SIT210 Project Artefact
Smart computer temperature sensor

OverView

- Background:

  When computer working, the GPU, CPU and the other parts inside the computer will generate heat and it is very obvious on high-performance PC. If computer work at extremely high temperature it may cause damage to itself, and it is necessary to find a way to prevent the computer overheat. To improve the efficiency of heat radiation I build a water cooling system to my PC.

- Problem Statment:

  After building up the system, I don't know can it work better or not because sometimes I sit around the PC but I will feel warm and hot. I think there are two possible reasons why I feel warm and hot, the first reason is hot air remains inside the case, and the other reason is the hot air is sent out from the radiator. TO find which hypothesis is correct I will use an embedded system to help me.

- Requirement:
  - Hardware requirement:
    - Particle Photon
    - Raspberry Pi
    - Breadboard *2
    - LED *3(red, orange, green)
    - Resistors between 220 Ohms and 1000 Ohms *2
    - USB to micro USB cable *2 (one for Photon one for RPI)
    - Power source for USB cable (in here I will you the PC USB port)
    - Temperature sensor(TMP102 using I2C communication)

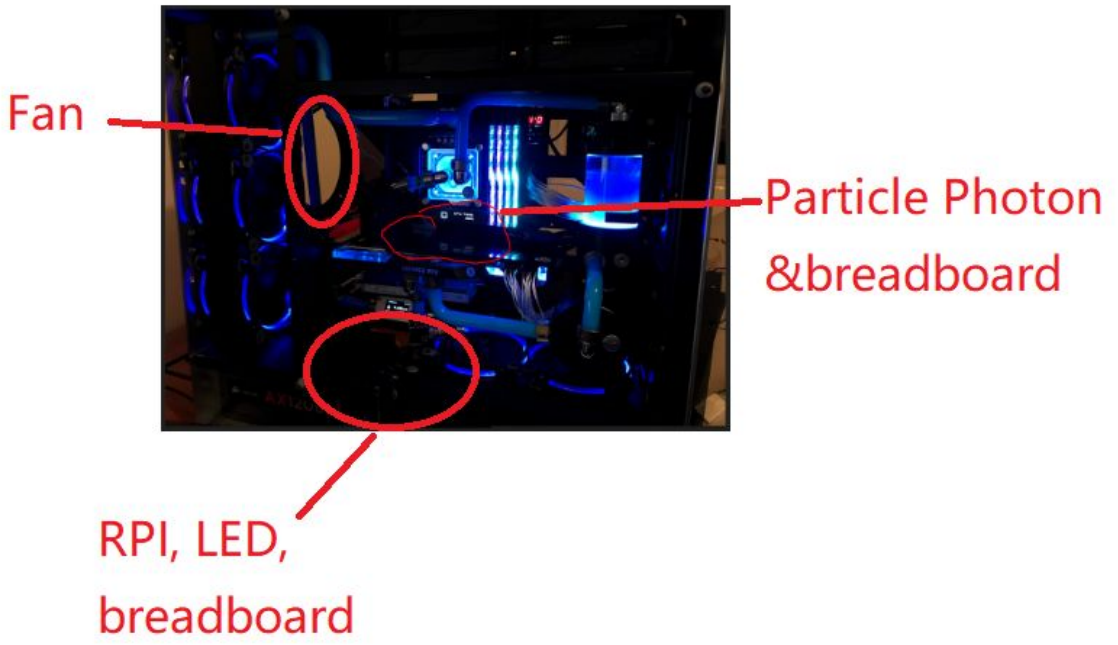
        - 120mm*120mm PC fan
        - Jumper wire
    - Software requirement:
        - Particle Agent(install in RPI)
        - Particle Web IDE
        - IFTTT
        - ThingSpeak

- Design Principles:

  Particle Photon will be used to detect the temperature and publish the corresponding event. RPI will be used to subscribe to the event from Photon return the corresponding LED colour and fan speed. I will use a webhook connect to Thingspeak to output how the temperature change into a diagram, on the other hand, I will use an IFTTT to give the notification to the user if the temperature is in high level.

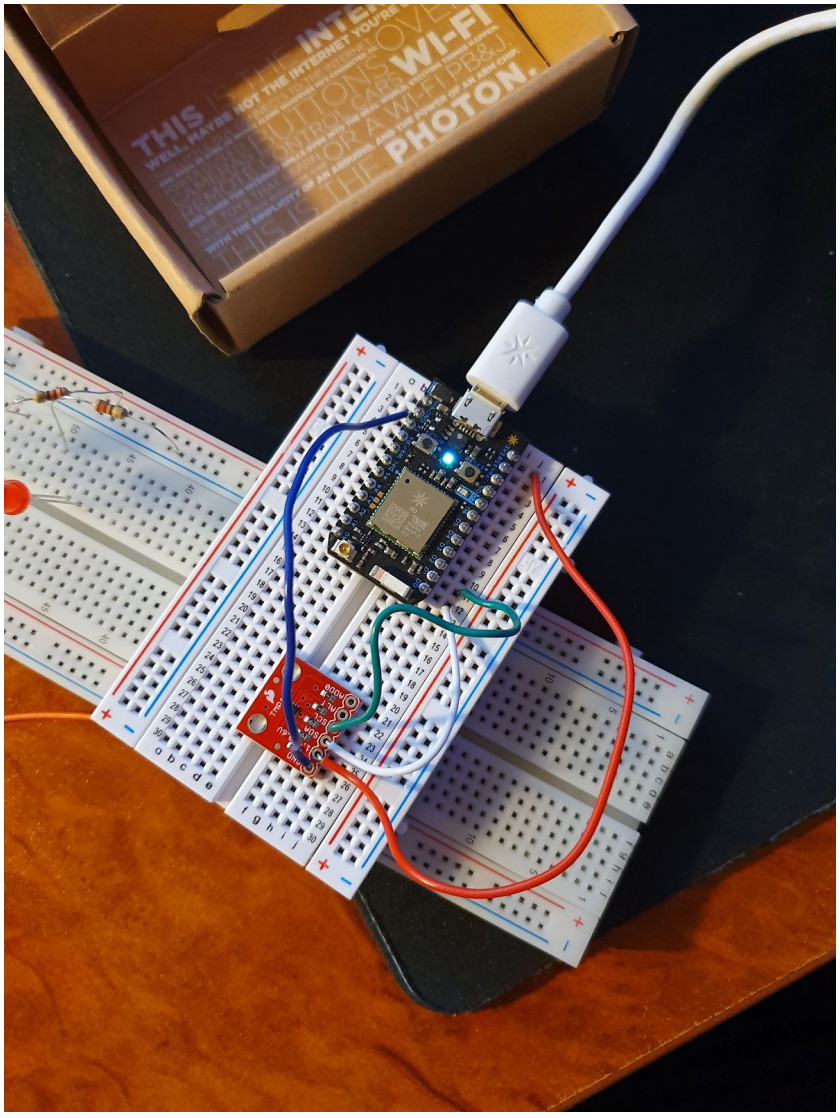
- Prototype Architecture:

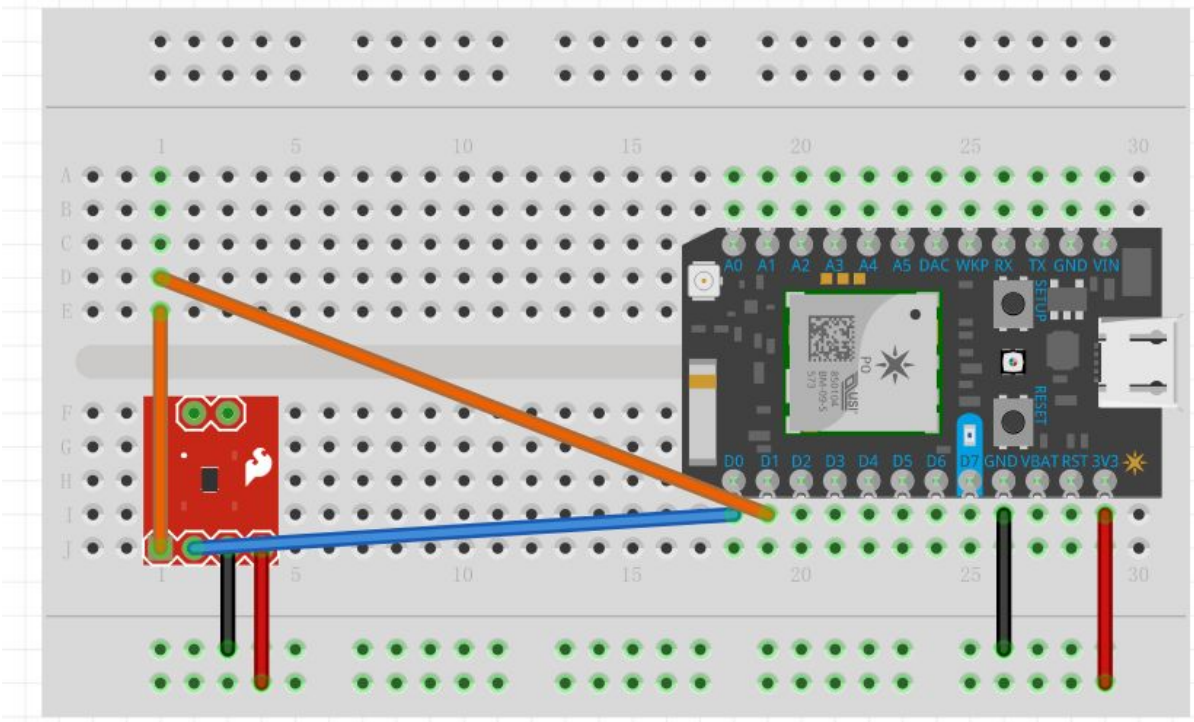
  All the hardware will be placed in the PC case.


Fan
Particle Photon
&breadboard
RPI, LED,
breadboard

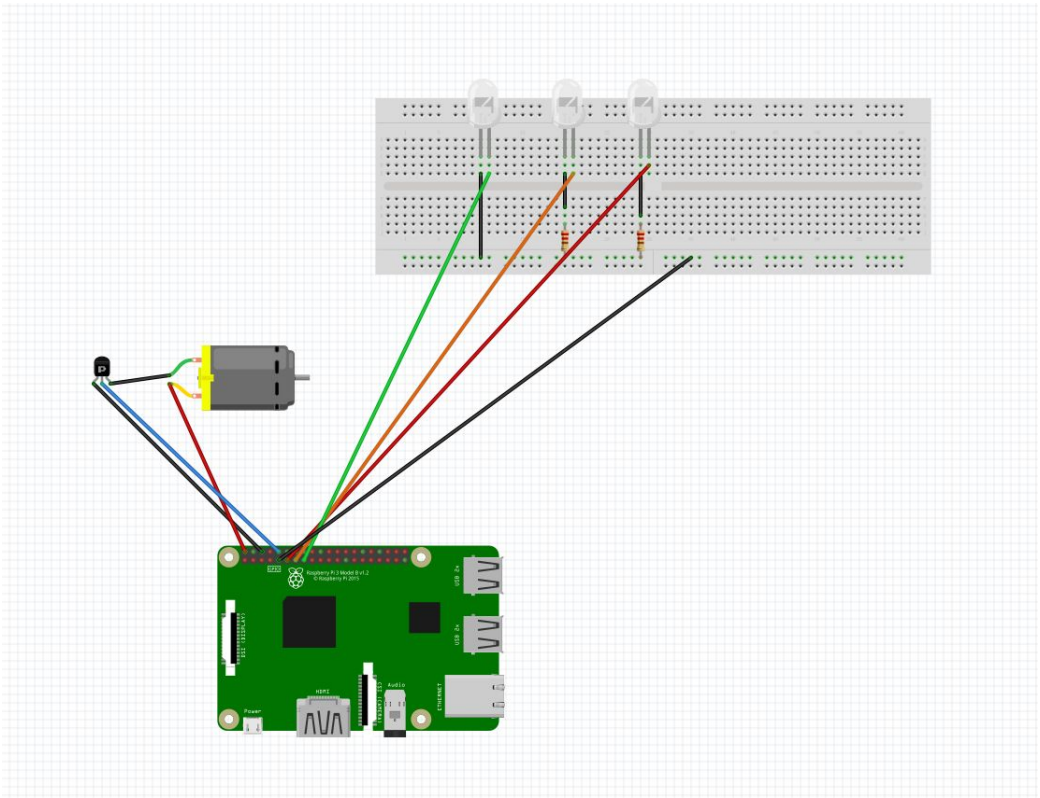
On Particle Photon I will just connect the temperature sensor to detect the temperature inside the PC case, and I will use Particle Web IDE design the code, in the Particle Web IDE I will use the ‘Publish’ statement to publish the temperature

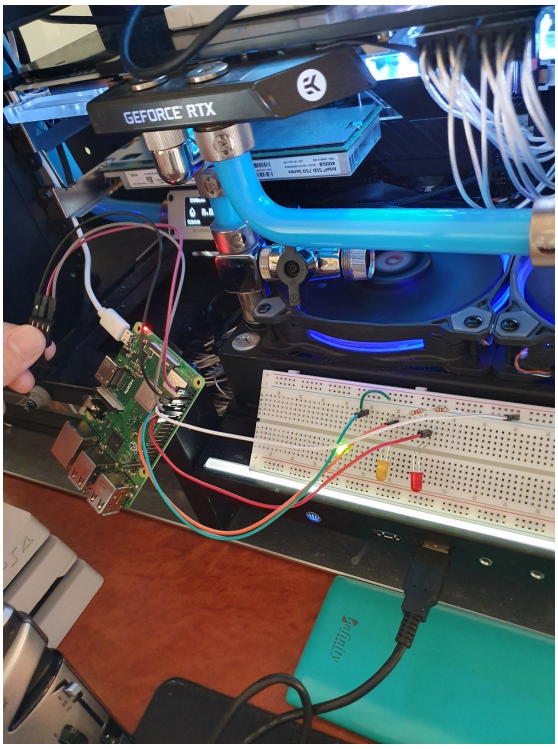
value and the level of the temperature. On the other hand, I will use a webhook which connect to the Thingspeak and output the temperature to a diagram let user able to see how's the temperature change inside the PC case. I also use an IFTTT connects to the phone app, when Photon publishes the Event call ' Temperature' and the content of the event is ' HIGH' it will send to message to user phone to remind them their PC is in high temperature.

