



## Raspberry Pi 4B Installing Ubuntu 18.04.4 & ROS and Testing Laser

### Radar

Note: Raspberry Pi is not supposed be connected to laser radar when starting it, otherwise it can't be activated.

#### Hardware:

Raspberry Pi 4B, over 8G card, HDMI cable, power supply, ethernet cable, mouse with USB, keyboard

#### Software:

SD Card Formatter 、 Win32DiskImager、 WNetWatcher、 PuTTY、 WinSCP

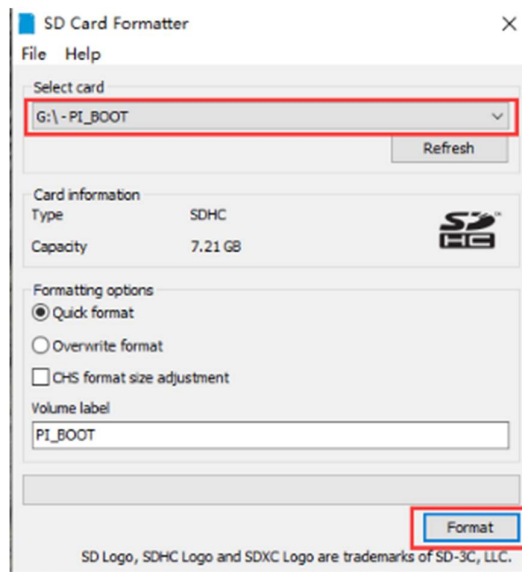
#### Download link for software:

<https://1drv.ms/u/s!ArhgRvK6-RyJhV9RwRBqgD6gKMxv?e=J5WV1b>

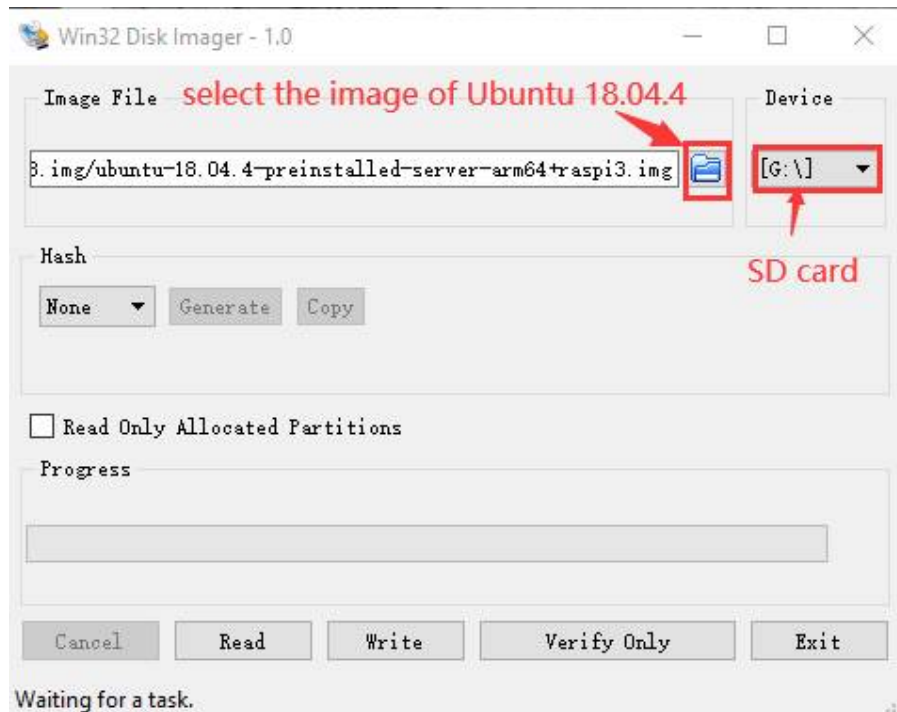
Raspberry Pi Ubuntu 18.04.4 64-bit mirror system:

<https://ubuntu.com/download/raspberry-pi/thank-you?version=18.04.4&architecture=arm64%20raspi3>

