

Tech Lab Temp and Humidity Sensor Guide

Raspberry Pi, DHT11 Sensor, and Beebotte

To monitor and log the temperature and humidity in the Tech Lab we will utilize a Raspberry Pi and a DHT11 sensor to log the data. The data will be accessible via a Beebotte dashboard.

This guide will reference instructions provided by this guide
beebotte.com/tutorials/monitor_humidity_and_temperature_with_raspberrypi

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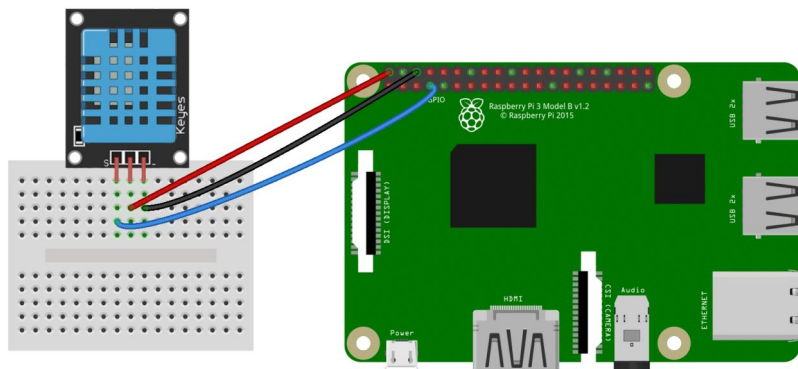
Needed Hardware

A few items will be needed.

- Raspberry Pi 3+ - <http://amzn.com/ABOX-Raspberry>
- DHT11 Sensor - amzn.com/dht11

Setting-up Hardware

1. Unbox the Raspberry Pi and case. Assemble the case and place the Raspberry Pi in it.



2. Begin by plugging in jumper cables either directly into the sensor or in a breadboard with corresponding connections. The pin out of the sensor is (left to right) Signal, Positive, and Negative. Plug in accordingly.
3. Plug in the HDMI and Mouse/Keyboard

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Building Raspian

1. Insert a preloaded Raspian SD-Card or create one
 - a. Create a Raspian image using Balena.Etcher and an image file from raspberrypi.org/downloads/raspbian/
 - i. Raspian Stretch is recommended
 - ii. See this guide for more info on flashing an image - raspbpi.org/magpi/pi-sd-etcher/
 - b. Flash the image onto an available SD-Card larger than 16GB and place in the Raspberry Pi.
2. Plug in the power cable to boot.
3. After the Raspberry Pi boots up, follow the onscreen prompts to set language, location, network, etc.
4. Set the password to *24-FusionIT* (the username will automatically be 'pi')
5. Log in to the Student WiFi network
 - a. *MyStudentVlan*
6. Run 'System Update' and reboot
7. Setting up WiFi and SSH
8. Verify Student Network is connected
9. Open terminal by pressing `ctl+alt+T` and type:

```
sudo raspi-config
```

9. Navigate to 'Interfaces' and 'SSH'. Enable SSH and hit save/finish.
10. Obtain the Raspberry Pi IP address:

```
ifconfig
```

11. The output will show you what network interface is assigned an address. We are looking for 'WLAN0'. The IP address should be something like '10.64.30.85'. Write this down for use in the next step.
12. Next open network settings:

```
sudo nano /etc/dhcpd.conf
```

Scroll to the bottom of the page and enter this:

```
interface wlan0

static ip_address=##.##.200/24
static routers=##.##.1
static domain_name_servers=8.8.8.8
```

Replace # with the corresponding numbers from the previous IP address.

ex. ifconfig yielded 10.64.30.85 so dhcpd config would be:

```
static ip_address=10.64.30.200/24
static_routers=10.64.30.1
```

This configuration will allow us to access the Raspberry Pi via SSH using the IP address 10.64.30.200. Press `crtl+O` to save and `crtl+X` to exit. It is suggested to print a label with this info and place it on the case of Raspberry Pi.

Reboot and run the command 'ifconfig' once more. Verify the IP address for wlan0 is same as what we just set.

Test this connection via SSH using Putty or Chrome Secure Shell App. Remember the username is 'pi'. Ignore if you are installing everything locally.