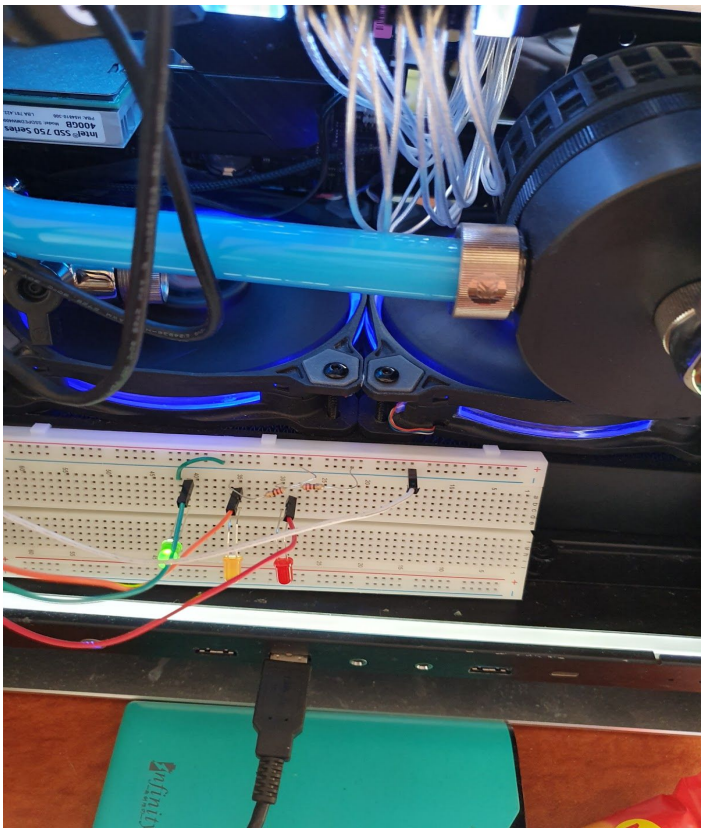




On RPI it connects to three different colour LED and connect to the fan, the fan is also using PWM to control its speed. I install the ‘Particle Agent’ on the RPI, it will make my RPI work like a Particle Photon, and I will use a ‘Subscribe’ statement to subscribe the ‘Publish’ statement in Photon. When Photon publish different temperature level signal the RPI will return the corresponding LED colour and the corresponding fan speed

