7.4 Multi-machine communication

7.4.1 ROS multi-machine communication

1. Universal version

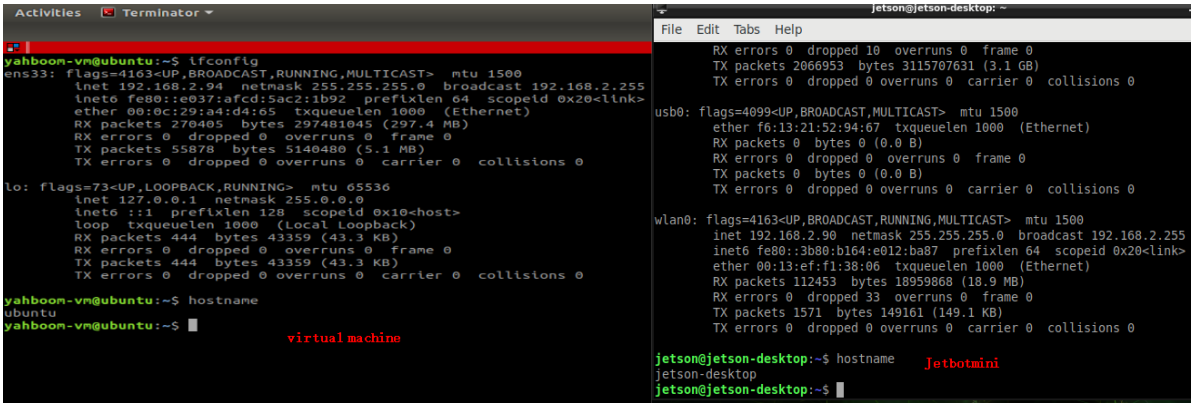
All ros masters are under the same network; if multiple devices have similar processes, choose one as the master, and the others are all slaves; the following two devices are taken as an example.

Install the ssh server on two devices; install the chrony package for synchronization:

```
sudo apt-get install chrony openssh-server
```

Input following command to view the IP information and host name of the two devices:

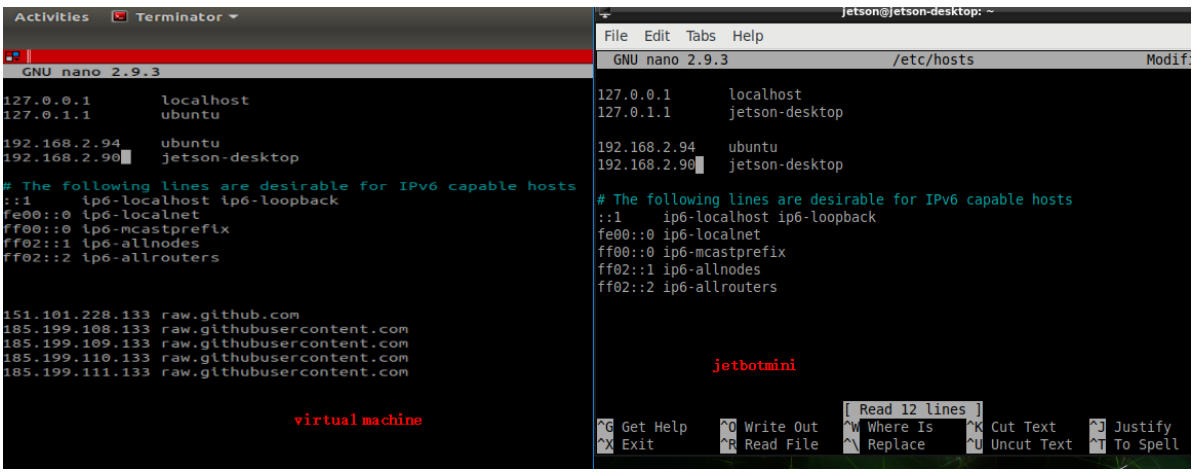
```
Command:ifconfig and hostname
```



Modify the hosts file in the /etc folder:

```
sudo chmod a+w /etc/hosts
sudo nano /etc/hosts
```

Add the IP and host names of the two devices to the hosts file of the two devices to bind users; the IP in the front and the name in the back.



After the modification, enter the following commands on both devices to restart the following network to realize the communication between the two devices:

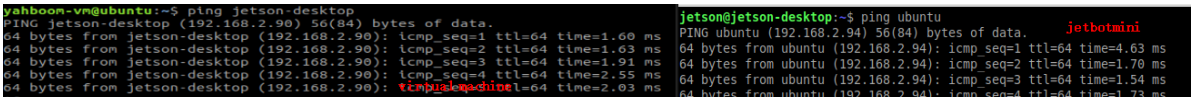
```
sudo /etc/init.d/networking restart
```

After installation, input following command confirm whether the server has been started:

```
ps -e|grep ssh
```

Input following command to check if the communication is normal:

```
ping 设备的主机名
```



