7、Install ROS1/ROS2 in docker container


```
Raspberry Pi Pi 5 raspios-bookworm
DOCKER HUB repository: https://hub.docker.com/
```

7.1 Install the corresponding images mirror (ROS environment)

(Use our latest image to skip the 7.1 installation image part!!!)

```
docker pull [latest image version number]
#(All version numbers of the tutorial are subject to the latest)
```

7.1.1 Method 1. Download from docke hub warehouse (requires internet connection)

ROS1-(melodic)

Use the command on the host:

```
docker pull yahboomtechnology/ros-melodic:1.2 # The latest image version number here is based on the actual modifications seen
```

```
pi@raspberrypi:~ $ docker pull yahboomclh/ros-melodic:1.2
1.2: Pulling from yahboomclh/ros-melodic
7f8ef08e85ad: Pull complete
5bb837b6f054: Pull complete
3aaa58d44f15: Pull complete
e4ddeb972ed1: Pull complete
f17825196719: Pull complete
Digest: sha256:d27386e6804c136bc87766222468bdf66e91aa4703dcc55a19294e3e6e54d882
Status: Downloaded newer image for yahboomclh/ros-melodic:1.2
docker.io/yahboomclh/ros-melodic:1.2
```

ROS2-(foxy)

Use the command on the host:

```
docker pull yahboomtechnology/ros2-foxy:2.0.1 # The latest image version number here is based on the actual modifications seen
```

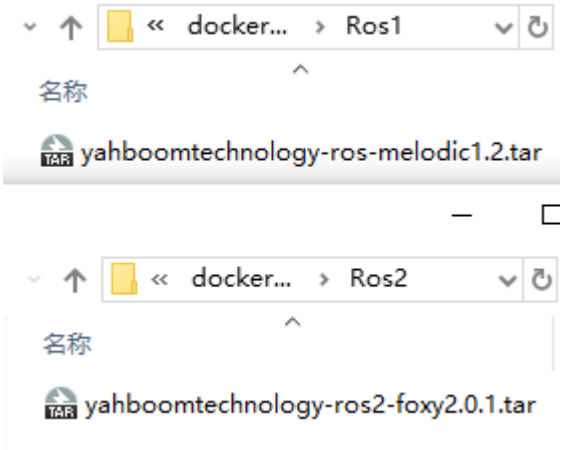
```
pi@raspberrypi:~ $ docker pull yahboomclh/ros2-foxy:2.0.1
2.0.1: Pulling from yahboomclh/ros2-foxy
0fd6d894cef8: Pull complete
2684a3f908c9: Pull complete
Digest: sha256:d102532bc7d0399c9ea0fbd967fc6ce6f37c746f31ced077f007b66c19ae58a7
Status: Downloaded newer image for yahboomclh/ros2-foxy:2.0.1
docker.io/yahboomclh/ros2-foxy:2.0.1
```

After the installation is complete, enter the docker images command to see the image list.

```
pi@raspberrypi:~ $ docker images
REPOSITORY TAG IMAGE ID CREATED SIZE
yahboomtechnology/ros2-foxy 2.0.1 4b8a5eee5110 7 days ago 5.61GB
yahboomtechnology/ros-melodic 1.2 1f3f7da97f2b 7 days ago 3.05GB
hello-world latest b038788ddb22 7 months ago 9.14kB
```

7.1.2 Method 2: Load from local file (offline)

Obtain the .tar compressed package from the network disk data and select the ROS environment you need.



Use the command in the directory where the [xxx.tar] file of the host machine is located:

```
docker load -i xxx.tar
```

This operation takes some time, but rarely fails.

```
pi@raspberrypi:~ $ docker load -i yahboomtechnology-ros2-foxy2.0.1.tar
Loaded image ID: sha256:4b8a5eee511087720ba69953ee957402a591e60c0285db3f1ee44a5b0f6e85ed
```

After docker load execution is completed, execute:

```
docker images
```

You can view the updated image and experience the new features

```
pi@raspberrypi:~ $ docker images
REPOSITORY                  TAG       IMAGE ID       CREATED         SIZE
<none>                      <none>    4b8a5eee5110   17 hours ago    5.61GB
yahboomclh/ros-melodic      1.2       1f3f7da97f2b   23 hours ago    3.05GB
hello-world                 latest    b038788ddb22   7 months ago    9.14kB
```

If you see the REPOSITORY TAG displayed as **<_none>**

In order to facilitate the use of subsequent scripts, we need to update the label of the image we pulled.