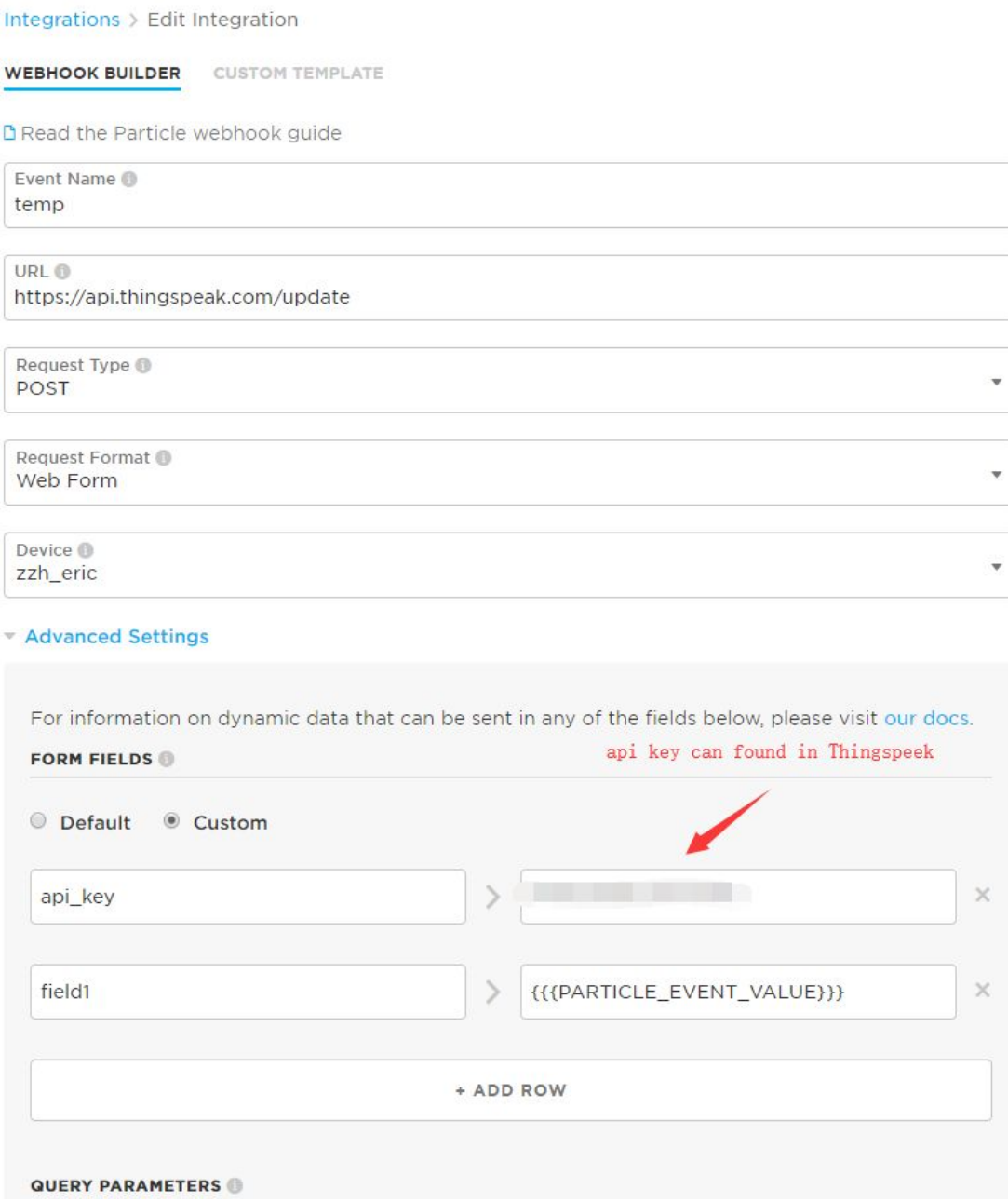



GEFORCE RTX

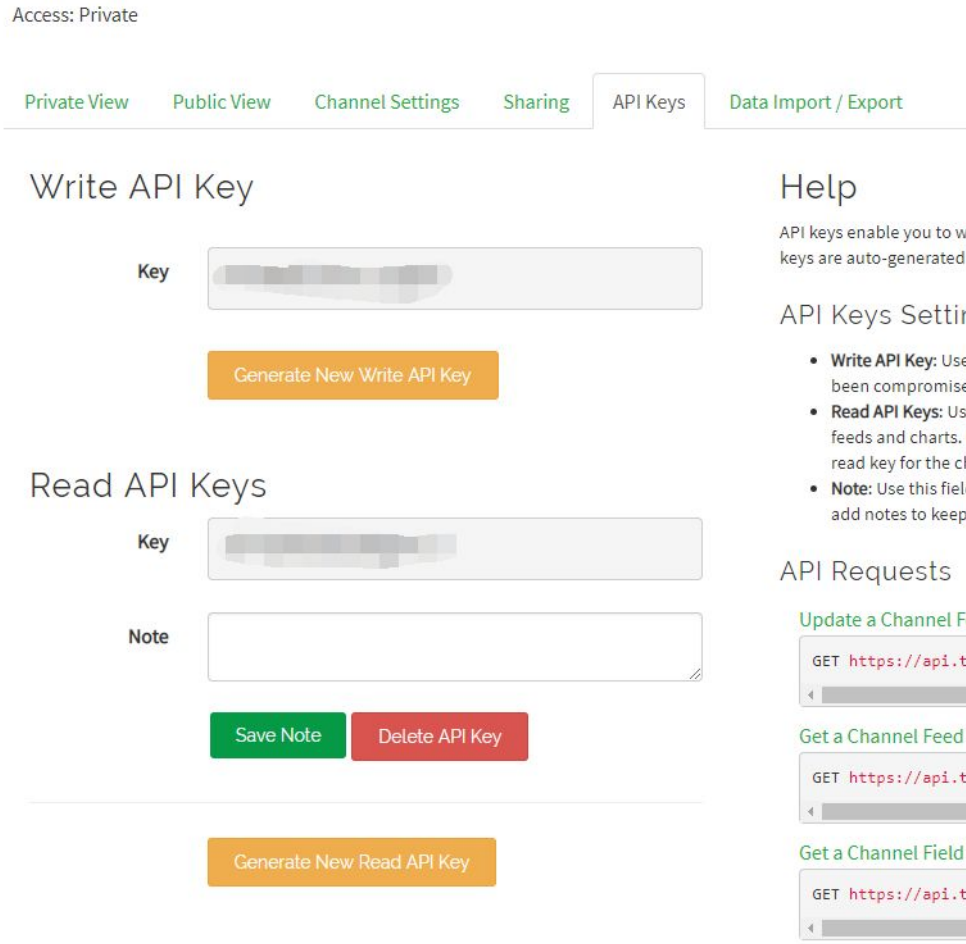



Raspberry Pi 3

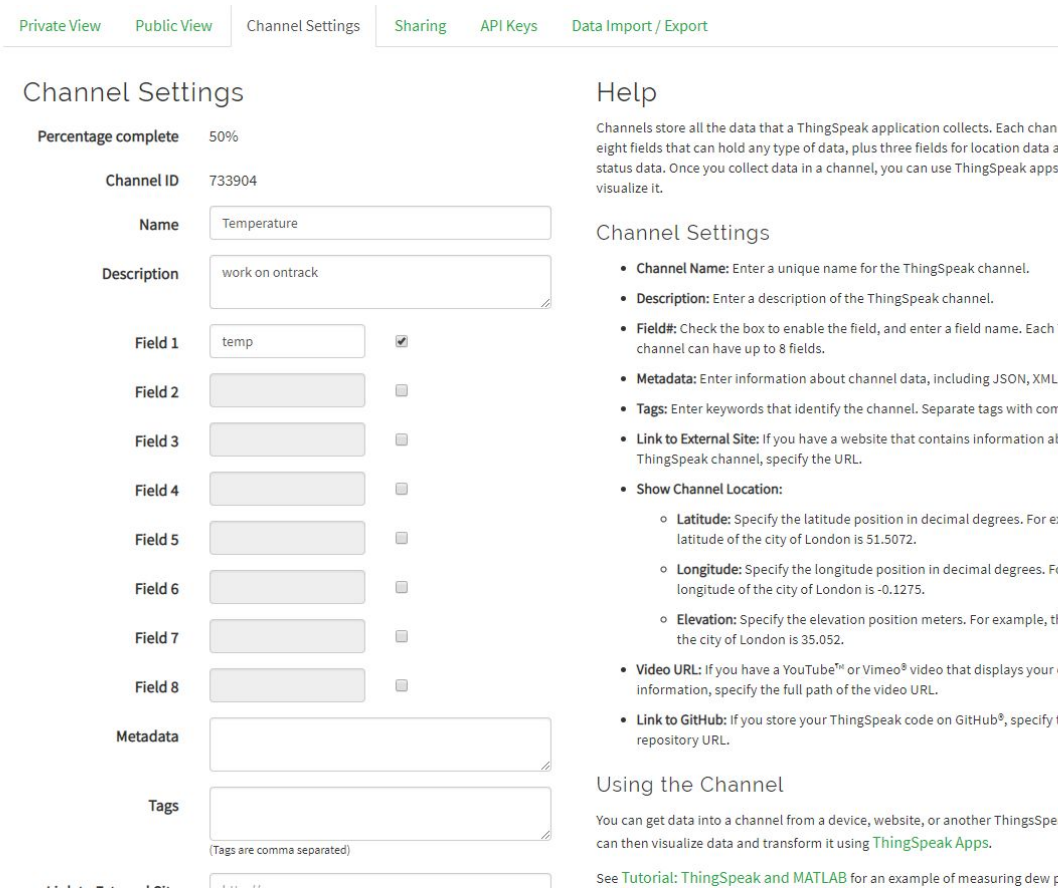
On the software setup:

- compile the code of RPI and the Photon on Particle Web IDE and send them.
- setup webhook using Thingspeak
    - firstly set up the Particle Console page first
    - 

