Minecraft Monitor

Lukas Smith - 1902745

CMP408

Introduction

The Minecraft Monitor is a downsized example of IoT Monitoring. IoT Monitoring allows organisations to gauge performance based on specific parameters. Monitoring gives organisations the data they need to make informed decisions and troubleshoot effectively (Splunk, 2022).

Security is a significant factor for this project, as several credentials must be used to communicate with the Minecraft Server, EC2 instance and DynamoDB.

The objectives of Minecraft Monitor have been split into three main sections, Software, Hardware and Infrastructure.

Software

- Checks Minecraft Server for players using RCON
    - On player change, light up the corresponding LED using LKM and display the username on the OLED screen for one second
- Current online players are to be displayed on OLED and webserver with the list of offline players on the webserver and the last time they were online

Hardware

- Two LEDs to be controlled by an LKM which is written to by userspace program
- An OLED screen controlled by an external Python Library

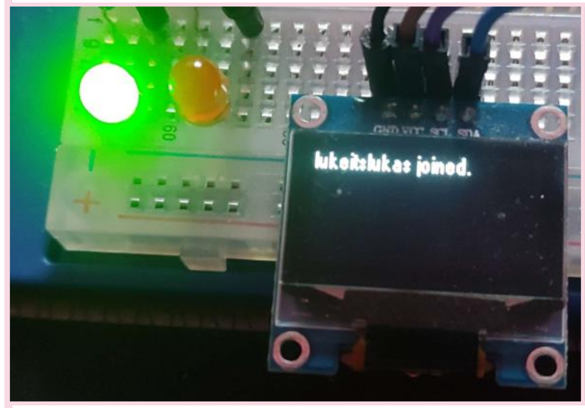
Infrastructure

- An EC2 instance to host the webserver
- DynamoDB to store the list of offline players

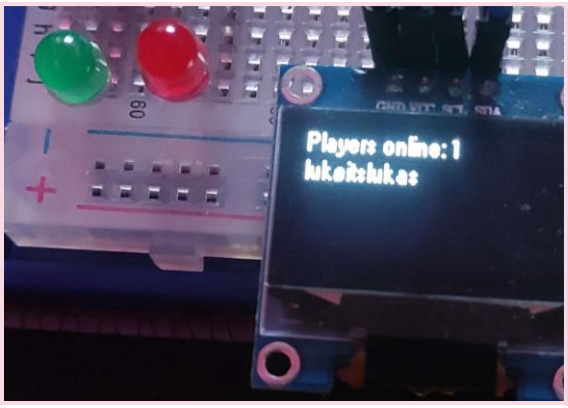
Methodology

Software

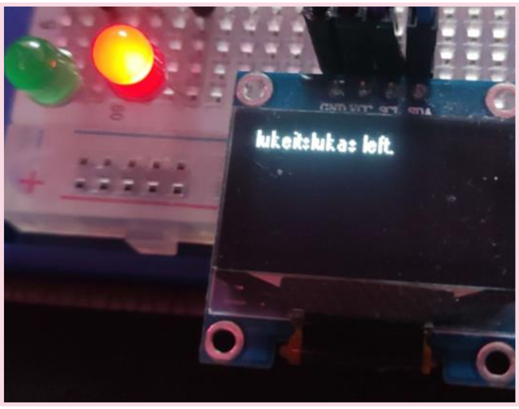
The main python script on the Raspberry Pi 0 W queries the Minecraft Server for active players every 15 seconds, the player list is saved in a JSON file and uploaded to an EC2 ubuntu instance. If a player leaves or joins, the JSON is updated, they are either added or removed to a DynamoDB, the corresponding LED is lit, and the OLED screen displays the players name and action. Finally, the player list displays on the OLED screen.



