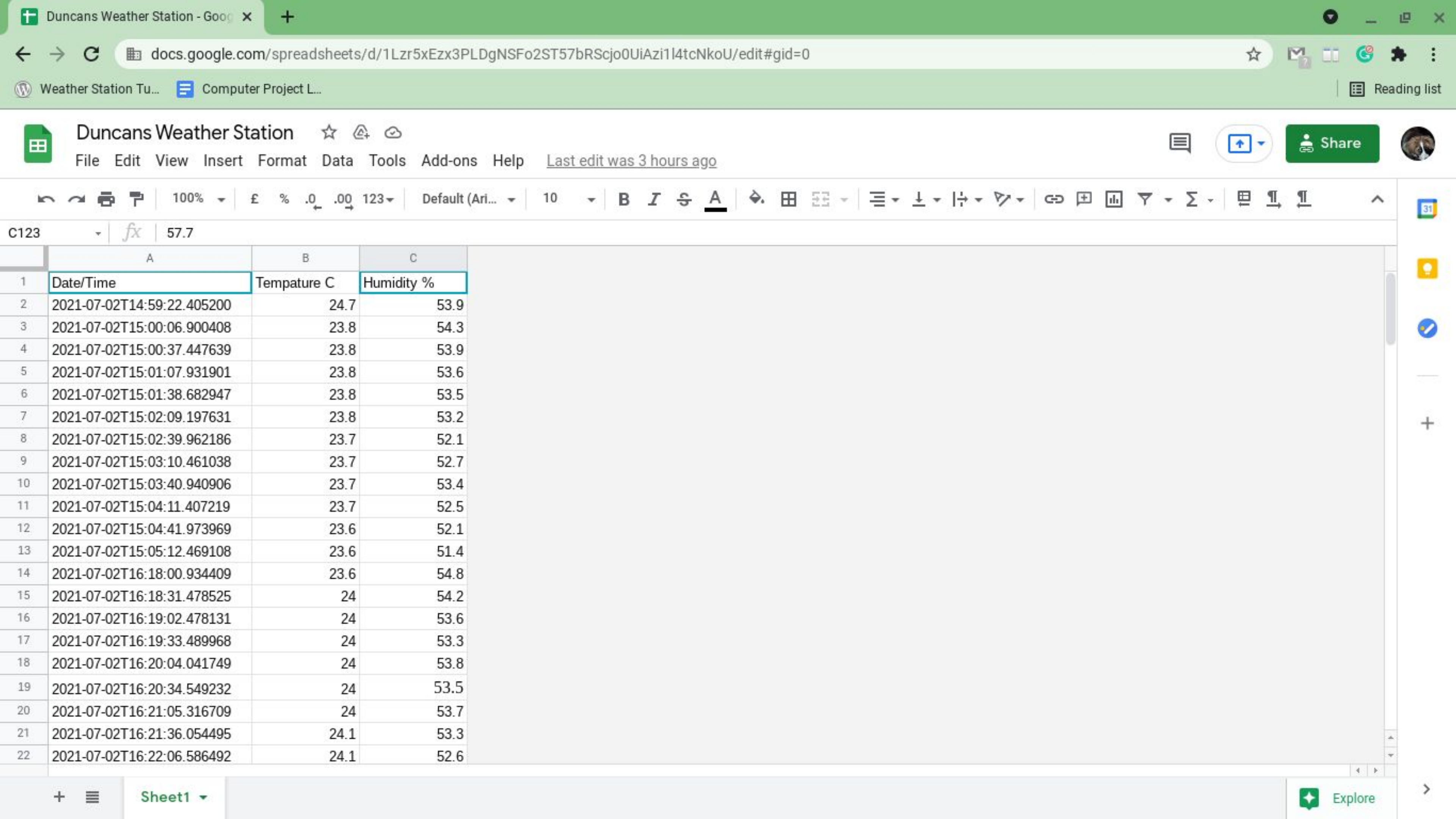
Duncan’s Weather Station

A project By: Duncan Baitz



	A	B	C
1	Date/Time	Tempature C	Humidity %
2	2021-07-02T14:59:22.405200	24.7	53.9
3	2021-07-02T15:00:06.900408	23.8	54.3
4	2021-07-02T15:00:37.447639	23.8	53.9
5	2021-07-02T15:01:07.931901	23.8	53.6
6	2021-07-02T15:01:38.682947	23.8	53.5
7	2021-07-02T15:02:09.197631	23.8	53.2
8	2021-07-02T15:02:39.962186	23.7	52.1
9	2021-07-02T15:03:10.461038	23.7	52.7
10	2021-07-02T15:03:40.940906	23.7	53.4
11	2021-07-02T15:04:11.407219	23.7	52.5
12	2021-07-02T15:04:41.973969	23.6	52.1
13	2021-07-02T15:05:12.469108	23.6	51.4
14	2021-07-02T16:18:00.934409	23.6	54.8
15	2021-07-02T16:18:31.478525	24	54.2
16	2021-07-02T16:19:02.478131	24	53.6
17	2021-07-02T16:19:33.489968	24	53.3
18	2021-07-02T16:20:04.041749	24	53.8
19	2021-07-02T16:20:34.549232	24	53.5
20	2021-07-02T16:21:05.316709	24	53.7
