4.Hardware interaction data processing

4.1、Hardware mounting (port binding)

1、Connect the device you need to mount to the board，Create udev rules in the host (/etc/udev/rules.d/)

The following is the ROS control board and Radar equipment mounting as an example, the actual situation according to their own equipment mounting

2、Then, when opening the container, mount the devices with rules set on the rules into the docker container through parameters such as --device=/dev/myserial --device=/dev/rplidar

```
docker run -it --device=/dev/myserial --device=/dev/rplidar ubuntu:latest
/bin/bash
```

3、The device can be found in the docker container

```
jetson@ubuntu:~$ docker images
REPOSITORY                    TAG       IMAGE ID       CREATED             SIZE
ubuntu                        1.0       78ca7be949b6   About an hour ago   69.2MB
pengan88/ubuntu               1.0       78ca7be949b6   About an hour ago   69.2MB
hello-world                   latest    46331d942d63   13 months ago       9.14kB

jetson@ubuntu:~$ ll /dev | grep ttyUSB*
lrwxrwxrwx   1 root   root          7 Apr 23 18:07 myserial -> ttyUSB0
lrwxrwxrwx   1 root   root          7 Apr 23 18:07 rplidar -> ttyUSB1
crwxrwxrwx   1 root   dialout 188,  0 Apr 23 18:07 ttyUSB0
crwxrwxrwx   1 root   dialout 188,  1 Apr 23 18:07 ttyUSB1

jetson@ubuntu:~$ docker run -it   --device=/dev/myserial --device=/dev/rplidar
ubuntu:latest  /bin/bash

root@03522257ba30:/# ls /dev  #There are myserial and rplidar device in docker
```

```
console  fd  full  mqueue  myserial  null  ptmx  pts  random  rplidar  shm
stderr  stdin  stdout  tty  urandom  zero
```

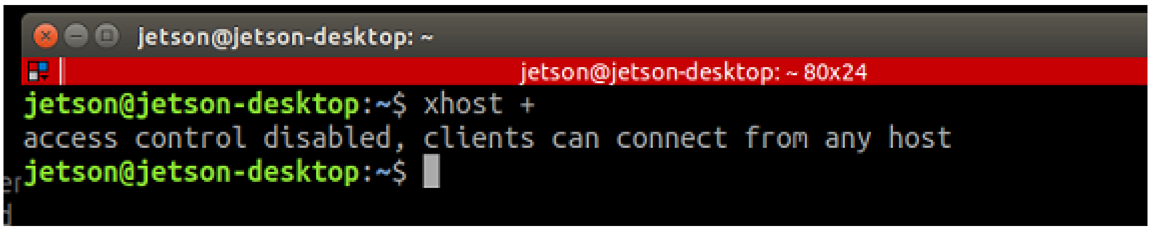
4.2、GUI display in docker

1、Install in the host (Factory image has been installed by default):

```
sudo apt-get install tigervnc-standalone-server tigervnc-viewer
sudo apt-get install x11-xserver-utils
```

2、Execute in the host: xhost +

After the following image is displayed, perform 3 steps:



```
jetson@jetson-desktop:~$ xhost +
access control disabled, clients can connect from any host
jetson@jetson-desktop:~$
```

3、Execute the command in the host to enter the container:

```
docker run -it \                        # Run docker images interactively
--env="DISPLAY" \                       # Open the display GUI interface
--env="QT_X11_NO_MITSHM=1" \            # Port 1 of X11 is used for display
-v /tmp/.X11-unix:/tmp/.X11-unix \      # map shows the service node directory
yahboomtechnology/ros-foxy:1.0.0        # The name of the image to start
/bin/bash                     # Executes the /bin/bash command in the container
```