    - then switch to Thingspeak

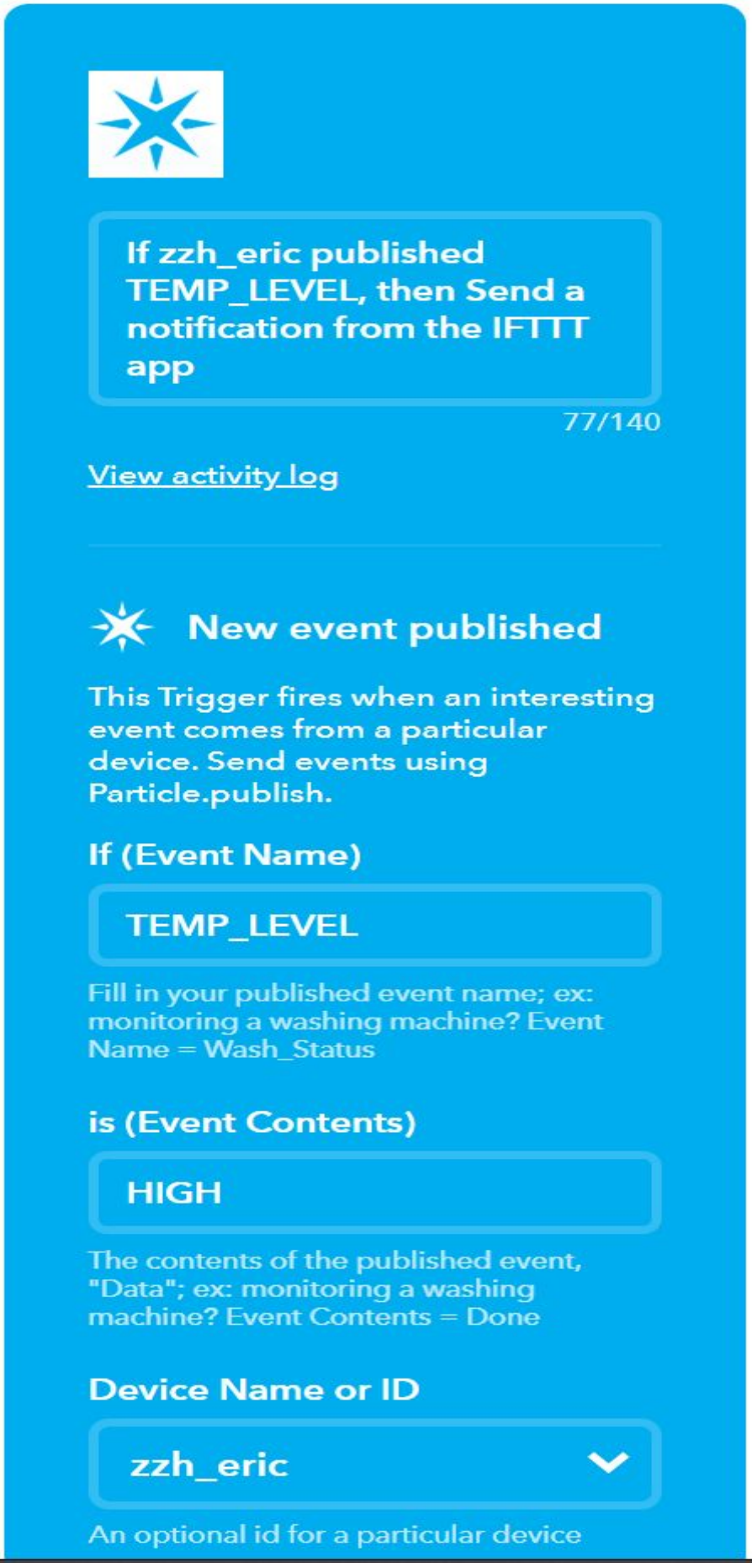


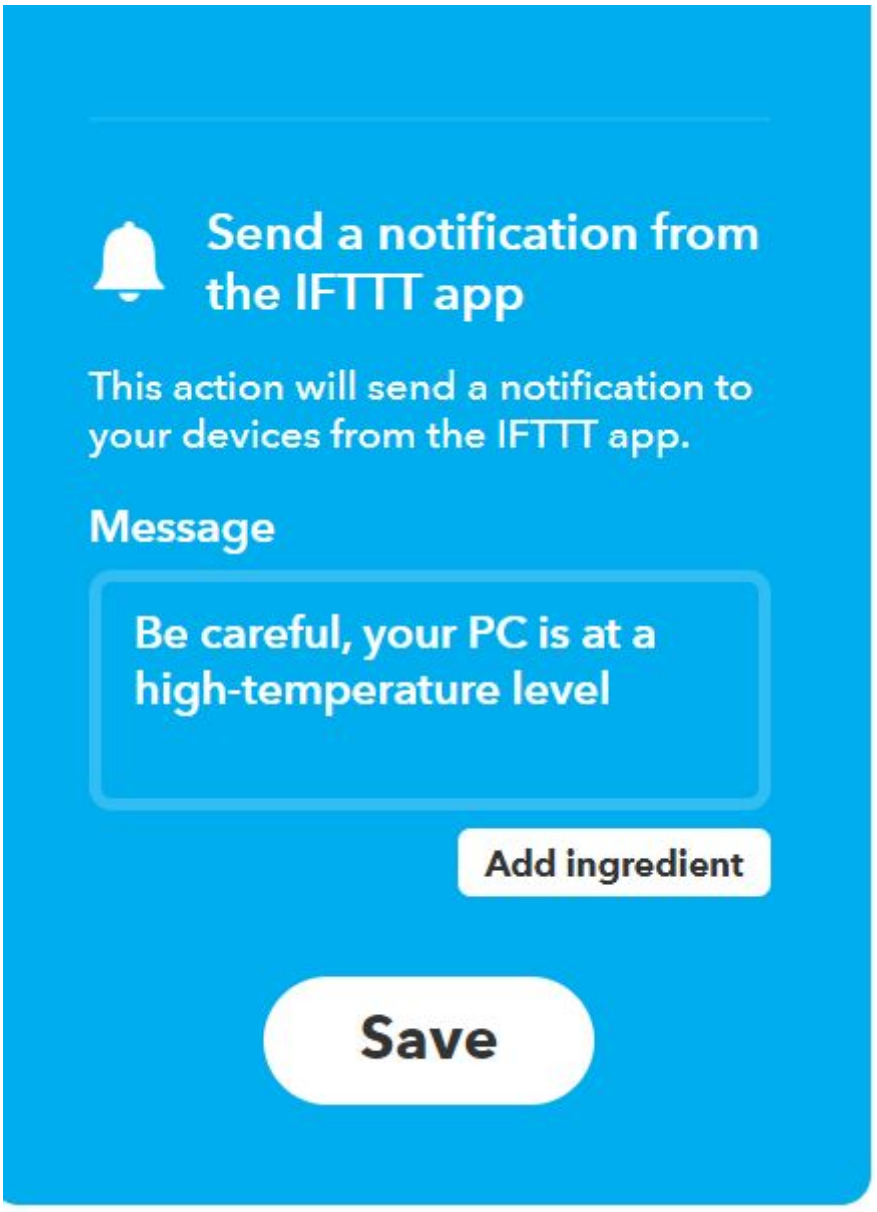
-
- setting up the Thingspeak channel



- Using IFTTT set up an IFTTT trigger

Configure


If zzh_eric published TEMP_LEVEL, then Send a notification from the IFTTT app
77/140
View activity log
New event published
This Trigger fires when an interesting event comes from a particular device. Send events using Particle.publish.
If (Event Name)
TEMP_LEVEL
Fill in your published event name; ex: monitoring a washing machine? Event Name = Wash_Status
is (Event Contents)
HIGH
The contents of the published event, "Data"; ex: monitoring a washing machine? Event Contents = Done
Device Name or ID
zzh_eric
An optional id for a particular device