Command prototype: **docker tag <IMAGE_ID> <REPOSITORY_NAME>:<TAG_NAME>**

```
docker tag 4b8a yahboomtechnology/ros2-foxy:2.0.1
docker tag 1f3f yahboomtechnology/ros-melodic:1.2
```

```
pi@raspberrypi:~ $ docker tag 4b8a yahboomtechnology/ros2-foxy:2.0.1
pi@raspberrypi:~ $ docker images
REPOSITORY                      TAG       IMAGE ID       CREATED         SIZE
yahboomtechnology/ros2-foxy     2.0.1     4b8a5eee5110   7 days ago      5.61GB
yahboomtechnology/ros-melodic   1.2       1f3f7da97f2b   7 days ago      3.05GB
hello-world                     latest    b038788ddb22   7 months ago    9.14kB
```

7.2 Usage tips

At this point, the ros environment in docker has been set up. Follow the instructions for the corresponding accessories to enter the docker container and use it.

```
Note: The environments inside the docker container and outside the container
(host) are completely independent. If there is a lack of dependent environments,
you need to install the relevant dependencies.
```

7.3 Using accessories in docker container ROS1/ROS2

7.3.1 Install device udev rules rule file

```
Note: This step needs to be used according to the tutorial (environment setup or
preparation before use) of the corresponding accessory.
Whether you are using ROS1 or ROS2 environment, you only need to bind it once
The rule file .rules is in the /etc/udev/rules.d/ directory
->Here we take Astra camera binding as an example
```

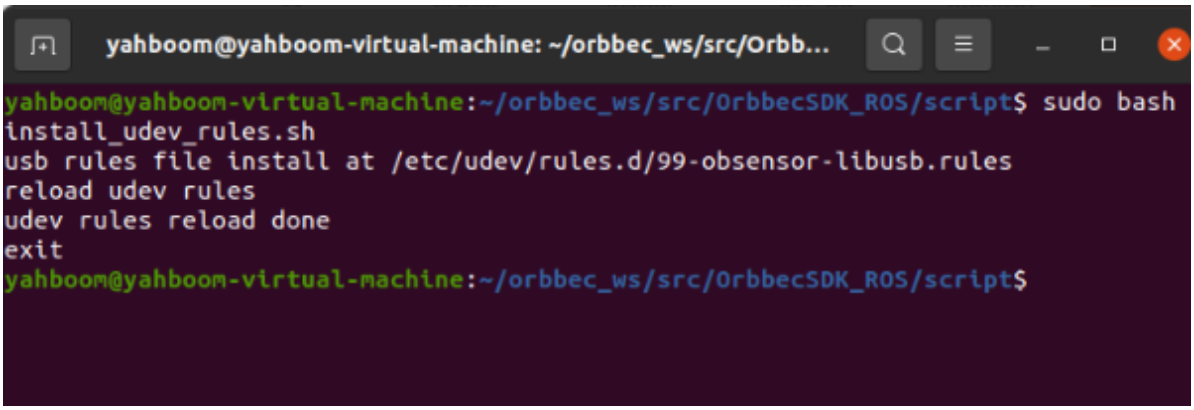
Terminal input,

```
cd ~/orbbec_ws/src/orbbec-ros-sdk/script
sudo chmod 777 install.sh
sudo bash install.sh
```

install.sh is mainly a script that executes binding rule files

Mainly done **(move xxx.rules to the /etc/udev/rules.d/ directory)** operation

The script or startup folder under each function package generally has a .sh script. Each function package is not necessarily named install.sh. Before using it, cd to the directory and ls to see the full name of the script, and then execute it. bash command. If there is no script, you can manually cp the .rules file to the directory and the effect will be the same.



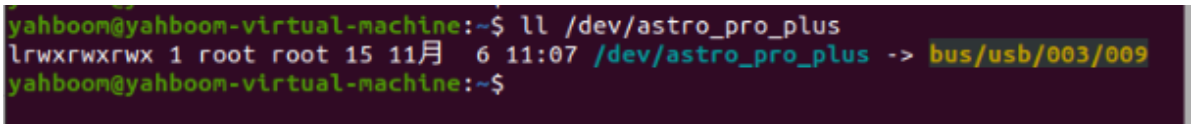
After the installation is complete, it is best to restart.

Enter the following command to verify,

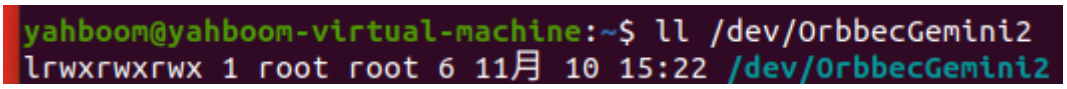
```
#astraproplus
ls -l /dev/astro_pro_plus
#gemini2
ls -l /dev/OrbbecGemini2
```

