

The Smart Lighting App

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Computer Systems and Networks Assignment

Project Description

The Smart Lighting App is designed to control home lighting in an efficient manner. The app provides several methods for switching on/off lighting, through manual and automated processes. For demonstrative purposes, an LED will be used to simulate the lighting.

There are **four** methods the LED can be switched on/off:

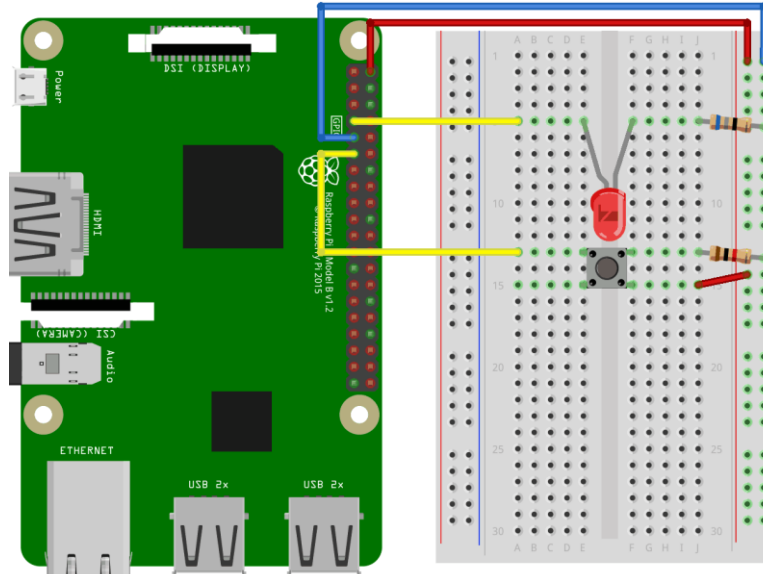
1. Interacting with a physical tactile on/off button which is wired to the Raspberry Pi.
2. Interacting with a virtual on/off button on a webpage.
3. The LED will switch on as when the sun sets, and switch off when the sun has risen.
4. Using MQTT protocol to switch the LED on/off

Tools, Technologies and Equipment

- Raspberry Pi 3 Model B+
- LED
- Tactile push button
- Sunwait
- HTTP
- MQTT
- Flask
- Python
- HTML
- CSS
- AJAX
- Cron

Physical ON/OFF button

- A tactile button is wired up to the Raspberry Pi. When the button is pressed, the state of the LED is changed through `button.py`.



Virtual ON/OFF button

- A Flask server running on the Raspberry Pi and hosts an interactive webpage which allows a user located in the LAN to switch the LED on/off by clicking on a light bulb image.
- When the image is clicked on, AJAX routes to the `led_toggle` function which sends a HTTP POST request to change the state of the LED.

WELCOME TO THE SMART LIGHTING APP

Click on the light bulb to switch the light on/off!



Sunset/Sunrise:

- The level of natural light that in a room will vary all year round as the sun is rising and setting at different times each day.
- As a result, the period each day for when artificial light is required will vary.
- The time of the sunrise and sunset are found using a pre-existing program called 'Sunwait' (<https://github.com/risacher/sunwait>).
- Cron jobs are used to monitor when the sun has risen or set.

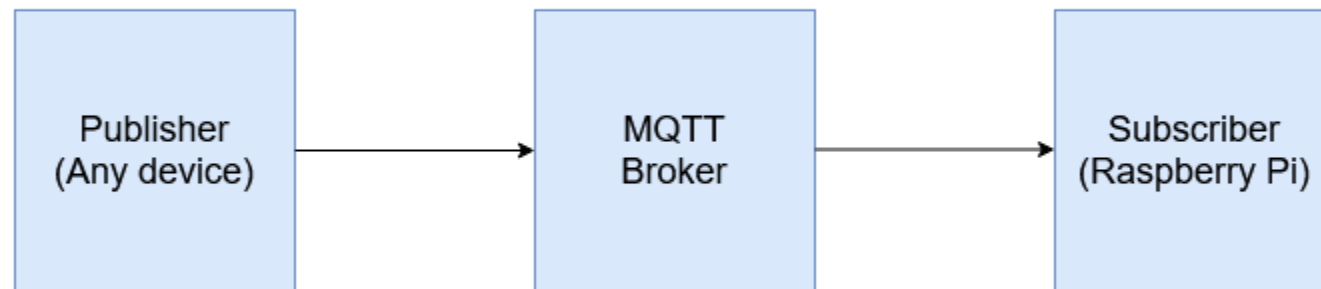
crontab entries:

```
`*/5 * * * * sunwait sun up 51.886661N 8.618732W ; python /home/pi/development/smart-lighting-app/light.py DAY'
```

