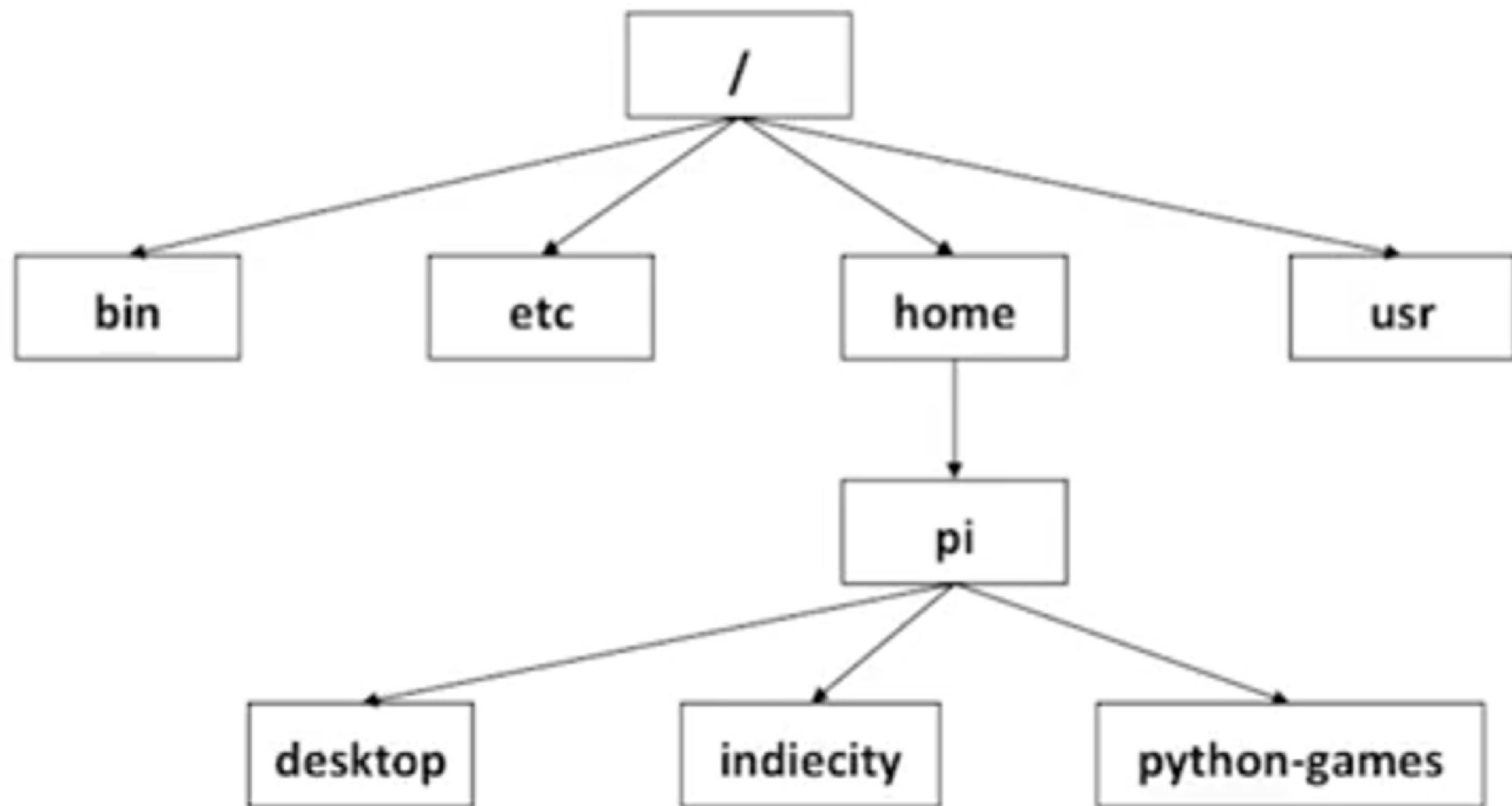


Linux Terminal & Python

Useful Devices that can be connected to Raspberry PI

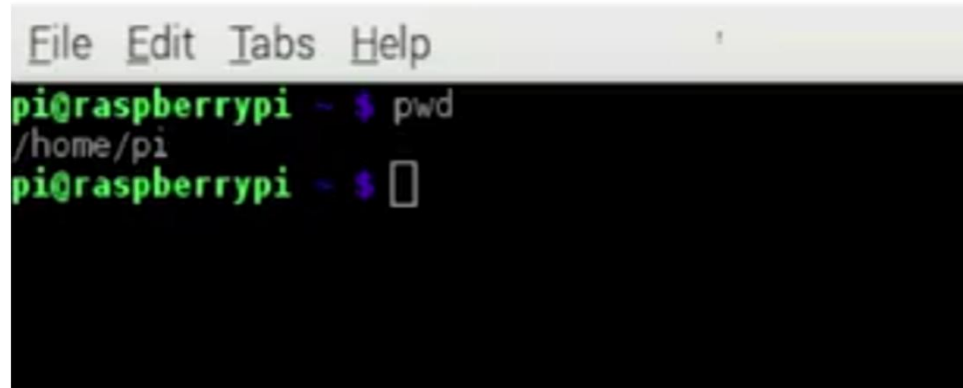
<http://www.wirelesshack.org/the-top-10-raspberry-pi-sensors-for-your-projects.html>

Linux File System



PWD linux command

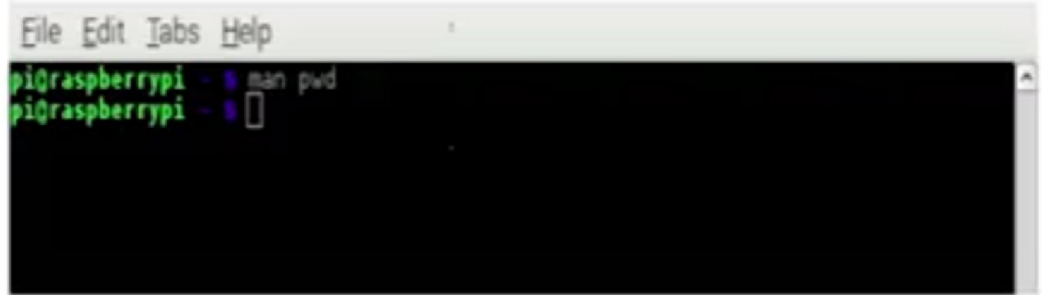
shows the current folder

A screenshot of a terminal window with a menu bar at the top containing 'File', 'Edit', 