- 

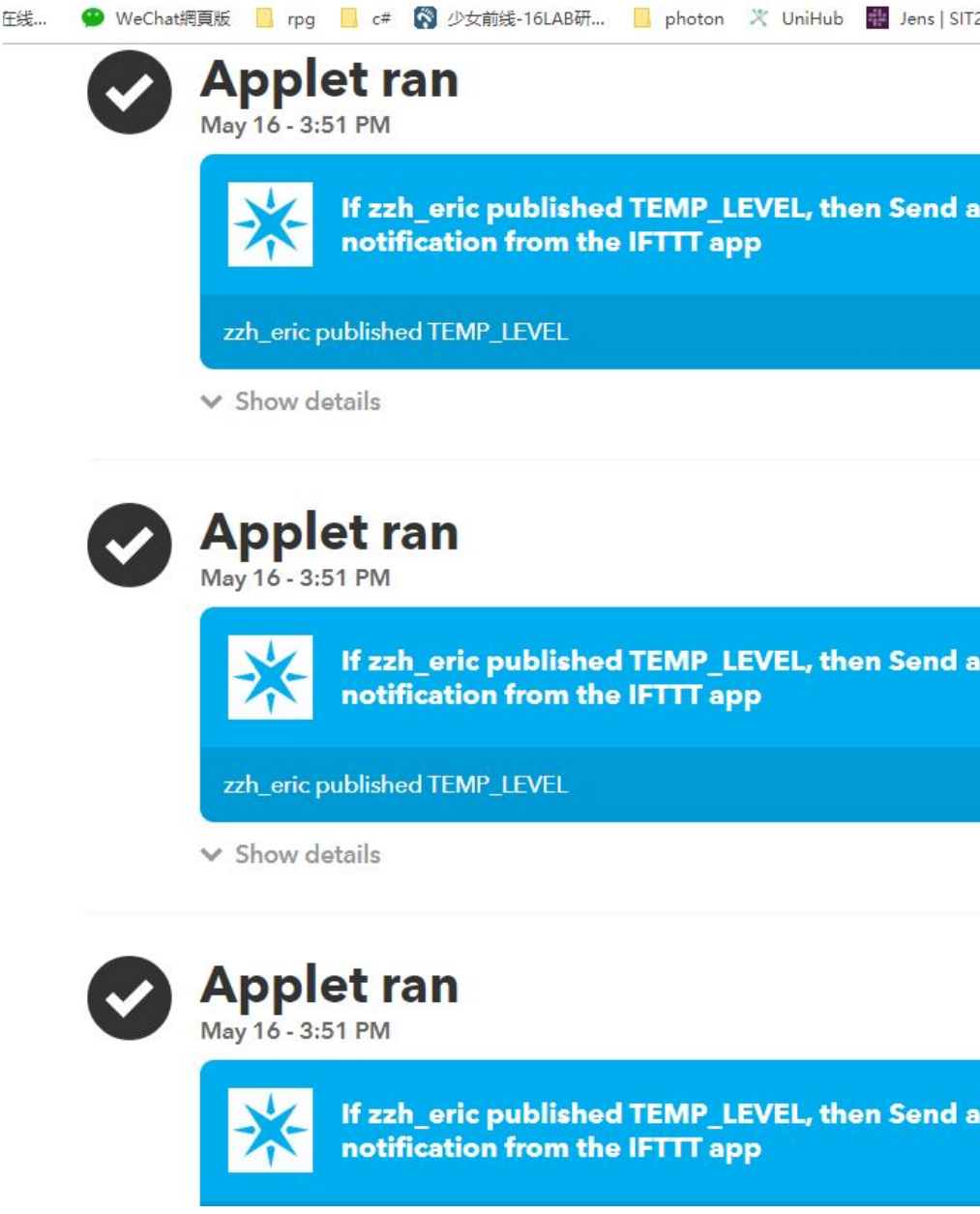
- Link to prototype code on Github: https://github.com/zzh900101/210-11.2-project.git

  https://github.com/zzh900101/210-11.2-project

  Testing:
  - I will test both hardware(led, fan) and software(Thingspeak, IFTTT) individually. To test all the things I will change the lowest temp level(15 degrees celicious) and the highest level(20 degrees celicious) in the code to show how the fan

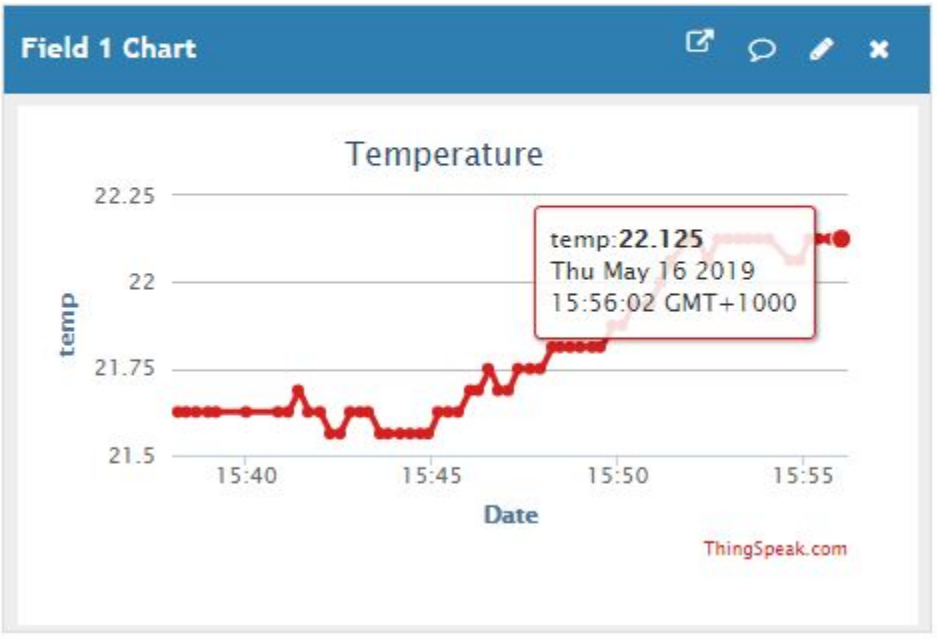
speed, led colour change and the IFTTT work. The Thingspeak will always work when the Photon is running.

- I record a video about testing the project both hardware and the software: https://www.youtube.com/watch?v=vKLL1XDeIYc
- When testing Photon will publish event ‘HIGH’ and the RPI will return led in red and the speed of the fan will turn upp
- The software part will see the Thingspeak graph and the IFTTT activity log
    - IFTTT



- Thingspeak

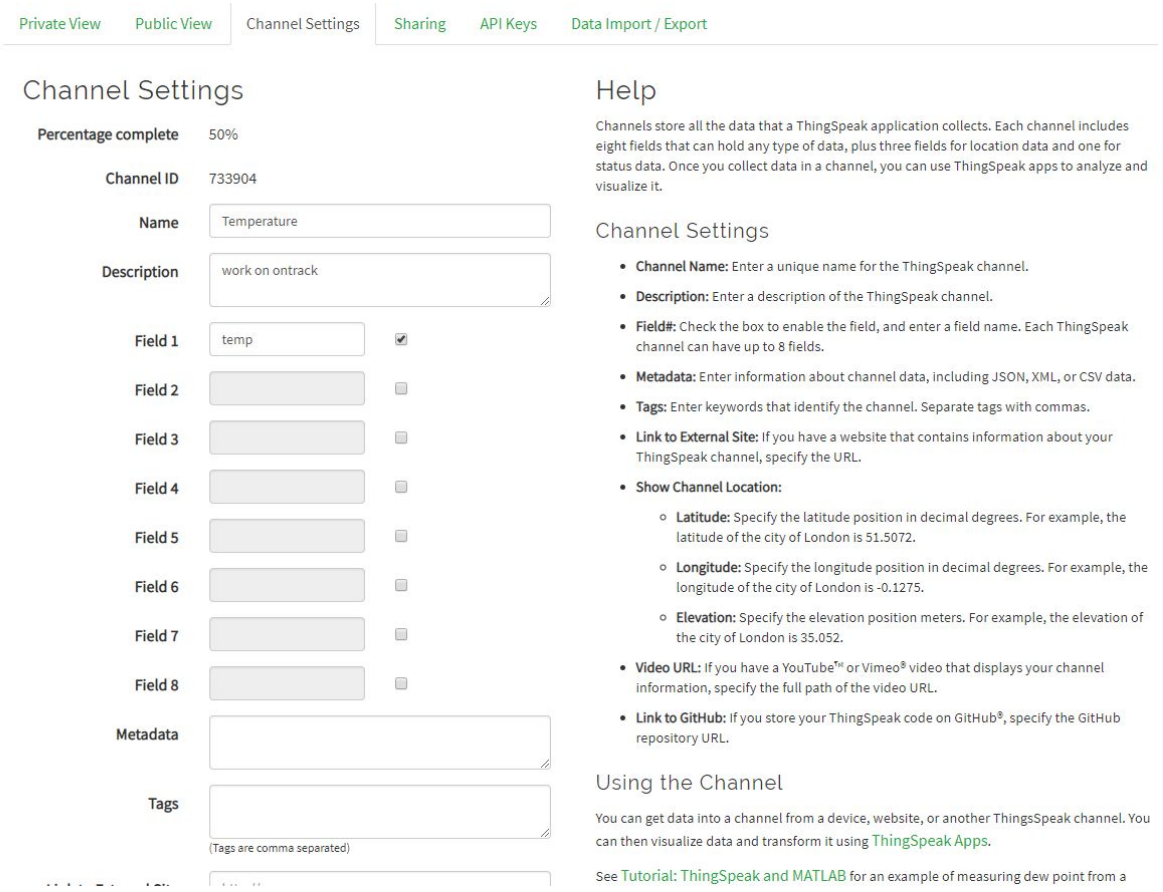
Created: about a month ago
Last entry: less than a minute ago
Entries: 12974

