LAB 1: SETTING UP YOUR RASPBERRY PI

This lab is the first in a series. In this lab the student will learn about the features of the Raspberry Pi. Students will also install the Raspbian operating system. The ultimate of objective of this lab is to set up the Raspberry Pi so that the student can work towards completing the RetroPie Video Game Emulation Labs.

IT 4530 Senior Capstone Project
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Georgia Southern University

Contents

Introduction

In this lab you will learn how to set up your Raspberry Pi. You will also learn how to use the Raspberry Pi.

Goal

The goal of this lab is to learn how to correctly set up and use your Raspberry Pi.

What You Will Need

- Power Supply (USB Type B with sufficient power supply)
- Keyboard and Mouse
- Display
- Micro SD Card
- Wi-Fi
- Access to Computer with Either and SD Card slot or MicroSD card slot

About the Raspberry Pi 3 Model B

This version of Raspberry Pi includes:

- 4 USB Ports
- 1 HDMI Port
- 1 Ethernet connection
- 3.5mm Headphone jack
- Micro USB charging port
- Micro SD Card slot
- GPIO Pin connections
- Wi-Fi Enabled
- Bluetooth

Downloading The OS

First you will need to download the operating system that will be used to run on the Raspberry Pi. For this step you will need access to a computer that has a working SD Card slot. If you do not, please talk to your professor or another student. Next, visit the following website: https://www.raspberrypi.org/downloads/noobs/. There you will click on the Download Zip button for NOOBS Lite. NOOBS is the installer for Raspberry Pi and contains the Raspbian Pi operating system that we will use. Save the ZIP file in a location that is easily accessible for you. Next we will set up the SD card for you to be able to install the NOOBS installer. Extract the files to a place on your computer that is easily accessible.

Inserting & Configuring the SD Card

In a computer that has an SD Card slot please insert your SD Card. We will need to install a SD Card Format software. Please download the format software at the following website: https://www.sdcard.org/downloads/formatter/index.html. Choose the Operating System your computer uses (either Windows or Mac) and accept the terms and conditions. You will then be able to install the software. Follow the SetUp Wizard steps to finish the install of SD Card Formatter. Next you will open SD Card Formatter. Next you will insert your SD card into your computer. Inside of SD Card Formatter select your card. Next, ensure that Quick Format is selected. You will then click Format at the bottom right of the program. Next you will navigate to the files that you extracted from the NOOBS zip file. You will also need to navigate to your SD Card. Open two File windows side by side. One of the windows will be for the NOOBS files and the other will be the SD Card. Copy all files and place them into the SD card file window. It may take a few minutes for the files to copy to your SD card. Once you have successfully copied your files onto your SD Card you may eject your SD Card.

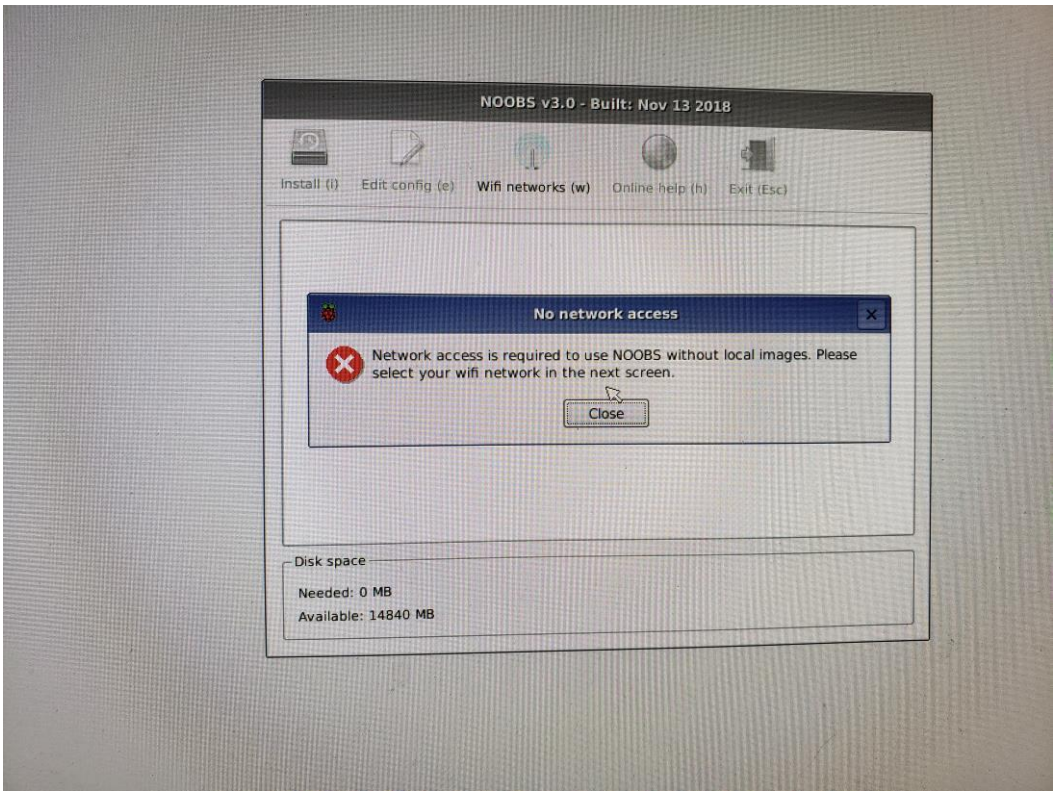
Connecting your Raspberry Pi

We will now connect the components to your Raspberry Pi. Connect your keyboard and mouse into separate USB ports. Next, we will insert our HDMI connector into the HDMI port on the Raspberry PI. Ensure the other end of the HDMI cord is connected to a powered monitor or television. Next, insert the microSD card into the back of the Raspberry Pi with the face of the card upside down facing away from the Raspberry PI. Finally, we will connect a USB Type B cable into the power port of the Raspberry Pi. A red light should have lit to signal that the Raspberry Pi is powered on. Next, we will set up the operating system on the Raspberry Pi. Your final setup should look similar to the picture below.

Setting up your Raspberry Pi

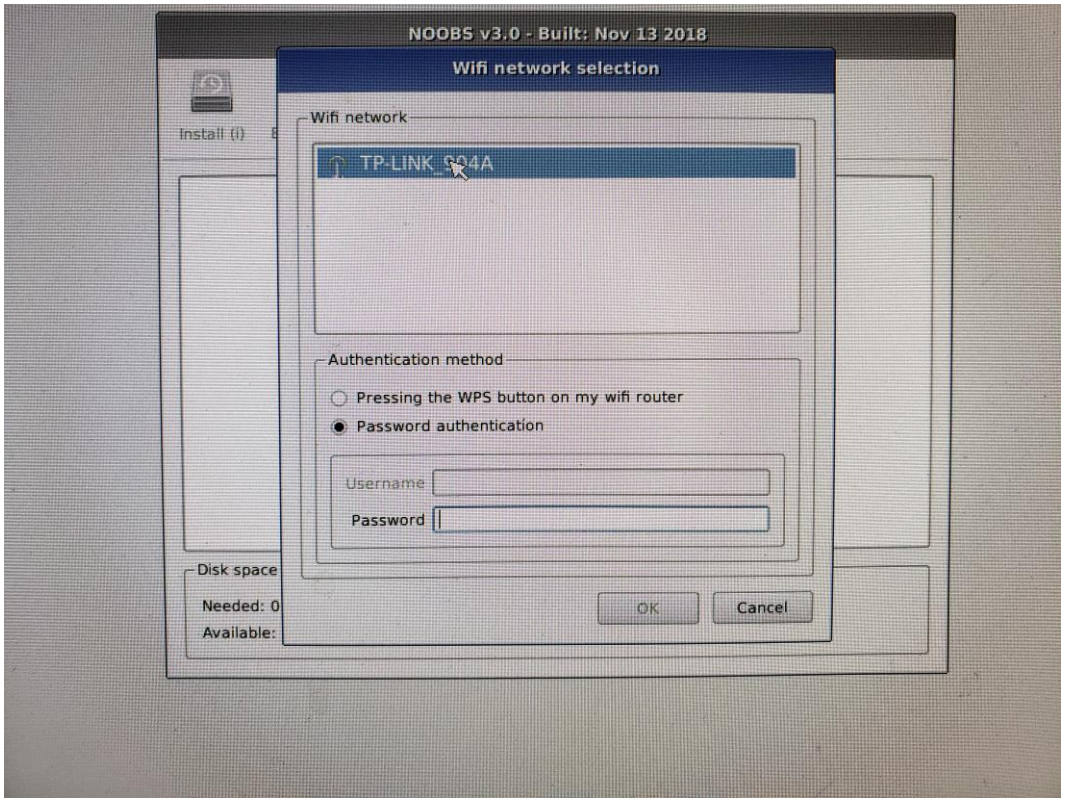
Your Raspberry Pi should now be set up and booting. We will now need to connect to the Wi-Fi. The first screen prompt should look like Figure 1. The screen is prompting you to connect to a Wi-Fi network. Click Close. The next screen should prompt you to choose a Wi-Fi Network to connect to and should look similar to Figure 2. In this case I am choosing the TP-Link Wi-Fi network. You should only connect to Wi-Fi networks you trust. Since this Wi-Fi network has a password, we will enter the password for the network. We will then click OK. You should come to a screen similar to Figure 4 that shows the Raspberry Pi is connecting to the Wi-Fi network. On the next screen you will choose the Operating System for the Raspberry Pi. We will choose the first choice, the Raspbian FULL RECCOMENDDED option. Click on the first option. Next click Install in the upper left corner. Accept the warning that all existing operating systems will be overwritten. Click Yes on the dialog box. On the next screen the Raspberry Pi will install the Operating System on the device. This may take a few minutes. At the end you should get a message similar to Figure 7.