'Tabs', and 'Help'. The terminal text shows a user 'pi' at a 'raspberrypi' machine. The prompt is '~ \$'. The user enters 'pwd' and the output is '/home/pi'. The prompt then returns to '~ \$' with a cursor. The text is color-coded: 'pi@raspberrypi' is green, '~' is purple, '\$' is purple, 'pwd' is white, and '/home/pi' is white.

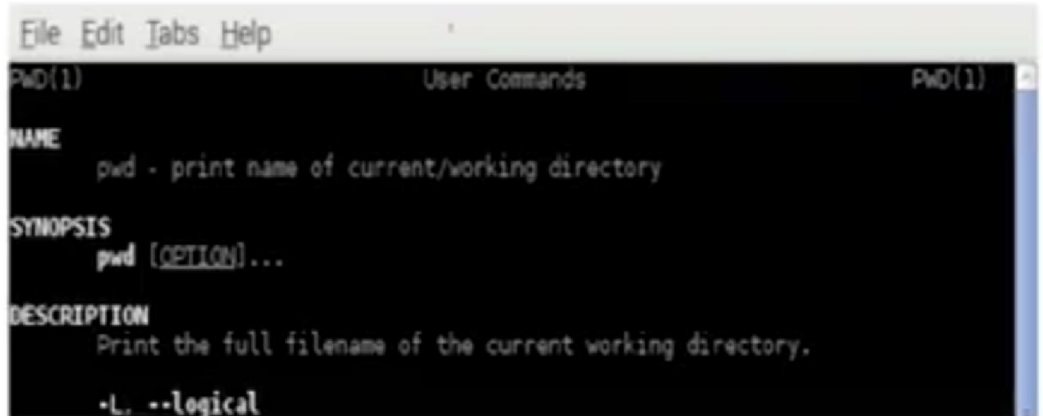
```
File Edit Tabs Help
pi@raspberrypi ~ $ pwd
/home/pi
pi@raspberrypi ~ $
```

