Operation Turn It Off! Installation Guide

Operation Turn It Off! is a smart home solution to save energy/electricity usage.
It allows you to monitor environmental data e.g. the temperature of your home office. You can also verify that the room is currently in use and make sure only to heat it when it is. Operation Turn It Off! can help you to create a cosy environment without wasting energy.

Full github repository here:
https://github.com/Fiona-Waters/OperationTurnItOff-Assignment

Requirements

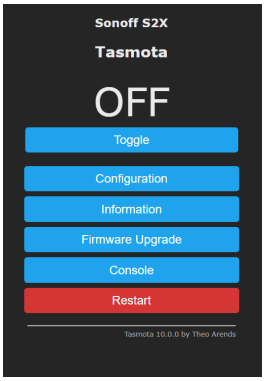
- Raspberry Pi 3 model B+
- Raspberry Pi Sense Hat
- SD Card
- Raspberry Pi Camera Module
- Computer with Visual Studio Code with SSH extension installed
- Sonoff S20 Smart Socket
- 3.3V USB-to-Serial adapter
- 4 jumper wires
- Electric Heater

Step 1

Flash Sonoff S20 Smart Socket using Tasmotizer. This allows you to configure the device, to set up WIFI and MQTT settings if required.

Instructions for this can be found here:
https://www.superhouse.tv/37-installing-tasmota-using-tasmotizer/
You can also follow this helpful youtube video https://www.youtube.com/watch?v=hlwIhu5OWiA

Connect to Sonoff Smart Socket using Tasmota. Use the IP address of the socket on your LAN. Find this using the ipconfig command for windows or ifconfig on Linux. Then use arp -a command and find the IP address relating to the MAC address of your smart socket.
If you enter the IP address into your browser you should see something like this:



Use this http request to check on/off status of Smart Socket
http://YOUR-SOCKET-IP/cm?cmnd=Power
You can enter this in your browser to check the status. We have used it in our code.

Step 2
Clone the git repository on the Secure Shell on your Raspberry Pi using this command:
git clone https://github.com/Fiona-Waters/OperationTurnItOff-Assignment
Ensure you are in the directory where you wish to run the program.
This program is written in python so you will need to have python installed.

Step 3
Set up Raspberry Pi and Sense Hat
We will use the Sense Hat to detect the temperature, pressure and humidity in the home office.
If you are setting up your Raspberry Pi for the first time you can follow the steps here:
https://projects.raspberrypi.org/en/projects/raspberry-pi-setting-up
If you are setting up your Sense Hat for the first time you can follow the steps here:
https://projects.raspberrypi.org/en/projects/getting-started-with-the-sense-hat/0

Step 4
Send data to ThingSpeak using MQTT

If you don't already have a ThingSpeak account you can sign up here:
https://thingspeak.com/login?skipSSOCheck=true

Set up a channel to receive data from your Raspberry Pi. Name your channel and set up 4 fields, one each for temperature, pressure, humidity and power.

Under the Devices tab on ThingSpeak choose MQTT and click the 'add a new device' button.
Once you have filled in these details, in the next step you will see your Client ID, username and password. Download and save these credentials in a safe place.
You will need to update these details in the .env file (from the cloned repo).

In the public view tab of your channel you can add widgets. Add a field chart for each of the 4 fields (temperature, pressure, humidity and power). We use these charts on our Glitch website later so that they can be accessed remotely. (You will need to update the chart links on the charts.html page)

If you would like to receive an email when the temperature reaches a certain point you can do so under the APPS menu option, then choose React. You can use a thingHTTP with

IFTTT to cause an email to be sent. We have set one to email the user when the temperature in the office reaches 22 degrees celsius. At this temperature the heater is turned off.

Step 5

Send data to Firebase Realtime Database, and images to Firebase Storage

Firebase

If you do not have a Google Firebase account you can sign up here:
https://firebase.google.com/
Then you need to create a project, and set up your Realtime Database. You will also need to set up Storage. If you would like to connect to Glitch you will need to allow read access to anybody, you can do this under the Storage - Rules tab.

To install the Firebase Admin package run the following command from the ssh on your Raspberry Pi:
Pip3 install firebase-admin

Step 6

Connect to Glitch, show charted data from ThingSpeak, latest readings from Firebase Database and latest photo from Firebase Storage

In order to connect Firebase and Glitch you will need to register your application. In Firebase in the Project Overview page click on the web app icon. Name and register the app. You will then need to access the settings, service accounts section to generate a new service account key.
You need to update the details in the serviceAccountKey.json file.
You will also need to update the firebase credentials in the main.py file to match your own.

Glitch

If you do not already have a Glitch account you can sign up here: https://glitch.com/
Use the Glitch files from the repo to set up what you need here or design your own webpage. Remember to update the iFrames on the chart.html page (from ThingSpeak) and your firebase configuration credentials on the script.js page.

Step 7

Use Google Cloud Vision AI to detect faces/occupancy in the room before turning the heater on.

Go to https://cloud.google.com/vision
You will have to set up a billing account to use this (although this functionality is free).
Follow this tutorial to set up
https://codelabs.developers.google.com/codelabs/cloud-vision-api-python#0

Step 8

Allow the program to run on start-up and continuously.

Copy the operationTurnItOff.service file using this command:
cp operationTurnItOff.service /etc/systemd/system

Ensure that the ExecStart and WorkingDirectory fields refer to where you have saved the cloned repository.

Enable this with this command:
sudo systemctl enable operationTurnIfOff.service

Final Step

You are now set up!
To run the program use this command:
Python3 main.py mqtt://mqtt3.thingspeak.com:8883

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If you come across an error containing the following: GLIBC_2.23' not found error and ImportError: cannot import name cygrpc
Run this command - python -m pip install grpcio --ignore-installed