RASPBERRY PI NAVIGATION

Edmond Lascaris - Creative Commons - 4 March 2021

OVERVIEW

Welcome to the Raspberry Pi and the Smart City - Internet of Things (IoT) Course.

In this first home lesson we will be learning how to start doing some basic activities with the Raspberry Pi.

LEARNING OBJECTIVES

- Learn how to navigate the Linux directory
- Finding the Raspberry Pi internal IP address
- Make directories and files in the Terminal
- Learn how to read and modify files
- Updating the Raspberry Pi system software library

WEEK 2 LESSON 2: LEARN HOW TO NAVIGATE THE LINUX DIRECTORY

- Setting up the Terminal
- Navigating on the Raspberry Pi
- Checking your Raspberry Pi internal IP address
- Making Directories and Files in the Terminal
- Updating the Raspberry Pi System Software Library
- Additional Resources:

If you want to learn more about the using commands in the Terminal check out the following resource published by the Raspberry Pi Foundation.

https://www.raspberrypi.org/magpi-issues/Essentials_Bash_v1.pdf

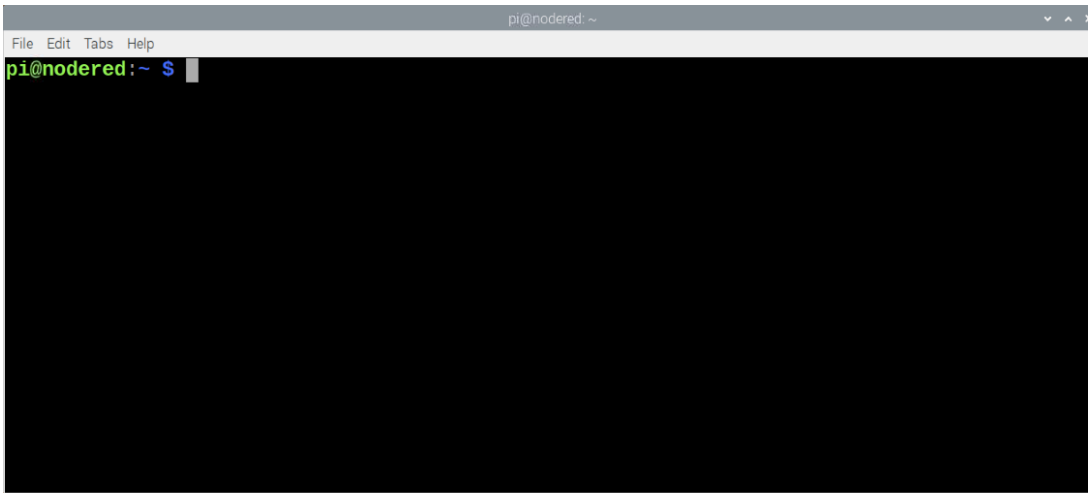
LEARN HOW TO NAVIGATE THE LINUX DIRECTORY

SETTING UP THE TERMINAL

1. **Open the Raspberry Pi Terminal**

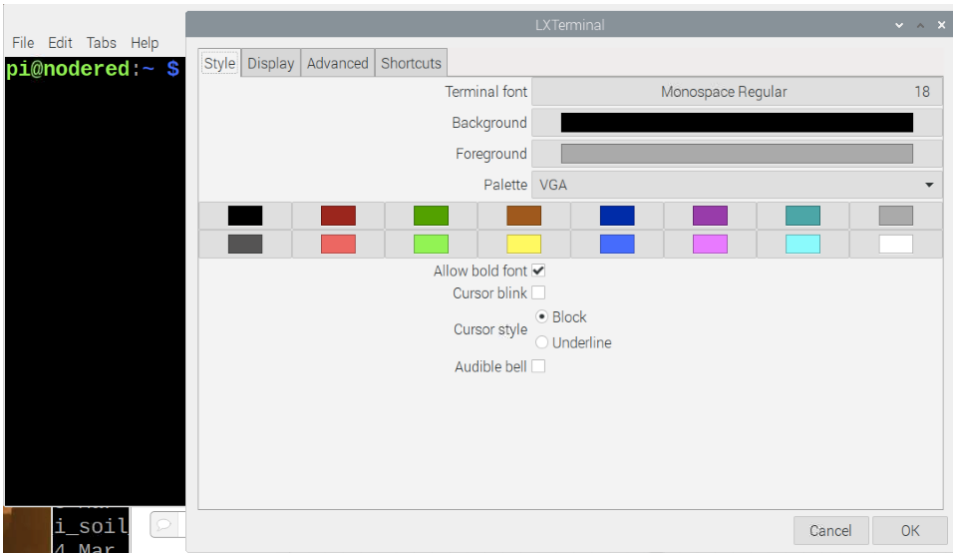
- From the Raspberry Pi desktop open up the Terminal.

