PARTICLE PHOTON2 TUTORIAL

smartPOT

FireFli PTY LTY ~ FE Basson

Introduction

The purpose of this project is to build a Smart Pot to help keep your favourite plants alive!
We will be utilising an inductive soil sensor and an UV sensor
We will display the data on a BLYN Web dashboard as well as in the BLYNK mobile app.

Prerequisites

You should have a basic understanding of Particle WebIDE or Visual Studio Code and how to import libraries. You should also have some knowledge of setting up Particle WEBHOOKS.

You should have a Particle Photon2 and a Particle account. If you do not have an account, visit https://www.particle.io and register and account.

You should have a BLYNK account and a basic understanding of Blynk WEBHOOKS and Datastreams

You should have at least one Particle Photon2 claimed and active on your account.

Before you start

Connect the soil sensor as indicated in STEP TWO and load the `simple_soil.ino` sketch. You will need to determine the maximum and minimum readings of your sensor as they can vary drastically.

First placed the sensor in open air and get the RAW reading from the serial print or Particle console event monitor. Then submerge the sensor in water and get the second RAW reading. Keep these nearby, we will used them later. Take care of the line on the sensor, do not submerge beyond that line!!

Bill of materials

Items you will need to complete this turorial

1 x Particle Photon2
1 x Breadboard
1 x USB cable
1 x Capacitive Soil sensor
1 x Wave LTR390-UV sensor
1 x 3.7V LiPo battery (or suitable power supply)
1 x Jumper Wires (male2-male and male-2-female)
1 x 3D printed pot (optional ~ STL's provided)

Software used

Visual Studio Code

Cura Slicer

Autodesk Fusion360

Blynk

Step 1

LTR390-UV wiring

Place your Particle Photon2 on the breadboard and ensure there are exposed holes on either side as we will be connecting wires on both sides of the Photon2.

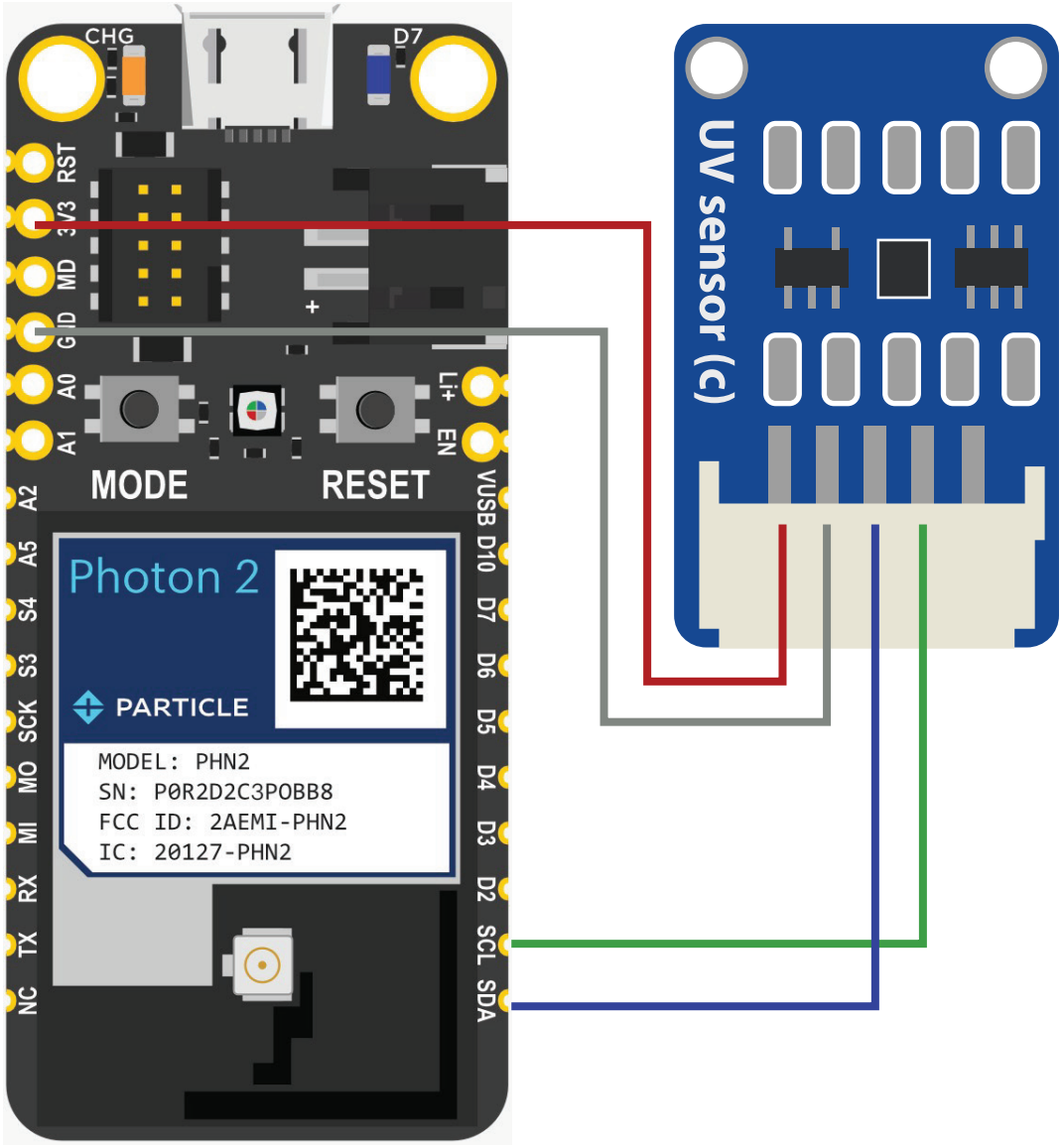
Make the necessary connections between die Photon2 and the LTR390-UV module

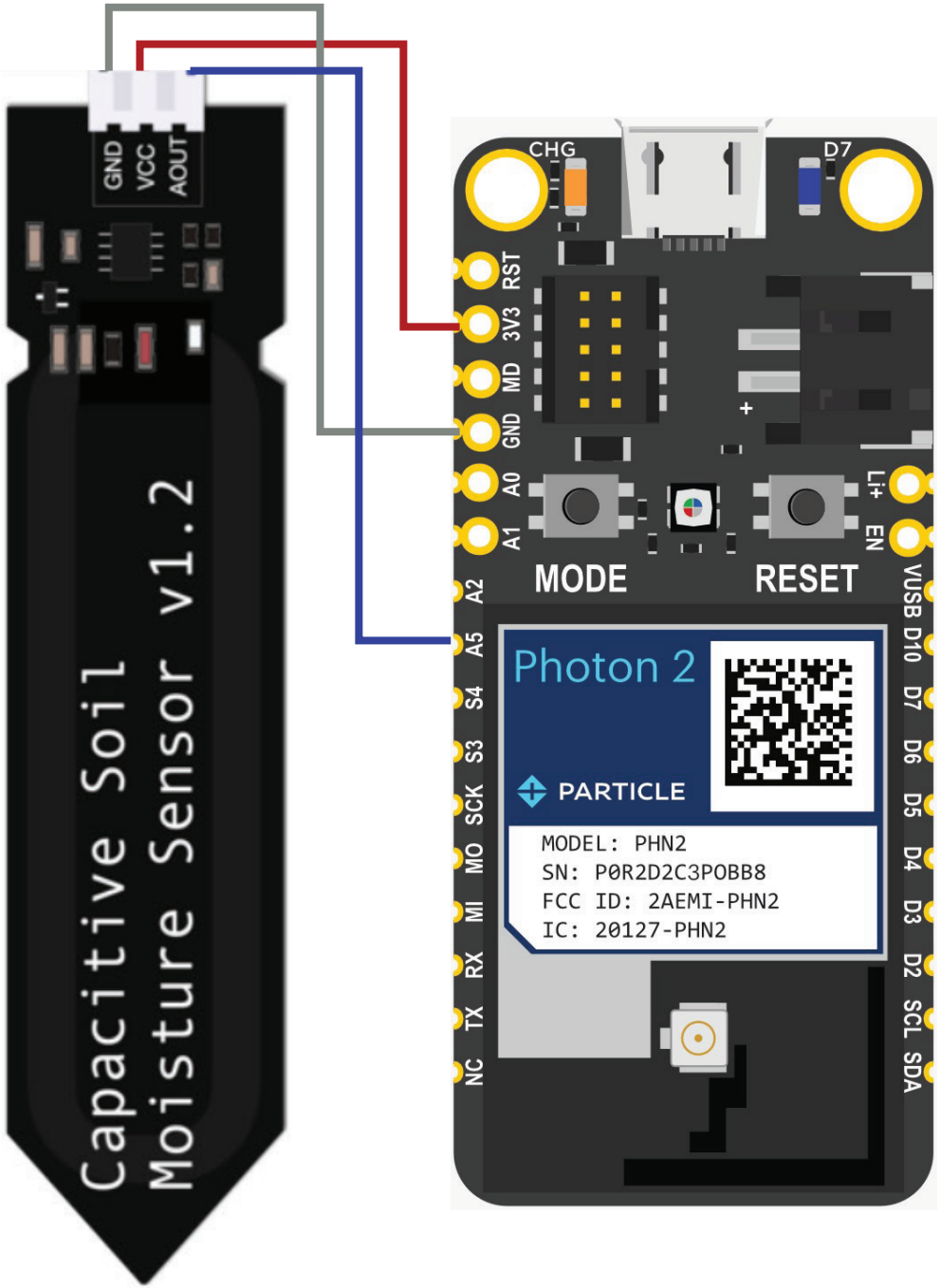
We will not be using the INT function in this tutorial so you can leave that unconnected

Photon 2	LTR390-UV
3V3	VIN/VCC
GND	GND
SDA	SDA
SCL	SCL

NOTE

Depending on the jumper wires you selected, it might look a little different but as long as the pin outs match all should be good





Step 2

Soil sensor wiring

The Soil Sensor requires only three connections, VCC, GND and A5

Photon 2		Soil Sensor
3V3	→	VCC
GND	→	GND
A5	→	AOUT

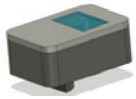
Step 3

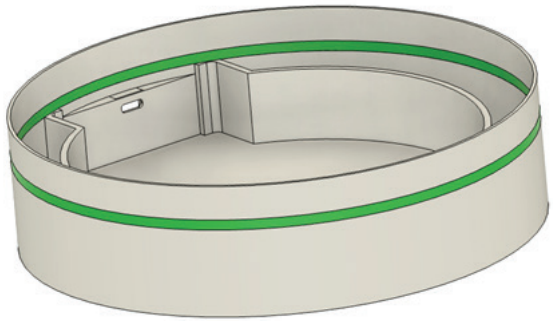
3D prints

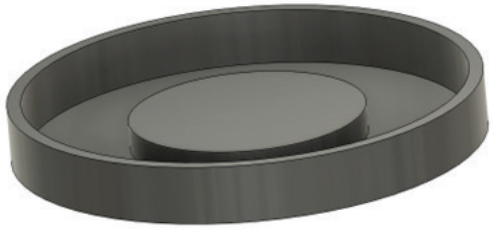
If you want to build the entire project, please make sure to print the following parts. Note that this can be quite a lengthy print, so be patient. I used PETG for this project and printed with a 0.8mm nozzle and a layer height of 0.6mm.