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Setup Git and access to Github

1. Install Git

```
sudo apt update && sudo apt upgrade -y  
sudo apt install git
```

Setup Python, Adafruit, Beebotte

1. Having gained SSH access we first will run an update command to make sure everything is up to date

```
sudo apt update && sudo apt upgrade -y
```

2. Gather the Adafruit Sensor Libraries

```
sudo apt-get install git-core
```

```
git clone https://github.com/adafruit/Adafruit_Python_DHT.git
```

- a. With libraries pulled, navigate to that folder:

```
cd Adafruit_Python_DHT
```

- b. Build python essentials:

```
sudo apt-get install build-essential python-dev
```

- c. Install the library:

```
sudo python setup.py install
```

3. Test the hardware and library:

```
cd /Adafruit_Python_DHT/examples
```

```
sudo python AdafruitDHT.py 11 4
```

The output should be:

```
Temp=20.0* Humidity=22.0%
```

4. Install Beebotte python module:

```
sudo pip install beebotte
```

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Scripting and Running at Boot

1. Log in to your campus' Beebotte at beebotte.com
Username: [school]techlab@fusionacademy.com
Password: 24-FusionIT
ie: austintechlab@fusionacademy.com
2. Download a template script from:
http://source.fusionacademy.com/ts/pd/Shared/Tech%20Lab%20Documents/raspi_dht11.py

Or use Git via terminal to fetch the template:

```
git clone https://github.com/dhaggardFEG/TL-TempHumid-Sensor/
```

*Follow characters exactly. Command is case-sensitive.

3. Click 'Account Settings' from the left hand column and click 'Access Management' on beebotte.com
4. Using SSH, use Notepad++ to edit the script recently downloaded
 - a. Change API_KEY and SECRET_KEY on line 13 to the keys on the access management page.

```
1  #!/usr/bin/env python
2
3  #####
4  # This code uses the Beebotte API, you must have an account.
5  # You can register here: http://beebotte.com/register
6  #####
7
8  import time
9  import Adafruit_DHT
10 from beebotte import *
11
12 ### Replace API_KEY and SECRET_KEY with those of your account
13 bbt = BBT('sEB5bgNuuLBjSIWLfa0oql8', 'vcARVDssOWrWqWJB43OvypLx86uY2XnG')
14
15 period = 60 ## Sensor data reporting period (1 minute)
16 pin = 4 ## Assuming the DHT11 sensor is connected to GPIO pin number 4
17
```

Line 13 should appear similar to this screenshot. Take note of the quotations and other characters

5. Installing locally, open a new terminal window and open the recently downloaded script via nano
 - a. First, view the contents of the home folder

```
ls
```

- b. Verify the project directory of 'TL-TempHumid-Sensor'
- c. Change directory into the project directory

```
cd TL-TempHumid-Sensor
```

- d. Copy the configuration file to the home directory and change back to the home directory

```
cp raspi_dht11.py /home/raspi_dht11.py
cd
```

- e. Edit the configuration file via nano

```
sudo nano raspi_dht11.py
```

- f. Refer back to step 4 of this section referring to configuration using SSH. Setting of API and Secret Keys are the same.

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6. Save the script to the computer for later use, if needed. Copy all the contents and return the SSH session.

- a. Change the directory back to the home folder.

```
cd
```

- b. Create a python script file in the home folder named 'raspi_dht11.py'

```
sudo nano raspi_dht11.py
```

This will open a text editor with in the terminal emulator of SSH. Right click with in the field to paste the copied contents from the script. Verify everything is in place. Press ctrl+O to save and ctrl+X to exit.

7. Lastly, add set the script to run when the Raspberry Pi boots up. This will allow you to run the logging without having to direct the Raspberry Pi to run this script.

Edit rc.local:

```
sudo nano /etc/rc.local
```

8. Add the command to run the script via python to the bottom of the file.

```
#####  
echo Running at boot  
sudo python /home/pi/raspi_dht11.py &
```

```
GNU nano 2.7.4  
  
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile  
# sources /etc/bash.bashrc).  
if ! shopt -oq posix; then  
  if [ -f /usr/share/bash-completion/bash_completion ]; then  
    . /usr/share/bash-completion/bash_completion  
  elif [ -f /etc/bash_completion ]; then  
    . /etc/bash_completion  
  fi  
fi  
  
#####  
echo Running at boot  
sudo python /home/pi/raspi_dht11.py &  
]
```

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Channels and Building a Dashboard

1. On Beebotte Control Panel, goto 'Channels' in the left column and click 'Create New'
 - a. Follow the details below:

Create a new channel

RaspberryPi

Raspberry PI board reporting temperature and humidity

☒ Public

Configured Resources

temperature	Temperature sensor	number	X
humidity	Humidity sensor	number	X

+ Resource

Create channel

Verify line 19 and 20 of the script resource name matches that of the resource name in the 'Configured Resources' field. Click 'Create Channel' once complete.

2. Goto 'My Dashboards' and click 'Create'
 - a. Name the Dashboard '[School Acronym] TechLab' and enter 'Temp and Humidity' in the 'Description'

ie *AUS TechLab*
 Temp and Humidity
3. Check the box to make the Dashboard public. Bookmark this link on chrome to have easy access for students.
4. Send the link to dhaggard@fusionacademy.com for overall logging.

Then add 2 Attribute Widgets and 2 Timeline widgets. For every widget, indicate the channel and resource where data will be read from. Here is an example of what the dashboard may look like.