21	2021-07-02T16:21:36.054495	24.1	53.3
22	2021-07-02T16:22:06.586492	24.1	52.6

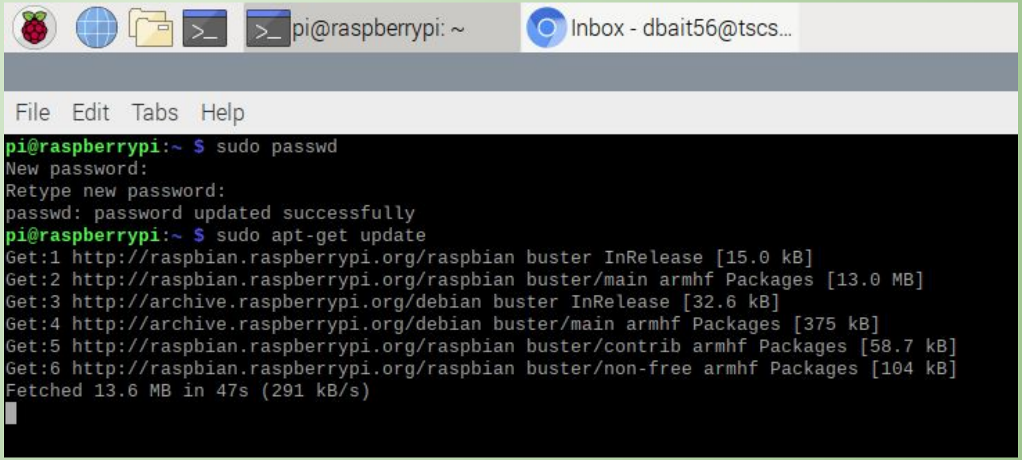
Overview

My idea started last year when I wanted to join the computer project. I was looking for easier projects to start with and found a tutorial to a weather station. Turns out it being made so long ago it was so outdated that last year I could only make the wordpress site part of the weather station. So this year I decided to buckle down, start early and make the entire weather station. So I restarted the project had many fails and wrote most of the code 5 times. So I hope you find this slideshow informative and interesting.

Updating

The first thing I had to do was install and update the OS. I chose Raspbian because it is a full desktop os that I already had pre uploaded onto a SD card. Then I did basic setup which included