Manual Command

Man gives information
about linux commands.



```
File Edit Tabs Help
pi@raspberrypi ~$ man pwd
pi@raspberrypi ~$
```



```
File Edit Tabs Help
PwD(1)                                User Commands                                PwD(1)

NAME
    pwd - print name of current/working directory

SYNOPSIS
    pwd [OPTION]...

DESCRIPTION
    Print the full filename of the current working directory.

    -L, --logical
```

```
File Edit Tabs Help
pi@raspberrypi ~ $ pwd
/home/pi
pi@raspberrypi ~ $ cd /bin
pi@raspberrypi /bin $ pwd
/bin
pi@raspberrypi /bin $ cd
pi@raspberrypi ~ $ pwd
/home/pi
pi@raspberrypi ~ $
```

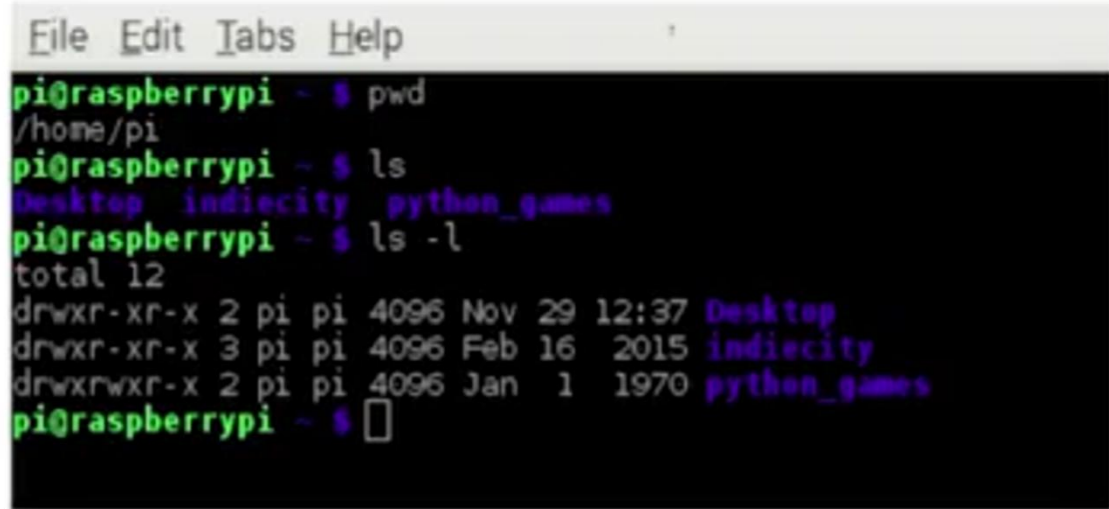
To a specific directory

```
File Edit Tabs Help
pi@raspberrypi ~ $ pwd
/home/pi
pi@raspberrypi ~ $ cd ..
pi@raspberrypi /home $ pwd
/home
pi@raspberrypi /home $ cd pi
pi@raspberrypi ~ $ pwd
/home/pi
pi@raspberrypi ~ $
```