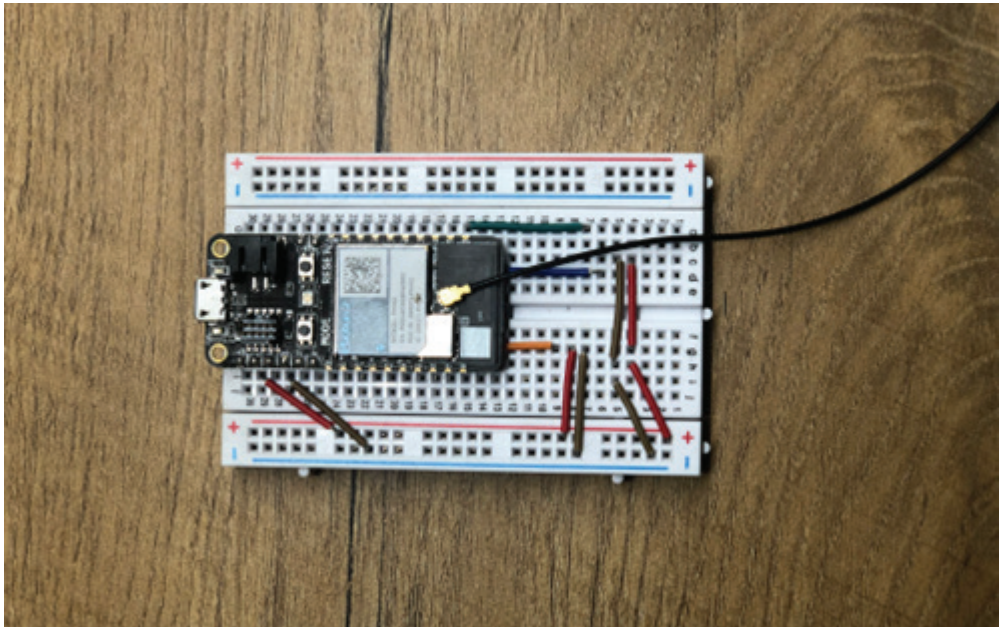
- Water tray
- Base
- Main pot
- UV sensor lid
- UV sensor connector
- UV Sensor base

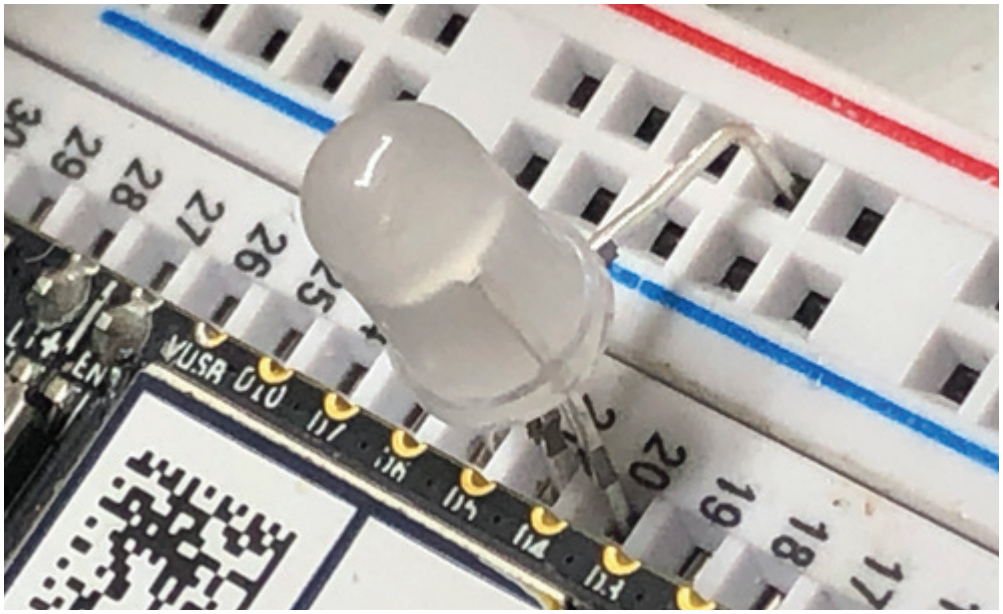
The Base is made up of three parts to allow you to print with dual extrusion in order to include the LED RING. If you do no have dual extrusion, you can simply print the parts separately but will have to glue them together.











Step 4

Setting up everything on the breadboard

Now that you have all the individual wiring diagrams, we can start to prepare the breadboard.

Depending on the wiring you have on hand, your breadboard might look a little different. I opted for solid core option which can be placed neatly on the breadboard.

I allowed for the LTR-390-UV sensor on the right-hand side of the breadboard as this is where the I2C pins of the Photon is.

The Soil Sensor connects on the left-hand side of the breadboard.

You can also add the RGB LED (common anode) to the right of the Photon using pins D5, D6, D7. The common Anode of the LED goes to the V+ rail on the breadboard.

Step 5.1

Installing into the enclosure

Assemble the three parts of the sensor enclosure and insert the sensor as shown in **Fig 5.1**

Place the breadboard in the base and make sure to align the USB port as indicated in **Fig 5.2**

Fig 5.3 shows the sensor placed in position on the main body. Make sure to run the wires through the enclosed conduit in the main body to ensure the wires are not exposed to damp soil.

Now connect all the wires of both sensors to your breadboard - **Fig 5.4**

NOTE

make sure to tuck all the wires in the most inner ring to ensure that they do not come in contact with any water. Do no leave any wires in the middle ring with the drainage holes.

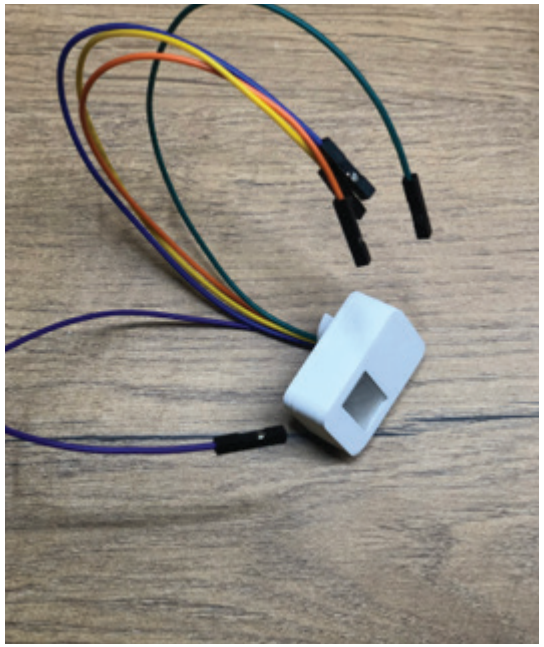


Fig 5.1

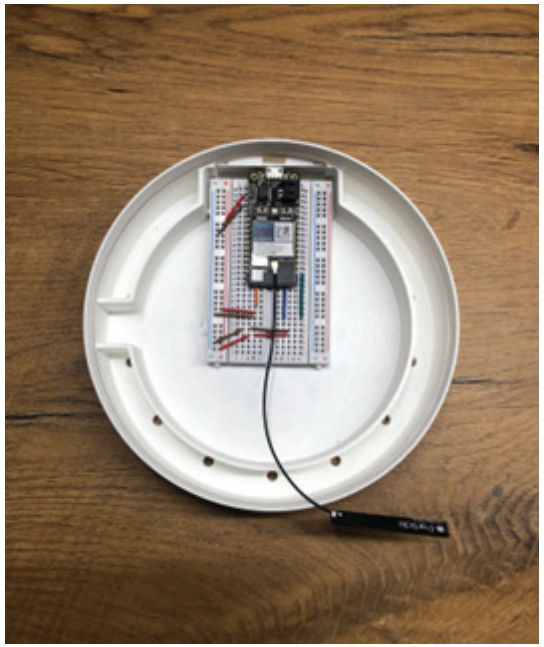


Fig 5.2

Fig 5.3

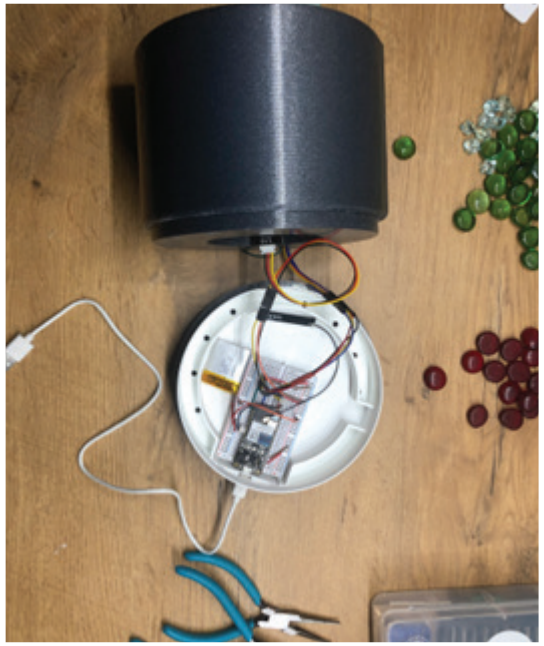


Fig 5.4

Step 5.2

Assemble the three parts of main assembly as shown in **Fig 5.5**

Place small gravel at the bottom of the pot plant to assist with draining access water and prevent soil from falling through the drainage holes - **Fig 5.6**

NOTE

It is time to use that Minimum and Maximum values you determined.