  - The Terminal is the small black box looking icon at the top left of the Desktop
  - When you open the Terminal it will appear as a large window with a black background.
  - All inputs to this window will be text (command based). We won't use a mouse.

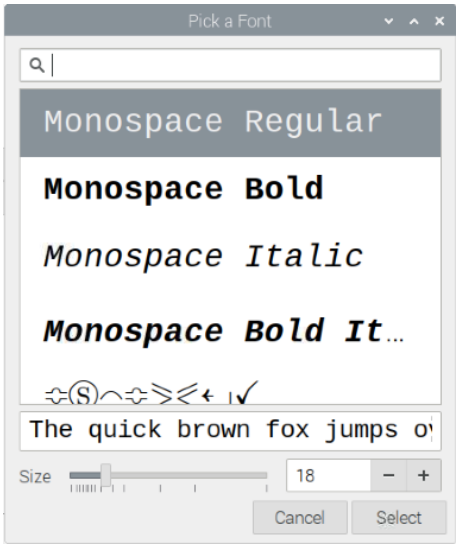


2. **Adjusting font settings**

- When you first open the Terminal you may need to adjust the Font settings.
- To edit settings, from the top drop-down menu select **Edit > Preferences.**
- Click on the box to the right of **Terminal font**.



- This will open up another window where you can adjust font size and type.
- In my case I increased the **font size to 18.**
- Click **Select** and then **OK** to make the changes permanent.



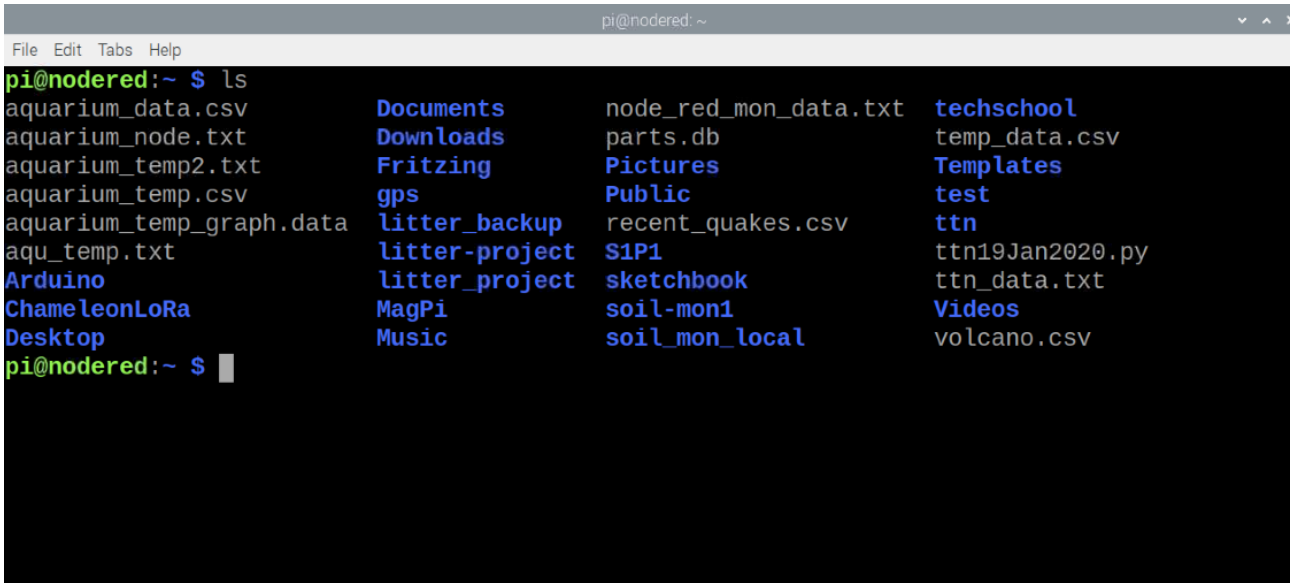
NAVIGATING ON THE RASPBERRY PI

1. **Check for files and directories**

- Now that we know how to open up the Terminal we can use it to navigate around the Raspberry Pi.
- When we start using the Terminal we are in the **user pi home directory**.
- To list all the files and directories we enter the command **ls**

➢ You should see a list appear:

  - white items are files
  - blue items are directories (directories can be empty, or have other files and directories inside)



2. **Navigating up and down directories**

- The directory structure on the Raspberry Pi is arranged in the form of a tree.
- To go back down the tree - towards the root - we need to enter the command **cd ..** (cd and two dots)
- cd is short for **Change Directory**
- Every time we enter this command (**cd ..**) it will take us down the tree.

