Setting Up ssh to Raspberry Pi Model B

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Contents

1 Introduction

In order to ease development of the system, it is useful to allow the Raspberry Pi 3 Model B+ to be connected to your personal computer without the need for an external monitor, mouse, or keyboard. This allows you to develop on the Raspberry Pi anyplace where you can get access to WiFi, with minimal need for cables.

This guide explains how to set up the Raspberry Pi Model B+ for this sort of development. It uses ssh to connect to the Raspberry Pi.

2 Connecting to the Raspberry Pi

If you are on Windows, install MobaXTerm. This software allows you to both use ssh to connect to various systems as well as employ the Linux command prompt for various commands. Using the Linux prompt allows the following instructions to apply equally well whether you are running Windows, Linux, or Mac.

Having installed MobaXTerm, using ssh simply involves opening a local terminal, then typing `ssh user@ip/hostname`, a typical example being `pi@192.168.1.200` or `pi@myraspberry.local`

2.1 For WiFi Connection

Using a WiFi connection to connect the Raspberry Pi to your personal network is the easiest way to set up a headless connection. You simply need to create a textfile on the SD card according to the instructions below, which were adapted from Raspberry Pi Blog: The Latest Update to Raspbian

1. Insert the SD card with the Raspbian OS into your computer.
2. Create a new file named `wpa_supplicant.conf`. The file should have the extension `.conf`; on some computers, you may need to enable an option to show file extensions before you can change it.
3. Follow the instructions here: Automatically connect a Raspberry Pi to a Wifi network concerning the `wpa_supplicant.conf` file to add the correct lines to the file you just created.
4. Also follow the instructions in the link above to assign a static IP address to your Raspberry Pi, which you will later use to ssh into it.
5. Replace the SD card into your Raspberry Pi, insert the WiFi dongle, and attach the power supply. It should automatically connect to your wireless network.

2.2 For Ethernet Connection

In case connecting to WiFi is not so simple, such as when your WiFi network requires a webpage-based login or registering a device in a database, one option is to perform a direct ethernet connection between your laptop and the Raspberry Pi. This approach also allows you to share the internet connection between your computer and the Raspberry Pi.

2.2.1 Option 1: Change the hostname

1. Install Bonjour Print Services from Apple.

   Windows Link: `https://support.apple.com/kb/DL999?viewlocale=en_US&locale=en_US`
2. Follow the instruction at Dexter Industries: Change the Hostname of your Pi to change the hostname on the SD card to something of your choosing.
3. Replace the SD card into your Pi, connect it to your computer using the ethernet cable, and attach the power source.
4. ssh into the Raspberry Pi using `ssh pi@myhostname.local` - you should not have access to the terminal!

2.2.2 Option 2: Change the IP Address

Changing the hostname is the easiest and most flexible way to access the Raspberry Pi through a direct ethernet connection. In case that doesn't work, the below instructions will also connect you to the Raspberry Pi. The instructions are adapted from this source: Raspberry Pi forums: SSH over direct ethernet connection

1. Insert the Raspberry Pi's microSD card into your computer using an adapter, as needed. Open the microSD card and append the following line into cmdline.txt:

```
ip=192.168.1.200::192.168.1.1:255.255.255.0:rpi:eth0:off
```

So that the total text looks something like:

```
dwc_otg.lpm_enable=0 console=ttyAMA0,115200 kgdboc=ttyAMA0,115200 console=tty1
    root=/dev/mmcblk0p2 rootfstype=ext4 elevator=deadline rootwait
    ip=192.168.1.200::192.168.1.1:255.255.255.0:rpi:eth0:off
```

You MUST ensure that there is no new line after the new entry. In other words, do not hit the "Enter" key on your keyboard after pasting the line in.

2. Now change the IP address settings for your ethernet connection:

   Windows: Navigate to `"Control Panel\Network and Internet\Network Connections"` and right clicking on the ethernet connection that you have connected your Raspberry Pi to, go to Properties » Internet Protocol Version 4 » Properties » Use the following IP Address

3. Use the following IP address settings:

   IP Address: 192.168.1.100

   Subnet Mask: 255.255.255.0

   Default gateway: 192.168.1.1

4. Open your terminal (or MobaXTerm) and ssh to pi@192.168.1.200 with the default password, which is "raspberry".

5. You have now successfully ssh'd into the Raspberry Pi computer!

2.3 Sharing your Internet Connection with the Raspberry Pi

Supposing that it is difficult to connect your Raspberry Pi to WiFi, but you have internet access on your personal computer, it is possible to share your internet connection with your Pi. The below instructions pertain to Windows only, though it should also be possible on other operating systems.

1. Install Bonjour Print Services from Apple.

   Windows Link: `https://support.apple.com/kb/DL999?viewlocale=en_US&locale=en_US`

2. Assign a hostname to your Raspberry Pi if you haven't done so already, using the instructions at Dexter Industries: Change the Hostname of your Pi.