#### 1. Format SD card by SD Card Formatter



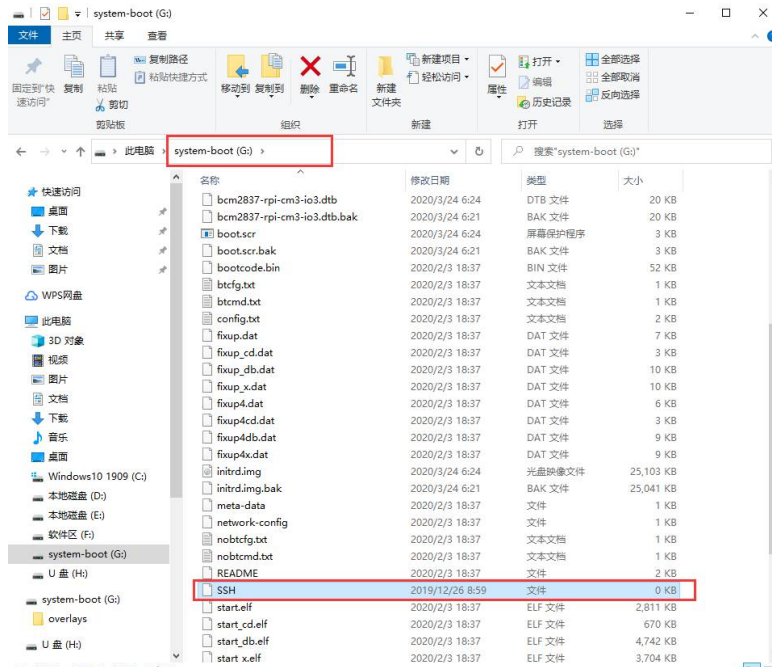
## 2. Burn ubuntu 18.04.4 64-bit mirror to SD with Win32DiskImager





### 3. Open the “boot” folder after burning, add a empty file named

SSH( You can use Notepad of the window to create new files SSH , then delete “.txt”)



### 4. Insert SD card into Raspberry Pi 4B

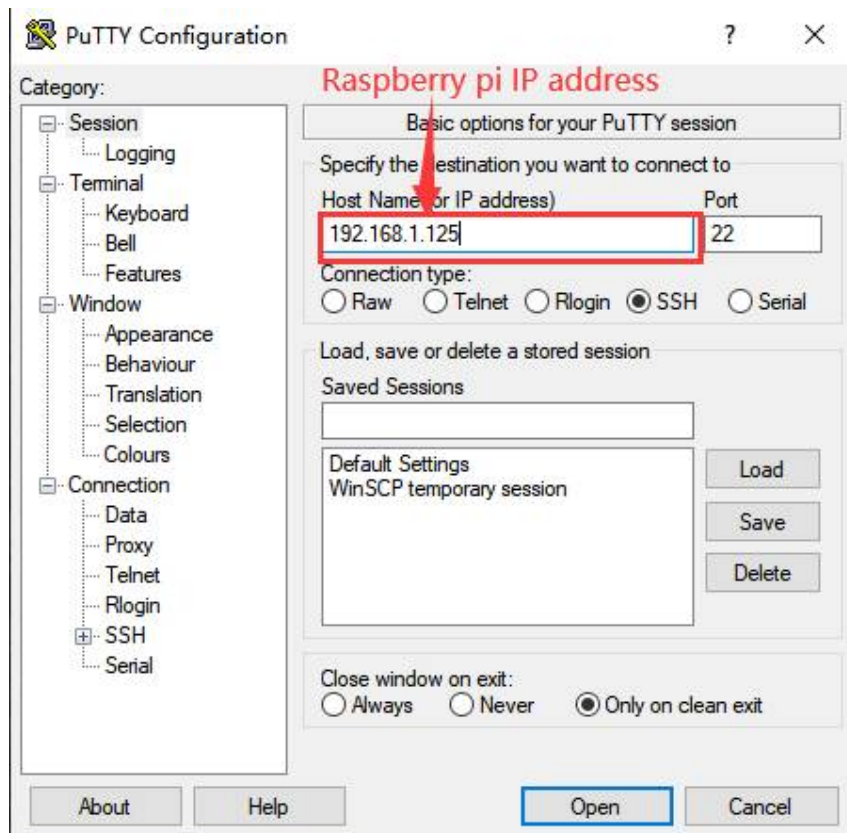
5. Wire Raspberry Pi with power and ethernet cable, wait for 1 minute, open WNetWatcher software, look up ip address of Raspberry Pi(just disconnect Raspberry Pi and open WNetWatcher to search, if you don't know the Mac address of Raspberry Pi or which ip address searched belongs to, there will be detection time on the right side of the interface. Connect to Raspberry Pi again,



check by WNetWatcher. Then the detection frequency of Raspberry Pi is less than the IP tested on other devices, record the ip and mac address of Raspberry Pi.