Up or down one level

Listing command

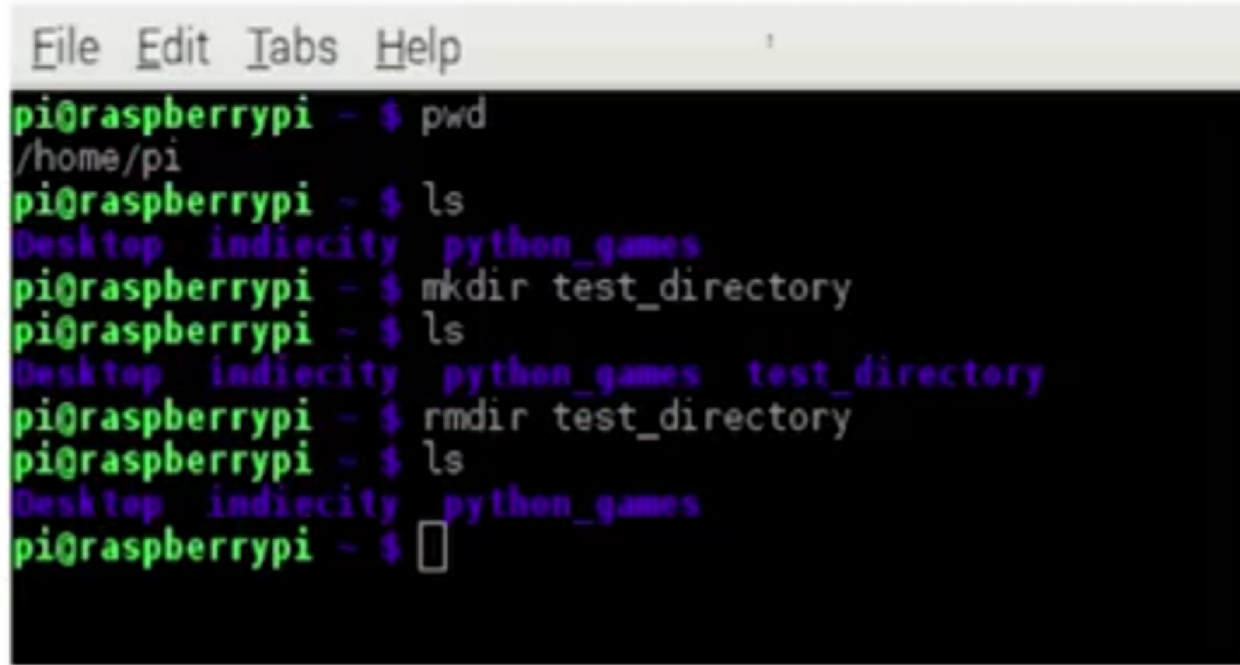
Show the contents
of a directory



```
File Edit Tabs Help
pi@raspberrypi ~ $ pwd
/home/pi
pi@raspberrypi ~ $ ls
Desktop indiecity python_games
pi@raspberrypi ~ $ ls -l
total 12
drwxr-xr-x 2 pi pi 4096 Nov 29 12:37 Desktop
drwxr-xr-x 3 pi pi 4096 Feb 16 2015 indiecity
drwxrwxr-x 2 pi pi 4096 Jan 1 1970 python_games
pi@raspberrypi ~ $
```

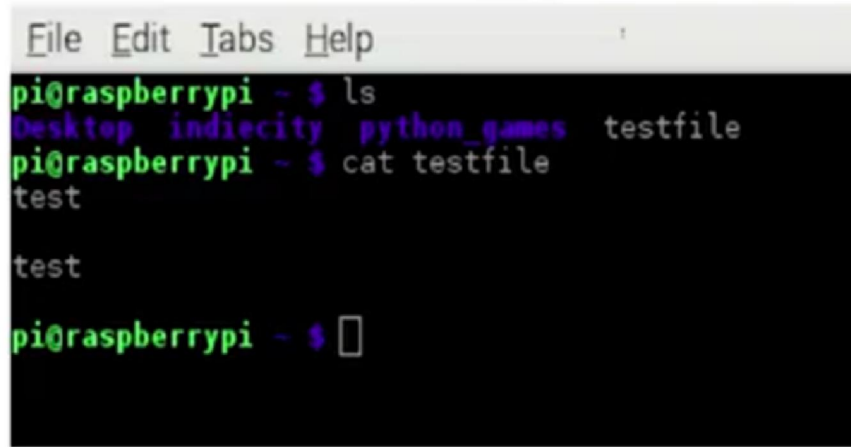

Mkdir , Rmdir commands

Rmdir only works if the directory is empty and if it is not empty you should use -r option.