- The Terminal tells us that we have moved down one branch and are now in the /home directory

```
pi@nodered:~ $ cd ..
pi@nodered:/home $
```

- If we enter the command **cd ..** again it will take us right down to the root of the tree.
- This is symbolised by the / (forward slash) symbol.

```
pi@nodered:/home $ cd ..
pi@nodered:/ $
```

- Using the ls command we can have a look around to see what branches are coming up out of the root (/) directory. Enter the command **ls**

```
pi@nodered:/ $ ls
bin   dev  home  lost+found  mnt  proc  run   srv  tmp  var
boot  etc  lib   media       opt  root  sbin  sys  usr
pi@nodered:/ $
```

➢ Another way we can find out where we are in the Raspberry Pi (Linux) directory is to enter the command **pwd**

- pwd is short for **Present Working Directory** or **Print Working Directory**.
- In the root directory, the output will be the / symbol (forward slash).
- This is as low down the tree as we can travel.

```
pi@nodered:/ $ pwd
/
pi@nodered:/ $
```

- Let's go up the **/home** directory. To do this enter the command **cd home**
- The home directory is one of the many branches travelling up from the root.

```
pi@nodered:/ $ pwd
/
pi@nodered:/ $ ls
bin   dev  home  lost+found  mnt  proc  run   srv  tmp  var
boot  etc  lib   media       opt  root  sbin  sys  usr
pi@nodered:/ $ cd home
pi@nodered:/home $
```

- We can use the command **pwd** and **ls** to find out more information.
- In the home directory there is only one more directory named pi

```
pi@nodered:/home $ pwd
/home
pi@nodered:/home $ ls
pi
pi@nodered:/home $
```

- To go up the branch into the pi directory enter the command **cd pi**

```
pi@nodered:/home $ cd pi
pi@nodered:~ $ ls
aquarium_data.csv         Documents       node_red_mon_data.txt  techschool
aquarium_node.txt         Downloads       parts.db               temp_data.csv
aquarium_temp2.txt        Fritzing        Pictures               Templates
aquarium_temp.csv         gps             Public                 test
aquarium_temp_graph.data  litter_backup   recent_quakes.csv      ttn
aqu_temp.txt              litter-project  S1P1                   ttn19Jan2020.py
Arduino                   litter_project  sketchbook             ttn_data.txt
ChameleonLoRa             MagPi           soil-mon1              Videos
Desktop                   Music           soil_mon_local         volcano.csv
pi@nodered:~ $
```

- The /home/pi is normally shown just as a **~** (tilde symbol).
- If you see this the ~ then you are in your pi user home directory.

