museummate

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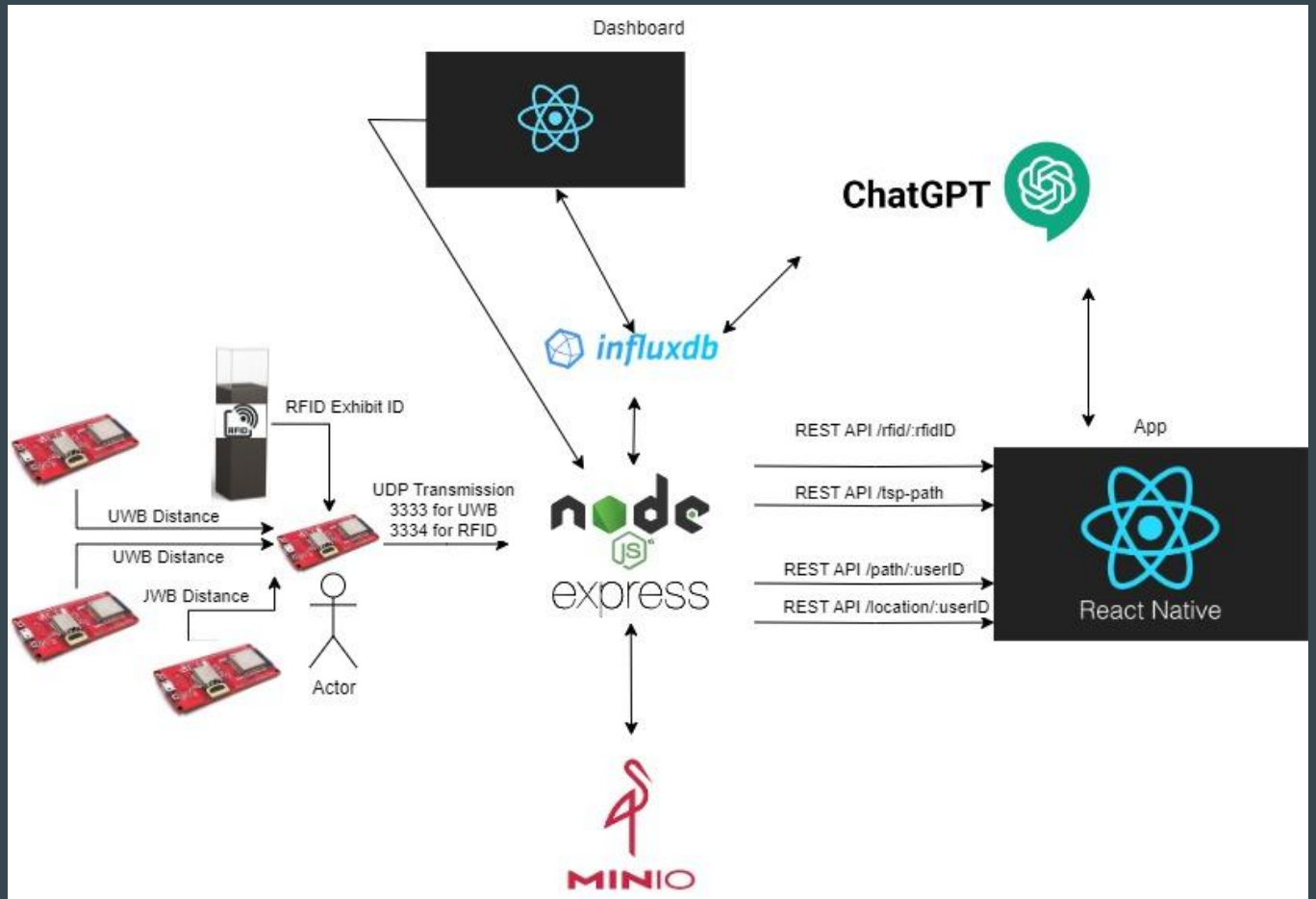
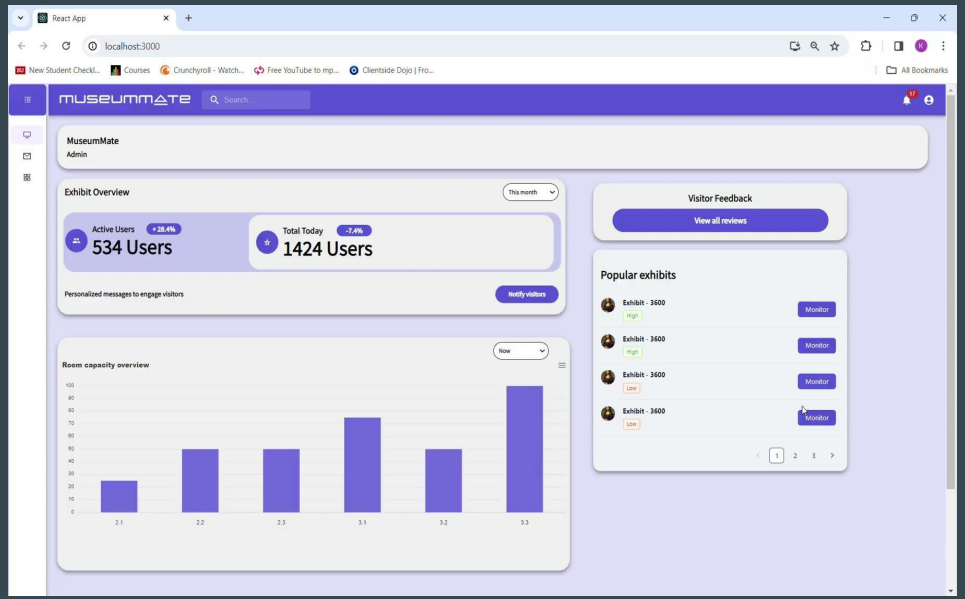
Project Introduction