Figure 1



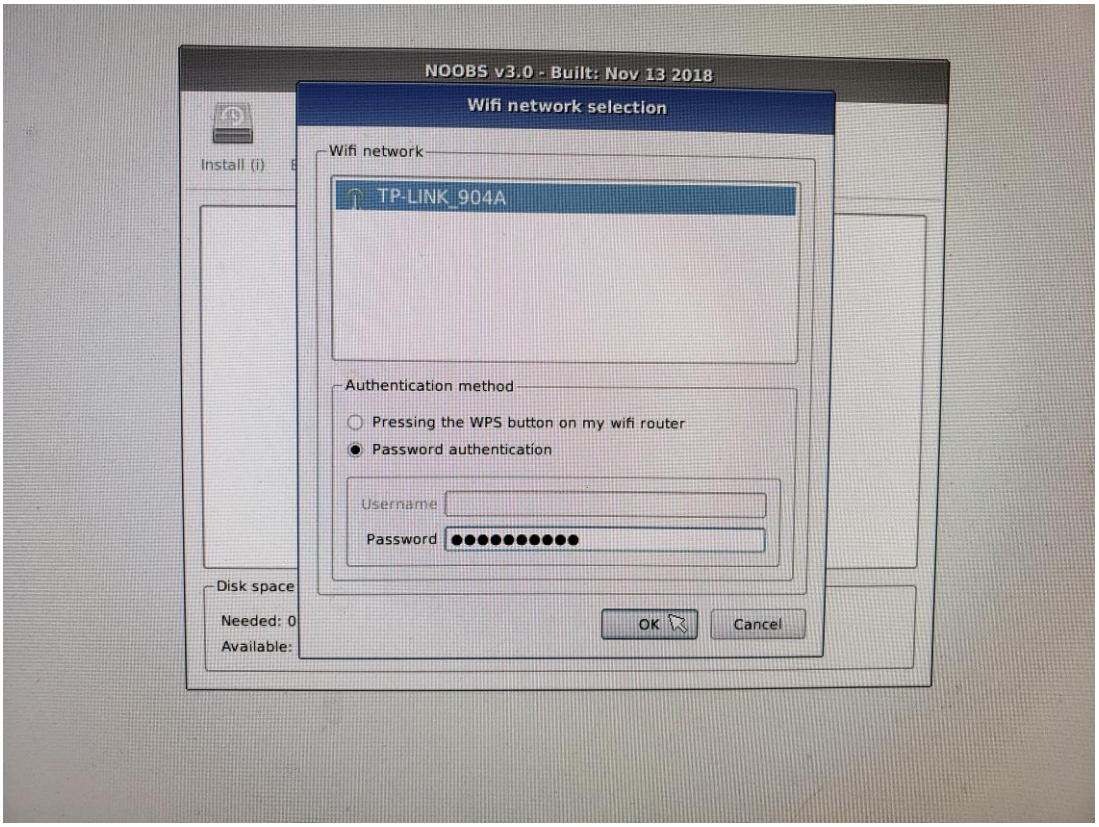
This screenshot shows that the Raspberry Pi has not yet been connected to a Wi-Fi network. Click close and then choose your Wi-Fi network.

Figure 2



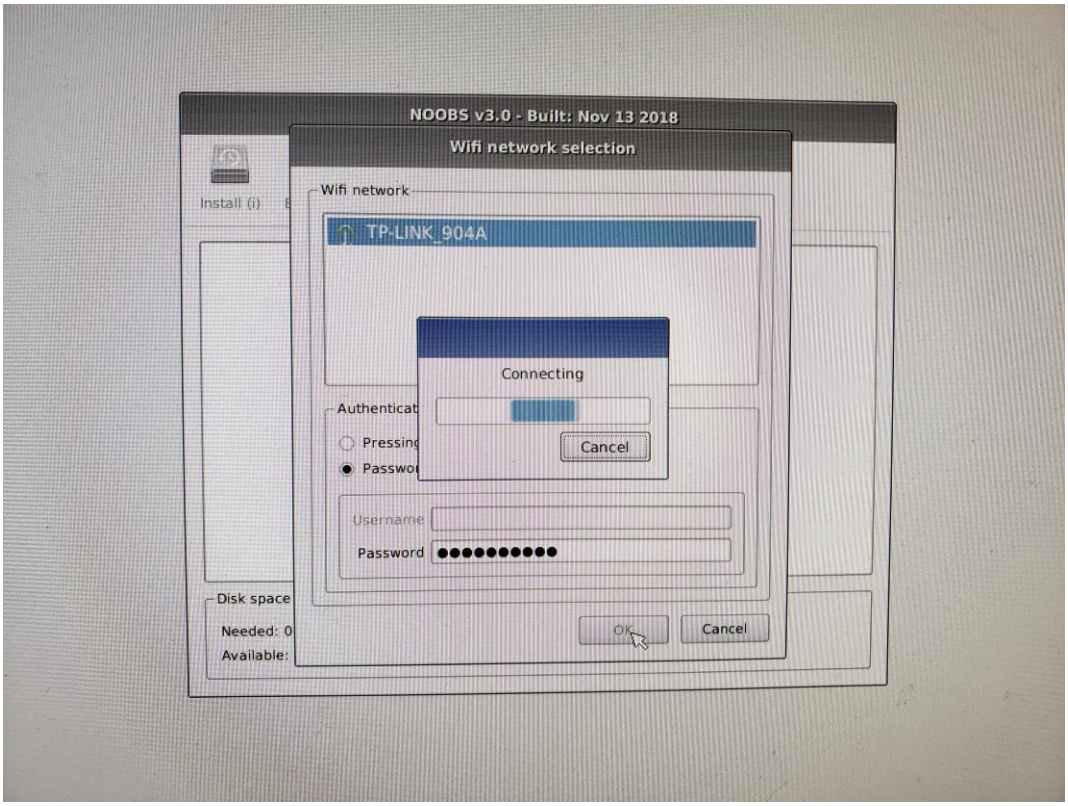
In this screenshot we are choosing the Wi-Fi network that we are connecting to. Choose your Wi-Fi network and then enter your password. Only connect to networks that you trust.