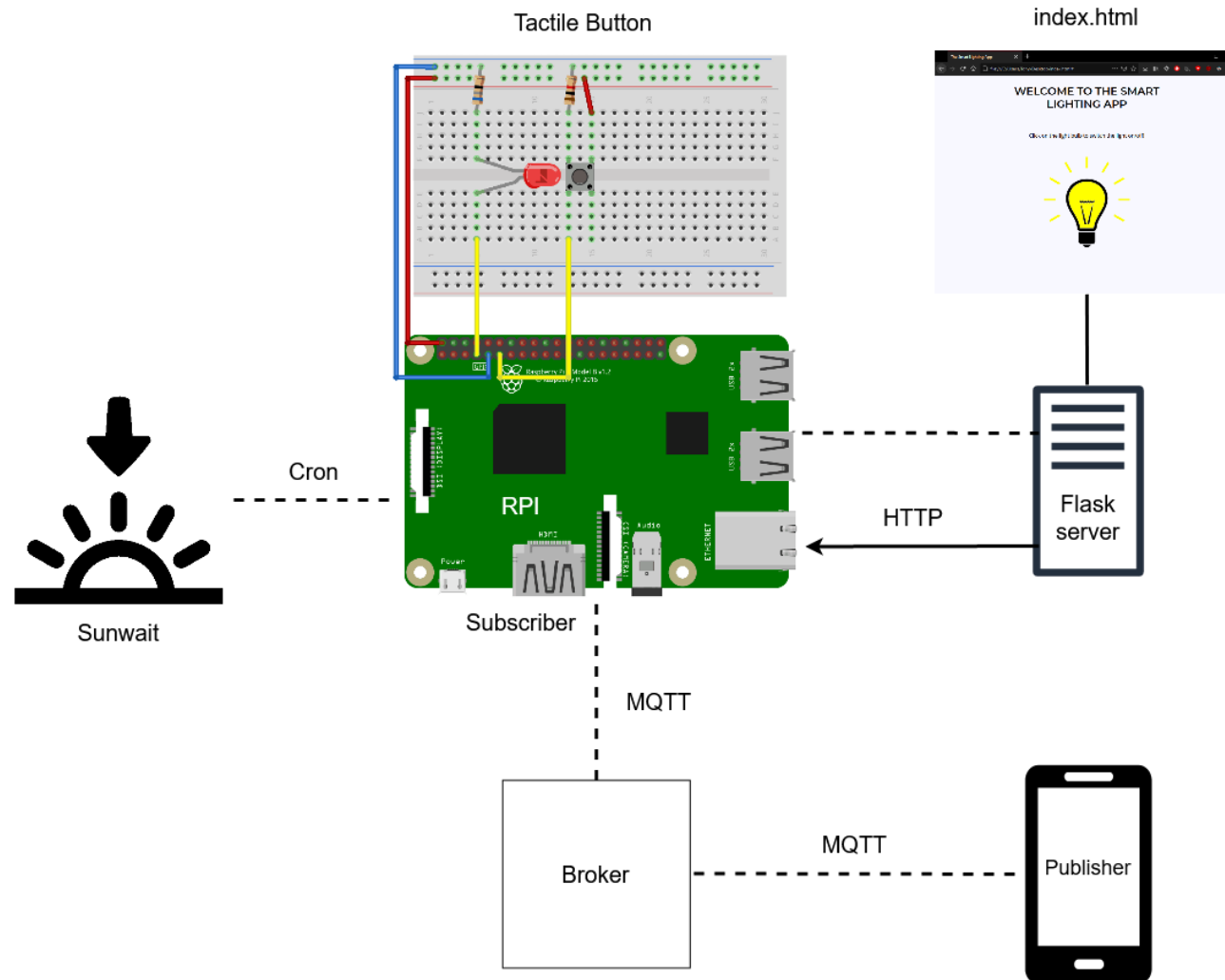
```
`*/5 * * * * sunwait sun down 51.886661N 8.618732W ; python /home/pi/development/smart-lighting-app/light.py NIGHT'
```

MQTT

- An MQTT broker can be used to change the state of the LED.
- With `led_sub.py` running on the RPI, an MQTT payload can be published from any device with an "ON" or "OFF" message.
- The MQTT broker sends this to the subscriber (the RPI) which in turn switches the LED on/off.



Pictorial Representation



Flow chart