The following content appears, indicating that the binding is successful

astraproplusshow



gemini2display



7.3.2 Write startup script

```
Places to add modifications: (After the Raspberry Pi is connected to accessories, all newly added device numbers need to be mapped to the container)
--device=/dev/xxx #Needs to be replaced with the bound device name
--device=/dev/videox #The video device number that needs to be replaced with the accessory
-v /dev/bus/usb/00x/0xx:/dev/bus/usb/00x/0xx #Needs to be replaced with the actual queried USB device number
->Add it to the script after modification
```

ROS1 example: docker_ros1.sh

```
#!/bin/bash
xhost+
docker run -it \
--net=host \
--env="DISPLAY" \
--env="QT_X11_NO_MITSHM=1" \
-v /tmp/.X11-unix:/tmp/.X11-unix \
--security-opt apparmor:unconfined \
-v /home/pi/temp:/root/temp \
--device=/dev/xxx \
yahboomtechnology/ros-melodic:1.2 /bin/bash
```

ROS2 example: docker_ros2.sh

```
#!/bin/bash
xhost+
docker run -it \
--net=host \
--env="DISPLAY" \
--env="QT_X11_NO_MITSHM=1" \
-v /tmp/.X11-unix:/tmp/.X11-unix \
--security-opt apparmor:unconfined \
-v /home/pi/temp:/root/temp \
--device=/dev/xxx \
yahboomtechnology/ros2-foxy:2.0.1 /bin/bash
```

Annotated script (not run directly)

```
#!/bin/bash
xhost + # xhost is used to support GUI display in docker
docker run -it \ # Interactively run the docker image
--net=host \ # Container network is set to host mode
--env="DISPLAY" \ # Turn on the display GUI interface
--env="QT_X11_NO_MITSHM=1" \ # Use X11 port 1 for display
-v /tmp/.X11-unix:/tmp/.X11-unix \ # Mapping display service node directory
--security-opt apparmor:unconfined \
-v /home/pi/temp:/root/temp \ # As a directory for the host and container to
temporarily transfer files. Later, the corresponding function package of the
accessories needs to be imported for use. The directory name can be modified by
yourself.
-v /dev/bus/usb/00x/0xx:/dev/bus/usb/00x/0xx \ # Add host device to the
container, here is the xxx device port
--device=/dev/videox \ # Add host device to the container, here is x
--device=/dev/xxx \ # Add the host device to the container, here is xxx. If you
don't add it, the corresponding peripherals will not be recognized after entering
the container.
-p 9090:9090 \ # Open port
-p 8888:8888 \
yahboomtechnology/ros2-foxy:2.0.1 /bin/bash # Mirror version number
```

7.3.3 Run the script to enter the container

Note: It must be executed on the VNC of the host machine or on the screen. It cannot be executed on the terminal that remotely accesses the Raspberry Pi through SSH. Otherwise, the GUI image may not be displayed in the container.

(If entering via ssh, this is an error message)

```
pi@raspberrypi:~ $ ./docker_ros1.sh
xhost:  unable to open display ""
WARNING: Published ports are discarded when using host network mode
```

```
./run_docker.sh
```

```
---------------------------------------
ROS_DOCKER: ROS1-melodic
---------------------------------------
root@raspberrypi:/#
```

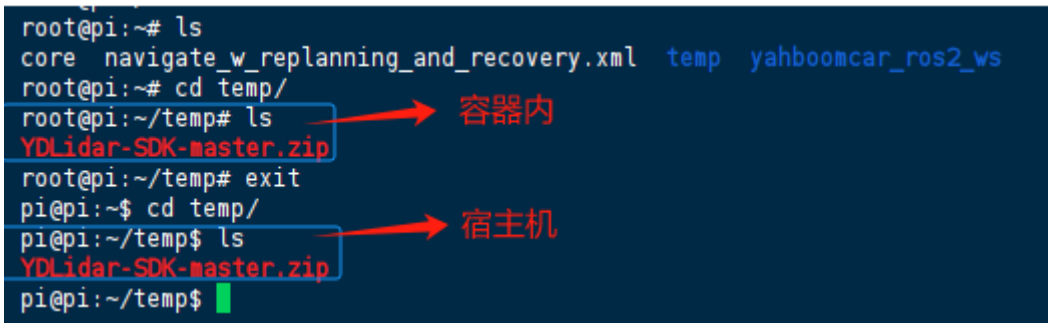
After entering the container, you can execute the rviz/rviz2 command to test whether the GUI is displayed normally.

```
Test whether the device is mapped into the container: ls -l /dev
```

7.3.4 Incoming accessory function package

Pass the corresponding function package of the accessory into the temporary transfer file directory in the container (the shared directory set in the startup script).

For example: Use WINSCP software to transfer the function package to the host, and then copy it to the shared directory, that is, /home/pi/temp. The files in the /root/temp directory in the container are synchronized.



Next, just follow the tutorial corresponding to the accessory in the container to use it.