Step 6

Code

Everything has been done for you. Simply follow the link below and download the entire project from the Github repository. You will have to replace the the minimum and maximum values in the two lines below:

```
22
23  int min_raw_value = 1945;                    //  Adjust these with the values you determined
24  int max_raw_value = 2450;                    //  Adjust these with the values you determined
25
```

https://github.com/friedl1977/Soil_Sensor

The repository also includes a folder with STL and STEP files if you want to print the enclosure or need to make some modifications on the design.

The code is quite heavily commented for informational purposes. You are welcome to remove these, but please keep all mentions of contributors in place if you intend to publish this code as some parts are loosely based on existing libraries even though quite heavily amended.

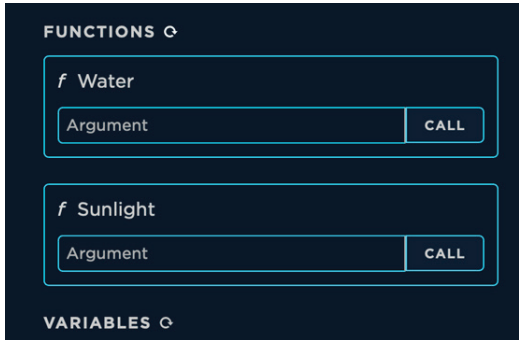


Fig 7.1

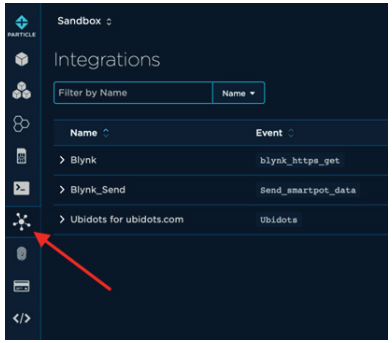


Fig 7.2

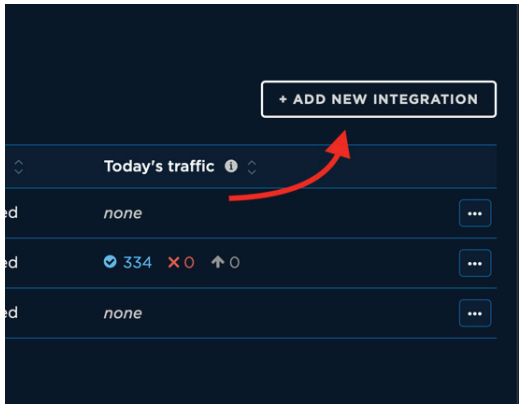


Fig 7.3

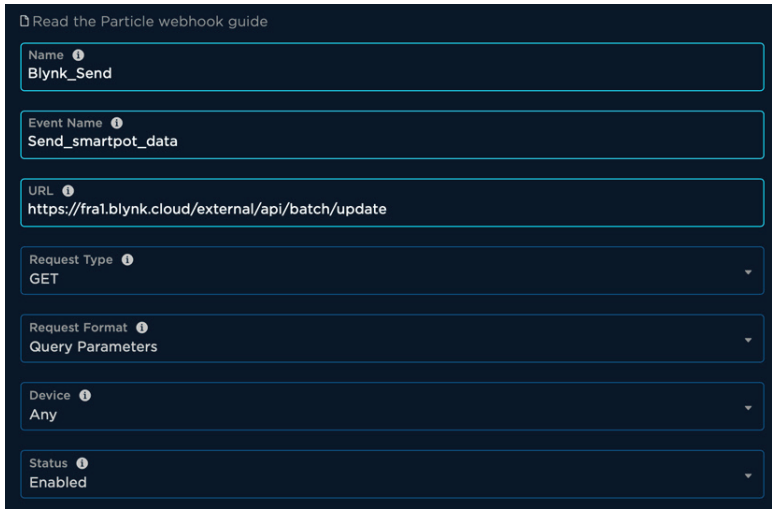


Fig 7.4

Step 7.1

Particle Webhook and Exposed Variables

Fig 7.1 shows the exposed variables we set up in the code. These are needed to receive data from the Blynk App. You can find this by logging into Particle Console and clicking on the device you are using.

Now lets proceed in setting up the Webhook needed to send data to Blynk.

In the menu on the left of your screen, click on the INTEGRATIONS tab - **Fig 7.2**

The click on +ADD NEW INTEGRATION button on the top right - **Fig 7.3**

Complete the first section as indicated in **Fig 7.4**

NOTE

*You will need to update the URL a little later once you obtained you sever address from BLYNK. If you already have the URL, you can add it now. It is only the ...***fra1.blynk.cloud/***.... Part that will vary depending on your location*

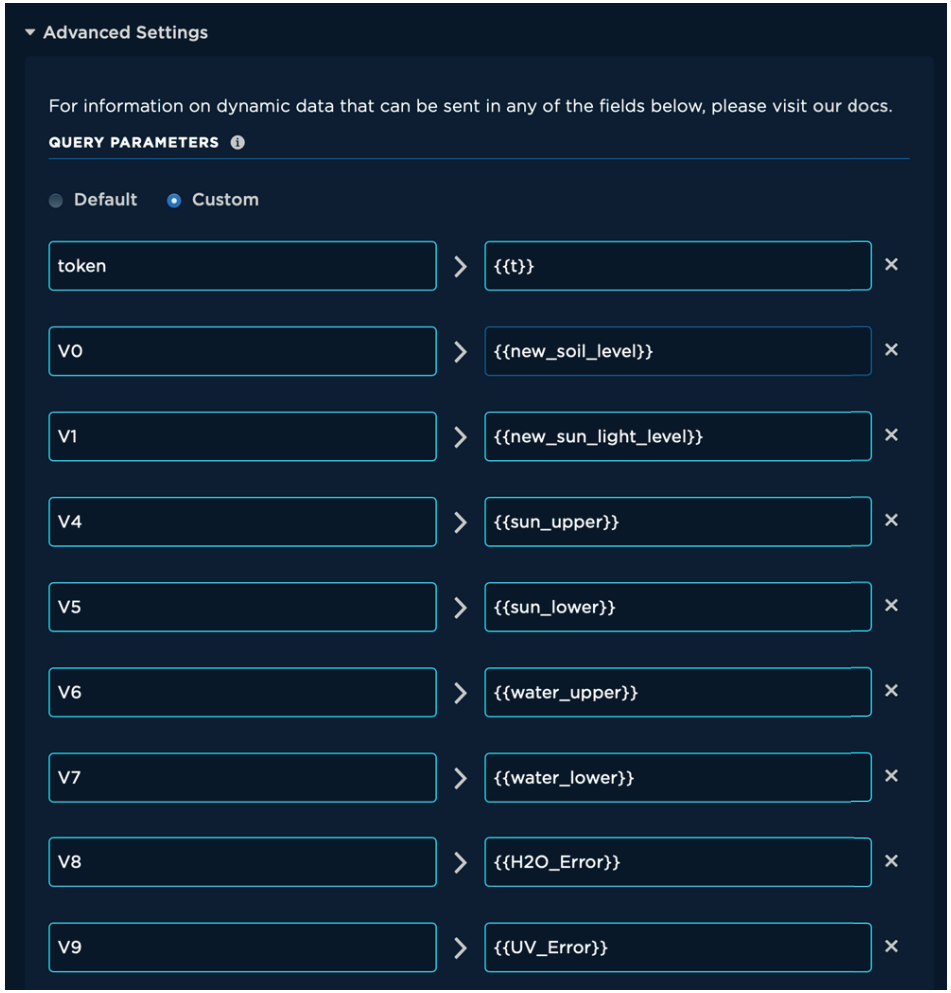


Fig 7.4

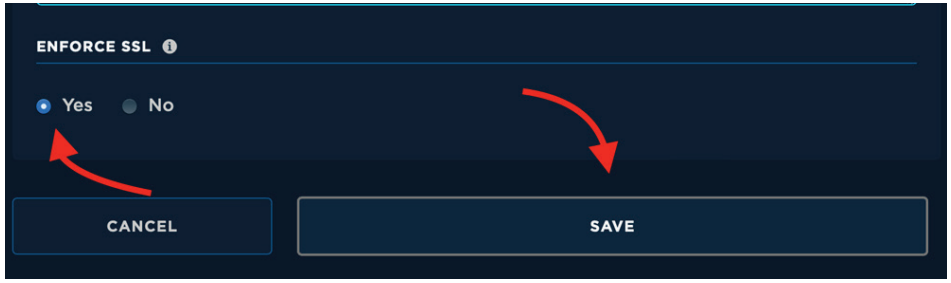


Fig 7.5

Step 7.2

Next click on ADVANCE SETTINGS and select CUSTOM to expose the Query parameters.

For the purpose of this tutorial, please fill in the fields EXACTLY as indicated in **Fig 7.4**

If you change anything without amending your code accordingly, the Webhook will not work.

Right at the bottom, make sure to select enforce SSL and click SAVE - **Fig 7.5**

Step 8.1

BLYNK 2.0

Log in into your BLYNK account and click on the **Template** icon in the left menu - **Fig 8.1**

Click on **+NEW TEMPLATE** - **Fig 8.2**

For the purpose of this tutorial, fill in the fields exactly as indicated in **Fig 8.3**