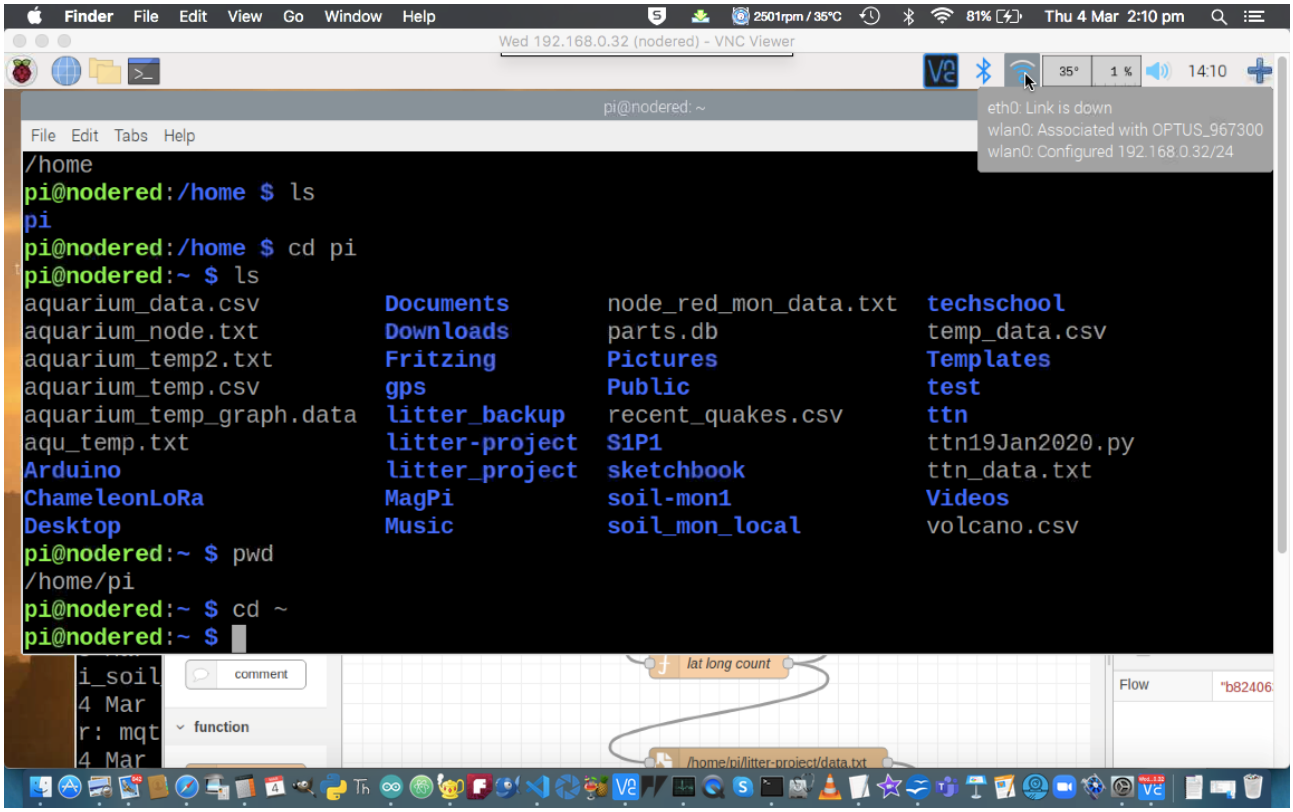
➢ We can also enter **cd ~** to go home:)

```
pi@nodered:~ $ pwd
/home/pi
pi@nodered:~ $ cd ~
pi@nodered:~ $
```

CHECKING YOUR RASPBERRY PI INTERNAL IP ADDRESS

1. Finding your IP address

- Once you have connected to your home WiFi router you can find the IP address for your Raspberry Pi by hovering you mouse above the WiFi icon (top right of desktop).
- You should see your IP address on the third line.
- In the example below by Raspberry Pi IP address is 192.168.0.32
- Everyone's IP address will be different



- Another way you can find your IP address is from the Terminal.
- Enter the command ifconfig

```
pi@nodered:~ $ ifconfig
```

- Scroll to the end of the Terminal output and look for **wlan0**
- wlan is short for **Wireless Local Area Network.**
- If you look closely on the **second line** you will see the IP address after **inet - 192.168.0.32**

```
wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.0.32  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 fe80::fb94:40b2:b66c:1c52  prefixlen 64  scopeid 0x20<link>
        ether b8:27:eb:e4:f5:80  txqueuelen 1000  (Ethernet)
        RX packets 130369  bytes 13548579 (12.9 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 97067  bytes 51139929 (48.7 MiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

pi@nodered:~ $
```

MAKING DIRECTORIES AND FILES IN THE TERMINAL

1. Creating a directory

Up to now we have navigated up and down directories. In this lesson we will show you have to make new directories and also to populated them with files.

- To make a new directory techschool we enter the command **mkdir techschool**

```
pi@nodered:~ $ mkdir techschool
```

- To check that the new directory has been created use the **ls** command.
- To enter into the techschool directory we enter the command **cd techschool**
- You can also check to see if you have entered the /home/pi/techschool directory correctly be entering the command **pwd** (present working directory).

```
pi@nodered:~ $ cd techschool
pi@nodered:~/techschool $ pwd
/home/pi/techschool
pi@nodered:~/techschool $
```

2. Looking inside the directory

- We can have a look inside the **~/techschool** (/home/pi/techschool) directory using the **ls** command.

