@nx:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/nvme0n1p1 117G   13G   99G  12% /
none            3.5G   0    3.5G   0% /dev
tmpfs           3.8G  88K   3.8G   1% /dev/shm
tmpfs           3.8G  21M   3.8G   1% /run
tmpfs           5.0M  4.0K   5.0M   1% /run/lock
tmpfs           3.8G   0    3.8G   0% /sys/fs/cgroup
tmpfs           777M  12K   777M   1% /run/user/120
tmpfs           777M  112K  777M   1% /run/user/1000
/dev/mmcblk0p1 14G    13G  341M  98% /media/nvidia/18f0845e-cfbd-4087-ba7c-8c3d
b08ad3c6
```

NVIDIA JetPack SDK Installation

The FZ-F305 product is independently developed for use with NVIDIA[®] Jetson Xavier/Orin NX™. The carrier board and supporting firmware for the core board are also developed and designed by Fangzhu Technology. If during use, due to the need to reboot the machine, it is necessary to download the firmware package provided by our company and install the corresponding firmware in order to use all functions normally.

- 1) Preparation before downloading:
- 2) 1 computer for Ubuntu 18.04/20.04s system
- 3) 1 USB TYPE-C data cable
- 4) Set download mode:
- 5) The NVIDIA Jetson platform software is upgraded through a USB interface, and the FZ-F305 needs to be put into Recovery mode before updating. In Recovery mode, file system updates can be performed, including kernel, file system RootFS, JetPack SDK, etc.
- 6) Steps for FZ-F305 to enter Recovery mode:
- 7) 1) Connect the FZ-F305 system power supply;

- 8) 2) Connect the Jetson and Ubuntu Host hosts using the USB TYPE-C data cable (one end plugged into the TYPE-C port of the FZ-F305 and the other end plugged into the USB port of the Ubuntu Host host);
- 9) 3) Press the REC download button (hold) first, and then use the power supply matched with FZ-F305 to power on and start the system;
- 10) 4) After waiting for more than 3 seconds, FZ-F305 enters the Recovery flash mode (you can confirm whether it has entered normal by running the command lsusb on the Ubuntu Host host to check if there are Nvidia Corporation devices (different Jetson modules have different USB VID/PID)

```
Bus 004 Device 001: ID 1d6b:0003 Linux Foundation 3.0
Bus 003 Device 005: ID 0955:7c18 NVidia Corp.
```

Note:

The Recover mode, also known as the download mode, is mainly used to reinstall the system and install JetPack using SDK Manager. The method for this device to enter the Recover mode is to first press and hold the REC button and connect to the power supply to power on the carrier board, wait for 3 seconds, and then input lsusb on the host terminal to check if there is Nvidia Corp. If there is, it indicates successful entry. If not, check if the data cable is connected properly and if the host USB is connected properly. When entering USB Recovery mode, the system will not start and there will be no debugging information output from the serial port.

If the NX core board is already installed with a system, you only need to update the firmware of the comparative version of F305. To obtain the firmware package, please contact sales personnel to obtain the corresponding JetPack version of the firmware and install the Readme.txt instructions in the firmware package. If you have any questions, please contact technical support

Warranty Regulations of Fangzhu Technology (Shenzhen) Co., Ltd

Important reminder

Fangzhu Technology (Shenzhen) Co., Ltd. guarantees that all products provided are free from any defects in materials and workmanship to the best of its knowledge, and fully comply with the specifications officially shipped by the original factory.

The warranty scope of Fangzhu Technology (Shenzhen) Co., Ltd. includes all original products. If there is a malfunction in the accessories configured by the dealer, please negotiate with the dealer to resolve it. All products provided by Fangzhu Technology have a warranty period of one year (lifetime maintenance service is provided for those exceeding the warranty period), and the warranty period starts from the date of delivery. For products repaired during the warranty period, the warranty period is extended by 12 months for the repaired part. Unless otherwise notified by Fangzhu Technology, the date of your original factory shipment is the date of manufacture.

How to obtain warranty services

If your product cannot operate normally during the warranty period, please contact Fangzhu Technology to obtain warranty service. When providing product warranty, please provide proof of purchase invoice (which is proof of your right to receive warranty service).

Warranty resolution measures

When you request warranty service, you need to follow the problem determination and resolution procedures stipulated by Fangzhu Technology. You need to accept technical personnel to conduct your first diagnosis through phone, WeChat, or email. At that time, you need to cooperate and fill out all the issues on the repair form we provide in detail to ensure that we accurately determine the cause of the fault and the location of the damage (we will also provide a fee list for products that have passed the warranty, and you need to confirm). Fangzhu Technology has the right to "repair" or "replace" the reported product. If the product is "replaced" or "repaired", the replaced "faulty" product or repaired "faulty" parts will be returned to Fangzhu Technology. Due to the need to ship some repaired products to the original factory, in order to avoid accidental losses, Fangzhu Technology requests that you purchase transportation insurance. If the user waives the insurance, Fangzhu Technology will not be responsible for any damage or loss of the shipped items during transportation. For products within the warranty period, the user shall bear the shipping cost when the repaired product is returned to the manufacturer, while Fangzhu Technology shall bear the shipping cost when the repaired product is returned to the user.

The following situations are not covered by the warranty

1. Inappropriate installation, improper use, misuse, and abuse of products (such as exceeding workload)
2. Improper maintenance and storage (such as fire, explosion, etc.) or natural disasters (such as lightning, earthquake, typhoon, etc.) causing product failure or damage.

3. Changes to the product (such as circuit characteristics, mechanical characteristics, software characteristics, three prevention measures, etc.).
4. Other faults clearly caused by improper use (such as high voltage, low voltage, reversed polarity, bent or broken pins, incorrect bus connection, device detachment, electrostatic breakdown, external force compression, falling damage, high temperature, high humidity, poor transportation, etc.).
5. The logo and part number on the product have been deleted, modified, or removed.
6. The product has exceeded the warranty period.

Special instructions:

If multiple products experience the same fault or multiple occurrences of the same fault or damage on the same equipment, in order to identify the cause and confirm responsibility. Our company has the right to request users to provide physical or technical information on peripheral devices, such as monitors, external devices, cables, power supplies, connection diagrams, system structure diagrams, etc. Otherwise, we have the right to refuse to fulfill the warranty, and the repair will be charged at the market price and a maintenance deposit will be collected.