- Connecting to Internet
- Changing Password
- Updating
- Installing Hex

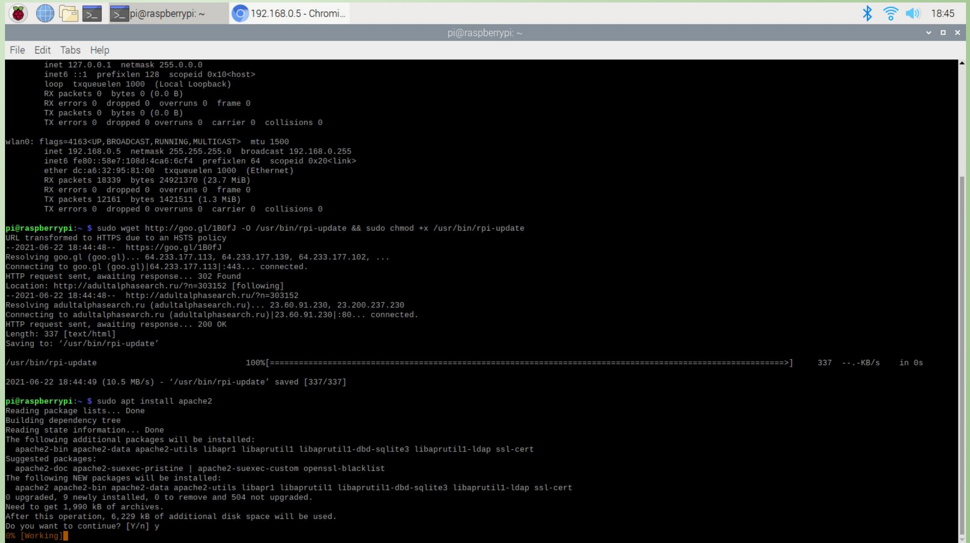


```
pi@raspberrypi:~ $ sudo passwd
New password:
Retype new password:
passwd: password updated successfully
pi@raspberrypi:~ $ sudo apt-get update
Get:1 http://raspbian.raspberrypi.org/raspbian buster InRelease [15.0 kB]
Get:2 http://raspbian.raspberrypi.org/raspbian buster/main armhf Packages [13.0 MB]
Get:3 http://archive.raspberrypi.org/debian buster InRelease [32.6 kB]
Get:4 http://archive.raspberrypi.org/debian buster/main armhf Packages [375 kB]
Get:5 http://raspbian.raspberrypi.org/raspbian buster/contrib armhf Packages [58.7 kB]
Get:6 http://raspbian.raspberrypi.org/raspbian buster/non-free armhf Packages [104 kB]
Fetched 13.6 MB in 47s (291 kB/s)
```

Installing Apache

Now I had to install Apache2 and MariaDB. I had to do this so that I could get Wordpress installed. The following things have to be installed:

- Php
- Php mysql
- Libapache2
- Mariadb Common
- Mariadb Server
- Mariadb Client

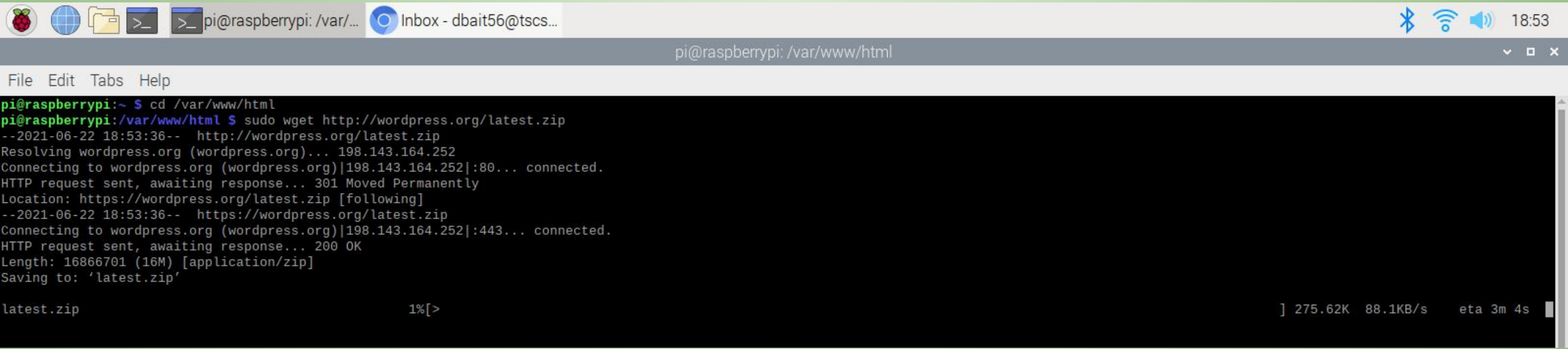


```
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.0.5  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 fe80::58e7:108d:4ca6:6cf4  prefixlen 64  scopeid 0x20<link>
        ether dc:a6:32:95:81:00  txqueuelen 1000  (Ethernet)
        RX packets 18339  bytes 24921370 (23.7 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 12161  bytes 1421511 (1.3 MiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

pi@raspberrypi:~ $ sudo wget http://goo.gl/1B0fJ -O /usr/bin/rpi-update && sudo chmod +x /usr/bin/rpi-update
URL transformed to HTTPS due to an HSTS policy
--2021-06-22 18:44:48--  https://goo.gl/1B0fJ
Resolving goo.gl (goo.gl)... 64.233.177.113, 64.233.177.139, 64.233.177.102, ...
Connecting to goo.gl (goo.gl)|64.233.177.113|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: http://adultalphasearch.ru/?n=303152 [following]
--2021-06-22 18:44:48--  http://adultalphasearch.ru/?n=303152
Resolving adultalphasearch.ru (adultalphasearch.ru)... 23.60.91.230, 23.200.237.230
Connecting to adultalphasearch.ru (adultalphasearch.ru)|23.60.91.230|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 337 [text/html]
Saving to: '/usr/bin/rpi-update'

/usr/bin/rpi-update                          100%[=====================================================================================================>]     337  --.-KB/s    in 0s

2021-06-22 18:44:49 (10.5 MB/s) - '/usr/bin/rpi-update' saved [337/337]

pi@raspberrypi:~ $ sudo apt install apache2
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap ssl-cert
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom openssl-blacklist
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap ssl-cert
0 upgraded, 9 newly installed, 0 to remove and 504 not upgraded.
Need to get 1,990 kB of archives.
After this operation, 6,229 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
0% [Working]
```