Modify ~/.bashrc file

```
sudo nano ~/.bashrc
```

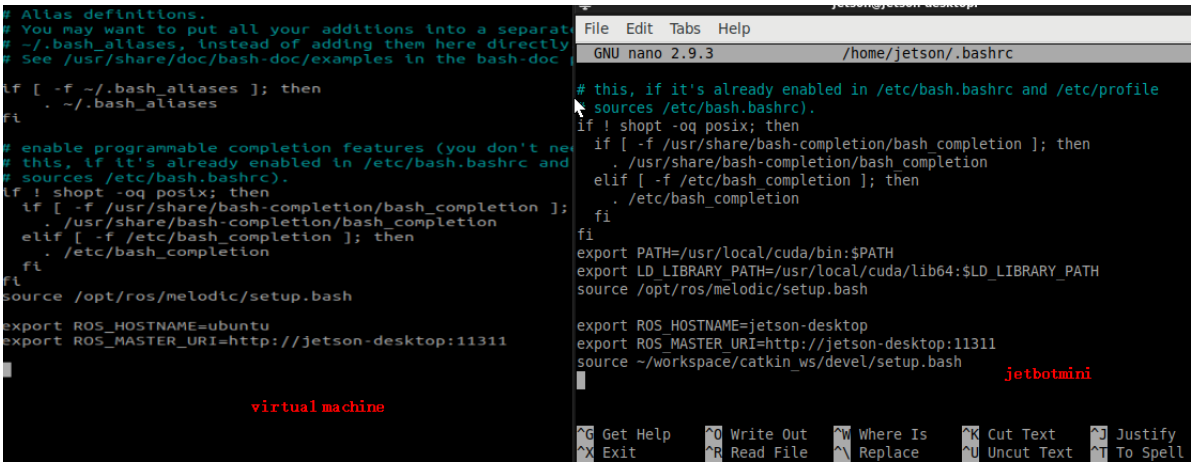
Add following content to ~/.bashrc file of master

```
export ROS_HOSTNAME=Local user name
export ROS_MASTER_URI=http://Host username:11311
```

Add following content to ~/.bashrc file of slave

```
export ROS_HOSTNAME=Local user name
export ROS_MASTER_URI=http://Host username:11311
```

For example, jetson nano as a master



After setting the IP, we need to refresh it, and then we can communicate.

```
source ~/.bashrc
```

Phenomenon show

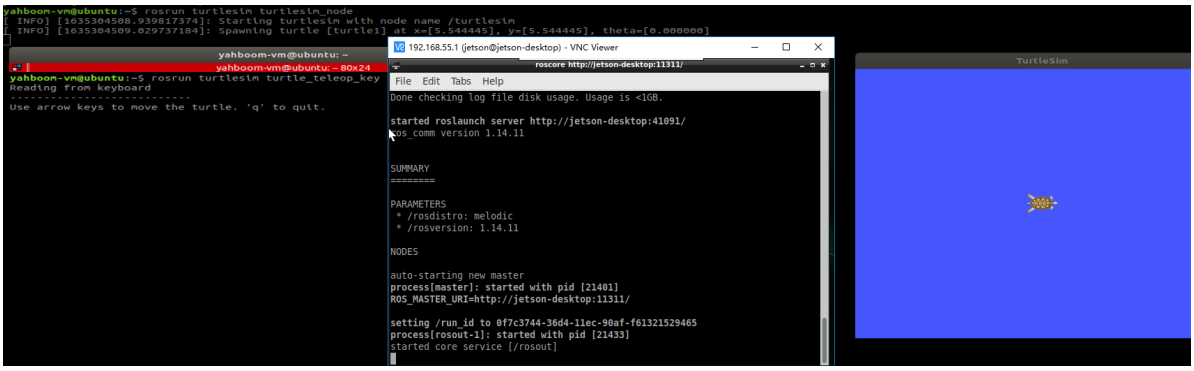
Note: we need to start up ROS Master on ROS Master

jetbotmini side

```
roscore
```

ubuntu (virtual machine)

```
rosrun turtlesim turtlesim_node
rosrun turtlesim turtle_teleop_key
```



2. Smiple version

If jetson nano is the host and the IP address is known, you only need to modify the .bashrc file of the slave.

```
sudo vim ~/.bashrc
```

Add following content file at the bottom.

```
export ROS_MASTER_URI=http://master username IP:11311
```

7.4.2 Webpage real-time monitoring

Environment setup

Note: if the jetbotmini factory image is burned, this part of the configuration can be skipped because the required software has been configured in the jetbotmini factory image.

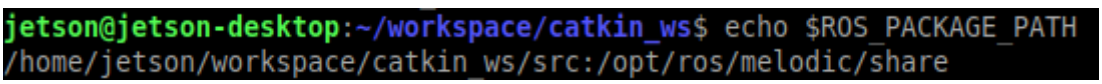
Transfer the jetbotmini course source code to the jetbotmini file system /home/Jetson directory through "WinSCP" or other file transfer tools.

Path of package : [JetBot-Mini-Robot-Car] --> [13.Code] --> [workspace]

```
cd ~
sudo chmod 777 * -R workspace
cd ~/workspace/catkin_ws
catkin_make
```

Check if it is successful

```
echo $ROS_PACKAGE_PATH
```



Build jetson-inference

```
cd ~/workspace/jetson-inference/build
cmake ../
make
sudo make install
```

Install the necessary environment

```
sudo apt-get install ros-melodic-async-web-server-cpp ros-melodic-web-video-
server
```

Run

Open terminal, input following command to start it.

```
roslaunch jetbot_ros sci-cam-test.launch
```

View pictures

```
View on local web browser
http://localhost:8080/
If you want to view by other devices, you must ensure they at the same local area
network
http://192.168.2.103:8080/
(192.168.2.103 is the IP address of the master)
Note: It is recommended to use Google browser, other browsers may not be able to
open the image
```

file path：/home/jetson/workspace/catkin_ws/src/jetbot_ros/launch/sci-cam-test.launch