MuseumMate aims to enrich the museum visitor experience through precise indoor navigation, time-based tours, augmented multimedia information, and real-time congestion management. This initiative addresses the challenges faced by traditional museums, including overcrowding, accessibility issues for individuals with disabilities, and limitations in content display and language options.

Block Diagram



Demos


React App
localhost:3000
museummate
MuseumMate
Admin
Exhibit Overview
This month
Active Users
+28.4%
534 Users
Total Today
-7.4%
1424 Users
Personalized messages to engage visitors
Notify visitors
Visitor Feedback
View all reviews
Popular exhibits
Exhibit - 3600
High
Monitor
Exhibit - 3600
High
Monitor
Exhibit - 3600
Low
Monitor
Exhibit - 3600
Low
Monitor
Now
Room capacity overview
2.1
2.2
2.3
3.1
3.2
3.3

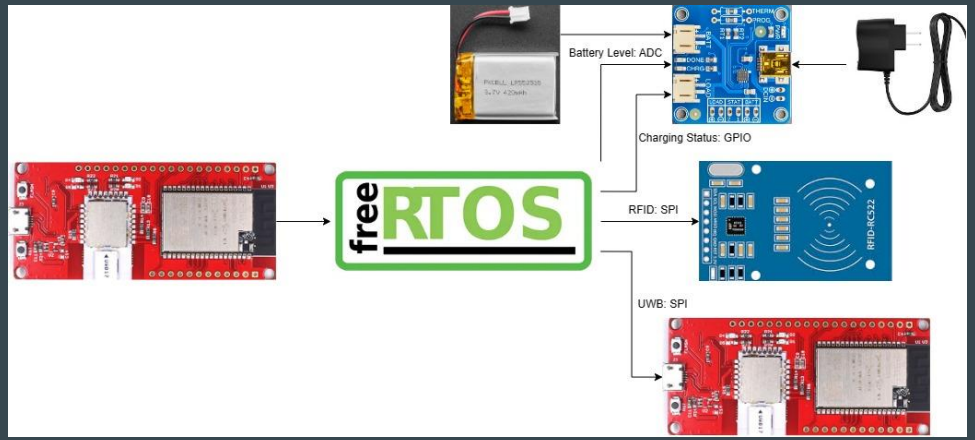

9:41
Home
museummate
Please Scan Your TourTag
Scan

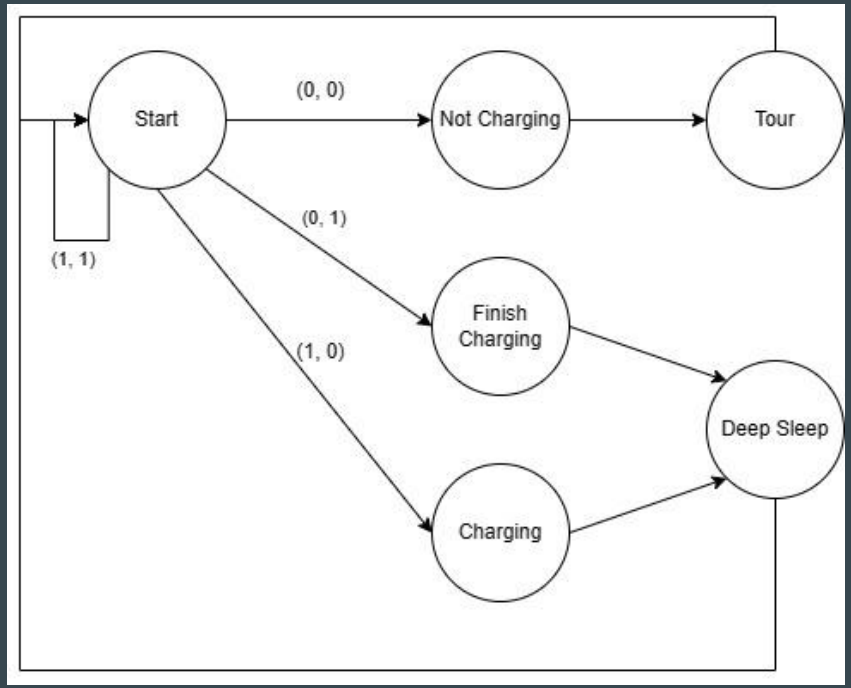
Gantt Chart


Task Group
Task
9/15/2023
9/22/2023
9/29/2023
10/6/2023
10/13/2023
10/20/2023
10/27/2023
11/3/2023
11/10/2023
11/17/2023
11/24/2023
12/1/2023
12/8/2023
12/15/2023
1/19/2024
2/9/2024
2/16/2024
3/1/2024
3/8/2024
3/15/2024
Project Scope and Requirements
(Deliverables)
Have a fully functional Application
Track user loctaion
Provide routing
Use RFID for media
Phase 1 Senior Project
(Semester 1 tasks)
Create Logo
Create Wireframes
Set up React Native Environment
Reserch development methods
Set up Expo Environment
Set up Jest
Connect ESP to wifi
use esp at BLE
build enclose for UD
build UD for BLE
set up esp for UD