6. **Log in via PuTTY, the default name and password are ubuntu, need to modify the password.** (log on firstly, next to enter “ubuntu”, then change into the password you set).

Interface of PuTTY





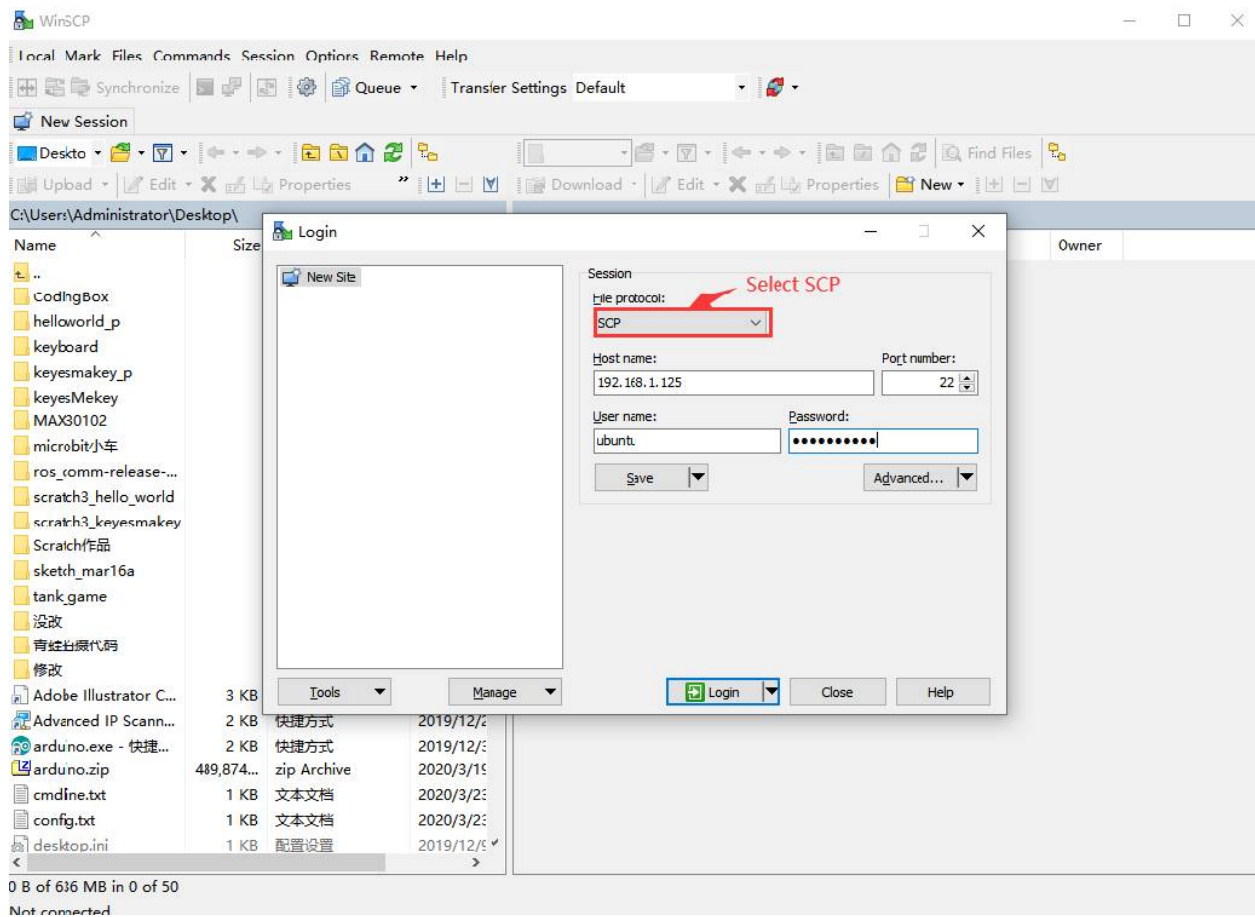
Page pops up after logging in successfully

```
ubuntu@ubuntu: ~  
System information as of Tue Mar 24 07:20:01 UTC 2020  
System load:  0.0          Processes:      137  
Usage of /:   53.5% of 14.30GB  Users logged in:  0  
Memory usage: 13%          IP address for eth0: 192.168.1.125  
Swap usage:  0%  
  
* Latest Kubernetes 1.18 beta is now available for your laptop, NUC, cloud  
instance or Raspberry Pi, with automatic updates to the final GA release.  
  
    sudo snap install microk8s --channel=1.18/beta --classic  
  
* Multipass 1.1 adds proxy support for developers behind enterprise  
firewalls. Rapid prototyping for cloud operations just got easier.  
  
    https://multipass.run/  
  
12 packages can be updated.  
0 updates are security updates.  
  
Your Hardware Enablement Stack (HWE) is supported until April 2023.  
  
Last login: Tue Mar 24 04:29:20 2020 from 192.168.1.8  
ubuntu@ubuntu:~$
```