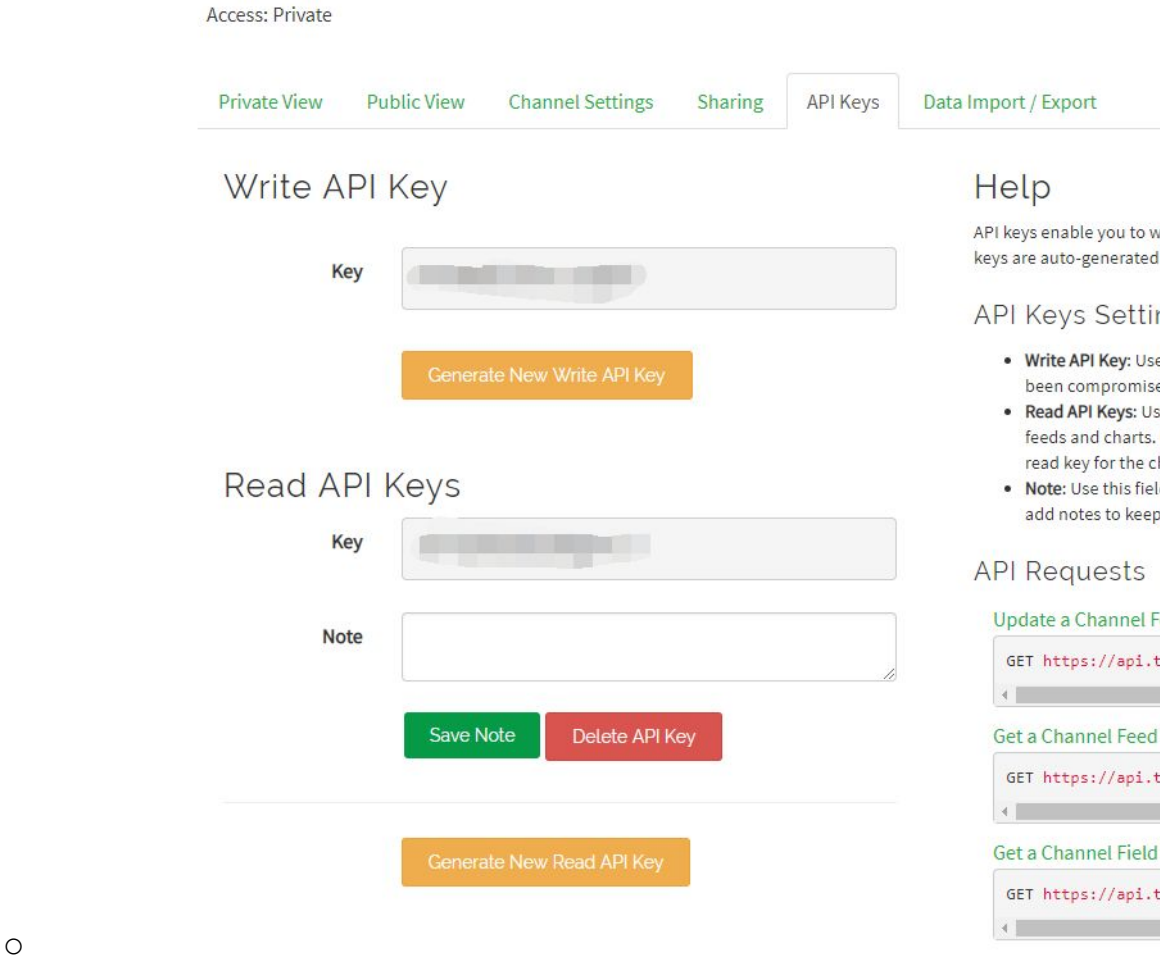


User Manual:

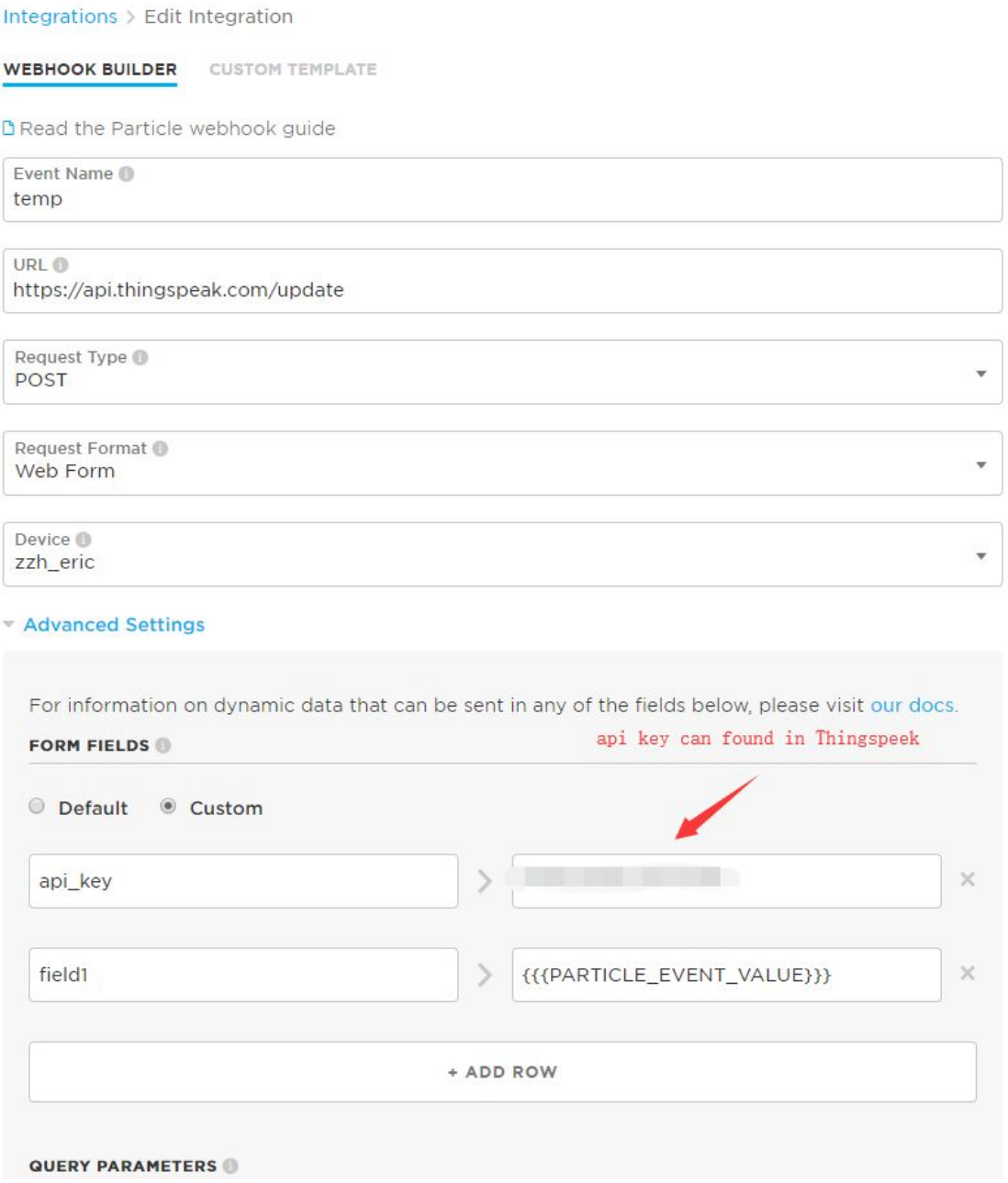
1. Connect the hardware(RPI, Photon, Breadboard, LEDs, fan, sensor) correctly.
2. In RPI install ‘Particle agent’ https://docs.particle.io/reference/discontinued/particle-agent/