Installing Wordpress

Now I had to install WordPress to do that I had to change directories and then get wordpress and unzip latest.zip. The other things I had to do were

- Move Wordpress folder
- Remove directory wordpress was in.

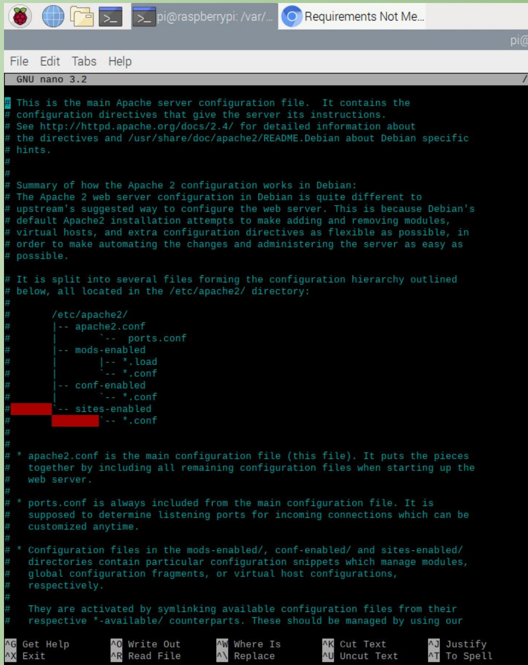


```
pi@raspberrypi:~ $ cd /var/www/html
pi@raspberrypi:/var/www/html $ sudo wget http://wordpress.org/latest.zip
--2021-06-22 18:53:36--  http://wordpress.org/latest.zip
Resolving wordpress.org (wordpress.org)... 198.143.164.252
Connecting to wordpress.org (wordpress.org)|198.143.164.252|:80... connected.
HTTP request sent, awaiting response... 301 Moved Permanently
Location: https://wordpress.org/latest.zip [following]
--2021-06-22 18:53:36--  https://wordpress.org/latest.zip
Connecting to wordpress.org (wordpress.org)|198.143.164.252|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 16866701 (16M) [application/zip]
Saving to: ‘latest.zip’

latest.zip                                  1%[>                                                                                                                                          ] 275.62K  88.1KB/s    eta 3m 4s
```

Changing Permissions

Now I had to change permissions for wordpress to be able to install its database by itself. To do that I had to allow a2enmod and change the nano file.

- I had to change the first two overrides from None To All
- Change ONLY the first two overrides
- Change in the nano file /etc/apache/apache2.conf