## 7. Installing ubuntu18.04.4 Desktop

Continue to operate the following command by PuTTY, WinSCP is recommend so that you can have access to system file of ubuntu

Log in ubuntu via WinSCP



After logging on successfully, as shown below





ubuntu - ubuntu@192.168.1.125 - WinSCP

本地(L) 标记(M) 文件(F) 命令(C) 会话(S) 选项(O) 远程(R) 帮助(H)

传输选项 默认

ubuntu@192.168.1.125 X 新建会话

桌面

上传 下载 编辑 属性 新建

C:\Users\Administrator\Desktop\

名字	大小	类型	已改	名字	大小	已改变	权限	所有者
KD0003 小赛车中文...	160,537...	WPS PDF 文档	202	..		2020/2/3 18:38:31	rw-r-xr-x	root
Keil uVision5.LNK	1 KB	快捷方式	202	.cache		2020/3/24 5:31:43	rw-r-----	ubuntu
keystudio_module.js	21 KB	JavaScript 文件	202	.config		2020/3/24 3:17:58	rw-rwxr-x	ubuntu
kk.ico	564 KB	图标	202	.gnupg		2020/3/24 1:33:39	rw-r-----	ubuntu
LED_test.zip	1 KB	zip Archive	202	.local		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
MassStorageDevice...	2 KB	PTF 文件	201	.pcsc10		2020/3/24 3:46:59	rw-rwxrwt	ubuntu
MassStorageDevice...	1 KB	文本文档	201	.ros		2020/3/24 5:36:34	rw-rwxr-x	ubuntu
Microsoft Edge.Link	2 KB	快捷方式	201	.ssh		2020/2/3 18:38:32	rw-r-----	ubuntu
Mixly.exe - 快捷方式...	1 KB	快捷方式	201	Desktop		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
mixly.ico	67 KB	图标	201	Documents		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
ros_comm-release...	4 KB	gz Archive	202	Downloads		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
SSH	0 KB	文件	201	Music		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
Sublime Text 3.Link	1 KB	快捷方式	202	Pictures		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
Visual Studio Code...	1 KB	快捷方式	201	Public		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
wpa_supplicant.conf	1 KB	CONF 文件	202	Templates		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
WPS 2012.Lnk	2 KB	快捷方式	202	thinclient_drives		2020/3/24 3:27:06	rw-rwxr-t	ubuntu
x-128.jpg	564 KB	JPEG 图像	202	Videos		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
百度网盘.Link	1 KB	快捷方式	201	.bash_history	1 KB	2020/3/24 6:53:29	rw-r-----	ubuntu
网络有道词典.Link	2 KB	快捷方式	201	.bash_logout	1 KB	2018/4/4 18:30:26	rw-r-----	ubuntu
写给业务的简书.wps	68 KB	WPS文字 文档	202	.bashrc	4 KB	2020/3/24 4:36:41	rw-r-----	ubuntu
迅雷.Link	2 KB	快捷方式	202	.dmrc	1 KB	2020/3/24 3:17:46	rw-r-----	ubuntu
				.ICEauthority	2 KB	2020/3/24 5:31:41	rw-r-----	ubuntu