3. Setting up the Thingspeak channel and copy the API key




Access: Private
Private View
Public View
Channel Settings
Sharing
API Keys
Data Import / Export
Write API Key
Key
Generate New Write API Key
Read API Keys
Key
Note
Save Note
Delete API Key
Generate New Read API Key
Help
API keys enable you to w
keys are auto-generated
API Keys Settir
Write API Key: Use
been compromise
Read API Keys: Us
feeds and charts.
read key for the cl
Note: Use this fiel
add notes to keep
API Requests
Update a Channel F
GET https://api.t
Get a Channel Feed
GET https://api.t
Get a Channel Field
GET https://api.t

4. Setting up the webhook in Particle Console and put the API key in the advanced setting



5. Setting up the IFTTT

Configure

If zzh_eric published TEMP_LEVEL, then Send a notification from the IFTTT app

77/140

View activity log

New event published

This Trigger fires when an interesting event comes from a particular device. Send events using Particle.publish.

If (Event Name)

TEMP_LEVEL

Fill in your published event name; ex: monitoring a washing machine? Event Name = Wash_Status

is (Event Contents)

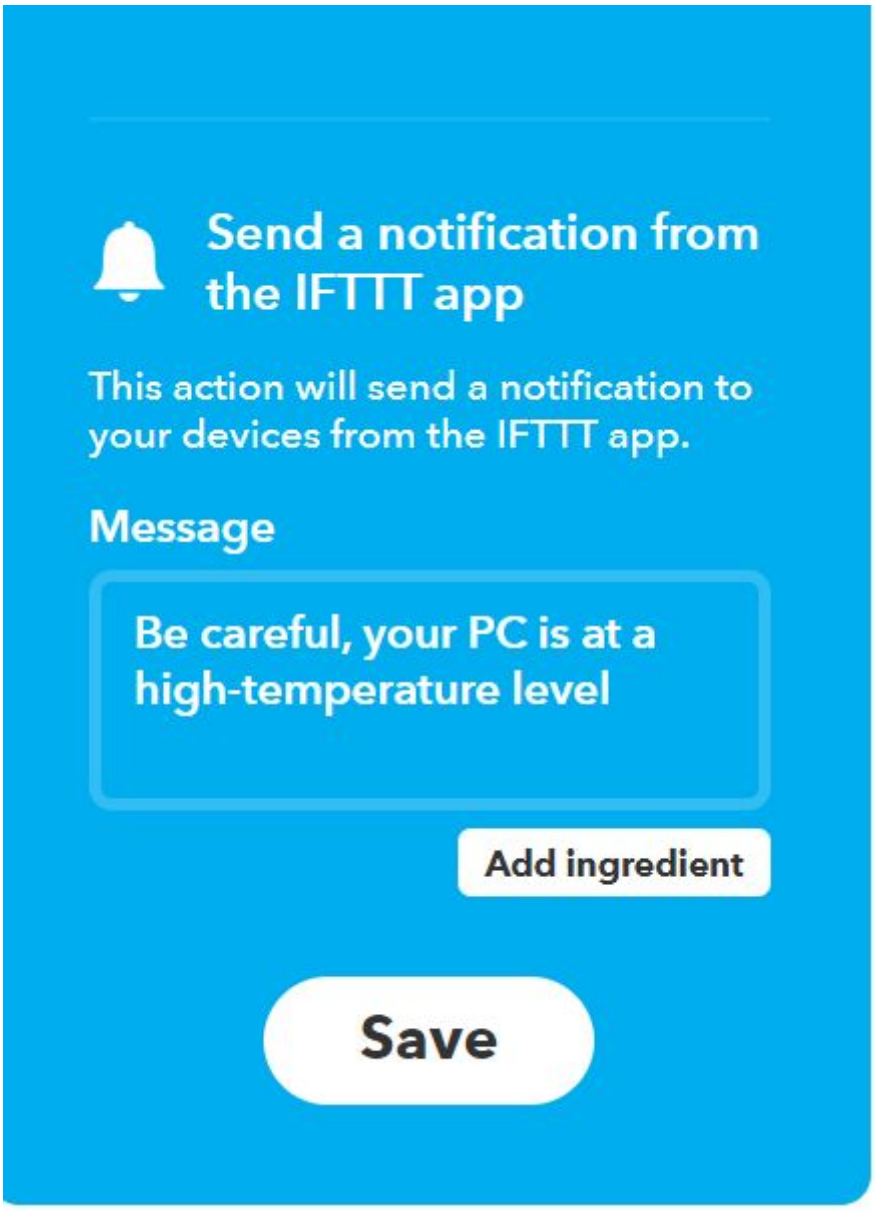
HIGH

The contents of the published event, "Data"; ex: monitoring a washing machine? Event Contents = Done

Device Name or ID

zzh_eric

An optional id for a particular device



6. Using Particle Web IDE sends the code to the Particle Photon and the RPI.
7. Finished

- Conclusion:

  Through designing and preparing the project I have learned from it, such as using the I2C communication on Particle Photon(I just only know how to use it in RPI python editor) and know how to use a Photon control the RPI to do something(using Particle Agent). When doing the project I also meet some problem such as the temperature sensor will return the incorrect value and I found this is the connection

problem, and I also need to know how to use PWM on Particle Photon(I have learned how to use on RPI python editor but not using Particle Web IDE, because the programming language they use is different, one is C++ and the other is Python).

If I have the second chance I will try to add the control command and HTML to the Photon to allow the user to control the fan speed) I also want to try to add a 12V power supply to the Fan because its normal work environment is not in 5V, add a power supply to the fan can let the fan works better and the hot air will be transferred more efficiently.