Establish the core structure of the Node.js server
Implement a UDP port that accepts incoming RSSI data from multiple user devices
Implement a RSSI data structure that automatically updates RSSI for each user device based on incoming RSSI data
mplement KNN ML model for location services
Collect 2000 data points for training the ML model
API with 3 REST responsible retrieving location, routing user to specific node, finding the shortest path to visit many nodes
create home and barcode scanner
make tourtype screen
make premade tour screen
create current loction screeen
create room images and maps
send new nodes to server
Phase 1 Test and Requirements
(semester 1 testing)
testing RSSI strength
Collecteing data for machine learning
lesting positioning
testing app
Phasre 2 Senior Project
(semester 2 tasks)
Style the custom tour screen
connect the explore button
Work on camera roughting overlay
RFID popups and population
Implement a UDP port that accepts RFID IDs and then forwards relevent multi media to the front end application
Dashboard
Chat Gpt integration
PCB
New User device
Final Integration Test
(semeseter 2 testing)
Full test with all copenemts

Hardware

- ESP32-DW30000 (UWB)
- RC522 RFID Reader Module
- MCP73833 Li-Ion Charger Module
- 3.7 V 420 mAh Li-Ion Battery





Hardware - still needs completed

- New UWB Reading Algorithm
  - Optimize algorithms to get more accurate user positioning at a faster rate.
- Battery Voltage Regulator
  - Let input voltage to be stable 3.3V
- Filter Signals for Battery Voltage
  - Get more accurate voltage to calculate battery level.