- At the moment the directory is empty. No files are listed in the directory.

```
pi@nodered:~/techschool $ ls
pi@nodered:~/techschool $
```

3. Creating a file within the ~/techschool directory

- We can now quickly create an empty file in the techschool directory
- Enter the command touch test1.txt we create a new file called text1.txt
    - The file name and extension do not matter. You don't have to write a file extension, and you could also add any extension (e.g. .dat .exe .csv)

```
pi@nodered:~/techschool $ touch test1.txt
pi@nodered:~/techschool $ ls
test1.txt
pi@nodered:~/techschool $
```

- Let's create another file called dummy.txt by entering the command **touch dummy.txt**
- Then enter **ls** to check that the file dummy.txt appears in the list.

```
pi@nodered:~/techschool $ touch dummy.txt
pi@nodered:~/techschool $ ls
dummy.txt  test1.txt
pi@nodered:~/techschool $
```

- Create a few more files with the **touch** command and then enter the **ls** command to list them.

```
pi@nodered:~/techschool $ touch demo1.txt
pi@nodered:~/techschool $ touch helpFile.txt
pi@nodered:~/techschool $ ls
demo1.txt  dummy.txt  helpFile.txt  test1.txt
pi@nodered:~/techschool $
```

- We have just been using the ls command by itself.
- We can add an Option to the ls command.

- By entering **ls -l** (-l is short for long format Option) it will list all files in long format.
    - This will include other details about each file such as who the owner is and when the file was created.

```
pi@nodered:~/techschool $ ls -l
total 0
-rw-r--r-- 1 pi pi 0 Mar  4 15:49 demo1.txt
-rw-r--r-- 1 pi pi 0 Mar  4 15:46 dummy.txt
-rw-r--r-- 1 pi pi 0 Mar  4 15:49 helpFile.txt
-rw-r--r-- 1 pi pi 0 Mar  4 14:41 test1.txt
pi@nodered:~/techschool $
```

4. Creating a directory within the ~/techschool directory

- We can make a new directory called **backup** within the ~/techschool directory with the command **mkdir backup**
- If we enter the command **ls -l** we can see that there is a lower case **d** in the line with the directory backup. The d tells us that this item is a directory.

```
pi@nodered:~/techschool $ mkdir backup
pi@nodered:~/techschool $ ls -l
total 4
drwxr-xr-x 2 pi pi 4096 Mar  4 15:55 backup
-rw-r--r-- 1 pi pi    0 Mar  4 15:49 demo1.txt
-rw-r--r-- 1 pi pi    0 Mar  4 15:46 dummy.txt
-rw-r--r-- 1 pi pi    0 Mar  4 15:49 helpFile.txt
-rw-r--r-- 1 pi pi    0 Mar  4 14:41 test1.txt
pi@nodered:~/techschool $
```

5. Navigating back to home directory

- After all this fun we need to navigate back to our pi user home directory (/home/pi).
- The easy way to do this is to enter the command **cd ~** (tilde symbol – top left on the keyboard).
- You can prove that you are in the pi user home directory with the commands **pwd** and **ls**.

```
pi@nodered:~/techschool $ cd ~
pi@nodered:~ $ pwd
/home/pi
pi@nodered:~ $ ls
aquarium_data.csv         Documents       node_red_mon_data.txt  techschool
aquarium_node.txt         Downloads       parts.db               temp_data.csv
aquarium_temp2.txt        Fritzing        Pictures               Templates
aquarium_temp.csv         gps             Public                 test
aquarium_temp_graph.data  litter_backup   recent_quakes.csv      ttn
aqu_temp.txt              litter-project  S1P1                   ttn19Jan2020.py
Arduino                   litter_project  sketchbook             ttn_data.txt
ChameleonLoRa             MagPi           soil-mon1              Videos
Desktop                   Music           soil_mon_local         volcano.csv
pi@nodered:~ $
```

UPDATING THE RASPBERRY PI SYSTEM SOFTWARE LIBRARY

The great thing about the Raspberry Pi is that you can install lots of free software.

The software is written by a community of computer enthusiasts who believe that most things in life should be free - especially computer software and operating systems.

Before we can install or search for any new software we need to update a software library catalog stored on our computer.

- To update our local library we need to enter the command **sudo apt-get update**
    - **sudo** is short for Super User. It gives us special powers
    - **apt-get** is the program or application that is responsible for maintaining the software library
    - **update** is the instruction to update the library

Once the command is entered, your computer will start the update process.

Sometimes this takes only a few seconds, but it can take longer depending on the speed of your internet connection and also how many updates to the library are required.

```
pi@nodered:~ $ sudo apt-get update
Hit:1 http://packages.microsoft.com/repos/code stable InRelease
Get:2 http://raspbian.raspberrypi.org/raspbian buster InRelease [15.0 kB]
Hit:3 http://archive.raspberrypi.org/debian buster InRelease
Fetched 15.0 kB in 2s (9,458 B/s)
Reading package lists... Done
pi@nodered:~ $
```