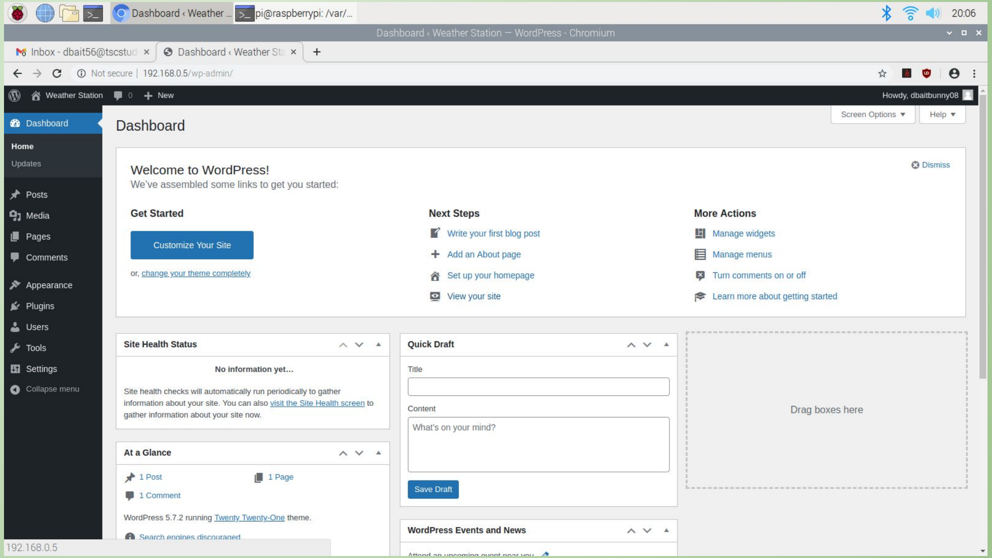


```
  GNU nano 3.2

# This is the main Apache server configuration file.  It contains the
# configuration directives that give the server its instructions.
# See http://httpd.apache.org/docs/2.4/ for detailed information about
# the directives and /usr/share/doc/apache2/README.Debian about Debian specific
# hints.
#
#
# Summary of how the Apache 2 configuration works in Debian:
# The Apache 2 web server configuration in Debian is quite different to
# upstream's suggested way to configure the web server. This is because Debian's
# default Apache2 installation attempts to make adding and removing modules,
# virtual hosts, and extra configuration directives as flexible as possible, in
# order to make automating the changes and administering the server as easy as
# possible.

# It is split into several files forming the configuration hierarchy outlined
# below, all located in the /etc/apache2/ directory:
#
#       /etc/apache2/
#       |-- apache2.conf
#       |       `--  ports.conf
#       |-- mods-enabled
#       |       |-- *.load
#       |       `-- *.conf
#       |-- conf-enabled
#       |       `-- *.conf
#       `-- sites-enabled
#               `-- *.conf
#
#
# * apache2.conf is the main configuration file (this file). It puts the pieces
#   together by including all remaining configuration files when starting up the
#   web server.
#
# * ports.conf is always included from the main configuration file. It is
#   supposed to determine listening ports for incoming connections which can be
#   customized anytime.
#
# * Configuration files in the mods-enabled/, conf-enabled/ and sites-enabled/
#   directories contain particular configuration snippets which manage modules,
#   global configuration fragments, or virtual host configurations,
#   respectively.
#
#   They are activated by symlinking available configuration files from their
#   respective *-available/ counterparts. These should be managed by using our

^G Get Help     ^O Write Out    ^W Where Is     ^K Cut Text     ^J Justify
^X Exit         ^R Read File    ^\ Replace      ^U Uncut Text   ^T To Spell
```

WordPress Database

Now You have to sign in to the mysql monitor and create the Wordpress Database. Then you can go to your localhost and set up wordpress. You will need

- Database name
- Login
- Password
- Database prefix



Dashboard

Welcome to WordPress!
We've assembled some links to get you started:

or, change your theme completely

No information yet...

Site health checks will automatically run periodically to gather information about your site. You can also visit the Site Health screen to gather information about your site now.

WordPress 5.7.2 running Twenty Twenty-One theme.