4、Test

```
Execute in container: rviz2
```

4.3、docker containers and hosts transfer files to each other

4.3.1、use cp command

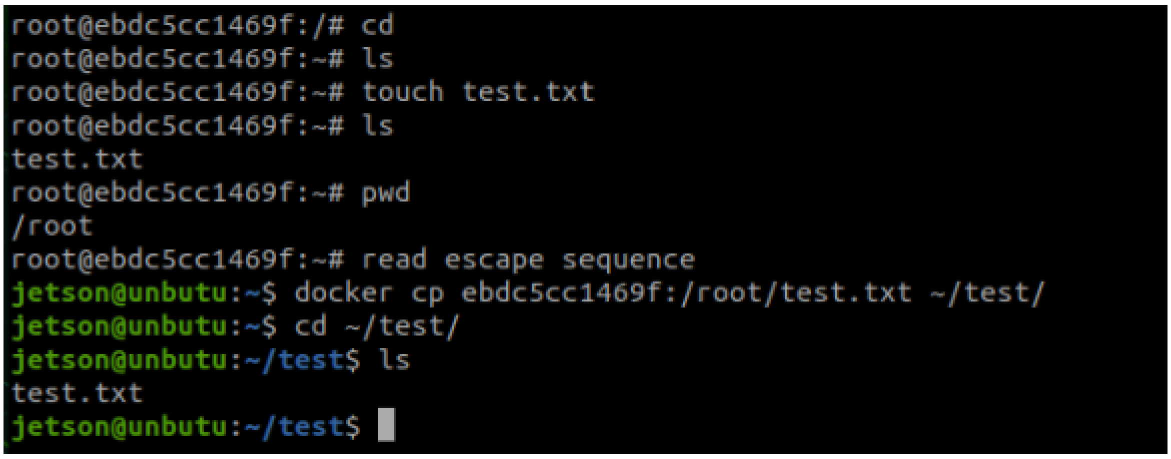
4.3.1.1、Copy files from the container to the host

```
# command
docker cp [container id:Intra-container path] [Destination host path]

# test
# Execute inside the container, create a file test
jetson@ubuntu:~$ docker ps -a
```

```
CONTAINER ID   IMAGE           COMMAND       CREATED       STATUS
  PORTS     NAMES
c54bf9efae47   ubuntu:latest   "/bin/bash"   2 hours ago   Up 9 minutes
            funny_hugle
3b9c01839579   hello-world     "/hello"      3 hours ago   Exited (0) 3 hours ago
            jovial_brown
jetson@ubuntu:~$ docker attach c5
root@c54bf9efae47:/# cd
root@c54bf9efae47:~# ls
root@c54bf9efae47:~# touch test.txt
root@c54bf9efae47:~# ls
test.txt
root@c54bf9efae47:~# pwd
/root
root@c54bf9efae47:/#  (read escape sequence)    #ctrl+P+Q The container does not
stop exiting
jetson@ubuntu:~$ docker cp c54bf9efae47:/root/test.txt ~/
jetson@ubuntu:~$ ls      # The test .txt file has been copied in
Desktop  Documents  Downloads  fishros  Music  openvino  Pictures  Public
rootOnNVMe  run_docker.sh  sensors  snap  temp  Templates  test.txt  Videos
```

example:



```
root@ebdc5cc1469f:/# cd
root@ebdc5cc1469f:~# ls
root@ebdc5cc1469f:~# touch test.txt
root@ebdc5cc1469f:~# ls
test.txt
root@ebdc5cc1469f:~# pwd
/root
root@ebdc5cc1469f:~# read escape sequence
jetson@unbutu:~$ docker cp ebdc5cc1469f:/root/test.txt ~/test/
jetson@unbutu:~$ cd ~/test/
jetson@unbutu:~/test$ ls
test.txt
jetson@unbutu:~/test$
```