0 B / 636 MB, 0 / 50

0 B / 105 KB, 0 / 28

SCP 0:01:05

Desktop - ubuntu@192.168.1.125 - WinSCP

Local Mark Files Commands Session Options Remote Help

Synchronize Queue Transfer Settings Default

ubuntu@192.168.1.125 X New Session

Desktop

Upload Edit Properties Download Edit Properties New

C:\Users\Administrator\Desktop\

Name	Size	Type	Changed	Name	Size	Changed	Rights	Owner
CodingBox		Parent directory	2020/3/26	..		2020/2/3 18:38:31	rw-r-xr-x	root
helloworld_p		文件夹	2020/1/9	.cache		2020/3/24 9:27:33	rw-r-----	ubuntu
keyboard		文件夹	2020/1/8	.config		2020/3/24 9:27:31	rw-rwxr-x	ubuntu
keyesmakey_p		文件夹	2019/12/1	.gnupg		2020/3/24 1:33:39	rw-r-----	ubuntu
keyesMekey		文件夹	2020/3/1/8	.local		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
MAX30102		文件夹	2020/3/26	.pcsc10		2020/3/24 3:46:59	rw-rwxrwt	ubuntu
microbit小车		文件夹	2019/12/1	.ros		2020/3/24 8:13:09	rw-rwxr-x	ubuntu
ros_comm-release...		文件夹	2020/1/14	.rviz		2020/3/24 8:12:31	rw-rwxr-x	ubuntu
scratch3_hello_world		文件夹	2020/1/6	.ssh		2020/2/3 18:38:32	rw-r-----	ubuntu
scratch3_keyesmakey		文件夹	2020/1/6	.thumbnails		2020/3/24 8:15:12	rw-rwxr-x	ubuntu
Scratch作品		文件夹	2020/1/14	catkin_ws		2020/3/24 7:46:00	rw-rwxr-x	ubuntu
sketch_mar16a		文件夹	2020/3/16	Desktop		2020/3/24 8:17:08	rw-r-xr-x	ubuntu
tank_game		文件夹	2020/1/3	Documents		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
没改		文件夹	2020/3/5	Downloads		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
青蛙拍摄代码		文件夹	2019/12/1	Music		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
修改		文件夹	2020/3/5	Pictures		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
Adobe Illustrator C...	3 KB	快捷方式	2019/12/5	Public		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
Advanced IP Scann...	2 KB	快捷方式	2019/12/5	Templates		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
arduino.exe - 快捷...	2 KB	快捷方式	2019/12/5	thinclient_drives		2020/3/24 3:27:06	rw-rwxr-t	ubuntu
arduino.zip	489,874...	zip Archive	2020/3/15	Videos		2020/3/24 3:17:48	rw-r-xr-x	ubuntu
cmdline.txt	1 KB	文本文档	2020/3/25	.bash_history	2 KB	2020/3/24 9:16:45	rw-r-----	ubuntu
config.txt	1 KB	文本文档	2020/3/25	.bash_logout	1 KB	2018/4/4 18:30:26	rw-r-----	ubuntu
desktop.ini	1 KB	配置设置	2019/12/5	.bashrc	4 KB	2020/3/24 7:46:09	rw-r-----	ubuntu
				.dmrc	1 KB	2020/3/24 3:17:46	rw-r-----	ubuntu
				.ICEauthority	3 KB	2020/3/24 9:26:44	rw-r-----	ubuntu

0 B of 636 MB in 0 of 50

0 B of 59.8 KB in 0 of 31

SCP 0:00:03



Enter the following command at the terminal to install ubuntu desktop:

```
sudo apt-get install xubuntu-desktop
```

Wait for about an hour

## 8. Installing ROS

Just like installing on the ubuntu 18.04 of the virtual machine.