Server

- UDP communication with TourTag to receive:
  - UWB data
  - RFID data
  - Dynamic Polling
  - Hardware metrics
- Data Processing
  - Trilateration (accurate within 10cm)
  - Weighted scoring based on exhibit popularity metrics
- Metric collection and transmission to InfluxDB
- Multimedia retrieval via MinIO
- REST API Service

Server is complete (still requires performance testing)

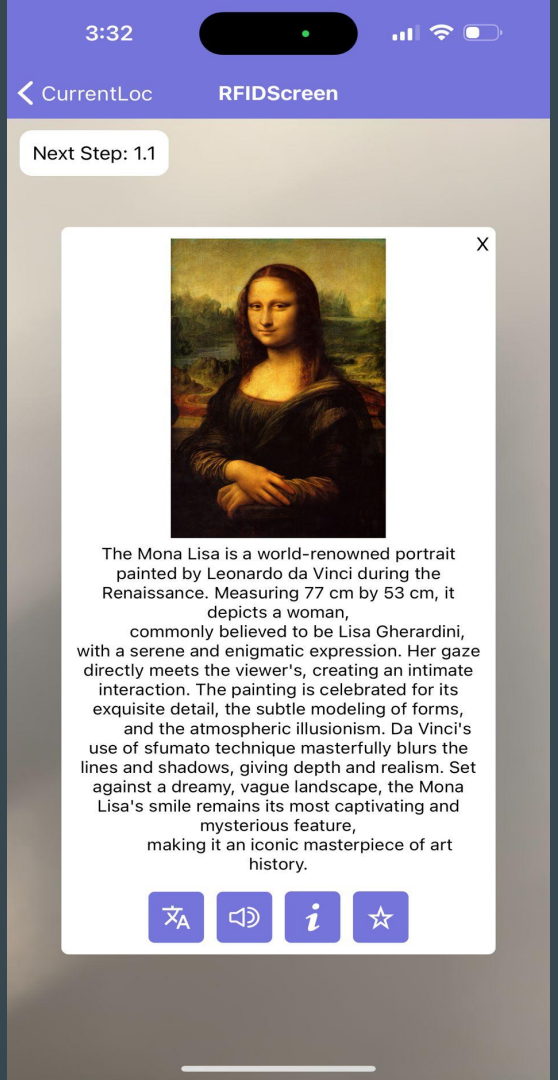
Mobile App

- All Screens completed
  - Home Page
  - QR Scanner
  - Tour Type
  - Timed Tours
    - Explore
    - Timed Tour
  - Custom Tour
  - Guidance and RFID Screen
- DDNS implemented

- Guidance and RFID screen
  - Text to Speech
  - Translation
    - Google Translate API
  - ChatGPT
  - Rating
  - RFID Websocket
  - Location Websocket

