

06. Bind device ID

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When the robot uses two or more USB serial devices, the correspondence between the device name and the device is not fixed, but is assigned in the order in which the devices are plugged into the system. Plugging in one device first and then another can determine the relationship between the device and the device name, but it is troublesome to plug and unplug the devices every time the system starts. You can map the serial port to a fixed device name, regardless of the order of insertion, the device will be mapped to the new device name, we just need to use the new device name to read and write to the device can be.

6.1 Device View Commands

Device ID View

```
lsusb
```

As can be seen from the figure below, the ID number of each device, Astra has the official binding device file, the handle generally do not need to bind, the main binding PCB and radar can be.

```
jetson@yahboom: ~  
jetson@yahboom: ~ 83x41  
jetson@yahboom:~$ lsusb  
Bus 002 Device 002: ID 0bda:0411 Realtek Semiconductor Corp.  
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub  
Bus 001 Device 003: ID 8087:0a2b Intel Corp.  
Bus 001 Device 009: ID c0f4:04e0  
Bus 001 Device 007: ID 413c:301a Dell Computer Corp.  
Bus 001 Device 005: ID 214b:7250  
Bus 001 Device 008: ID 2bc5:0403  
Bus 001 Device 006: ID 2bc5:0501  
Bus 001 Device 004: ID 05e3:0608 Genesys Logic, Inc. Hub  
Bus 001 Device 012: ID 1a86:7523 QinHeng Electronics HL-340 USB-Serial adapter  
Bus 001 Device 018: ID 0079:181c DragonRise Inc.  
Bus 001 Device 013: ID 10c4:ea60 Cygnal Integrated Products, Inc. CP210x UART Bridge / myAVR mySmartUSB light  
Bus 001 Device 010: ID 2109:2813 VIA Labs, Inc.  
Bus 001 Device 002: ID 0bda:5411 Realtek Semiconductor Corp.  
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub  
jetson@yahboom:~$
```

Annotations in the image:

- Astra Depth points to Bus 001 Device 008: ID 2bc5:0403
- Astra RGB points to Bus 001 Device 006: ID 2bc5:0501
- Joy points to Bus 001 Device 018: ID 0079:181c DragonRise Inc.
- PCB points to Bus 001 Device 012: ID 1a86:7523 QinHeng Electronics HL-340 USB-Serial adapter
- Laser points to Bus 001 Device 013: ID 10c4:ea60 Cygnal Integrated Products, Inc. CP210x UART Bridge / myAVR mySmartUSB light

Device Number View

```
11 /dev/
```

```
jetson@yahboom: ~ 117x43
crw----- 1 root root 3, 10 12月 10 17:15 ttya
crw----- 1 root root 3, 11 12月 10 17:15 ttyb
crw----- 1 root root 3, 12 12月 10 17:15 ttyc
crw----- 1 root root 3, 13 12月 10 17:15 ttyd
crw----- 1 root root 3, 14 12月 10 17:15 ttye
crw----- 1 root root 3, 15 12月 10 17:15 ttyf
crw--w---- 1 root tty 4, 64 2月 14 18:01 ttyS0
crw-rw---- 1 root dialout 4, 65 12月 10 17:15 ttyS1
crw-rw---- 1 root dialout 4, 66 12月 10 17:15 ttyS2
crw-rw---- 1 root dialout 4, 67 12月 10 17:15 ttyS3
crw--w---- 1 root tty 238, 1 2月 14 18:01 ttyTHS1
crw-rw---- 1 root dialout 238, 2 12月 10 17:15 ttyTHS2
crwxrwxrwx 1 root dialout 188, 0 12月 10 17:15 ttyUSB0
crwxrwxrwx 1 root dialout 188, 1 2月 14 18:01 ttyUSB1
crw----- 1 root root 10, 239 12月 10 17:15 uhid
crw----- 1 root root 10, 223 12月 10 17:15 uinput
crw-rw-rw- 1 root root 1, 9 12月 10 17:15 urandom
drwxr-xr-x 4 root root 80 12月 10 17:15 v4l/
crw-rw---- 1 root tty 7, 0 12月 10 17:15 vcs
crw-rw---- 1 root tty 7, 1 12月 10 17:15 vcs1
crw-rw---- 1 root tty 7, 2 12月 10 17:15 vcs2
crw-rw---- 1 root tty 7, 3 12月 10 17:15 vcs3
crw-rw---- 1 root tty 7, 4 12月 10 17:15 vcs4
crw-rw---- 1 root tty 7, 5 12月 10 17:15 vcs5
crw-rw---- 1 root tty 7, 6 12月 10 17:15 vcs6
crw-rw---- 1 root tty 7, 128 12月 10 17:15 vcsa
crw-rw---- 1 root tty 7, 129 12月 10 17:15 vcsa1
crw-rw---- 1 root tty 7, 130 12月 10 17:15 vcsa2
crw-rw---- 1 root tty 7, 131 12月 10 17:15 vcsa3
crw-rw---- 1 root tty 7, 132 12月 10 17:15 vcsa4
crw-rw---- 1 root tty 7, 133 12月 10 17:15 vcsa5
crw-rw---- 1 root tty 7, 134 12月 10 17:15 vcsa6
drwxr-xr-x 2 root root 60 1月 1 1970 vfio/
crw----- 1 root root 10, 137 12月 10 17:15 vhci
crw-rw----+ 1 root video 81, 0 12月 10 17:15 video0
crw----- 1 root root 10, 130 12月 10 17:15 watchdog
crw----- 1 root root 244, 0 12月 10 17:15 watchdog0
crw-rw-rw- 1 root root 1, 5 12月 10 17:15 zero
brw-rw---- 1 root disk 252, 0 2月 14 18:01 zram0
brw-rw---- 1 root disk 252, 1 2月 14 18:01 zram1
brw-rw---- 1 root disk 252, 2 2月 14 18:01 zram2
brw-rw---- 1 root disk 252, 3 2月 14 18:01 zram3
jetson@yahboom:~$
```