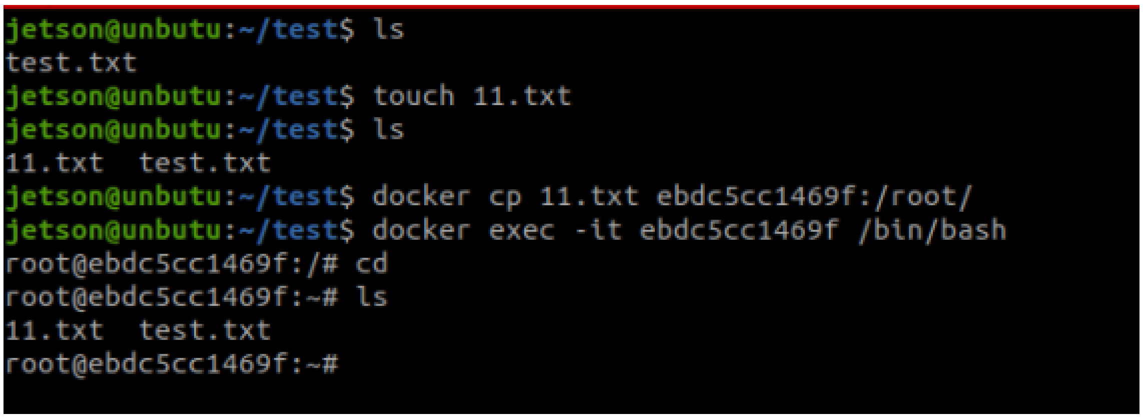
4.3.1.2、Copy files from the host to the container

```
# command
docker cp [host_file_path] [container id:the path within the docker]

# test
jetson@ubuntu:~$ docker ps -a
CONTAINER ID   IMAGE           COMMAND       CREATED       STATUS
  PORTS     NAMES
c54bf9efae47   ubuntu:latest   "/bin/bash"   2 hours ago   Up 5 minutes
            funny_hugle
3b9c01839579   hello-world     "/hello"      3 hours ago   Exited (0) 3 hours ago
            jovial_brown
jetson@ubuntu:~$ ls
Desktop  Documents  Downloads  fishros  Music  openvino  Pictures  Public
rootOnNVMe  run_docker.sh  sensors  snap  temp  Templates  test.txt  Videos
jetson@ubuntu:~$ touch 11.txt
jetson@ubuntu:~$ ls
```

```
11.txt  Desktop  Documents  Downloads  fishros  Music  openvino  Pictures  Public
rootOnNVMe  run_docker.sh  sensors  snap  temp  Templates  test.txt  Videos
jetson@ubuntu:~$ docker cp 11.txt c54bf9efae47:/root/
jetson@ubuntu:~$ docker exec -it c54b /bin/bash
root@c54bf9efae47:/# ls
bin  boot  dev  etc  home  lib  media  mnt  opt  proc  root  run  sbin  srv  sys
tmp  usr  var
root@c54bf9efae47:/# cd /root/
root@c54bf9efae47:~# ls     # 11.txt The file has been copied in
11.txt  test.txt
```

example:



```
jetson@unbutu:~/test$ ls
test.txt
jetson@unbutu:~/test$ touch 11.txt
jetson@unbutu:~/test$ ls
11.txt  test.txt
jetson@unbutu:~/test$ docker cp 11.txt ebdc5cc1469f:/root/
jetson@unbutu:~/test$ docker exec -it ebdc5cc1469f /bin/bash
root@ebdc5cc1469f:/# cd
root@ebdc5cc1469f:~# ls
11.txt  test.txt
root@ebdc5cc1469f:~#
```

4.3.2、Using Data Volumes

4.3.2.1、Data Volume Overview

Package the application and the running environment to form a container to run, and the run can be accompanied by the container, but our data requirements are expected to be persistent! For example, if you install a mysql and you delete the container, it is equivalent to deleting the library and running away, which is definitely not okay! So we hope that it is possible to share data between containers, and the data generated by docker containers, if a new image is not generated through docker commit, so that the data is saved as part of the image, then when the container is deleted, the data will naturally be gone! This will not work!

In order to save data, we can use volumes in Docker! Let the data be mounted locally to us! So that the data is not lost due to container deletion!

Peculiarity:

1. Data volumes can share or reuse data between containers
2. Changes in the volume can take effect directly
3. Changes in the data volume will not be included in the update of the image
4. The lifecycle of a data volume lasts until no container uses it

4.3.2.2、Data volume use

```
# command
docker run -it -v host absolute path directory: directory inside the container
image name

# Test
docker run -it -v /home/jetson/temp:/root/temp yahboomtechnology/ros-foxy:3.4.0
/bin/bash

The /home/jetson/temp directory in the host and the /root/temp directory in the
container can share data
```