

# Raspberry PI Lab

**Goal:** To get acquainted with the PI, how it is built, useful ports.

**Outcome:** Communicate with the PI, send/receive files between the PI and your laptop.

**Note:** You will do this from your laptop, not the VM.

Other info: Ubuntu 22.04 server is already installed on the sd cards.

## Lab Instructions

Have a look at chapters 1 and 2 from the official Raspberry PI beginner's guide. Thereafter, have a look at the paragraph *Raspberry Pi - Linux Shell* from

[https://www.tutorialspoint.com/raspberry\\_pi/raspberry\\_pi\\_introduction.htm](https://www.tutorialspoint.com/raspberry_pi/raspberry_pi_introduction.htm).

For future labs, other sections can also be useful such as: GPIO Connector. At this point you should have a general sense of what the PI is. You can connect a raspberry PI to a monitor through, e.g., an HDMI cable, as well as a mouse and keyboard. You can try this, and see that it is just like any other computer, almost. Alternatively, and a more practical option, you can connect to the PI through wifi (some models), or an ethernet cable.

For the purposes of this tutorial, you can simply connect to the PI through the cable, and login to the PI from your own computer through **ssh**. The PI has already been configured such that ssh is enabled, and its static IP is set to 192.168.2.10, with network mask 255.255.255.0. On your side, depending on whether you are on Mac/Win/Linux, you need to setup a static IP equal to **192.168.2.1**. You can **ssh** from the command prompt (command line/terminal).

## Setting up a static IP

This will look a bit differently depending on which OS you're on.

### MacOS:

Go to system preferences, and select Network. Identify the connection, click on it, next to Configure ipv4, select manually from the drop-down menu. Fill in the ip address, and subnet mask. Click apply.

### Linux:

Find the Network preferences, select the wired connection, and click on settings (the gear shaped icon). You will then see a dialog box, go to the ipv4 tab, in the ipv4 method select manual. Fill in the ip address and mask.

### Windows:

Go to control panel, then Network and Internet, then Network and sharing center, right click on the ethernet connection (located somewhere on the right side), and then properties. Thereafter, select the Internet Protocol Version 4 (TCP/IPv4), and click properties. Assign the IP and mask. Click ok. Congrats, you're now done. (<https://pureinfotech.com/set-static-ip-address-windows-10/>)

### Checking the connection

Let's check the connection between your laptop and the PI. You can do that through the ping command:

From your laptop, check if the PI is reachable:

```
$ ping 192.168.2.10
```

From the PI you can also check the connection to your laptop:

```
$ ping 192.168.2.1
```

If the connection works, you should see something like this:

```
$ 64 bytes from 8.8.8.8: icmp_seq=0 ttl=47 time=24.886 ms
$ 64 bytes from 8.8.8.8: icmp_seq=1 ttl=47 time=19.989 ms
$ 64 bytes from 8.8.8.8: icmp_seq=2 ttl=47 time=19.748 ms
```

### SSH-ing into the PI

If the machines can see each other, then you can login to the PI from your laptop. This is the main way you will use to work with the PI through the course.

Let's have a quick look at how you can login to the PI from each OS.

#### MacOS/Linux/Windows:

Open a terminal and type the following (powershell on windows):

```
$ ssh ubuntu@192.168.2.10
```

Where **ubuntu** is the username on the pi. You will be prompted for a password, type: *turtlebot*

Now you can type commands to the shell of the PI from your own laptop. You can try again the simple commands from the *Raspberry Pi - Linux Shell*.

You can check your network interfaces using the following:

```
$ ip a
```

### Using scp to transfer files back and forth

There is a simple command that can be used to transfer a file from your laptop to the PI and vice versa.

```
$ scp file.txt ubuntu@192.168.2.10:/remote/directory
```

Where the file.txt is on your laptop, and you'd like to transfer to /remote/directory on the PI.

You will use this command to transfer the code you will write to the PI when you want to test.

### Setting up the Wifi

You can also ssh to the PI through a Wifi connection. The wifi network interface has already been configured on the PI, to connect to a network called **turtlebot** with password **turtlebot3**. Note however that all the PIs are configured to connect to the same wifi, so before using this you need to change the name of the network to one of your choice. Using your phones you can create a hotspot with the name and password of choice.

In order to change the current configuration, ssh to the PI via the ethernet. Thereafter, modify the following file:

```
$ sudo vim /etc/netplan/50-cloud-init.yaml
```

You can use nano instead of vim – both are text editors you can use when working on the terminal.

You will see that the file looks like this:

```
network:
  version: 2
  wifis:
    renderer: networkd
    wlan0:
      access-points:
        turtlebot:
          password: turtlebot3
      dhcp4: true
      optional: true
  ethernets:
    eth0:
      dhcp4: no
      addresses:
        - 192.168.2.10/24
      routes:
        - to: default
          via: 192.168.2.1
```

To modify the Wifi, change the name of network and password (bold and italics text). Save and exit.

Apply the new configuration:

```
$ sudo netplan apply
```

After this, check the network interfaces.

Try to login to the PI through the wireless connection – this is what you will use when you want to download packages from the internet (will be useful in the future weeks).