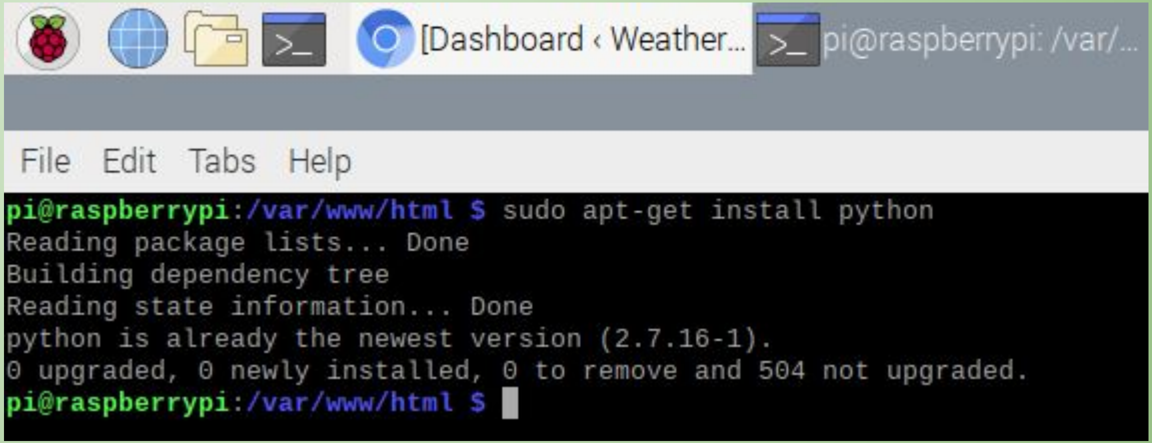
Search engines discouraged

Attend an upcoming event near you.

Installing Python

Now it was time to install the python which will be what I use for coding the sensor. I had to install a couple different python packages.

- Openssl
- Build_essentials
- Libmariadb
- python-dev



```
pi@raspberrypi:/var/www/html $ sudo apt-get install python
Reading package lists... Done
Building dependency tree
Reading state information... Done
python is already the newest version (2.7.16-1).
0 upgraded, 0 newly installed, 0 to remove and 504 not upgraded.
pi@raspberrypi:/var/www/html $ 
```

Research

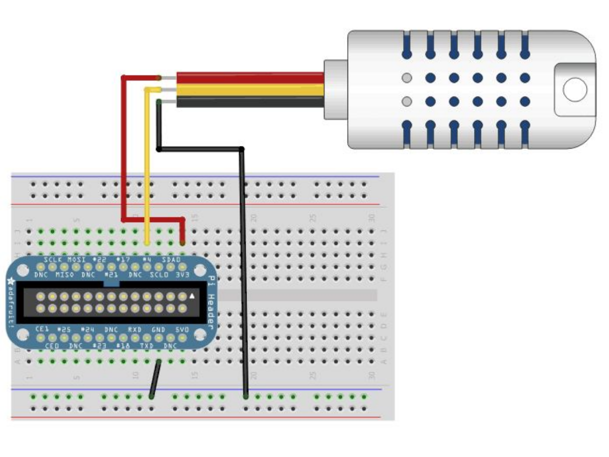
Now I had to do some research. I was struggling with the fact that it would not let me install the library that the data will be stored in. It turns out that the library was replaced with a more modern one that uses google drive. So all the work I had done was not needed. I still found a way to incorporate the wordpress so it was not all a waste.

New Tutorial

Now that I had found a new tutorial that I could use I got back to work. This tutorial uses circuit python to code the sensor and adafruit to record the data to google sheets. This was a plus because then all my data was recorded to a secure cloud drive.