(1) Set up the source of ROS

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc)
main" > /etc/apt/sources.list.d/ros-latest.list'
```

(2) Set up key

```
sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-key
C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654
```

(3) Update

```
sudo apt-get update
```

(4) Install the full edition of ROS desktop





```
sudo apt-get install ros-melodic-desktop-full
```

(5) Resolve dependence

```
sudo rosdep init
```

```
rosdep update
```

If sudo rosdep init shows errors, rosdep is not internal command:

Next to install: `sudo apt install rospack-tools`

rosdep update goes wrong, execute "rosdep update" again

(6) Adding environment variables

```
echo "source /opt/ros/melodic/setup.bash" >> ~/.bashrc
```

```
source ~/.bashrc
```

(7) Some handy tools for installing Ros

```
sudo apt install python-rosinstall python-rosinstall-generator python-wstool
```

```
build-essential
```

(8) Running turtle robot

A display is needed, connect HDMI cable to screen, log in and enter the interface of ubuntu



Open the first terminal, enter: `roscore`

Open the second terminal, enter: `roslaunch turtlesim turtlesim_node`

Open the third terminal, enter: `roslaunch turtlesim turtle_teleop_key`

choose the third terminal, then control the turtle robot by tapping direction icons on keyboard.

## 9. Testing Laser Lidar ( Lidar:YDLIDAR type:X2L)

(1) Create a directory file

```
mkdir -p ~/catkin_ws/src
```

(2) enter src folder via cd command

```
cd ~/catkin_ws/src
```

(3) create a workspace

```
catkin_init_workspace
```

(4) back to catkin\_ws directory and compile

```
cd ~/catkin_ws && catkin_make
```

(5) Add "catkin" environment variable in ~/.bashrc folder, and make it valid