When finished, click on **DONE**

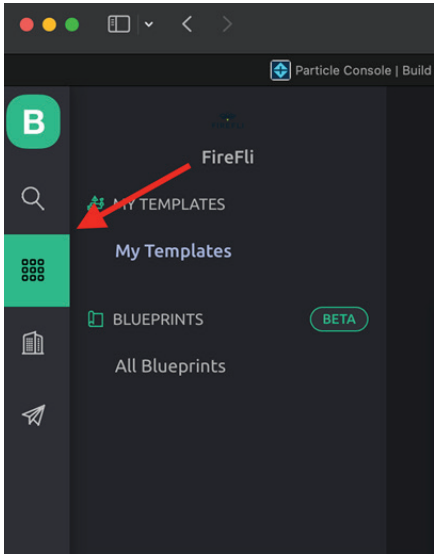


Fig 8.1

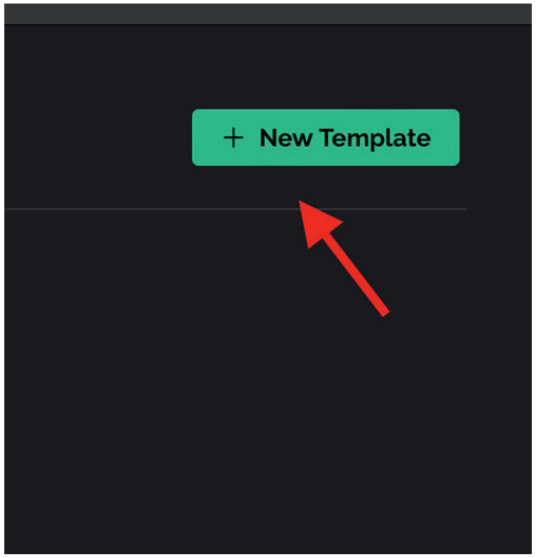


Fig 8.2

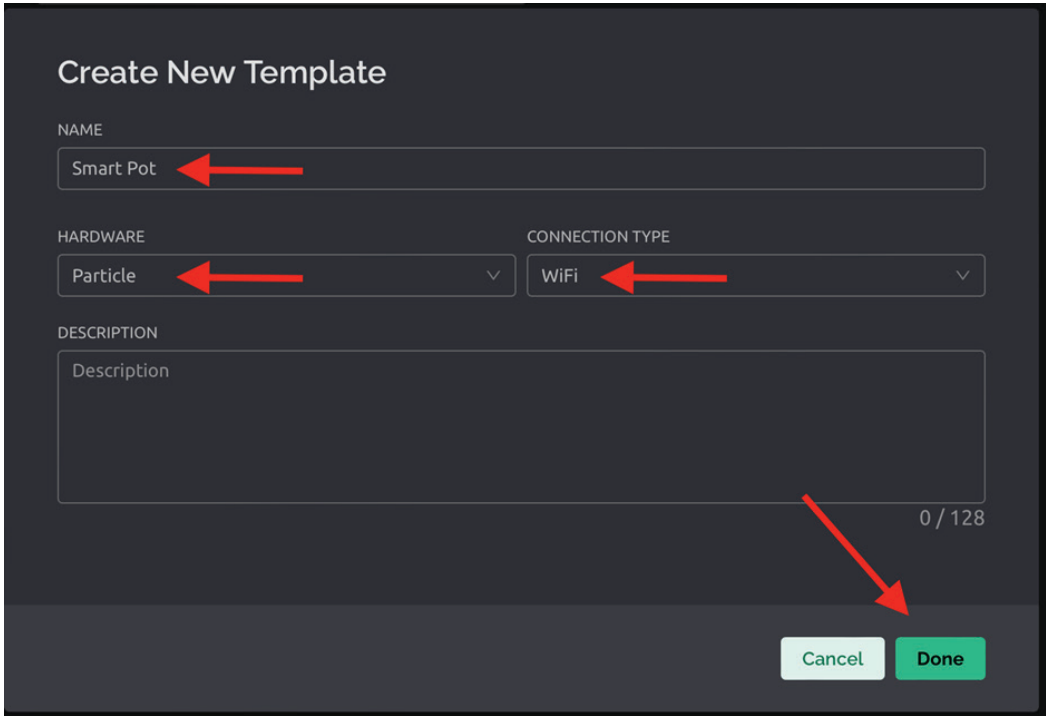


Fig 8.3

Step 8.2

BLYNK 2.0 – Continued

Lets start by configuring the DATASTREAMS required.

Click on **DATASTREAMS** as indicated in **Fig 8.4**

Next we need to enter **EDIT** mode. You can do this by clicking on the **EDIT** button on the top right of the screen after clicking on Datastreams.

Next click on **+NEW DATASTREAM** and choose **VIRTUAL PIN** - **Fig 8.5**

Complete the information as indicated in **Fig 8.6**

We will repeat this same process a couple of times. Please make sure to complete each Datastream **EXACTLY** as in the images that follow.