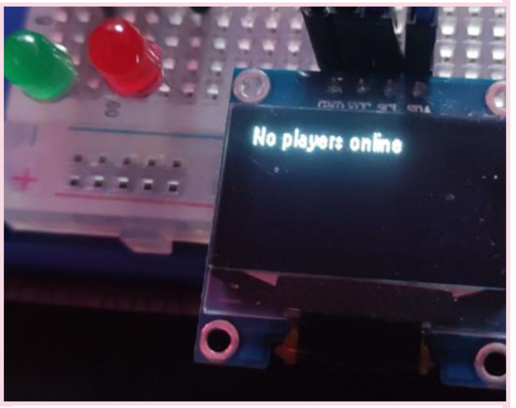
Player Joining



Player Online



Player Leaving



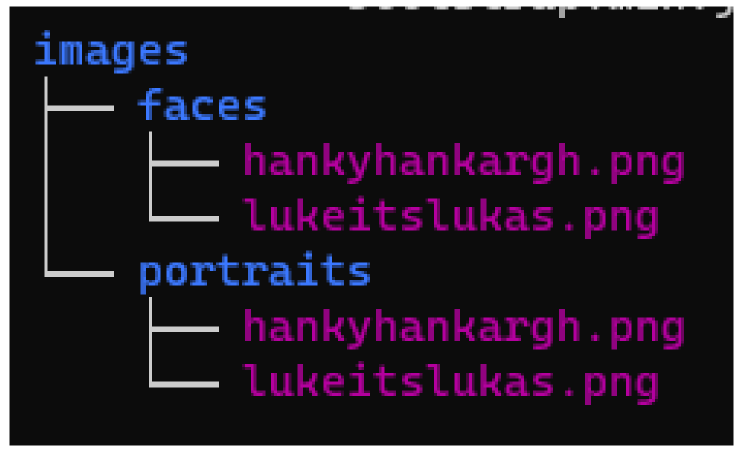
No Online Players

Hardware

The hardware consists of two LEDs and an OLED screen, the LEDs are controlled using an LKM developed in C and the OLED screen is controlled using an external python library.

Cloud

An Ubuntu EC2 instance was created to host the webserver with the player list. The backend of the website is handled by Python using the Flask library. On a GET request for the site, the player list JSON is read and the DynamoDB table is scanned to acquire online and offline players. The players are then displayed to the site using the Jinja template engine. Bootstrap 5 was used for the websites design. On a new player joining or leaving, their avatar is downloaded locally, to speed up the websites load time.

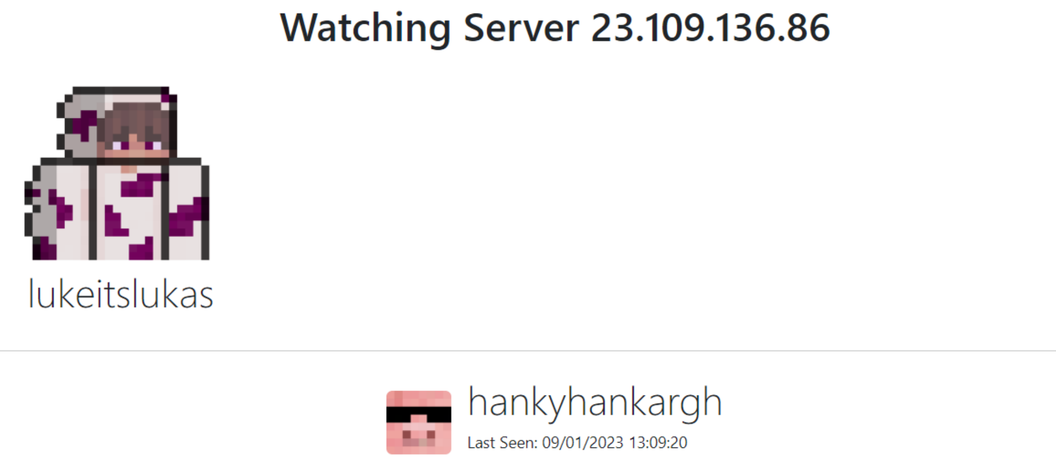


```
images
├── faces
│   ├── hankyhankargh.png
│   └── lukeitslukas.png
└── portraits
    ├── hankyhankargh.png
    └── lukeitslukas.png
```

Locally Stored Avatars

Project Highlights

All three parts of the project, Software, Hardware and Cloud work successfully together.



Watching Server 23.109.136.86

lukeitslukas

hankyhankargh
Last Seen: 09/01/2023 13:09:20

The project was secured by using .env files for all of the client credentials (RCON, SSH and DynamoDB) and the IAM users created to work with the Database have their permissions limited to only exactly what they need.

Future Work

A possible alternative project using the same hardware and infrastructure could be to use Multicraft to monitor the hardware the server is using, such as the RAM, CPU and Storage.

Additionally, the project could be stress tested to estimate it's scalability.

References

ada, l., 2012. Python Usage | Monochrome OLED Breakouts. [Online] Available at: https://learn.adafruit.com/monochrome-oled-breakouts/python-usage-2 [Accessed 3 January 2023]. Amazon Web Service, 2023. DynamoDB examples using SDK for Python (Boto3). [Online] Available at: https://docs.aws.amazon.com/code-library/latest/ug/python_3_dynamodb_code_examples.html [Accessed 3 January 2023]. Flask, 2010. Quickstart - Flask Documentation. [Online] Available at: https://flask.palletsprojects.com/en/2.2.x/quickstart/#rendering-templates [Accessed 3 January 2023]. Splunk, 2022. What Is IoT Monitoring?. [Online] Available at: www.splunk.com/en_us/data-insider/iot-monitoring.html [Accessed 10 January 2023].