Figure 3



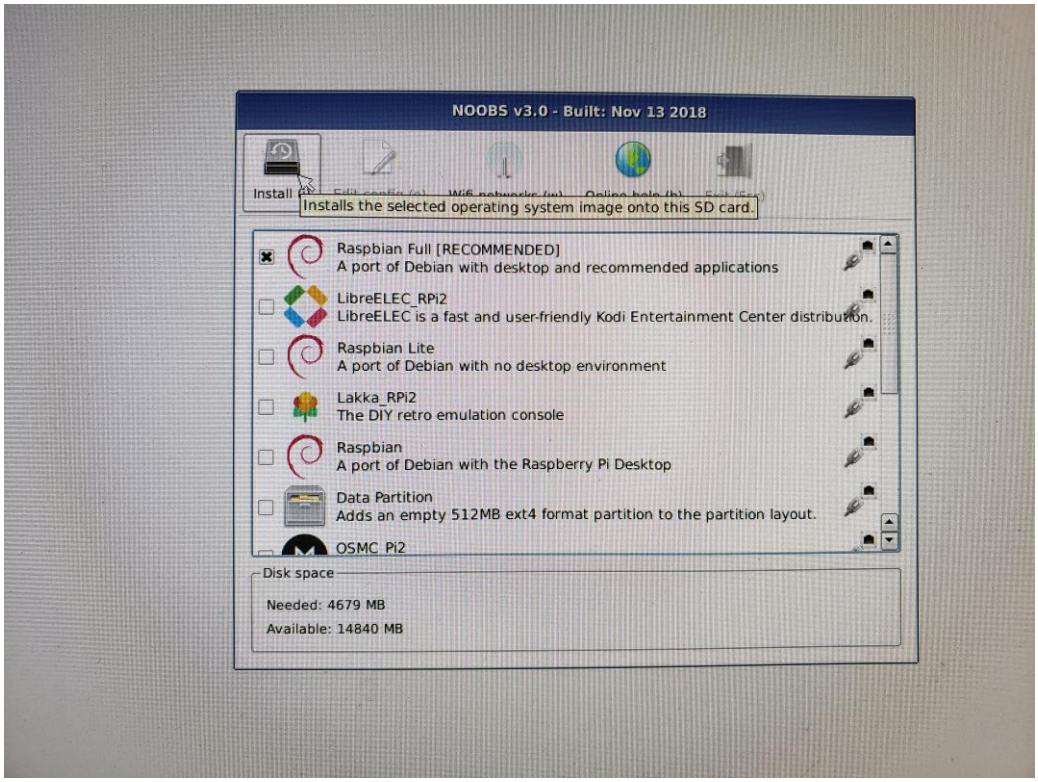
After entering your password for you Wi-Fi network hit OK. You will then be connected to your Wi-Fi network.

Figure 4



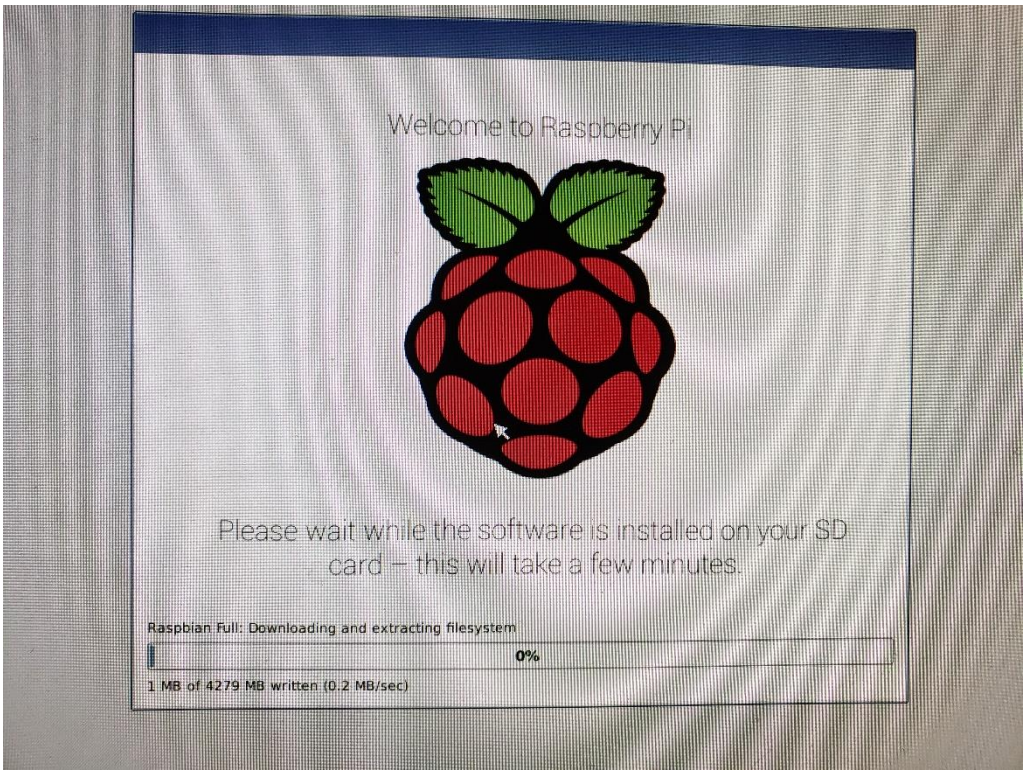
The Raspberry Pi is connecting to the Wi-Fi network.

Figure 5



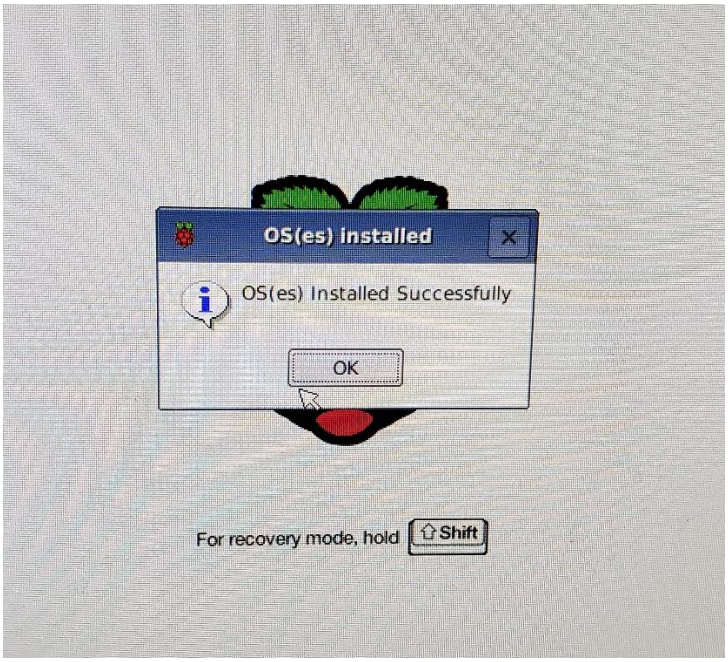
On this screen we will be choosing the operating system for the Raspberry Pi. Choose the first option, the Raspbian Full [Recommended] option. Then click install in the upper left corner.

Figure 6



Now the Raspberry Pi is installing the Raspbian Operating system. This may take a few minutes depending on your internet speed. Please be patient.

Figure 7

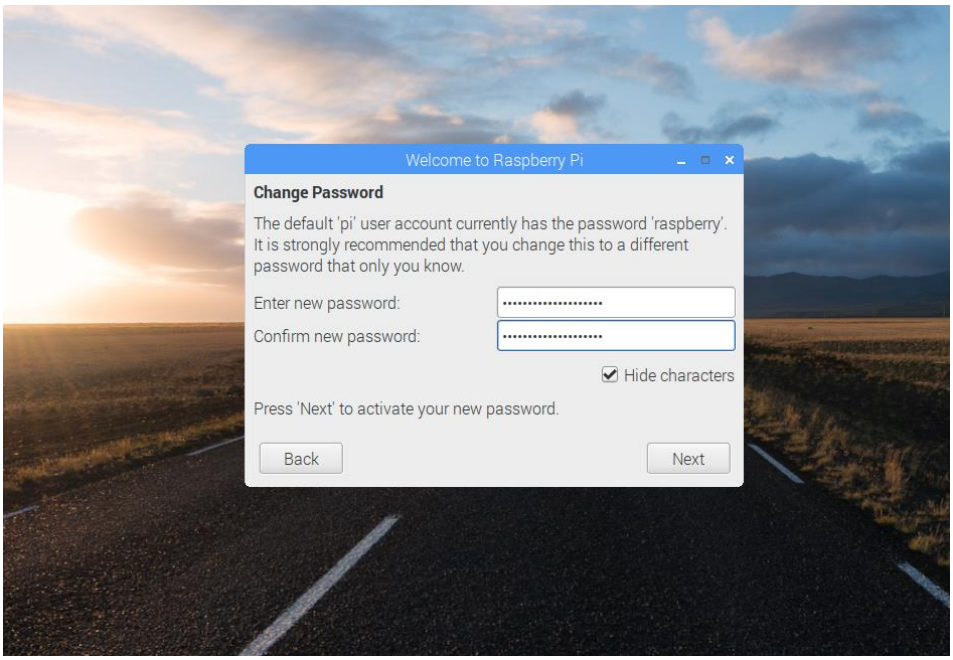


Once your Raspberry Pi has finished installing the Raspbian operating system you will receive the message above. Click OK. You have now finished setting up your Raspberry Pi and can begin using it. We will begin taking a tour of the Raspberry Pi in a later section.

Setting the Password

There are still a few more things we need to do before we can tour the Raspberry Pi. First, we need to set a password for the account on the Raspberry Pi. In the password prompt enter **student** as the password in the Enter New Password Field. Re-enter the password **student** in the Confirm net password field. Your screen should look similar to Figure 8. When you are finished click the Next button.

Figure 8



First enter **student** as the password in the Enter new password field. Next, re-enter the password **student** in the Confirm new password field.

Connect the Wi-Fi

You are required to choose a Wi-Fi network. Choose your Wi-Fi network and click the Next button. You should not have to re-enter your password.

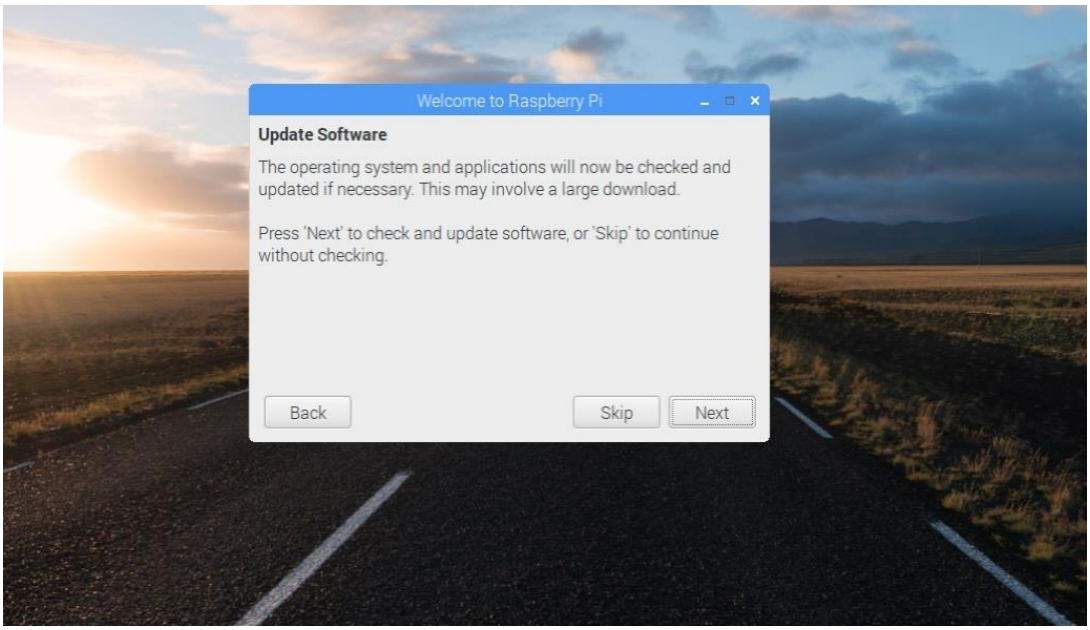
Figure 9

Choose your Wi-Fi network and click the Next button.

Update Software

On the next screen you will be prompted to update the software. Click the Next button to check and update the Raspbian software.

Figure 10

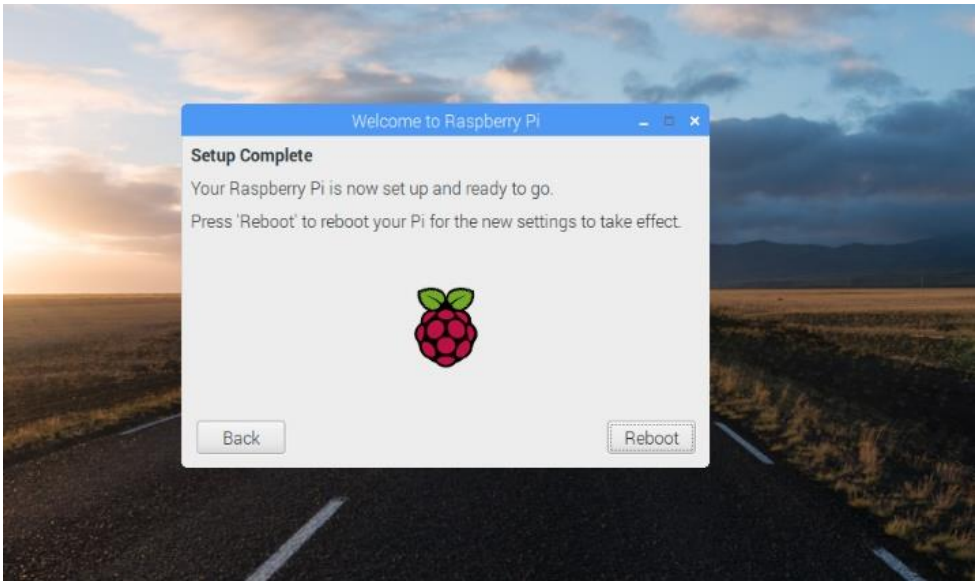


Click the Next button to check for and update software.

Reboot the Raspberry Pi

You should now be finished setting up your Raspberry Pi. You should have a screen similar to Figure 11. You will need to reboot the Raspberry Pi for the settings to take effect. Click the Reboot button. The reboot will not take long.

Figure 11

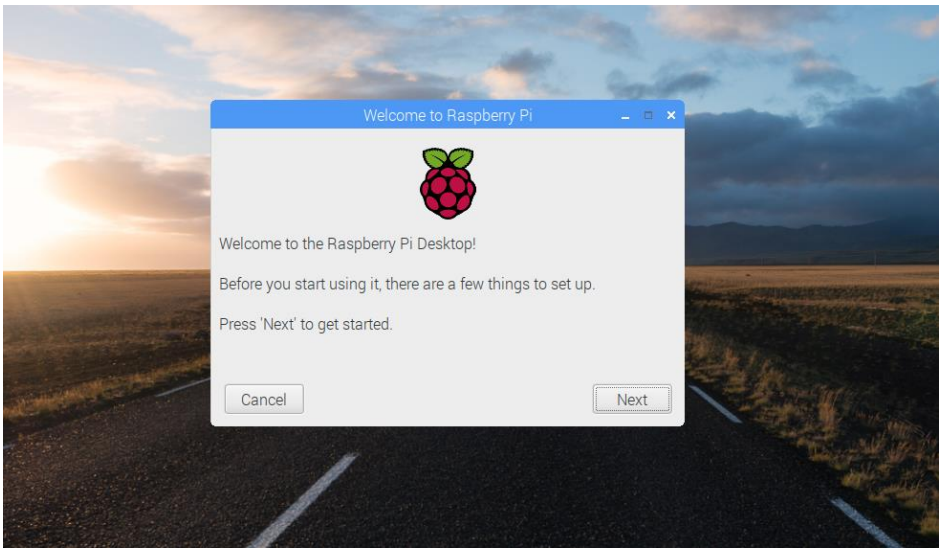


Click the Reboot button for the settings to take effect. Your Raspberry Pi will take a few seconds to reboot.

Setup Complete

You should now be finished setting up your Raspberry Pi. You should have a screen similar to Figure 12. There are a few settings you need to adjust for the Raspberry Pi. Click the next button to get started.

Figure 12

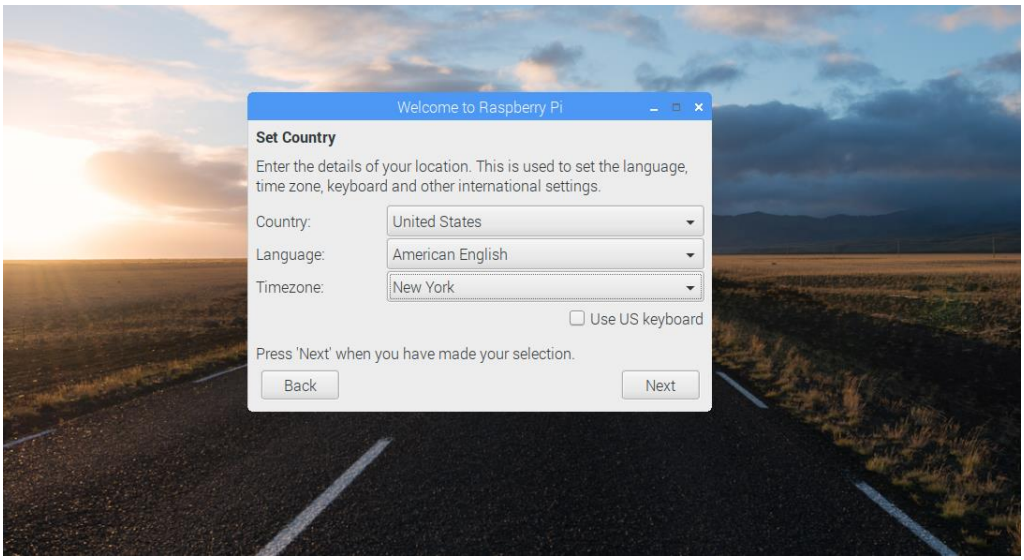


Click the Next button to adjust the settings for the Raspberry Pi.

Setting Country, Time Zone, and Language

We will now adjust the settings for Country, Time Zone, and Language. In the Country drop down menu, select your country, in our case it is United States. Under the Language drop down menu, select your language, in our case it is American English. Under the Timezone drop down menu select the major city that is in your time zone. In our case it is New York. When you are finished, click the Next button.

Figure 13

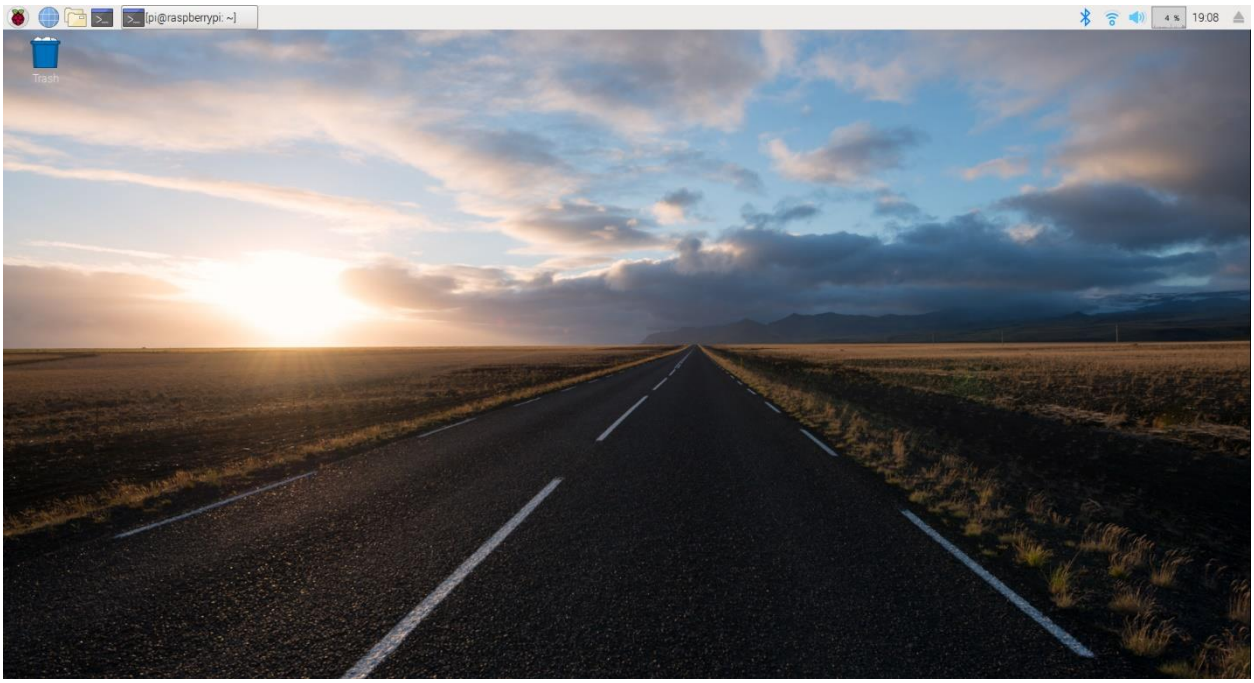


Choose the Country, Language, and Time Zone city that is most appropriate to you.

Touring the Raspberry Pi

After choosing your Country, Language, and Time Zone your screen should look similar to Figure 14. We will begin the tour shortly. Take a minute to look around.

Figure 14

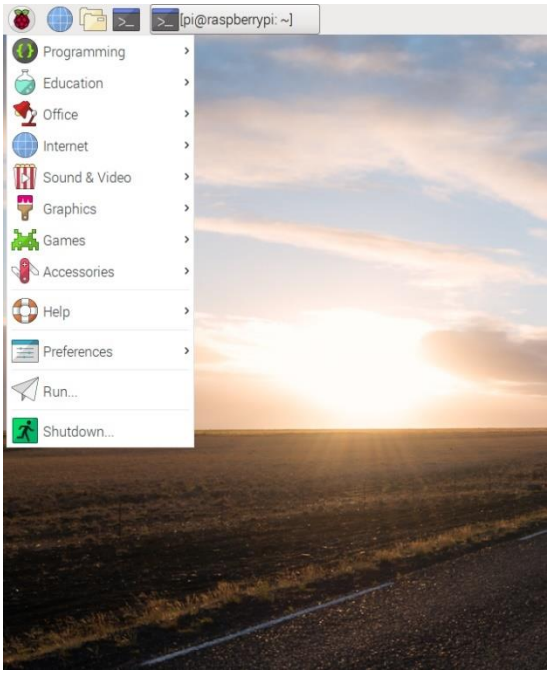


This is the default screen for the Raspbian operating system for Raspberry Pi.

Applications Menu

We will begin our tour with the Applications Menu. The Applications Menu is in the upper left corner of the screen. The Raspberry is the icon for the Applications Menu. Click on the Applications Menu to view the applications included on the Raspberry Pi 3 Model B. Your screen should look similar to Figure 15. Application sections include Programming, Education, Office, Internet, Sound and Video, Graphics, Games, Accessories, Help, Preferences, Run…, and Shutdown. We will take an in-depth tour of these sections in a later section.

Figure 15



Web Browser

The Raspbian operating system includes the development web browser Chromium. In works similar to Chrome. You can access Chromium by clicking the blue word icon shortcut in the upper left corner of the screen (Figure 16) or by navigating to Chromium under the Internet section in the Applications Menu. When you open the web browser it will look similar to Figure 17. Chromium looks similar to Google Chrome so it should be easy to navigate.

Figure 16

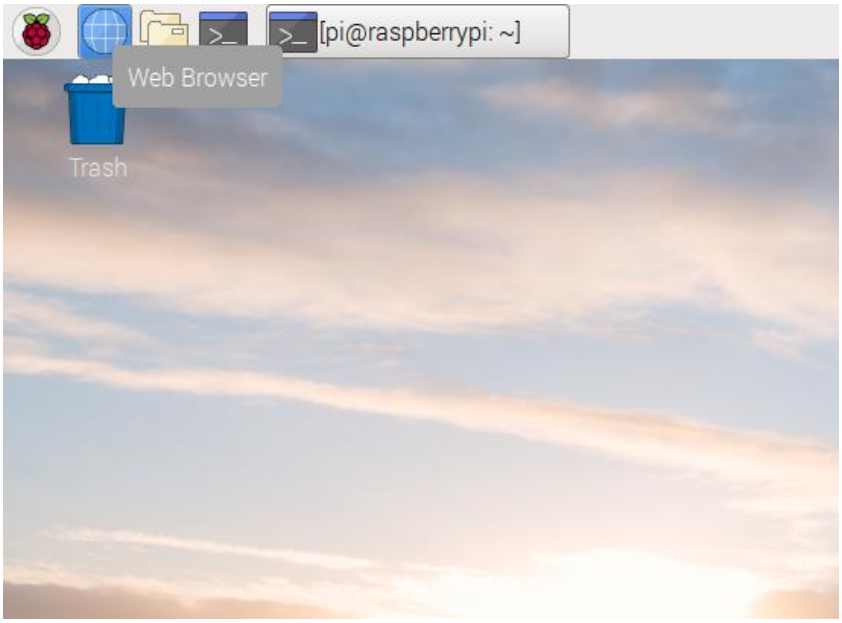
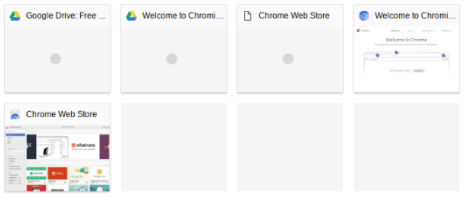


Figure 17



File Explorer

As with any operating system, Raspbian includes a File Explorer to easily manage and navigate your files. There is a shortcut at the top of the screen next to the internet icon. The shortcut is the file icon (Figure 18) with the red box outline. An example of a location in the File Explorer is shown in Figure 19.

Figure 18

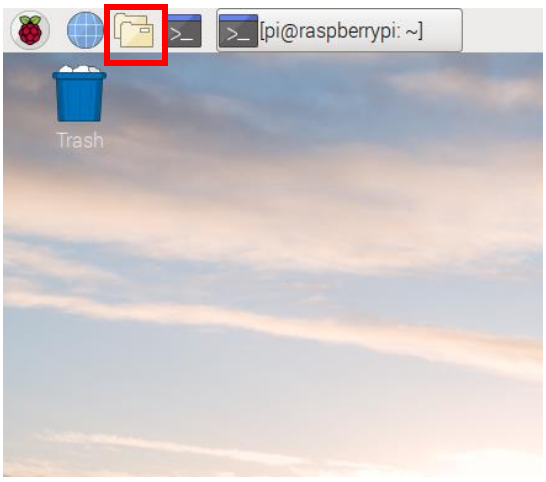
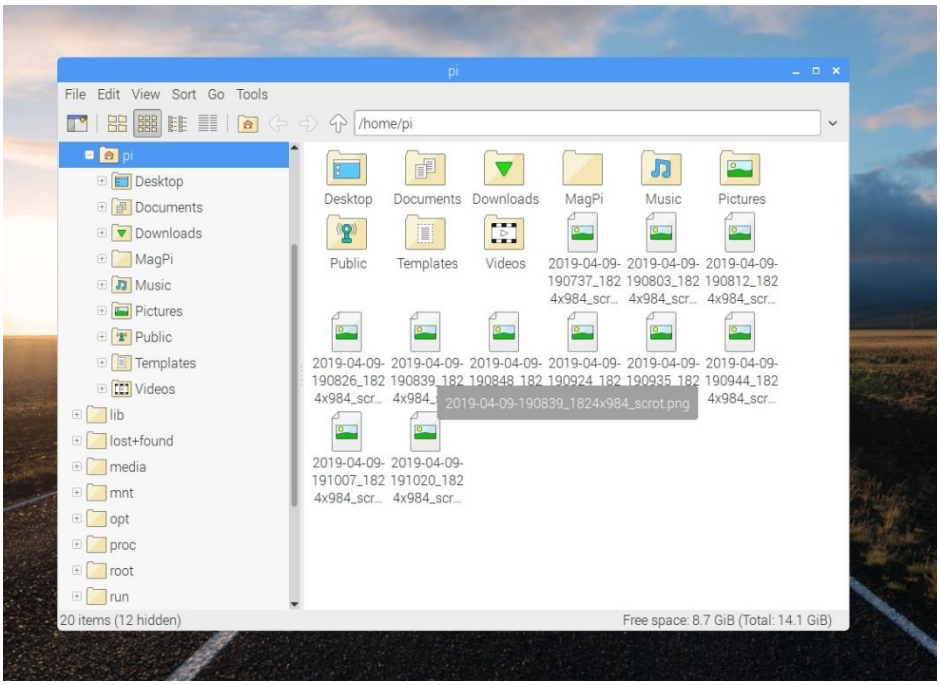


Figure 19



Terminal

The Raspbian operating system is a version of Linux and includes a terminal for you to run commands. A shortcut to the terminal is included on the upper left corner of the screen next to the File Explorer icon (Figure 20). In the terminal example in Figure 21 the commands for taking a screenshot are shown. The terminal on Raspbian works exactly like terminals on other Linux operating systems providing for ease of use.

Figure 20

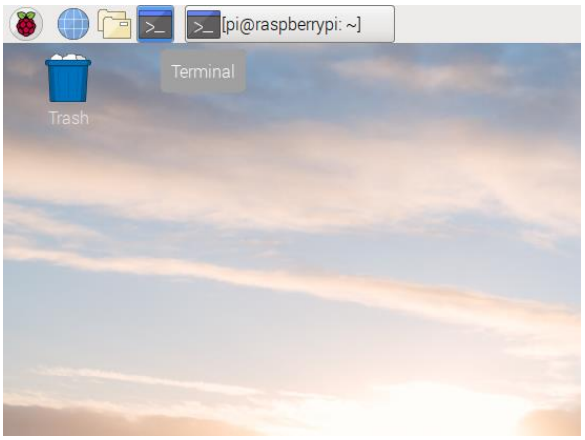
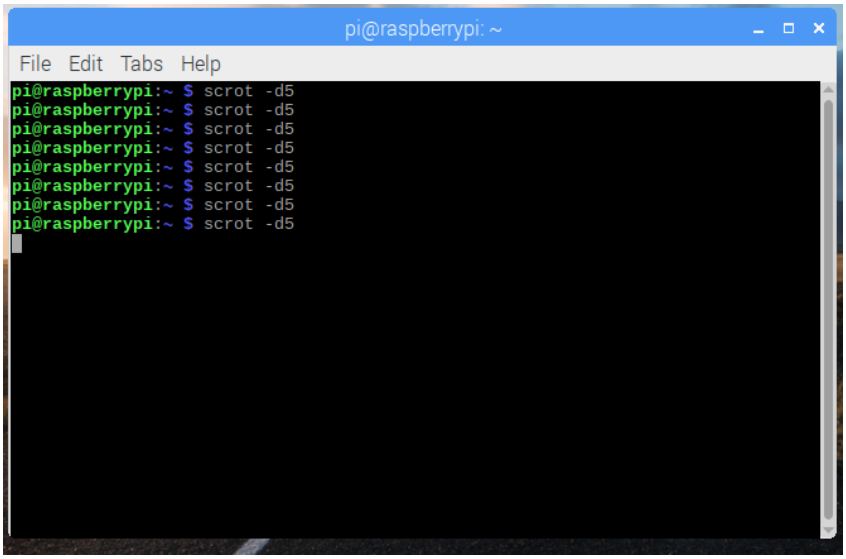


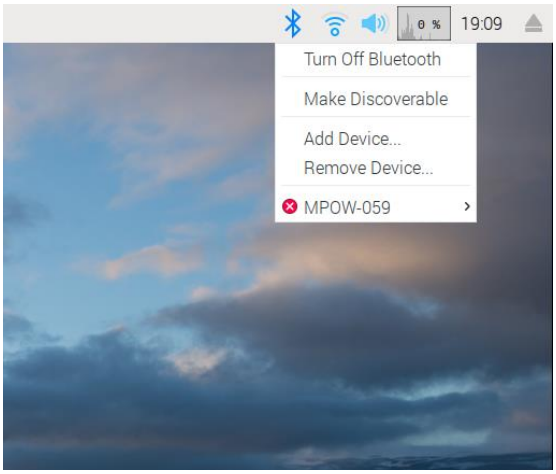
Figure 21



Bluetooth

The Raspberry Pi 3 Model B includes Bluetooth capabilities. You can access the Bluetooth menu by clicking on the blue Bluetooth icon in the upper right corner (Figure 22). On this menu you can turn Bluetooth on and off, make the Raspberry Pi discoverable, and add and remove devices.

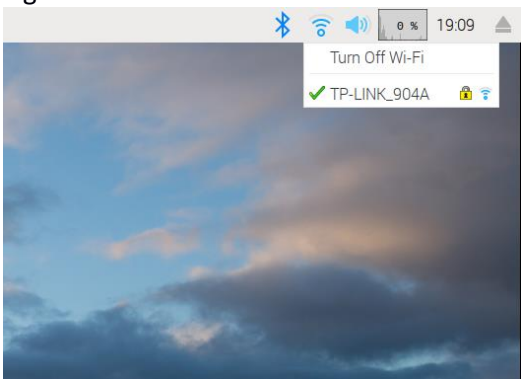
Figure 22



Wi-Fi

There is also a shortcut menu on the screen in the upper right corner next to the Bluetooth icon for Wi-Fi. Click on the blue Wi-Fi icon to bring up the Wi-Fi menu (Figure 23). You can turn Wi-Fi on and off, and connect and disconnect to available Wi-Fi networks.

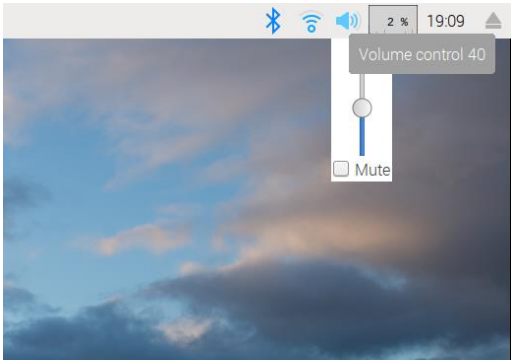
Figure 23



Volume Control

There is also a volume control shortcut in the upper right corner next to the Wi-Fi shortcut. You can easily adjust the output volume of the Raspberry Pi by clicking on the volume control shortcut.

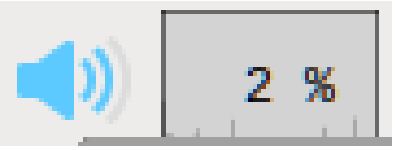
Figure 24



CPU Usage Monitor

There is also a handy CPU usage monitor on the home screen. The monitor tells you how much resources on the CPU are being used. The usage icon is located next to the blue volume control icon.

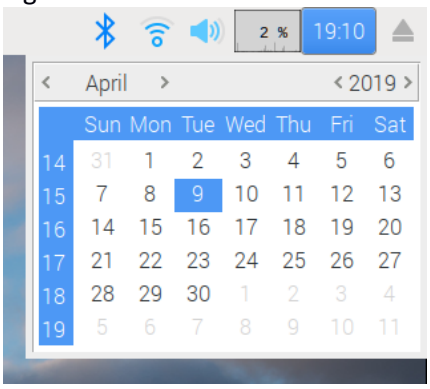
Figure 25



Calendar & Clock

The Raspberry PI also includes a calendar and clock shortcut on the home screen. The shortcuts are located in the upper right corner. The default clock format is 24-hour format. This can be changed in settings if you prefer 12-hour format.

Figure 26



Eject Button

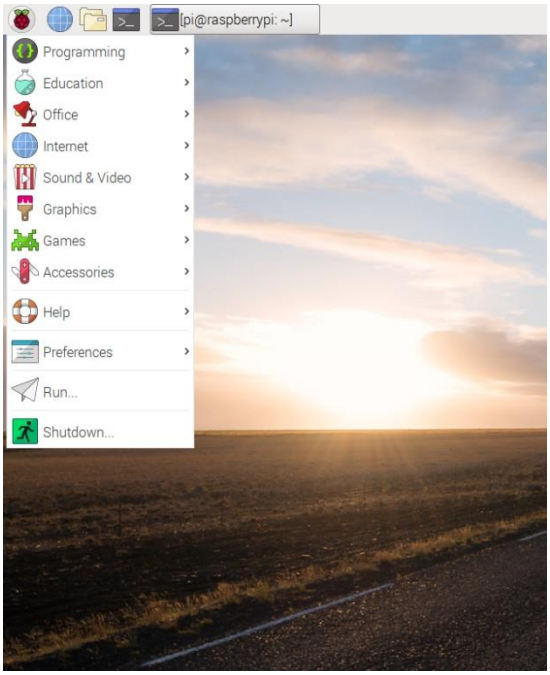
There is also a quick access eject button located on the home screen. The icon is located in the upper right corner. This eject button is for safely ejecting your microSD card.

Figure 27

Applications

In an earlier section we mentioned that there are many different applications for you to use on your Raspberry Pi. We will now go over the ones included in the Application Menu.

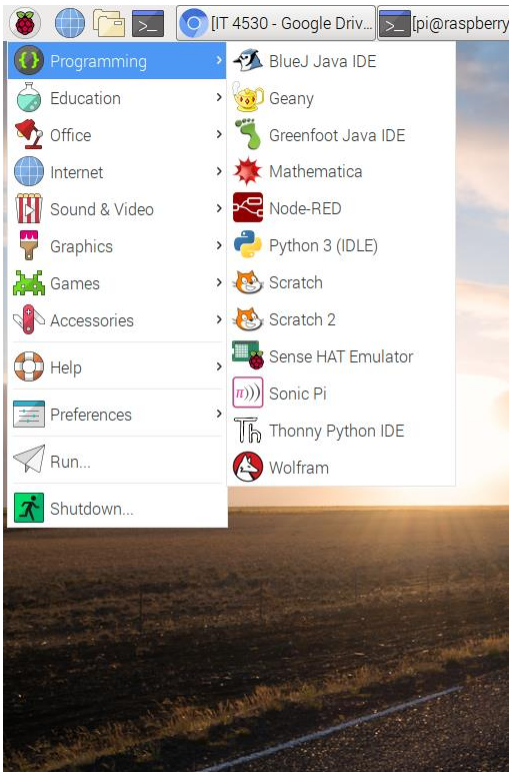
Figure 28



Programming Applications

The Programming Applications Menu includes the following applications: BlueJ Java IDE, Geany, Greenfoot Java IDE, Mathematica, Node-RED, Python 3 (IDLE), Scratch, Scratch 2, Sense HAT emulator, Sonic Pi, Thonny Pythin IDE, and Wolfram. You may explore any of these applications that you wish. In later labs, we will be using Geany for coding. The applications in this section are mainly used for coding.

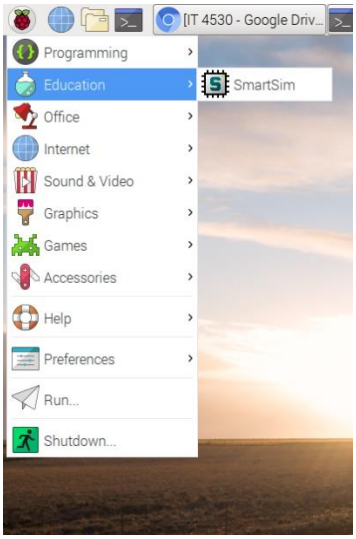
Figure 29



Education Applications

The Education Applications Menu includes programs that are used for education purposes. The applications include: SmartSIm.

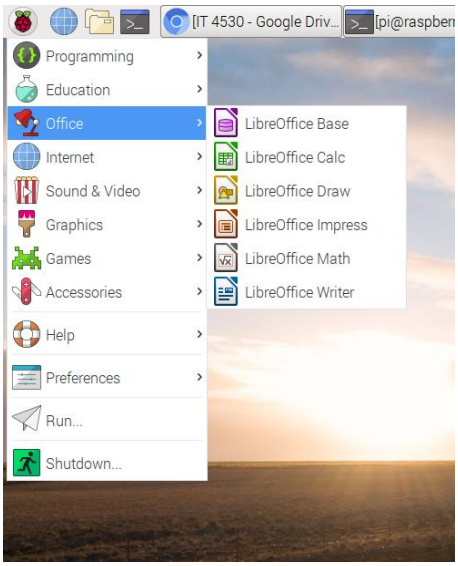
Figure 30



Office Applications

The Office Applications Menu includes applications that are similar to the Microsoft Office suite of products. However, the applications included on the Raspberry Pi are free and open source. The applications are: LibreOffice Base, LibreOffice Calc, LibreOffice Draw, LibreOffice Impress, LibreOffice, LibreOffice Math, and LibreOffice Writer.

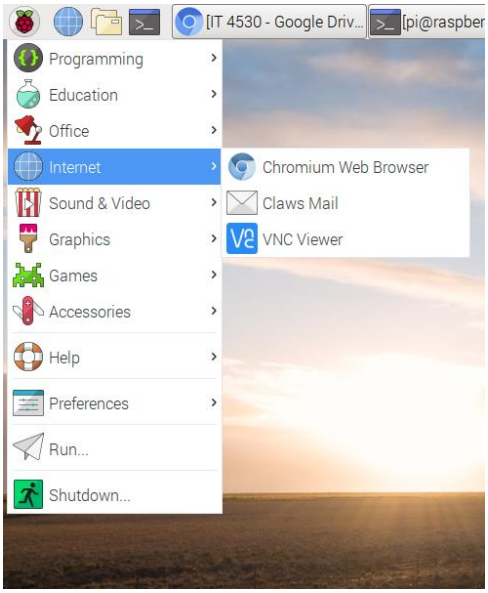
Figure 31



Internet Applications

The Internet Applications Menu includes the following applications: Chromium Web Browser, Claws Mail, and VNC Viewer.

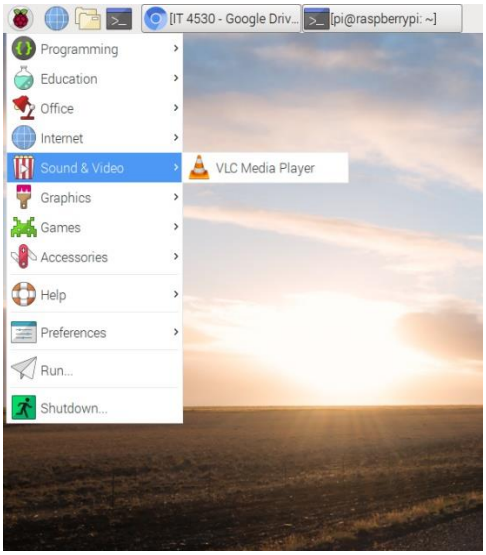
Figure 32



Sound and Video Applications

The Sound and Video Applications Menu includes the following applications: VLC Media Player.

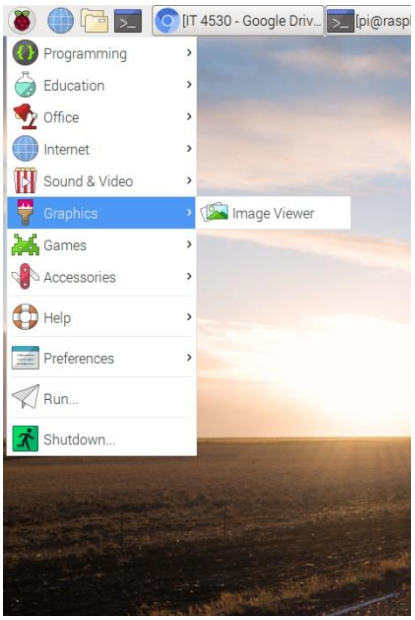
Figure 33



Graphics Applications

The Graphics Applications Menu includes the following applications: Image Viewer.

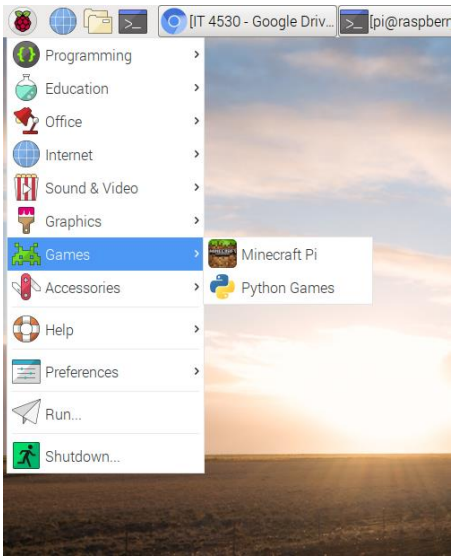
Figure 34



Games Applications

The Games Menu includes the following applications: Minecraft Pi and Python Games.

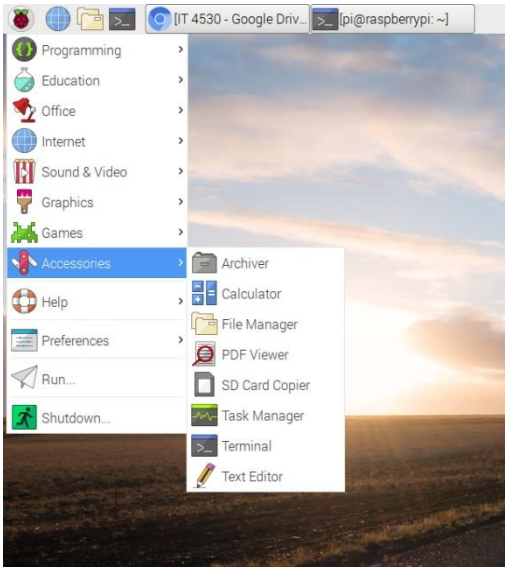
Figure 35



Accessories Applications

The Accessories Menu include the following applications: Archiver, Calculator, File Manager, PDF Viewer, SD Card Copier, Task Manager, Terminal, and Text Editor.

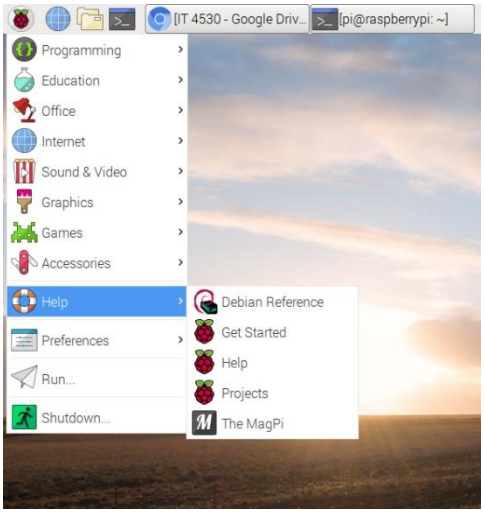
Figure 36



Help Menu

The Help menu offers information and support about the Raspberry PI should you need it. Resources include the following: Debian Reference, Get Started, Help, Projects, and The MagPi.

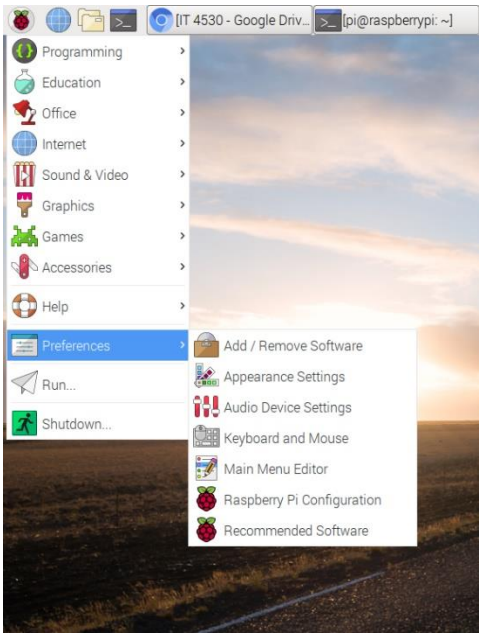
Figure 37



Preferences Menu

Under the Preferences menu you are able to change your personal preferences on the Raspberry Pi. Available preferences to be changed are: Add/Remove Software, Appearance Settings, Audio Device Settings, Keyboard and Mouse Settings, Main Menu Editor, Raspberry Pi Configuration, and Recommended Software.

Figure 38



Shutdown

After all this information you may be ready to take a break. You may want to know how to shutdown the Raspberry Pi. There is a quick access button under the Applications Menu. Click on Shutdown… (Figure 39). A new prompt will appear asking you to choose an option. Choose shutdown to shutdown the Raspberry Pi. You are now finished with this lab.

Figure 39

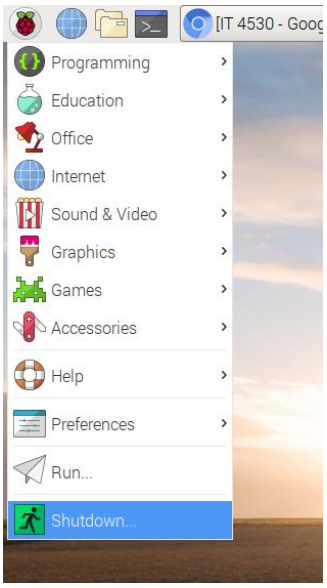
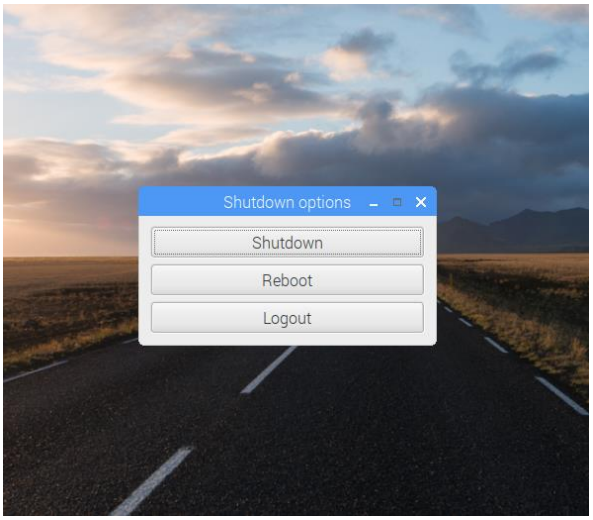


Figure 40



What's Next?

In the next lab you will learn to code HTML. The ultimate goal of these labs is to set up Retro Pie on your Raspberry Pi so that you can play video games. See you in the next lab!