A terminal window with a menu bar (File, Edit, Tabs, Help) and a title bar (1). The terminal shows a series of commands and their outputs on a Raspberry Pi. The prompt is 'pi@raspberrypi ~ \$'. The commands and outputs are: 'pwd' returns '/home/pi'; 'ls' shows 'Desktop', 'indiecity', and 'python_games'; 'mkdir test_directory' creates a new directory; 'ls' shows 'Desktop', 'indiecity', 'python_games', and 'test_directory'; 'rmdir test_directory' removes the directory; 'ls' shows 'Desktop', 'indiecity', and 'python_games'; and finally a blank line with the prompt 'pi@raspberrypi ~ \$' and a cursor.

```
File Edit Tabs Help
pi@raspberrypi ~ $ pwd
/home/pi
pi@raspberrypi ~ $ ls
Desktop indiecity python_games
pi@raspberrypi ~ $ mkdir test_directory
pi@raspberrypi ~ $ ls
Desktop indiecity python_games test_directory
pi@raspberrypi ~ $ rmdir test_directory
pi@raspberrypi ~ $ ls
Desktop indiecity python_games
pi@raspberrypi ~ $
```

Viewing a file

A terminal window with a menu bar (File, Edit, Tabs, Help) and a dark background. The prompt is 'pi@raspberrypi ~'. The first command is 'ls', which outputs 'Desktop', 'indiecity', 'python_games', and 'testfile'. The second command is 'cat testfile', which outputs 'test' on two separate lines. The prompt is then shown again with a cursor.

```
File Edit Tabs Help
pi@raspberrypi ~ $ ls
Desktop indiecity python_games testfile
pi@raspberrypi ~ $ cat testfile
test
test
pi@raspberrypi ~ $
```

- “cat” prints the file to the terminal
- “head” prints the first 10 lines
- “last” prints the last 10 lines

Copying a file

```
File Edit Tabs Help
pi@raspberrypi ~ $ ls
Desktop  indiecity  python_games  testfile
pi@raspberrypi ~ $ cp testfile test2
pi@raspberrypi ~ $ ls
Desktop  indiecity  python_games  test2  testfile
pi@raspberrypi ~ $ cat testfile
test
test

pi@raspberrypi ~ $ cat test2
test
test

pi@raspberrypi ~ $
```

Moving or renaming a file

```
File Edit Tabs Help
pi@raspberrypi ~ $ ls
Desktop  indiecity  python_games  test2  testfile
pi@raspberrypi ~ $ mv testfile test1
pi@raspberrypi ~ $ ls
Desktop  indiecity  python_games  test1  test2
pi@raspberrypi ~ $ mkdir testdir
pi@raspberrypi ~ $ ls
Desktop  indiecity  python_games  test1  test2  testdir
pi@raspberrypi ~ $ mv test2 testdir
pi@raspberrypi ~ $ ls
Desktop  indiecity  python_games  test1  testdir
pi@raspberrypi ~ $ cd testdir
pi@raspberrypi ~/testdir $ ls
test2
pi@raspberrypi ~/testdir $
```

- Move a file
- Rename it or move it to a new directory

File Permissions

- Files have **owners**
 - User who created the file
- Files have **access permissions**
 - Read (r), write (w), execute (x)
- Different permissions can be assigned according to type
 1. User: the file owner
 2. Group: a permission group
 3. Other: all users