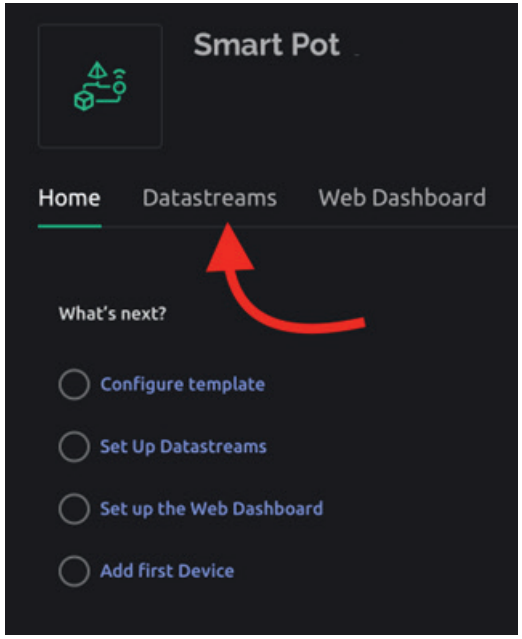


Fig 8.4

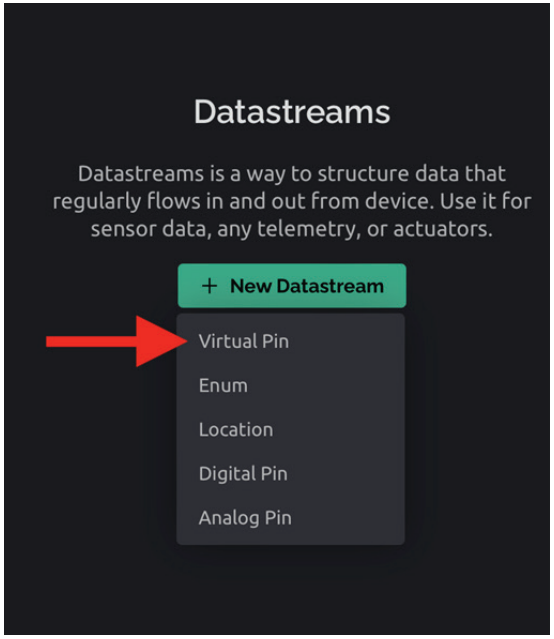


Fig 8.5

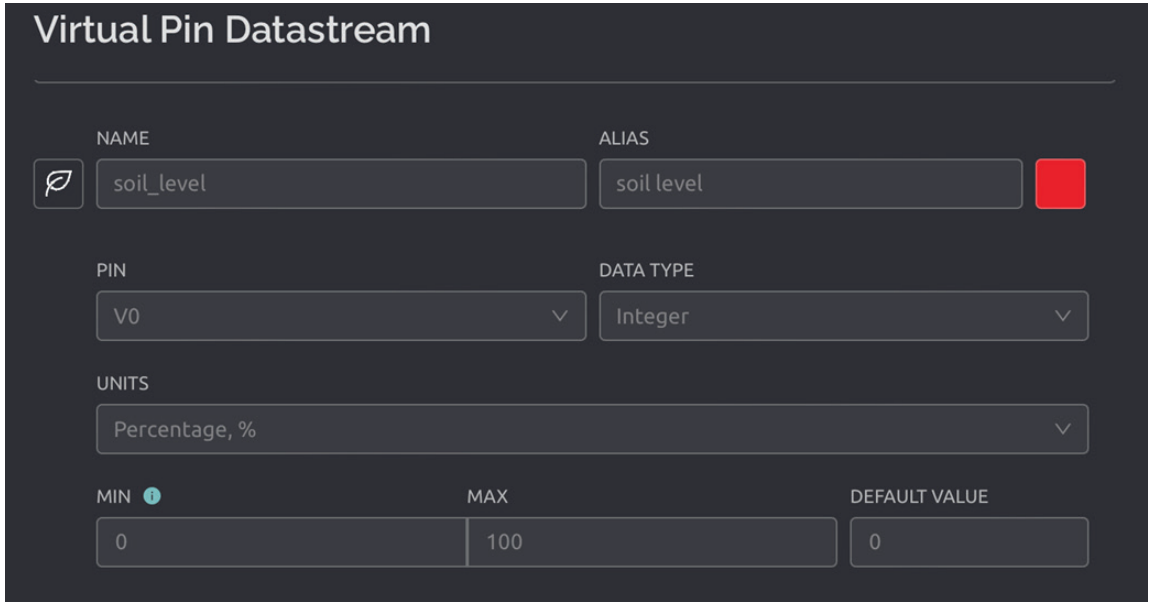


Fig 8.6

Step 8.3

BLYNK 2.0 - Continued

Virtual Pin 1 - **Fig 8.6**

Virtual Pin 2 - **Fig 8.7**

Virtual Pin 3 - **Fig 8.8**

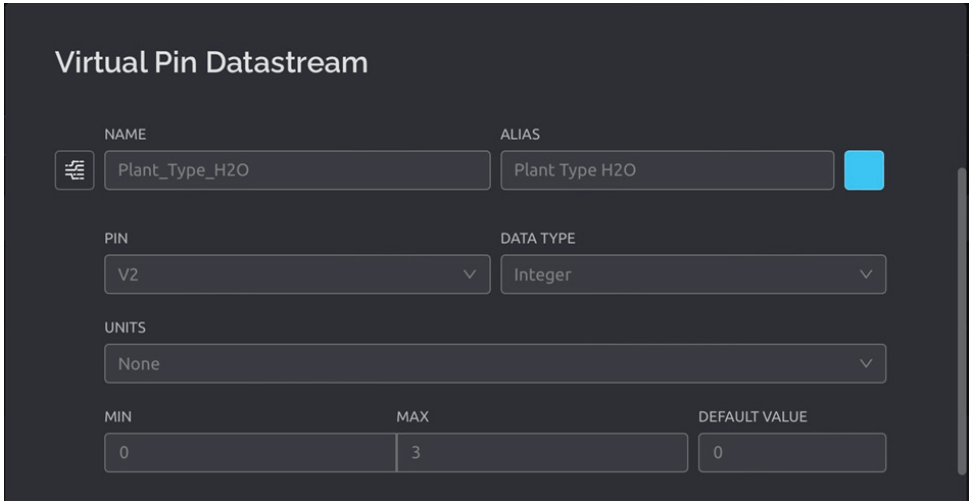


Fig 8.6

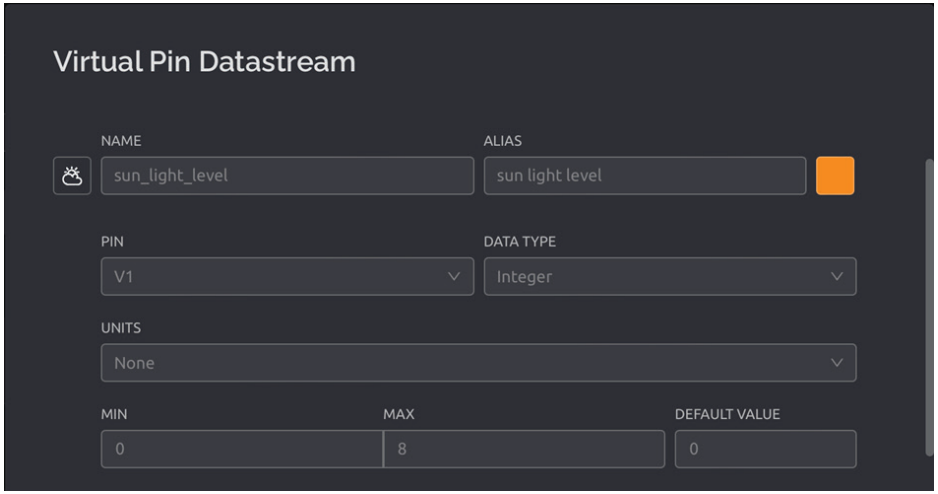


Fig 8.7

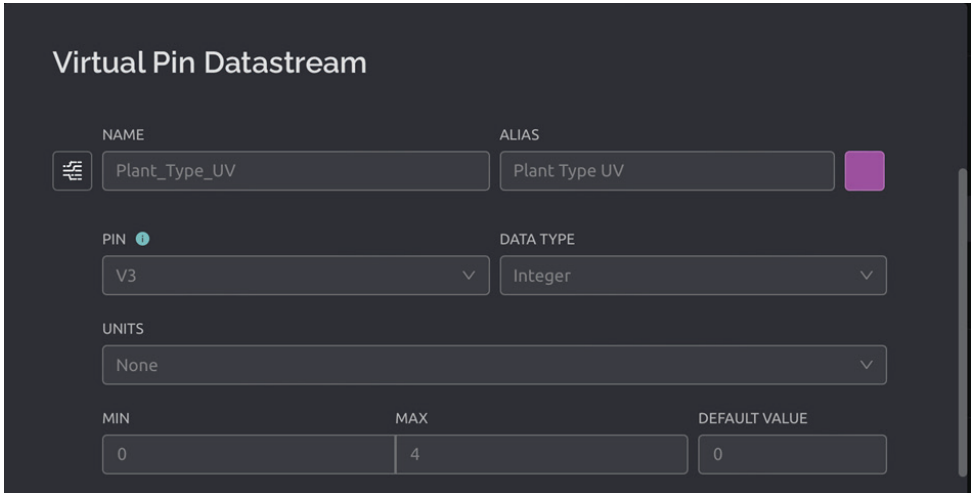


Fig 8.8

Step 8.4

BLYNK 2.0 – Continued

Virtual Pin 4 - **Fig 8.9**

Virtual Pin 5 - **Fig 8.10**

Virtual Pin 6 - **Fig 8.11**

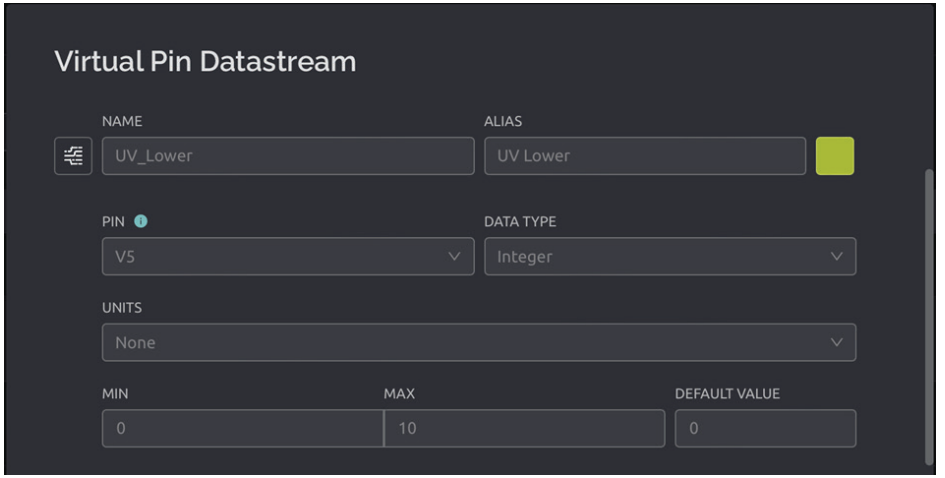


Fig 8.9

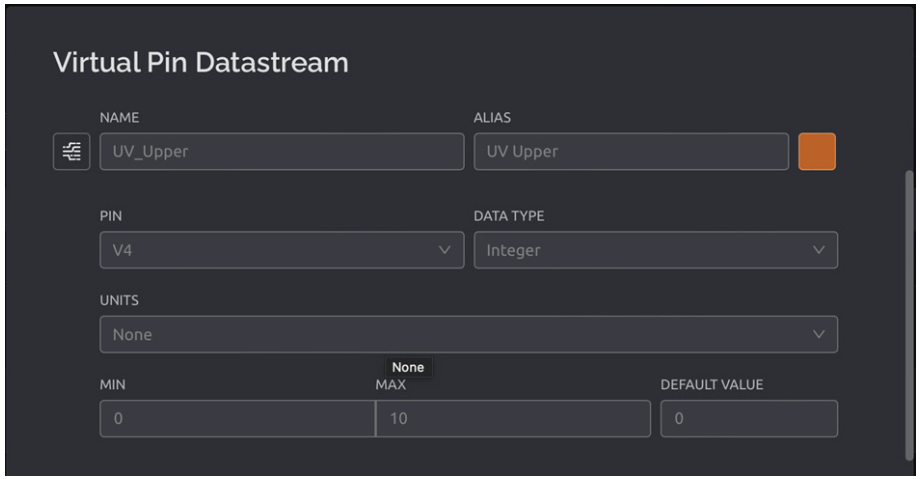


Fig 8.10

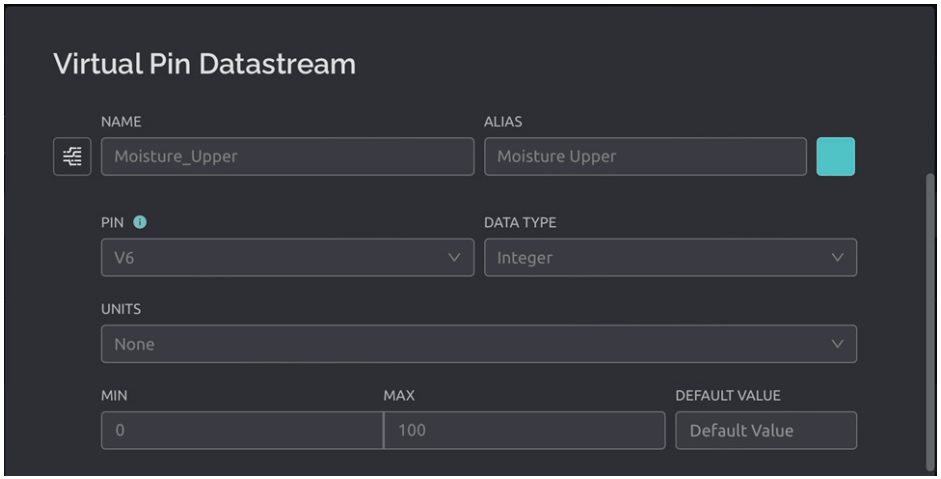


Fig 8.11

Step 8.5

BLYNK 2.0 – Continued

Virtual Pin 7 - **Fig 8.12**

Virtual Pin 8 - **Fig 8.13**

Virtual Pin 9 - **Fig 8.14**

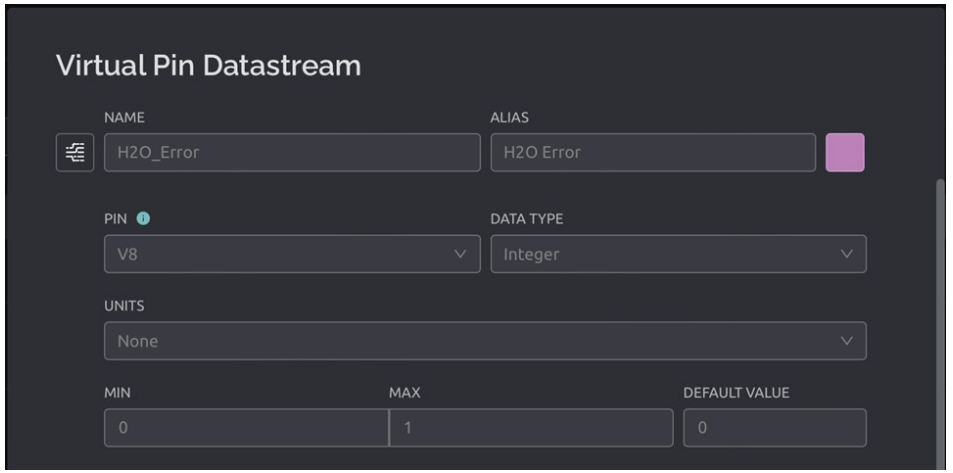


Fig 8.12

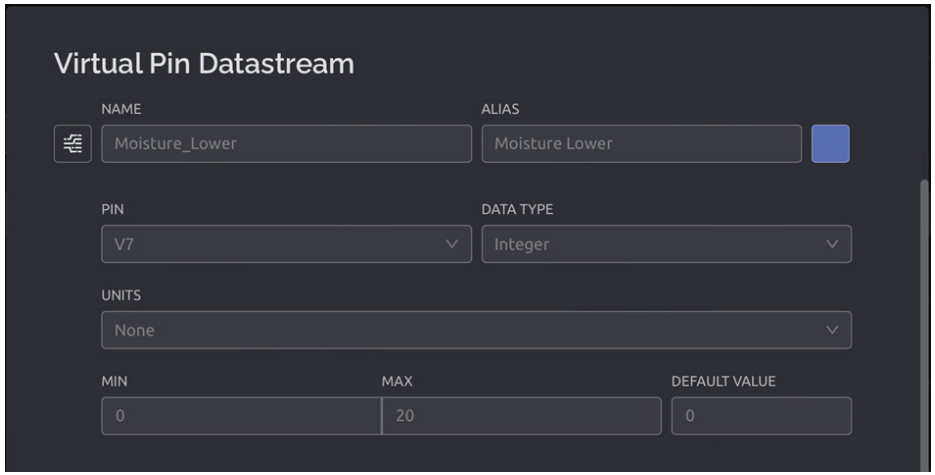


Fig 8.13