```
echo "source ~/catkin_ws/devel/setup.bash" >> ~/.bashrc
```

```
source ~/.bashrc
```

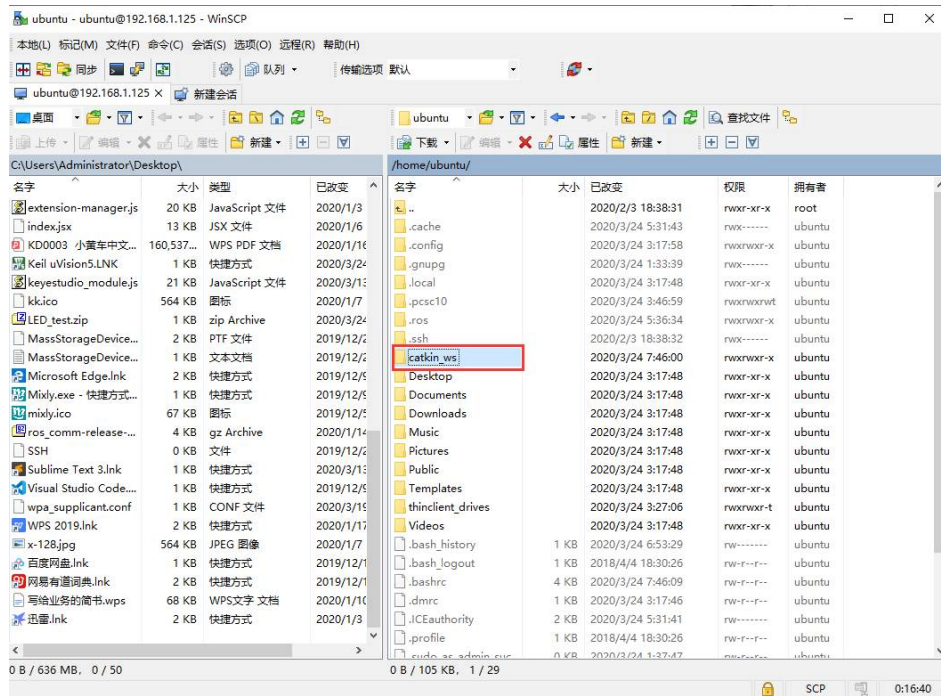
(6) Enter src directory, copy the engineering work package that corresponds to laser radar type of ydlidar in the src directory of ROS workspace.

### **Download Link:**

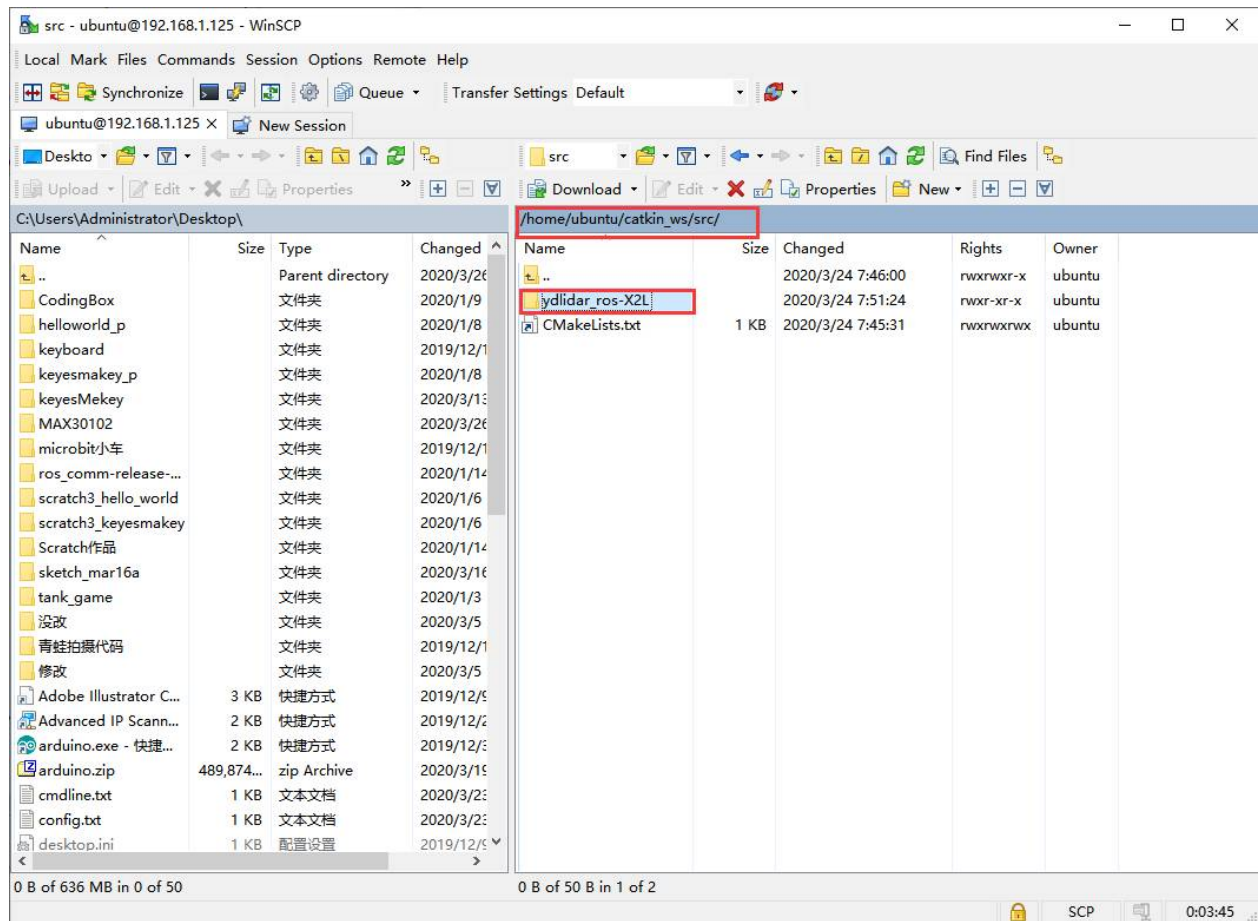
**<https://1drv.ms/u/s!ArhgRvK6-RyJhV6uyG0E98WVAjrj?e=N54Kko>**

Method (1) Open WinSCP to find the created catkin\_ws directory. You need to right-click to refresh it.

As shown below:



Click to enter the src folder, drag the downloaded engineering work package that corresponds to X2L into it directly, as shown below:



## Method (2)

enter into src folder via cd command, copy the file of github by git

```
cd ~/catkin_ws/src
```

```
git clone https://github.com/YDLIDAR/ydlidar_ros
```

```
cd ydlidar_ros
```

```
git checkout X2L
```



```
cd ../../
```

(7) Compile and generate ydlidar\_node and ydlidar\_client.

Enter the following command:

```
catkin_make
```

(8) Connect laser radar to Raspberry Pi

Wire correctly, the interface of the data cable is connected to the USB port of the Raspberry Pi

(9) Create the serial port alias [/dev/ydlidar] of YDLIDAR

```
roscore ydlidar/startup
```

```
sudo chmod 0777 *
```

```
sudo sh initenv.sh
```

(10) Run ydlidar\_node and ydlidar\_client

Open a terminal and run:

```
roslaunch ydlidar lidar.launch
```

Note: errors appear when running the above command because you don't find the serial port of laser radar, just execute the command of step 9 again, then act



the following command. If still don't work, close the terminal and restart, go to the path:`cd ~/catkin_ws` of `catkin_ws`, then execute the step 9.

As shown below if you make it.

