# Smart Home Architecture and Design

Frontend

Architecture

- A Raspberry Pi camera module hooked up to the Raspberry Pi 3
- Raspberry Pi will be placed in the software engineering lab so that we can take pictures of anyone who enters the building
- Picture will then be sent to the Web Server/Cloud Worker to be analyzed
- For the next week, we will be writing the software so that our RP 3 will send a signal to a separate module (software only) that will ensure the signal is received and set the light_switch variable to be True
- The following week, we will purchase a Philips Hue lightbulb and connect it to the RP3 to ensure and refactor the code so that when someone enters the room and actual light turns on
- Our MVP for the frontend would involve the Pi recognizing when a person enters the room and capture a picture

Architecture

- As of today, the RP3 is on and continuously running so all of our users can connect to the RP3 using PuTTY (for Windows) and Terminal (for Mac)
- During this week's sprint, our team will also be writing the code to analyze a video and take a picture when it recognizes a face
- Our team will also be writing the code to analyze when a person leaves the room to turn off the lights (only if that person is the last person left in the room)
- Over the next couple weeks, our team will be writing the software to keep track of the number of people
- The Raspberry Pi will send HTTPS POST data to the server with the image captured by the camera module
- The server will do all the processing of the image to determine the person

Frontend MVP Architecture
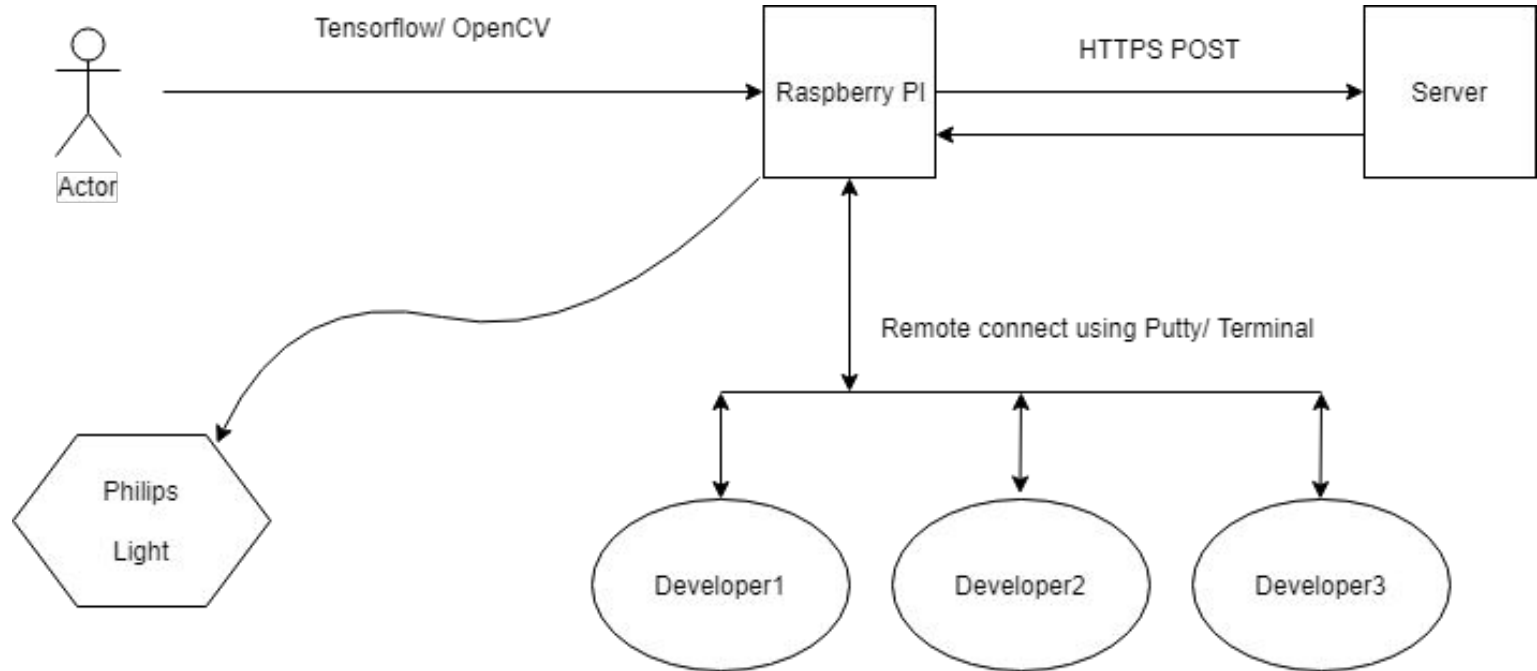
Backend

Backend Architecture

- Goal: Abstract away the machine learning so that the Raspberry PIs can easily get the information they need through a REST API
- To do this we are utilizing:
  - Web Server - Python Flask REST API with routes for simple actions such as communication with the database and getting the person associated with an image.
  - AutoML - A SAAS solution on GCP for our machine learning module. It essentially abstracts what it does to just a dataset and a model. This model can be hot swapped instead of being manually switched like CNN.
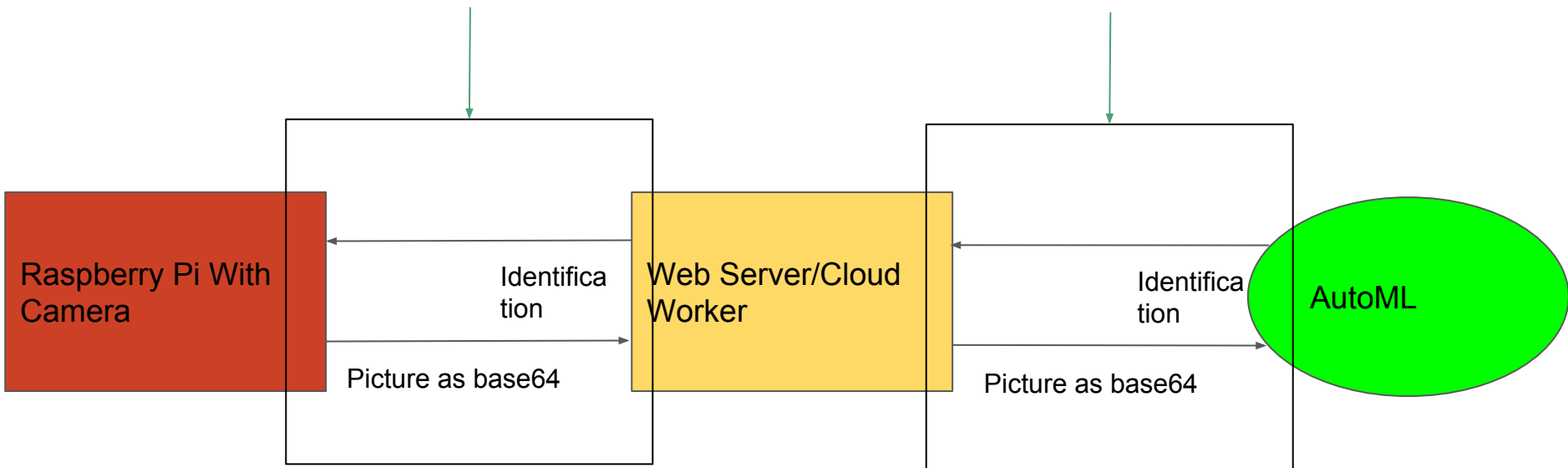
Architecture
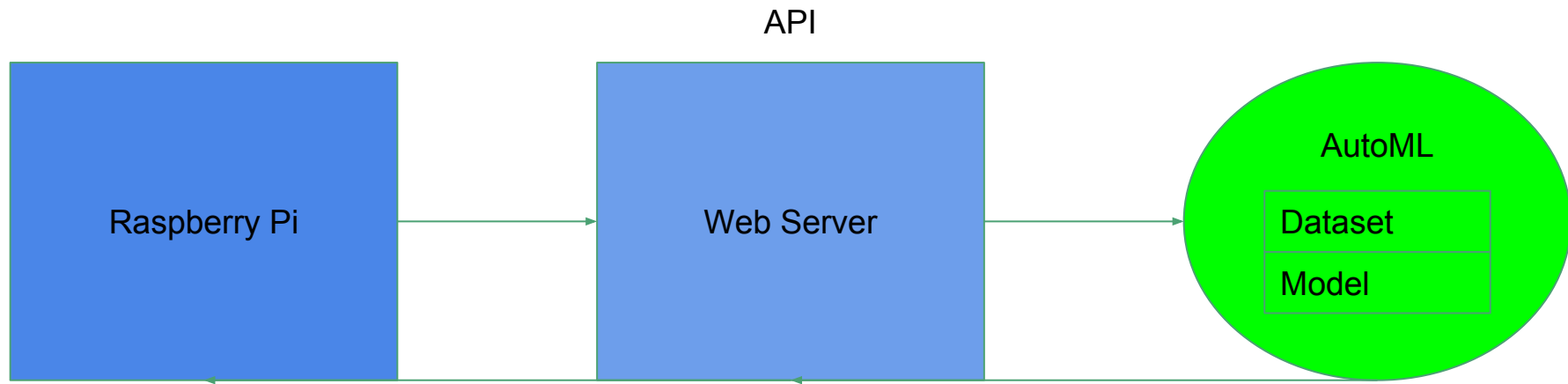
Communication

HTTPS

1. The Raspberry Pi will send an HTTPS POST request using JSON Body as the image will be represented as a Base64 string
2. The server will accept the request and forward the base64 string to AutoML
3. Server will get the response back from AutoML return a response code 200 with the name of the person

Response:

```
{
        success: True, //Whether the server was able to find the person or not
        identification: { //Object for containing information pertaining to the user
                name: 'Alex Supkay' //The person's name
        }
}
```