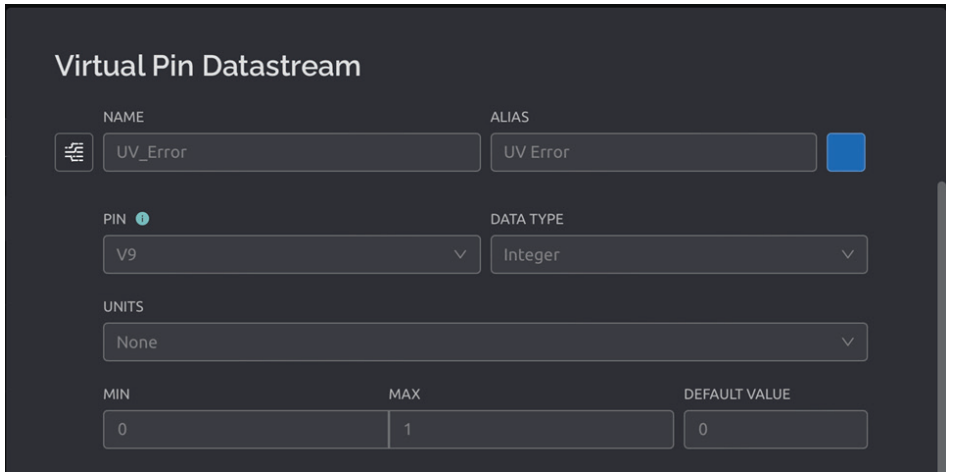


Fig 8.14

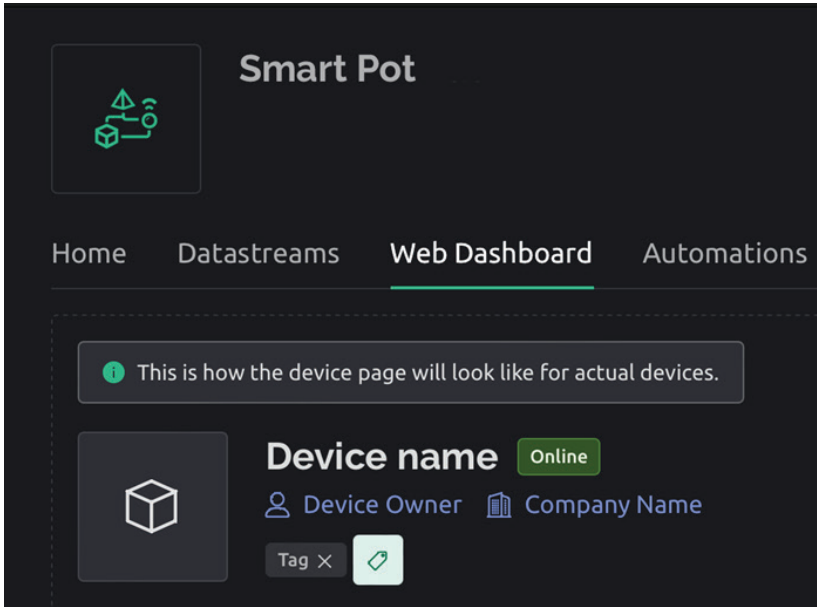


Fig 9.1

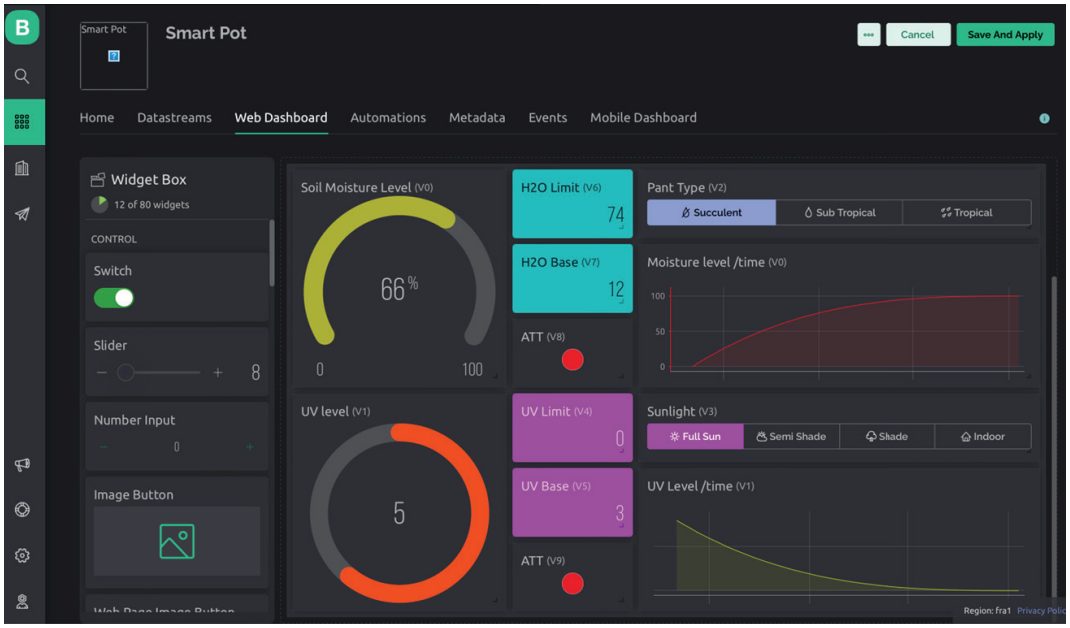


Fig 9.2

Step 9

BLYNK 2.0 - Dashboard

Now lets start with the dashboard. To set up a dashboard click on **WEB DASHBOARD** and click on **EDIT** to enter edit mode - **Fig 9.1**

Fig 9.2 is an example of what your dashboard could look like. If you match the widgets and Virtual pins as indicated, your dashboard should function exactly the same.

When done, click **SAVE AND APPLY**

Step 10

BLYNK 2.0 - Adding a Device

Next we have to add a DEVICE.

To add a deice, first click on the TEMPLATES icon in the left menu. Then click on the SMART POT template - **Fig 10.1**

Now click on + NEW DEVICE - **Fig 10.2**

Enter the Device name as Smart Pot. Once done, you will be presented with the unique details for your new device. Copy and paste the data as we will use it on your code - **Fig 10.3**