```

/home/ubuntu/catkin_ws/src/ydlidar_ros-X2L/launch/lidar.launch http://localhost:11...
* /ydlidar_node/reversion: False
* /ydlidar_node/sun_noise: True

NODES
/
  base_link_to_laser4 (tf/static_transform_publisher)
  ydlidar_node (ydlidar/ydlidar_node)

auto-starting new master
process[master]: started with pid [3092]
ROS_MASTER_URI=http://localhost:11311

setting /run_id to 0dfbd152-6da6-11ea-8533-dca63217619c
process[rosout-1]: started with pid [3103]
started core service [/rosout]
process[ydlidar_node-2]: started with pid [3110]
process[base_link_to_laser4-3]: started with pid [3111]

YDLIDAR

[ INFO] [1585037058.414809251]: [YDLIDAR INFO] Now YDLIDAR ROS SDK VERSION:1.4.1
.....
[YDLIDAR INFO] Now YDLIDAR SDK VERSION: 1.4.1
fhs_lock: creating lockfile:      3110

[YDLIDAR INFO] Connection established in /dev/ydlidar[115200]:
[YDLIDAR INFO] Now YDLIDAR is scanning .....
```

Open the second terminal and run:

```
cd ~/catkin_ws
```

```
roslaunch ydlidar ydlidar_client
```

The data is output, as shown below:





```
ubuntu@ubuntu: ~/catkin_ws
[YDLIDAR INFO]: angle-distance : [0.360716, inf, 250]
[YDLIDAR INFO]: angle-distance : [1.082162, inf, 251]
[YDLIDAR INFO]: angle-distance : [1.803607, 0.781250, 252]
[YDLIDAR INFO]: angle-distance : [2.525053, inf, 253]
[YDLIDAR INFO]: angle-distance : [3.246485, inf, 254]
[YDLIDAR INFO]: angle-distance : [3.967930, inf, 255]
[YDLIDAR INFO]: angle-distance : [4.689376, inf, 256]
[YDLIDAR INFO]: I heard a laser scan laser_frame[462]:
[YDLIDAR INFO]: angle_range : [-180.000005, 180.000005]
[YDLIDAR INFO]: angle-distance : [-4.689376, inf, 243]
[YDLIDAR INFO]: angle-distance : [-3.967944, inf, 244]
[YDLIDAR INFO]: angle-distance : [-3.246498, 0.746000, 245]
[YDLIDAR INFO]: angle-distance : [-2.525053, inf, 246]
[YDLIDAR INFO]: angle-distance : [-1.803607, 0.749000, 247]
[YDLIDAR INFO]: angle-distance : [-1.082162, inf, 248]
[YDLIDAR INFO]: angle-distance : [-0.360730, inf, 249]
[YDLIDAR INFO]: angle-distance : [0.360716, inf, 250]
[YDLIDAR INFO]: angle-distance : [1.082162, inf, 251]
[YDLIDAR INFO]: angle-distance : [1.803607, 0.793000, 252]
[YDLIDAR INFO]: angle-distance : [2.525053, 0.781250, 253]
[YDLIDAR INFO]: angle-distance : [3.246485, inf, 254]
[YDLIDAR INFO]: angle-distance : [3.967930, inf, 255]
[YDLIDAR INFO]: angle-distance : [4.689376, inf, 256]
```

(11) The floating-point graph scanned by lidar appears

A display is needed, enter the ubuntu desktop and open the terminal

Enter catkin\_ws folder

```
cd ~/catkin_ws
```

Enter the command:

```
roslaunch ydlidar lidar_view.launch
```

“enter”, after a while, the floating-point graph scanned by the laser radar will appear. As shown below:

