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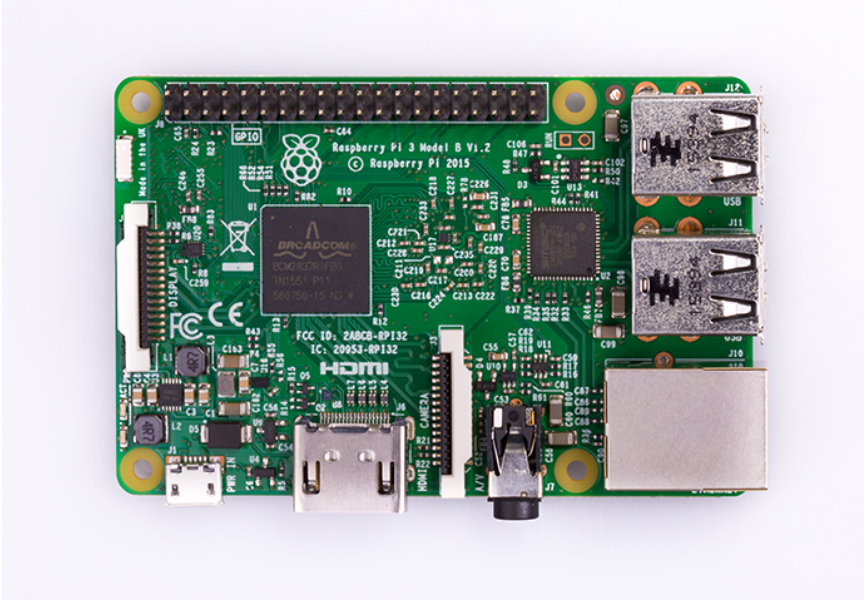
2 What is a Raspberry Pi?

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries. Tnere is a tradition of naming computers after fruits (Tangerine, Apricot, Acorn) which is where the "Raspberry" comes from. The "Pi" part refers to the Python programmming language



3 How do I get started using a Raspberry Pi?

To get started with you raspberry pi you will need to connect up some things

3.1 A Raspberry Pi

3.2 A micro USB Power Adapter

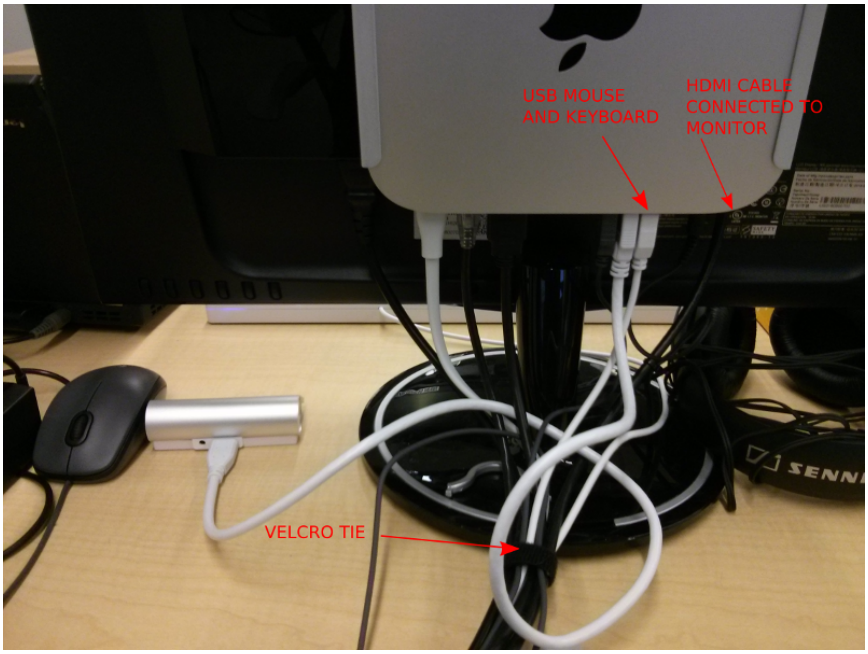
3.3 USB Mouse and Keyboard

3.4 HDMI Monitor and Cable

3.5 A preprogrammed SD Card with Raspberry Pi OS installed

4 Disconnect cables from mini mac

First we need to disconnect the USB Keyboard and Mouse cable from the Mini Mac, as well as the HDMI Cable from the Monitor. You may also need to remove one velcro tie to make enough slack in the USB mouse and keyboard cables to connect them to the Raspberry Pi. Connect up the Raspberry PI HDMI Cable where the Mac Cable went.


USB MOUSE
AND KEYBOARD
HDMI CABLE
CONNECTED TO
MONITOR
VELCRO TIE

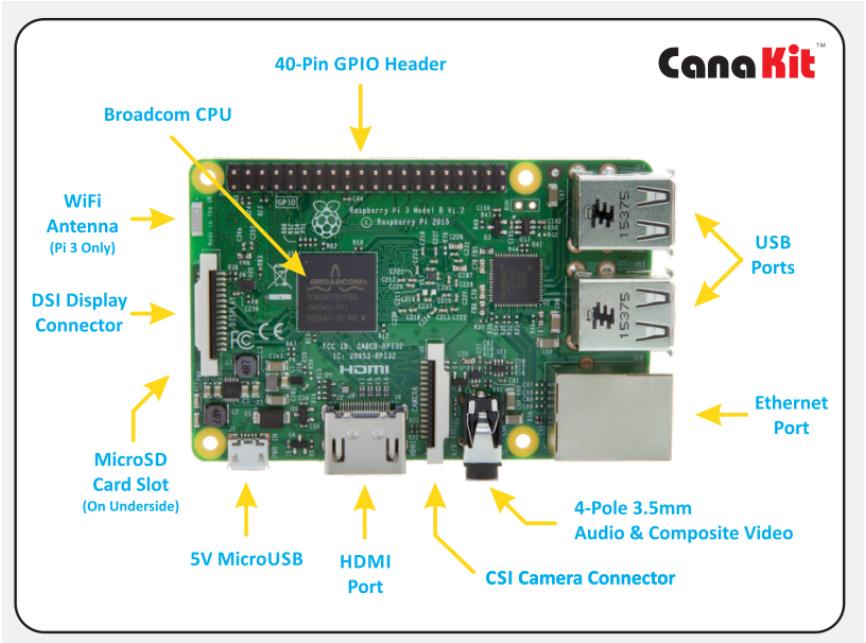
5 Connect up Raspberry PI

5.1 Remove the lid so you can see inside.

5.2 Insert Micro SD Card - this is easier if you turn the case upside down.

5.3 Connect up Mouse, Keyboard and HDMI Cable

5.4 Power up the Raspberry Pi via Mini USB



6 Installing NOOBS (demo)

We will show you how to install from scratch, but not actually have the students do it due to the time involved

7 Raspberry Pi Default Credentials

The raspberry pi has some default accounts that it come with. The username is "pi" and the password is "raspberry".

7.1 Excercise - logout and log in

7.1.1 From the GUI select the shutdown command

7.1.2 Select logout

1. You will be at the login screen
2. Using the default password log back in

8 GUI Overview

The Raspberry PI has a GUI that similar to many other computers, like windows or mac.

8.1 Connect up to the internet via WiFi

Startup Chromium Web Browser Use the Carlsbad Library Wifi Bookmark to accept internet agreement Confirm its working by browing to google or other site

8.2 Chaging the default password

Can be done using Preferences->Raspberry Pi Configuration Unders system there is a "Change password" command DON'T CHANGE THE DEFAULT PASSWORD PLEASE

8.3 Check the time settings (Raspberry Pi doesn't know what time it is until you connect to internet)

Select Preferences->Raspberry Pi Configuration Go To "localization" Select correct timezone and locale Time should now read correctly.

8.4 File Manager

Similar to Mac Finder or Windows, explorer. Useful for finding/moving/copying files Its under Accessories->File Manager

8.5 Shutting down

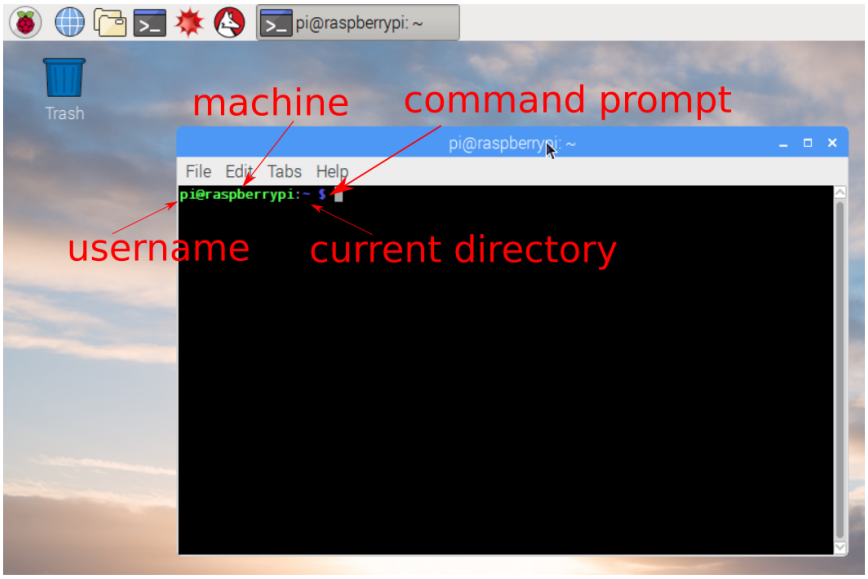
8.5.1 Its important to shutdown the raspberry pi, just like you would a windows or os-x machine. The shutdown command is on the first pulldown menu.

9 Using the terminal

Using the terminal (sometimes called command line, or shell) to do things (start programs, manipulate files, etc) is really common. Even if you are not a big fan of the command line, you will find that many tutorials and instructions for the raspberry pi (and linux in general) are given based on the command line. So knowing the basic is really important.

9.1 cntl-alt-tab brings up a new terminal

9.2 cntl-shift-tab brings up a new window in exising terminal



10 Terminal 101

10.1 / not \, ./ , ../ and ~

a single forward / goes to the "root" directory Unix uses a "forward" slash to delimit directories, not the "backslash" used by the windows. a single

period and slash (./) inidicates the "current" directory, the ../ indicates the one up directory. ~ is a shortcut for you "home" directory, ie /home/pi

10.2 cd, ls, pwd

10.2.1 cd is "change directory command". cd with no argument goes to home directory

10.2.2 ls is the "list directory contents command"

10.2.3 pwd is "print the current directory command"

10.3 man command

the "man" command will give you some basic info on a command. type "man man" for an example. type "man ls" for another. In practice I find if I have no idea on how a command works it's better for me to do a google search. But if I am familiar with the command but just can't remember an option man work great.

10.4 excercise: use the cd command to change to the desktop directory. Notice the change in the command prompt.

11 But I don't want to type/remember a bunch of commands

Neither do I. But there are a few tricks and shortcuts which can make things easier

11.1 command buffer

The command shell remembers command you have run. using the up and down arrow will bring up the previous command. Typing history will give you a list. Note there is a limit on how many commands it remembers.

11.2 using up and down will show let you select previous commands

11.3 history command will show you all previous commands

"history | less" will let you scroll through/search the list. !(followed by buffer number) will execute that command.

11.4 cntl-r (reverse search through history)

cntl-r will do a reverse search (last command first) through you history buffer. Pressing cntl-r again goes to the next match. cntl-s does a forward search

11.5 excercise: using history buffer

11.5.1 type cd <ret> to go to come directory.

11.5.2 use the up arrow to select the command to change to the Desktop directory.

11.5.3 Use the history command and find the command number to cd to the home diretory.

11.5.4 Use the !(number) to change back to the Desktop directory.

11.5.5 Use cntl-r c to search to find the "cd" command to change back to the home directory

11.6 Tab Completion

The terminal will try and autocomplete both commands and arguments. Its quite useful and worth playing around with. If there is only one valid command a single tab will complete pi@raspberrypi:~$

11.6.1 excercise: from the home directory type cd De<tab> to tab complete "cd Desktop"

12 Permissions, sudo

Unix (and linux) files have different types of permissions associated with them. There is one type of permission to read a file, another to write, and yet another to execute. Some things you can change with you regular account (user pi), but some things require a special account called root. Since it's fairly common to want to do things as root, there is a special command, sudo that lets you temporarily act like root, without actually logging out of your current account and into root. There are commands like chmod and chown for changing permissions. We will do an example to make it clear

13 Simple Bash script example for permissions

One of the reasons the command shell is popular is that its possible to automate repetive tasks using what's called a shell script. In our case our shell is the "bash" shell, which is the most popular type. Shell scripts by convention usually end with a .sh

13.1 Hello worlds in bash

from the home directory use the command "nano hello.sh" to bring up an editor.

1. Type the following #!/bin/bash echo hello world
2. type <cntl-o> to write the file
3. type <cntl-x> to exit
4. type "cat hello.sh" to see the file

14 Executing the command

1. type "./hello.sh" to execute the file. Notice you should get an error
2. type "ls -l hello.sh" to see the file permissions. You should see -rw-rw-r– 1 pi pi 29 Mar 29 14:56 ./hello.sh we need change the permissions so they are -rwxr-xr-x (the x inidicates you can eXecute the file)
3. type "chmod +x ./hello"
4. retype "ls -l hello.sh" to see the file permissions. The x's should now be set.
5. type "./hello.sh" to execute the command. You should see "Hello World" printed to the console

15 Executing the file from anywhere

It would be nice to be able to execute a command we have created from anywhere. Doing this involves copying the command to somewhere in the executable path. "/usr/local/bin" is one such directory. Let's copy our hello.sh to that

1. type "hello.sh" You should see command not found
2. type "cp ./hello.sh /usr/local/bin" you should get a permissions error
3. type "sudo cp ./hello.sh /usr/local/bin" the file is copied successfully
4. "type hello.sh" you should see "Hello
5. type "which hello.sh" confirm it's using /usr/local/bin/hello.sh

16 Installing Software

Many of the things that you might want to do with the Raspberry Pi involve installing software. There are many different ways to install software. Here is a non complete list arranged more or less from easier to harder

16.1 Already installed in your distribution

Before you install software, check and see if it's installed. The command "which program" is an easy way to check.

16.2 Use the "add/remove" software utility from the GUI under Preferences->Add/Remove Software

16.3 Use the command line apt-get utility

16.4 Add a repository that has the software you want, and then use apt-get utility

16.5 Download a precompiled binary

16.6 Download Source code and Compile using make (make config, sudo make install)

16.6.1 Many programs require you to use the "git" command to download the source.

16.7 Cross compile an exisiting program for Arm processor.

17 Example Install - nethack (and old terminal game program)

17.1 Make sure it's not installed

17.1.1 which nethack

17.2 try using apt-get (network must be connected)

17.2.1 sudo apt-get install nethack

17.3 read the message and pick a correct

17.3.1 sudo apt-get install nethack-console

17.4 Test the program

17.4.1 nethack

17.4.2 #quit command to end program

17.5 Excerise: Use man or google search to learn how to uninstall a

17.5.1 sudo apt-get purge nethack-console or

17.5.2 sudo apt-get remove netack-console

18 Dealing with problems

It's not uncommon for things not to work the first time. While there is no surefire way to correct all problems, I have a few tips based on my experience.

19 program x,y or z is not doing what I expected

19.1 googling the error message is a good start. The forums on raspberrypi.org and stackexchange have lots of good information. Sometimes you might have followed a writeup that is out of date with your version and you need to find a newer one. If you are using a precompiled binary you might try and see if someone has a repository, or instructions on how to compile the program.

19.2 I installed a program and now my system is messed up

19.2.1 Its a good idea to keep a backup perodically of your system. One way is to create a disk image of your entire SD card. These can be large files (even if compressed). The technique is different for Windows, OS-X and Linux.

19.3 Nothing on my monitor/ wrong resolution

I have seen this problem at my home setup using and HDMI adapter. There is a file called .txt that has many settings for these types of problems. The most common fix seems to be to disable overscan. Make a backup before you change it. It's also nice if you have a second sd card you can boot from so you can edit the file if it won't boot after the change. config.txt

20 I installed hardware x,y, z and it's not working

It's difficult to discuss the issues with all the different types of add on cards you can use, but USB peripherals and drivers are very common, and there are some basic steps you can do.

20.0.1 use lsusb and dmesg to determine if the hardware installed and the driver installed.

sometimes dmesg will show and error message when you put the device in. A google search can sometimes help you resolve a driver issue.

20.0.2 Excercise with lsusb and dmesg

1. run lsusb in one terminal and dmesg in another terminal (cntl-shift-t)

2. insert a usb memory stick
3. rerun lsusb and dmesg to see the message
4. eject (upper right hand corner) the usb device. Be careful to select the correct oine.

21 My system won't boot/is broken

21.1 Make sure it's not just the SD card that is corrupted. If you have a second raspberry pi try a good one there first and then try it in your raspberry pi

21.2 Make sure you power supply can really supply 2.5A. I've messed this one up so many times, it's easy to miss.

21.3 If you still have no luck, if you have a USB current meter (like DROK) you can compare a good/bad system to watch the current coming up

21.4 It's also possible to see if you can connect to the serial port to see if the system can boot at all.

21.4.1 How to a recover a corrupted SD Card

1. It's possible to corrupt and SD card such that your normal "format" command won't work on windows or os-x. For windows or os-x the sd card formatter from the sd association is a good tool to recover with.
2. Once you have formatted your card (FAT32) you can reload a "noobs" image or restore and backed up image.

22 Different types of Raspberry PI, and Hardware additions

Unlike Arduino, there really are only a few different types of Raspberry Pi boards and only a few vendors in the US (adafruit, canakit, etc). However there are many add on boards (called hats for Hardware Attached on Top) from different vendors Raspberry Pi Shop

23 Different types of OS Distributions for Raspberry PI (demo)

There are also many different types of OS. Many you can download from Raspberry Pi Raspberry Pi Download page