3. Navigate to `"Control Panel\Network and Internet\Network Connections"` and right click connection that has internet access.

4. Go to Properties » Sharing, check both boxes, and hit "OK".

5. Restart your Raspberry Pi. You may also need to restart your personal computer.

6. ssh into your Pi and type `ping google.com` to verify internet access. You should get output like:

```
PING google.com (172.217.2.14) 56(84) bytes of data.
64 bytes from lga15s45-in-f14.1e100.net (172.217.2.14): icmp_seq=1 ttl=56 time=6.30 ms
64 bytes from lga15s45-in-f14.1e100.net (172.217.2.14): icmp_seq=2 ttl=56 time=7.07 ms
64 bytes from lga15s45-in-f14.1e100.net (172.217.2.14): icmp_seq=3 ttl=56 time=7.09 ms
```

This indicates you have internet access. The ping program will continue by itself for a while after you verified internet access exists, so press Ctrl + C to exit it.

3 First Time Setup

This section details what you should do with your Raspberry Pi if it is your first time connecting to it. This assumes that you have access to the raspberry pi terminal already, either by attaching a monitor, mouse, and keyboard, or using ssh to connect to it "headlessly". You should also have an internet connection on your Raspberry Pi, either through connecting it to your network or sharing the internet connection from your PC.

1. If the "Raspi-Config" menu hasn't appeared automatically, type "sudo raspi-config" into the terminal.
2. Select 1 Expand File System. A confirmation should appear. Confirm it and return to the configuration menu.
3. Select the option to 2 Change User Password and change the password to something secure.

Warning

Do not forget your password! Write it down if you need to.

4. Select the option to 6 Enable Camera and enable it.
5. Select the option to Finish at the bottom, and confirm that you wish to reboot the Raspberry Pi. The Rpi will then reboot.
6. Run:

```
sudo apt-get update
sudo apt-get upgrade
```

Some prompts may appear during the upgrade command. Confirm them as they appear.

3.1 Installing Remote Desktop

If you are using running the Raspberry Pi headless, you may wish to use the desktop GUI for the Raspberry Pi. This details how to do that.

The following instructions are adapted from Raspberry Pi: VNC.

- On your Pi, run `sudo raspi-config` and navigate to Advanced Options > VNC > Yes to activate the VNC server.

- Type `vncserver` to start the VNC server on your Pi.
- On your PC, download VNC Viewer at `https://www.realvnc.com/download/viewer/`.
- Install the program and run it. Connect to the Raspberry Pi either through the hostname you set or the IP address that appeared when you ran the `vncserver` command on your Raspberry Pi.
- Optional: Increase the resolution of the connection (Adapted from `https://support.realvnc.com/knowledgebase/article/View/523`)

  `sudo nano /boot/config.txt`

  Add the following lines to the file:

```
# Custom settings to force a resolution - Weimen
hdmi_force_hotlpug=1
hdmi_ignore_edid=0xa5000080
hdmi_group=2
hdmi_mode=73
```

  Where `html_mode` is set according to the resolution you want according to `https://www.raspberrypi.org/documentation/configuration/config-txt.md` under the `These values are valid if hdmi_group=2 (DMT)` line.

  Hit Ctrl + O to save, and ctrl + X to exit.

  Reboot your pi with `sudo reboot`.

  Restart the VNC server with `vncserver` and connect to it using the VNCViewer program on your PC. The resolution should have increased to what you set it to.

4 Optional: Install Development Toolchains

4.1 Install gcc 6.2

`https://solarianprogrammer.com/2016/06/29/raspberry-pi-raspbian-compiling-gcc-6/`

```
sudo apt-get update
sudo apt-get upgrade
cd ~
wget mirrors-usa.go-parts.com/gcc/releases/gcc-6.2.0/gcc-6.2.0.tar.bz2
tar xf gcc-6.2.0.tar.bz2
cd gcc-6.2.0
contrib/download_prerequisites
cd ~
mkdir build && cd build
../gcc-6.2.0/configure -v --enable-languages=c,c++ --prefix=/usr/local/gcc-6.2.0 --program-suffix=-6.2.

vncserver -kill :1
```

Modify swap file as in link, then:

```
sudo /etc/init.d/dphys-swapfile stop
sudo /etc/init.d/dphys-swapfile start

cd ~
cd build
make -j 4
```

4.2 Install QT 5.7

Run:

```
sudo apt-get update
sudo apt-get upgrade
sudo apt-get install libfontconfig1-dev libdbus-1-dev libfreetype6-dev libudev-dev libicu-dev libsqlite
```

Revision History

Revision	Date	Author(s)	Description
1.0	11.19.16	WL	Created