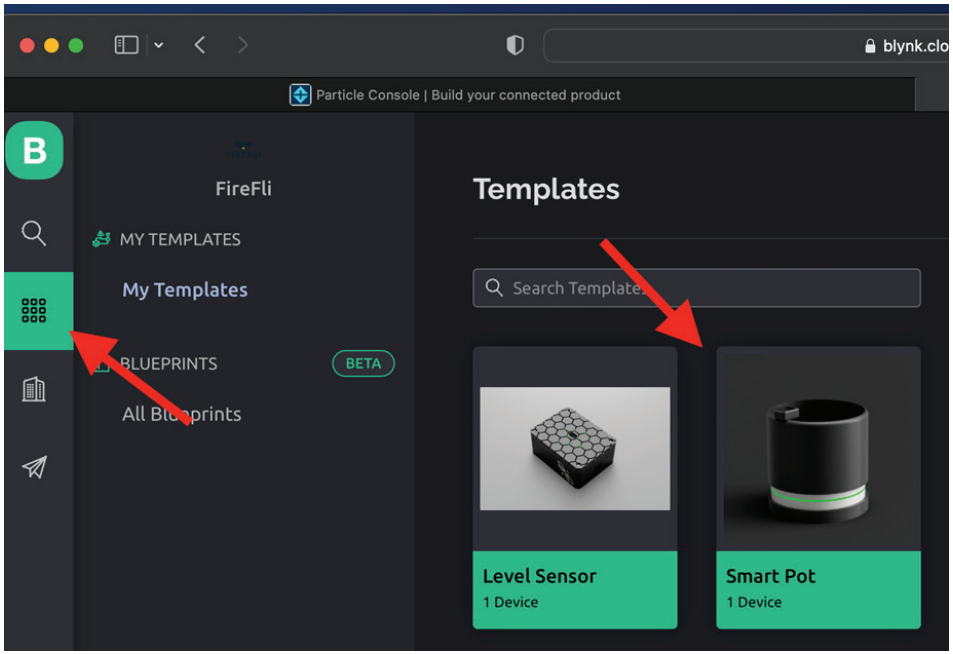


Fig 10.1

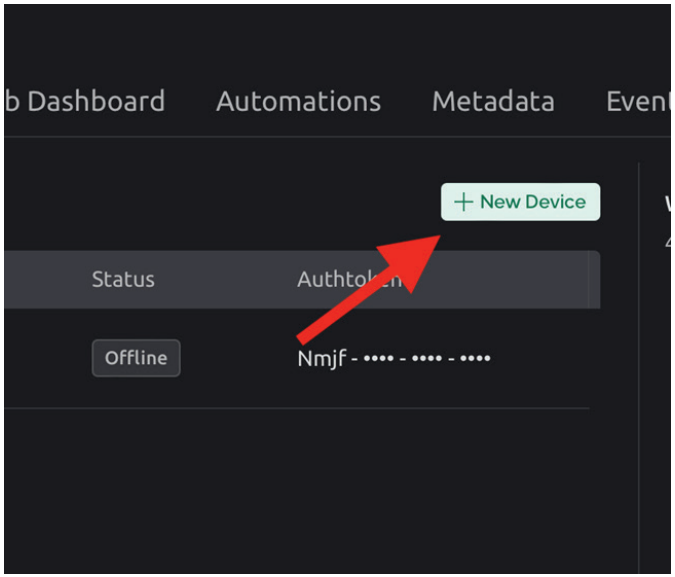


Fig 10.2

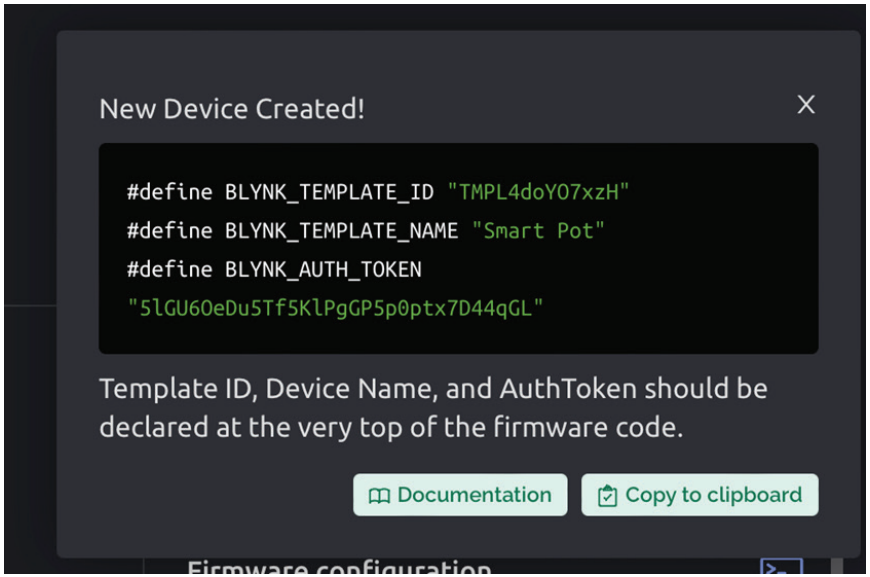


Fig 10.3

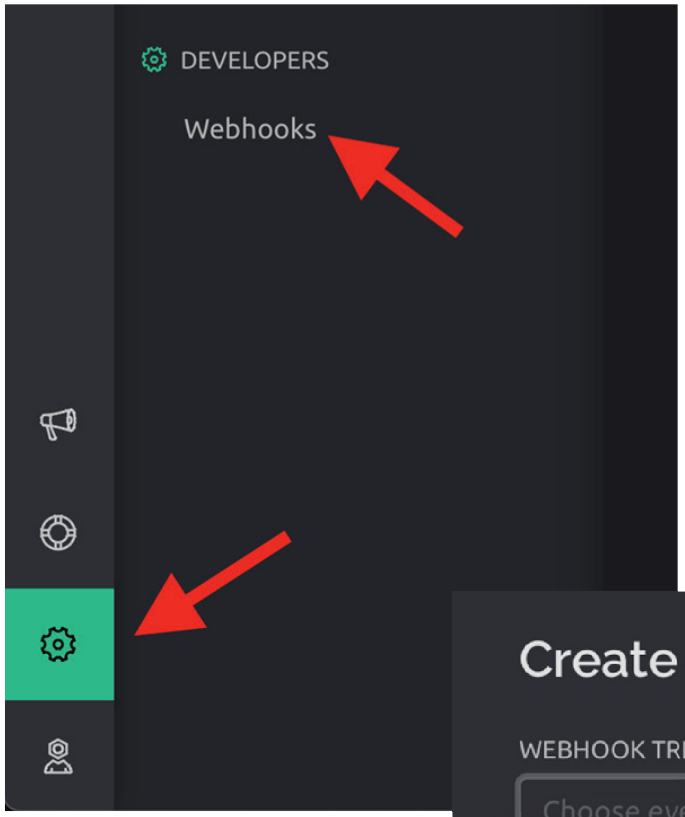


Fig 11.1

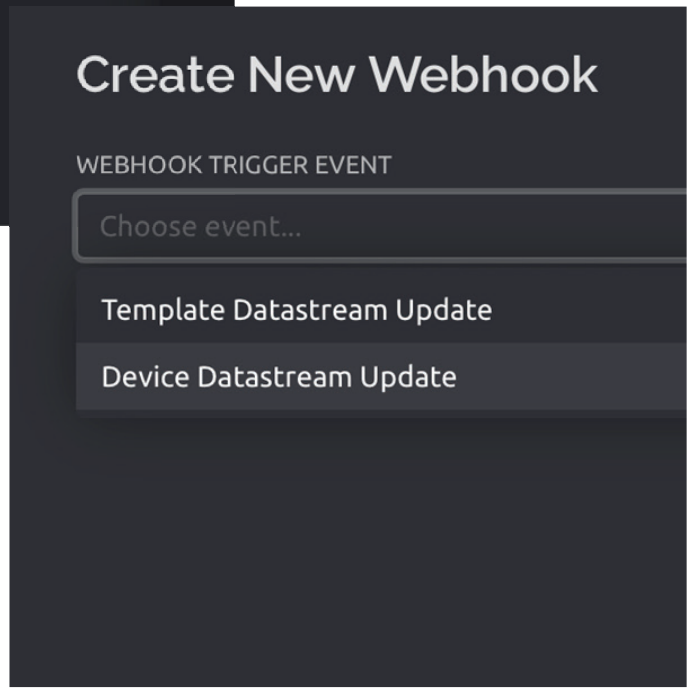


Fig 11.2

Step 11.1

BLYNK 2.0 - Webhooks

Now that we have done everything else, all we need to do is to configure the webhooks. To do so, forst click on **SETTINGS** icon in the left menu and then click on Webhooks - **Fig 11.1**

Click on **+ New Webhook**

Choose **DEVICE DATASTREAM UPDATE - Fig 11.2**

Step 11.2

BLYNK 2.0 - Webhooks

Next complete the webhook information EXACTLY as per **Fig 11.3, 11.4 and 11.5.**

There will be two changes. First is in Fig 11.3 where you will include your Particle Device ID in the webhook URL.

The second change will be the **PARTICLE ACCESS TOKEN** - **Fig 12.1** To get the access token, proceed to **STEP 12**

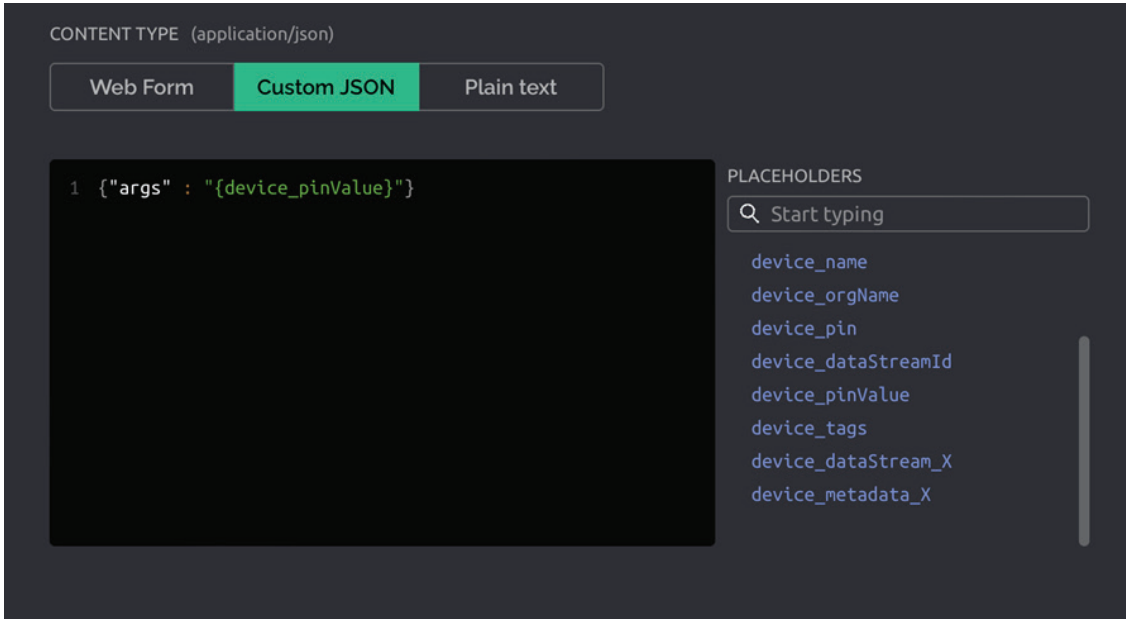


Fig 11.3

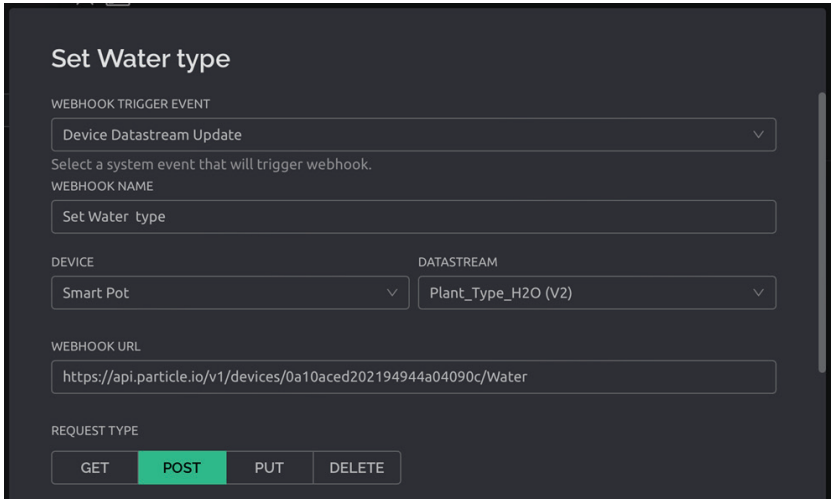


Fig 11.4

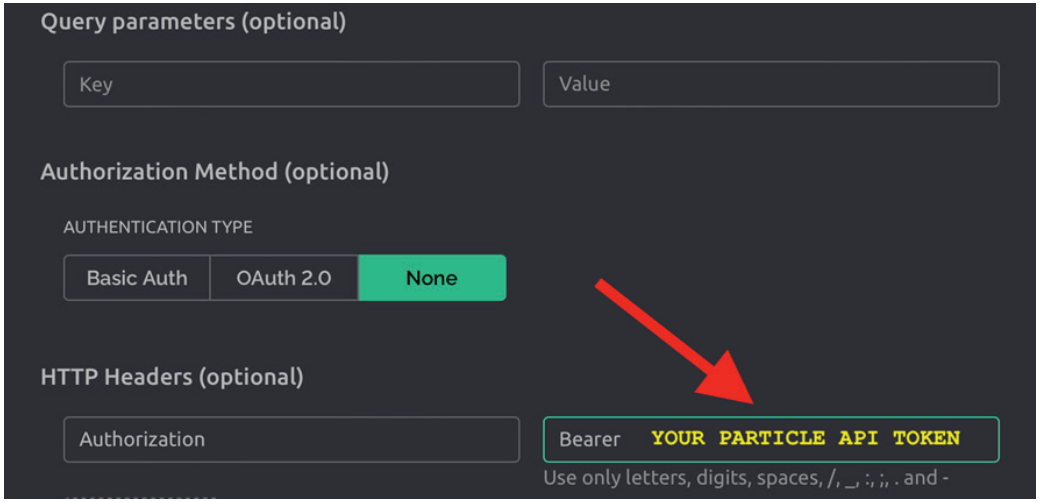


Fig 11.5

Step 12

Vist the following link:
https://docs.particle.io/reference/cloud-apis/access-tokens/

Scroll down to the Create a Token (Browser-based) section.