PCB
laser
Astra

6.2 Device binding

6.2.1 Astra Camera Binding

Astra camera binding rules file is [56-orbbec-usb.rules], which is provided by Astra vendor, and is demonstrated here with AstraPro Plus.

Put the [56-orbbec-usb.rules] file in the /etc/udev/rules.d directory of the master control

I.e. the following location:

```
/etc/udev/rules.d/56-orbbec-usb.rules
```

Execute the following command again to refresh the USB rules to bind the Astra camera in effect

```
sudo udevadm control --reload-rules && sudo udevadm trigger
```

Check to see if the binding was successful:

```
jetson@ubuntu:~$ ll /dev/astra*
lrwxrwxrwx 1 root root 15 May  5 17:42 /dev/astradepth -> bus/usb/001/007  #表示
深度的端口
# Ports that indicate depth
lrwxrwxrwx 1 root root 15 May  5 17:42 /dev/astrauvc -> bus/usb/001/009  #表示
RGB的端口
# denotes the port of RGB
```

Prints as above, indicating successful binding.

6.2.2 PCB and radar bindings

Go to the rules.d directory

```
cd /etc/udev/rules.d/
```

Create a new [usb.rules] file and edit it

```
sudo vim usb.rules
```

Write the following

```
KERNEL=="ttyUSB*", ATTRS{idVendor}=="1a86", ATTRS{idProduct}=="7523",
MODE=="0777", SYMLINK+="myserial"
KERNEL=="ttyUSB*", ATTRS{idVendor}=="10c4", ATTRS{idProduct}=="ea60",
MODE=="0777", SYMLINK+="rplidar"
```

Save and exit to make the rule effective and enforce it on the master:

```
sudo udevadm control --reload-rules && sudo udevadm trigger
```

Check to see if the binding was successful:

```
jetson@jetson-desktop:/etc/udev/rules.d$ ll /dev | grep ttyUSB*
lrwxrwxrwx 1 root root 7 5月 18 20:13 gps1 -> ttyUSB1  #这个
是系统自带的，不用管
#It comes with the system. Don't worry about it.
lrwxrwxrwx 1 root root 7 5月 18 20:13 myserial -> ttyUSB0  #pcb
绑定了ttyUSB0端口
#pcb bound to ttyUSB0 port
lrwxrwxrwx 1 root root 7 5月 18 20:13 rplidar -> ttyUSB1  #雷达
绑定了ttyUSB1端口
#Lidar bound to ttyUSB1 port
crwxrwxrwx 1 root dialout 188, 0 5月 18 20:13 ttyUSB0
crwxrwxrwx 1 root dialout 188, 1 5月 18 20:13 ttyUSB1
```

Prints as above, indicating successful binding.