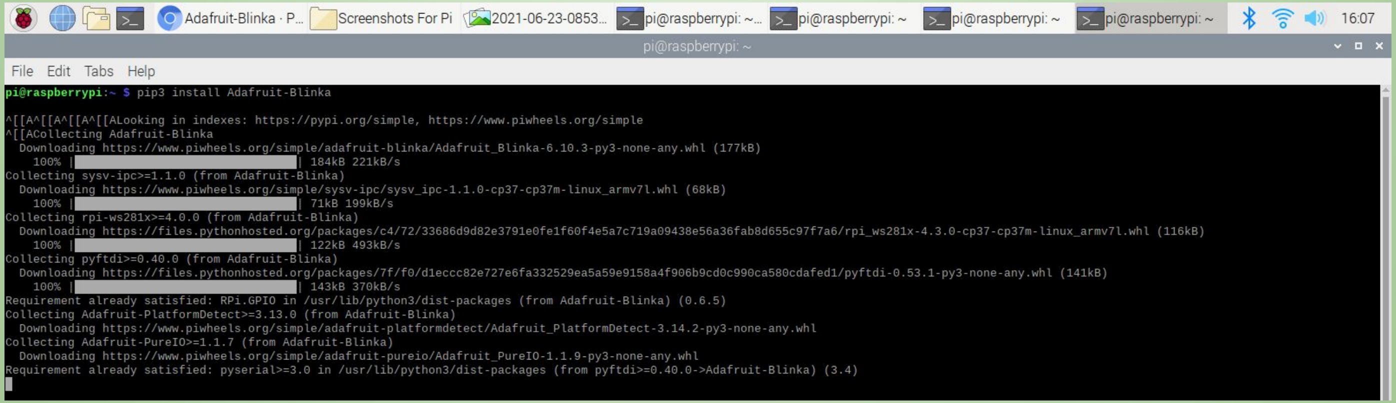
Wiring the Sensor

Now it is time to wire the sensor. What I needed for this was a breadboard, pi jumper cable, pig tails, and a AM2032/DHT22 sensor. Then you plug the jumper cable into breadboard and connect the sensor. Finally add the pig tail from ground to negative. Boom! The sensor is wired.


SCLK MOSI #22 #17 #4 SDAD
DNC MISO DNC #21 DNC SCLD 3V3
CE1 #25 #24 DNC RXD GND 5V0
CED DNC #23 #18 TXD DNC
Pi Header
adafruit!
1
5
10
15
20
25
30

Coding Sensor

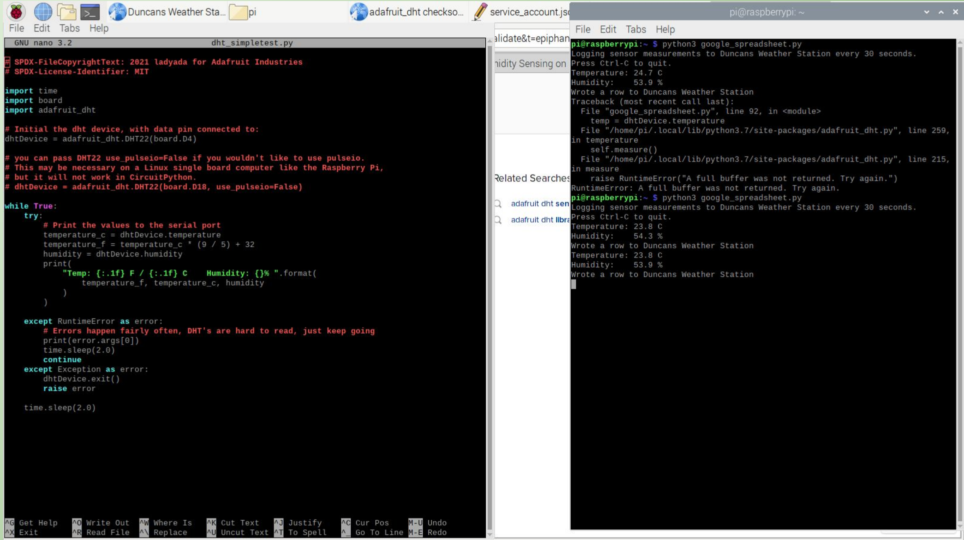
Now that I had a new way to code the sensor I got started. I installed circuit python and got my sensor coded. Then I was given a command that tests the code but doesn’t log it. I was so happy. Then I had to go into google and change permissions. I had to do that so my service bot I had created could edit the spreadsheet and log data.



```
pi@raspberrypi:~ $ pip3 install Adafruit-Blinka

^[[A^[[A^[[A^[[ALooking in indexes: https://pypi.org/simple, https://www.piwheels.org/simple
^[[ACollecting Adafruit-Blinka
  Downloading https://www.piwheels.org/simple/adafruit-blinka/Adafruit_Blinka-6.10.3-py3-none-any.whl (177kB)
    100% |████████████████████████████████| 184kB 221kB/s
Collecting sysv-ipc>=1.1.0 (from Adafruit-Blinka)
  Downloading https://www.piwheels.org/simple/sysv-ipc/sysv_ipc-1.1.0-cp37-cp37m-linux_armv7l.whl (68kB)
    100% |████████████████████████████████| 71kB 199kB/s
Collecting rpi-ws281x>=4.0.0 (from Adafruit-Blinka)
  Downloading https://files.pythonhosted.org/packages/c4/72/33686d9d82e3791e0fe1f60f4e5a7c719a09438e56a36fab8d655c97f7a6/rpi_ws281x-4.3.0-cp37-cp37m-linux_armv7l.whl (116kB)
    100% |████████████████████████████████| 122kB 493kB/s
Collecting pyftdi>=0.40.0 (from Adafruit-Blinka)
  Downloading https://files.pythonhosted.org/packages/7f/f0/d1eccc82e727e6fa332529ea5a59e9158a4f906b9cd0c990ca580cdafed1/pyftdi-0.53.1-py3-none-any.whl (141kB)
    100% |████████████████████████████████| 143kB 370kB/s
Requirement already satisfied: RPi.GPIO in /usr/lib/python3/dist-packages (from Adafruit-Blinka) (0.6.5)
Collecting Adafruit-PlatformDetect>=3.13.0 (from Adafruit-Blinka)
  Downloading https://www.piwheels.org/simple/adafruit-platformdetect/Adafruit_PlatformDetect-3.14.2-py3-none-any.whl
Collecting Adafruit-PureIO>=1.1.7 (from Adafruit-Blinka)
  Downloading https://www.piwheels.org/simple/adafruit-pureio/Adafruit_PureIO-1.1.9-py3-none-any.whl
Requirement already satisfied: pyserial>=3.0 in /usr/lib/python3/dist-packages (from pyftdi>=0.40.0->Adafruit-Blinka) (3.4)
```