Fill in your login details and set EXPIRES IN to NEVER - **Fig 12.1**

Click on CREATE TOKEN and copy and paste the token to your webhook. Be sure to include Bearer(space) and then your token.

We will now repeat this process to complete the second webhook.

Name the second webhook Set UV type. Use the following as you webhook URL:
https://api.particle.io/v1/devices/{Your Particle Deciv-eID}/Sunlight

The only other difference is the datastream, be sure to select Pant_Type_UV(V3) - **Fig 12.2**

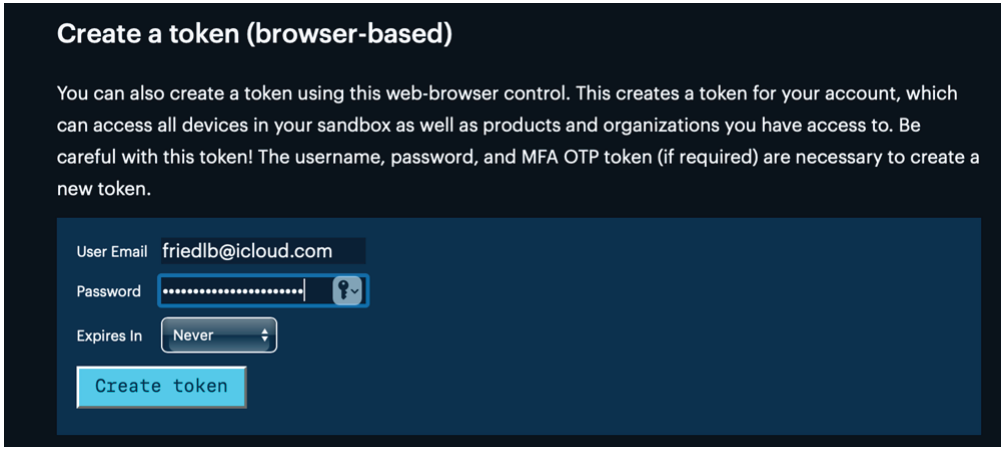


Fig 12.1

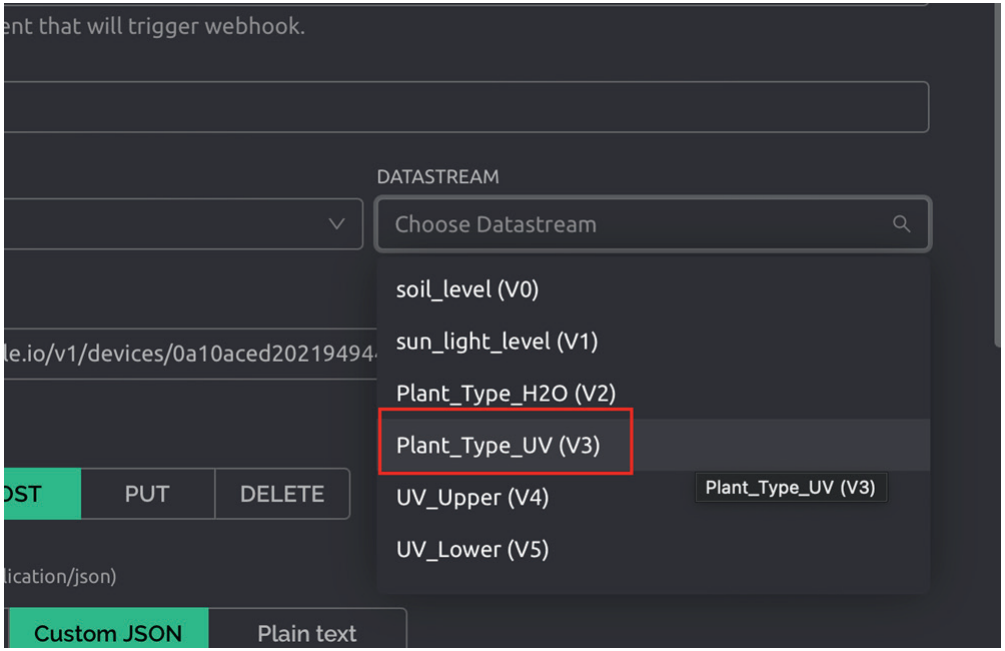


Fig 12.2

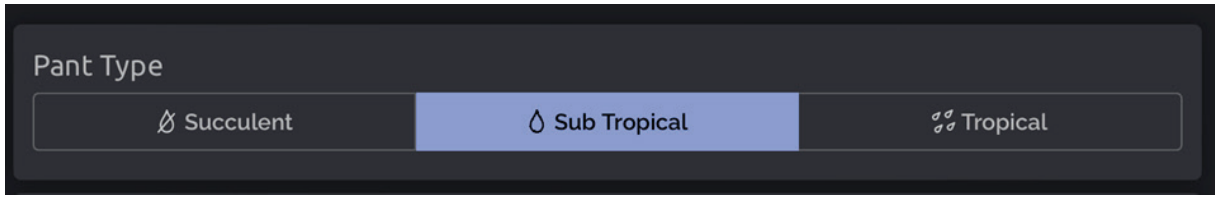


Fig 13.1

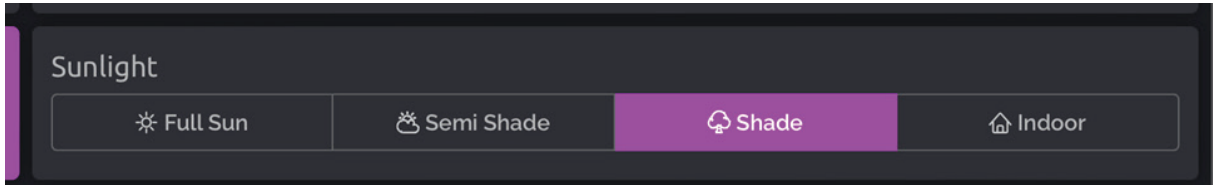


Fig 13.2

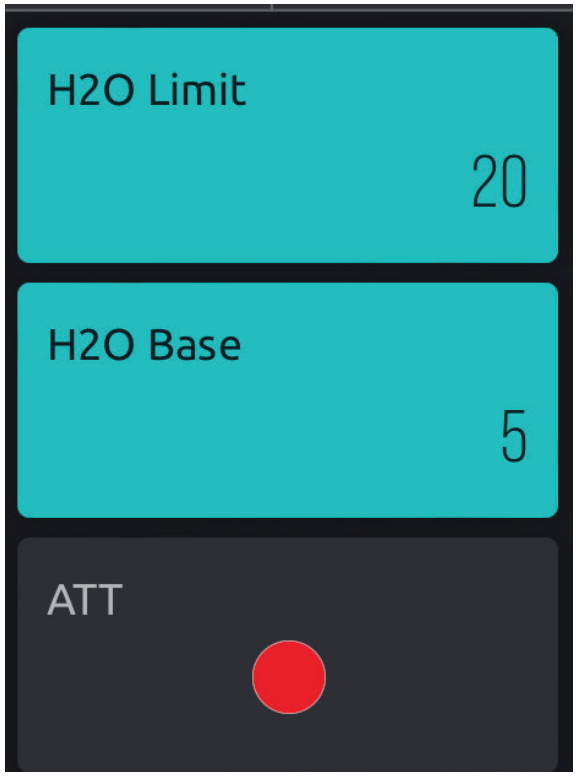


Fig 13.3

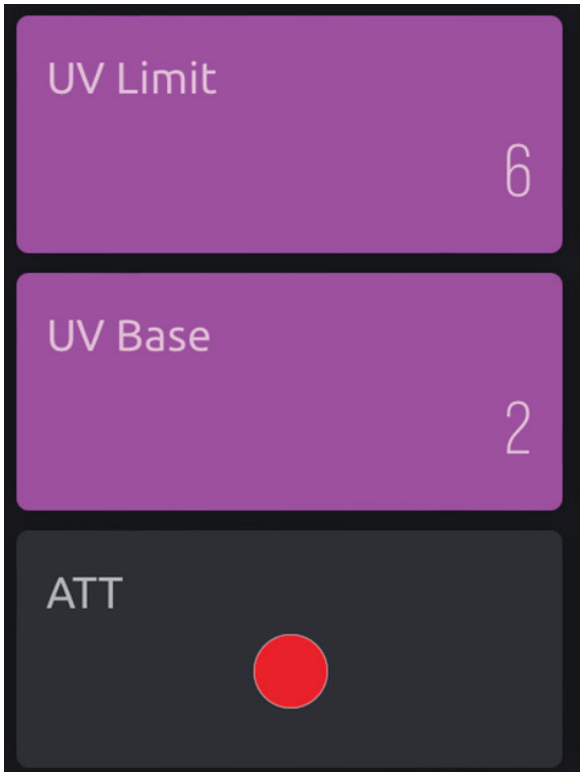


Fig 13.4

Step 13

Working pricipal

In Figures **13.1** and **13.2** you choose your plant type.

Depending on your choice, a desired water level and UV level will be set - **Fig 13.3**

The two sensors will now start detecting the soil moisture level and current UV levels. If either of these are our of bounds the ATT LEDs will light up

There are also two gauges showing the actual Soil moisture and UV levels.

Lastly there are two graphs providing some historical data

Room for imporovement

this is NOT a production ready design :)

Apply battery saving strategies.

Consider battery saving techniques.

Now that you have all the Datastreams and webhooks set up, why not create a BLYNK MOBILE APP as well :)

Important notice:
At the time of this tutorial, it was still unclear whether there is a solution to the offline error messages Blynk provides for Particle devices connected via API. I am trying to confirm this and will provide an update as soon as I have one. If you are able to solve this, please feel free to let us know in the Particle Forum so that other users can also benefit from the solution!

Enjoy the project!!