Viewing File Permissions

```
File Edit Tabs Help
pi@raspberrypi ~ $ ls -l
total 20
drwxr-xr-x 2 pi pi 4096 Nov 29 13:41 Desktop
drwxr-xr-x 3 pi pi 4096 Feb 16 2015 indiecity
drwxrwxr-x 2 pi pi 4096 Jan 1 1970 python_games
-rw-r--r-- 1 pi pi 12 Nov 29 13:03 test1
drwxr-xr-x 2 pi pi 4096 Nov 29 13:40 testdir
pi@raspberrypi ~ $
```

user

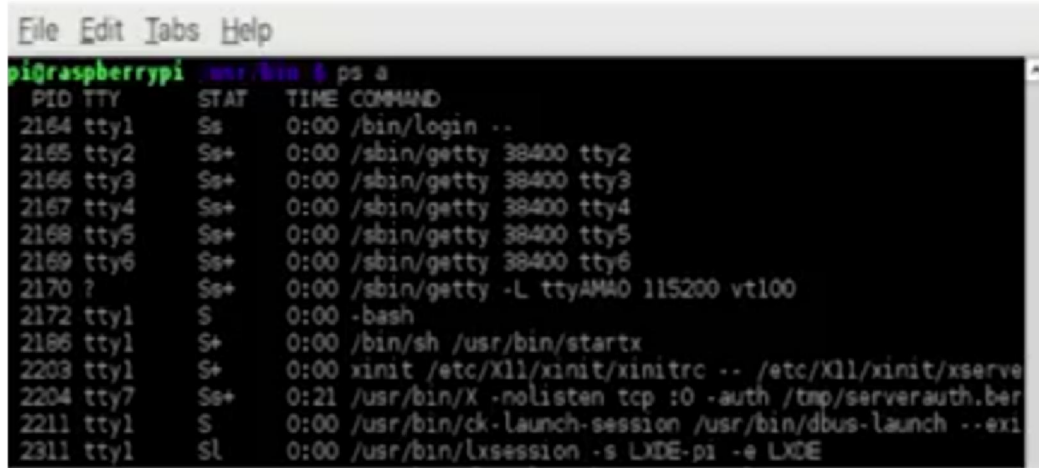
group

other

Root Account

- The **root** account has highest permission level
- Key files and directories are only accessible by root
- Sometimes you need root privileges
 - Install a program
 - Change the operating system

Viewing processes ps a



```
File Edit Tabs Help
pi@raspberrypi:~$ ps a
  PID TTY          STAT       TIME COMMAND
 2164 tty1      Ss+        0:00 /bin/login --
 2165 tty2      Ss+        0:00 /sbin/getty 38400 tty2
 2166 tty3      Ss+        0:00 /sbin/getty 38400 tty3
 2167 tty4      Ss+        0:00 /sbin/getty 38400 tty4
 2168 tty5      Ss+        0:00 /sbin/getty 38400 tty5
 2169 tty6      Ss+        0:00 /sbin/getty 38400 tty6
 2170 ?          Ss+        0:00 /sbin/getty -L ttyAMA0 115200 vt100
 2172 tty1      S          0:00 -bash
 2186 tty1      S+         0:00 /bin/sh /usr/bin/startx
 2203 tty1      S+         0:00 xinit /etc/X11/xinit/xinitrc -- /etc/X11/xinit/xserve
 2204 tty7      Ss+        0:21 /usr/bin/X -nolisten tcp :0 -auth /tmp/serverauth.ber
 2211 tty1      S          0:00 /usr/bin/ck-launch-session /usr/bin/dbus-launch --exi
 2311 tty1      Sl         0:00 /usr/bin/lxsession -s LXDE-p1 -e LXDE
```

- Each process has a unique PID
- “kill” can be used to end a process

Learn python

<https://github.com/bennuttall/python-intro/blob/master/intro.py>

Raspberry Pi for IoT

- Raspberry Pi can be used as a laptop/desktop
- To use it as part of an IoT device, **programming is needed**
- Many languages can be used
 - Need a compiler (C, C++, Java, etc.) and an interpreter (Java, Python, Perl, etc.)
- **Python** is most convenient
 - Good programming environment built-in
 - Good APIs available to access Raspberry Pi hardware

Python Language

- **High-level language, easy to use**
 - Do not need to explicitly declare data types
 - No pointers
 - Object-oriented programming, classes
- **Slow compared to C, C++**
 - Interpreted, not compiled
- **Two versions:** Python 2.x and Python 3.x
 - Python 2.x is still supported
 - Programming differences are small
 - Will use Python 3.x