First Test

Now that I had changed permissions and knew my sensor worked it was time to see if it would log the data to my spreadsheet. To do that I ran the command that always will be use when recording: *python3 google_spreadsheet.py*. I was so happy as it logged onto the google spreadsheet in real time. I had finally finished the weather station.



```
  GNU nano 3.2                          dht_simpletest.py

# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

import time
import board
import adafruit_dht

# Initial the dht device, with data pin connected to:
dhtDevice = adafruit_dht.DHT22(board.D4)

# you can pass DHT22 use_pulseio=False if you wouldn't like to use pulseio.
# This may be necessary on a Linux single board computer like the Raspberry Pi,
# but it will not work in CircuitPython.
# dhtDevice = adafruit_dht.DHT22(board.D18, use_pulseio=False)

while True:
    try:
        # Print the values to the serial port
        temperature_c = dhtDevice.temperature
        temperature_f = temperature_c * (9 / 5) + 32
        humidity = dhtDevice.humidity
        print(
            "Temp: {:.1f} F / {:.1f} C    Humidity: {}% ".format(
                temperature_f, temperature_c, humidity
            )
        )

    except RuntimeError as error:
        # Errors happen fairly often, DHT's are hard to read, just keep going
        print(error.args[0])
        time.sleep(2.0)
        continue
    except Exception as error:
        dhtDevice.exit()
        raise error

    time.sleep(2.0)

^G Get Help   ^O Write Out  ^W Where Is   ^K Cut Text   ^J Justify    ^C Cur Pos    M-U Undo
^X Exit       ^R Read File  ^\ Replace    ^U Uncut Text ^T To Spell   ^_ Go To Line M-E Redo
```

```
pi@raspberrypi:~ $ python3 google_spreadsheet.py
Logging sensor measurements to Duncans Weather Station every 30 seconds.
Press Ctrl-C to quit.
Temperature: 24.7 C
Humidity:    53.9 %
Wrote a row to Duncans Weather Station
Traceback (most recent call last):
  File "google_spreadsheet.py", line 92, in <module>
    temp = dhtDevice.temperature
  File "/home/pi/.local/lib/python3.7/site-packages/adafruit_dht.py", line 259,
in temperature
    self.measure()
  File "/home/pi/.local/lib/python3.7/site-packages/adafruit_dht.py", line 215,
in measure
    raise RuntimeError("A full buffer was not returned. Try again.")
RuntimeError: A full buffer was not returned. Try again.
pi@raspberrypi:~ $ python3 google_spreadsheet.py
Logging sensor measurements to Duncans Weather Station every 30 seconds.
Press Ctrl-C to quit.
Temperature: 23.8 C
Humidity:    54.3 %
Wrote a row to Duncans Weather Station
Temperature: 23.8 C
Humidity:    53.9 %
Wrote a row to Duncans Weather Station
```

Sources

Askunbuntu.com

Stackoverflow.com

Raspberryweather.com

wordpress.org/support/article/resetting-your-password/

learn.adafruit.com