6.3 Introduction to Rule File Syntax

```
KERNEL=="ttyUSB*", ATTRS{idVendor}=="1a86", ATTRS{idProduct}=="7523",  
MODE:="0777", SYMLINK+="myserial"  
KERNEL=="ttyUSB*", ATTRS{idVendor}=="10c4", ATTRS{idProduct}=="ea60",  
MODE:="0777", SYMLINK+="rplidar"
```

parse

```
KERNEL          # 匹配事件的设备名  
# Device name for matching events  
ATTR{filename}  # 匹配事件设备的sysfs属性。  
# Match the sysfs attribute of the event device.  
idVendor        # 生产商编号。  
# Manufacturer's number  
idProduct       # 产品号# Product number  
SYMLINK         # 为/dev/下的设备文件产生符号链接。就是给这个设备取一个别名。  
# Generate symbolic links for device files under /dev/. That is, give this device  
an alias.  
MODE           # 为设备设定权限。  
# Set permissions for the device.
```

By [6.1], see the PCB device number is [ttyUSB0] easy to jump, ID number is [1a86, 7523] fixed, [ttyUSB *] on behalf of whatever the device number becomes [ttyUSB] followed by [0, 1, 2, 3, 4, ...] are bound to [myserial]; lidar equipment [ttyUSB1] is the same; the need to bind other devices is also the same.

Note: When taking aliases, don't take some device names that already exist in the system, or it will fail. Note: When taking aliases, do not take some device names that already exist in the system, or they will fail.

6.4. Binding USB ports

The above cases are all different ID numbers, if the lidar and PCB have the same ID number, or if there are two or more PCBs (lidars) with the same ID, the above bindings will be confused. E.g. **If we need to bind the voice control board when we have already bound the lidar and PCB, this situation will occur**


Then, we need to bind the USB port, after binding **can not be replaced at will** USB port, each device **can only be linked to a fixed** USB port.

Binding method, to [ttyUSB0] as an example, view the port of the device at this time

First view ttyUSB0 corresponding to the device:

```
ll /dev | grep ttyUSB*
```

```
jetson@jetson-desktop:~$ ll /dev | grep ttyUSB*  
lrwxrwxrwx 1 root root 7 5月 18 20:13 gps1 → ttyUSB1  
lrwxrwxrwx 1 root root 7 5月 18 20:13 myserial → ttyUSB0  
lrwxrwxrwx 1 root root 7 5月 18 20:13 rplidar → ttyUSB1  
crwxrwxrwx 1 root dialout 188, 0 5月 18 20:13 ttyUSB0  
crwxrwxrwx 1 root dialout 188, 1 5月 18 20:13 ttyUSB1
```



The corresponding device for ttyUSB0 is: myserial

```
udevadm info --attribute-walk --name=/dev/ttyUSB0 | grep devpath
```

```
jetson@jetson-desktop:~$ udevadm info --attribute-walk --name=/dev/ttyUSB0 | grep devpath
Udevadm info starts with the device specified by the devpath and then
ATTRS{devpath}=="2.4"
ATTRS{devpath}=="2"
ATTRS{devpath}=="0"
jetson@jetson-desktop:~$
```

What we need is to change the rules for myserial in the rules file:

```
# 修改前:
# Before modification:
# KERNEL=="ttyUSB*", ATTRS{idVendor}=="1a86", ATTRS{idProduct}=="7523",
# MODE:="0777", SYMLINK+="myserial"
# 修改后:
# Modified:
KERNEL=="ttyUSB*", ATTRS{devpath}=="2.4", ATTRS{idVendor}=="1a86",
ATTRS{idProduct}=="7523", MODE:="0777", SYMLINK+="myserial"
```

Save and exit to make the rule effective and enforce it on the master:

```
sudo udevadm control --reload-rules && sudo udevadm trigger
```

Check to see if the binding was successful:

```
jetson@jetson-desktop:/etc/udev/rules.d$ ll /dev | grep ttyUSB*
lrwxrwxrwx 1 root root          7 5月 18 20:13 gps1 -> ttyUSB1      #这个
是系统自带的，不用管
#It comes with the system. Don't worry about it.
lrwxrwxrwx 1 root root          7 5月 18 20:13 myserial -> ttyUSB0    #pcb
绑定了ttyUSB0端口
#pcb bound to ttyUSB0 port
lrwxrwxrwx 1 root root          7 5月 18 20:13 rplidar -> ttyUSB1    #雷达
绑定了ttyUSB1端口
#Lidar is bound to the ttyUSB1 port
lrwxrwxrwx 1 root root          7 5月 18 20:13 myspeech -> ttyUSB2   #语音
控制板绑定了ttyUSB2端口
#Voice control board bundled with ttyUSB2 port
crwxrwxrwx 1 root dialout 188, 0 5月 18 20:13 ttyUSB0
crwxrwxrwx 1 root dialout 188, 1 5月 18 20:13 ttyUSB1
crwxrwxrwx 1 root dialout 188, 1 5月 18 20:13 ttyUSB2
```

Printing as above indicates that the lidar, PCB and voice control board are all bound successfully.

If you do not understand any of the above binding methods, please refer to the contents of Chapter 14 of the course document "**14, Voice Control Series Courses \2, Voice Control Module Port Binding**" course.