Mobile App - still needs to be completed

- Send Ratings to InfluxDB
- Map button
- Button Regulation

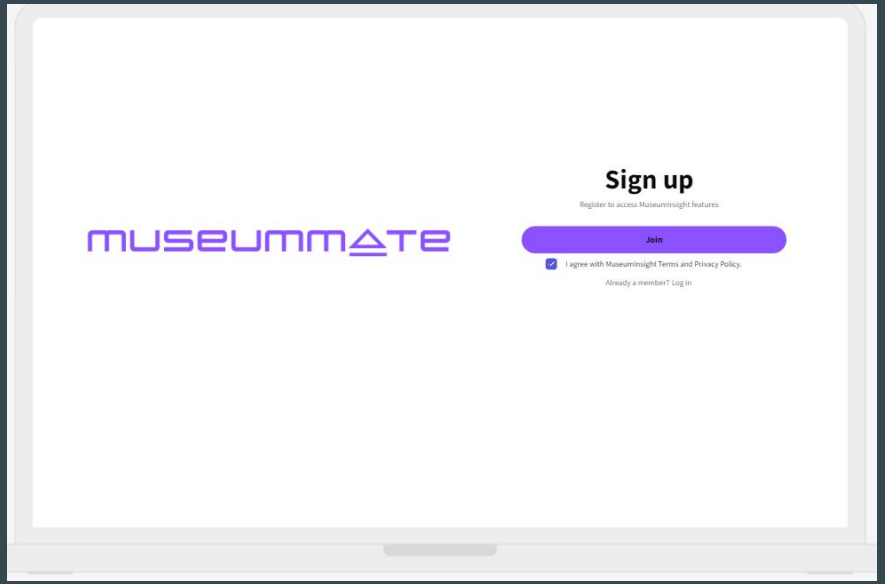


Dashboard

- Designed and implemented interactive dashboards for real-time data visualization.
- Integrated filtering options for the Exhibit Overview module.
- Developed the Occupancy Graph feature using ApexCharts for dynamic charting capabilities.
- Customized List and Table displays for better user navigation and data management.
- Added export functionality for reports in CSV and PDF formats.
- Created a responsive design framework to adapt seamlessly across devices.

Dashboard - still needs completed

- InfluxDB queries for live data updates
- Create the live Battery section user device monitoring
- Create enhanced Visitor Feedback system
- Create Role based Authorization through a password protected gateway
- Set up push notifications for real-time updates to users and staff.
- Search bar to search exhibits


museummate
Sign up
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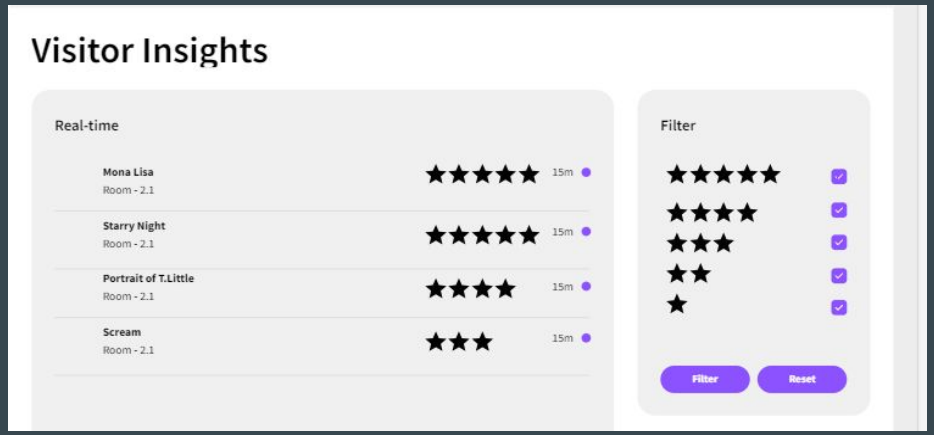
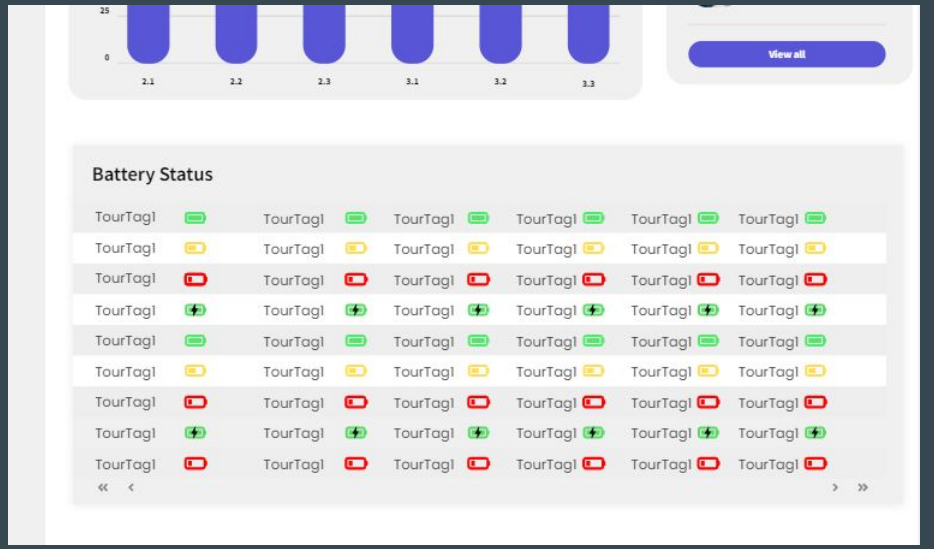

Visitor Insights
Real-time
Mona Lisa
Room - 2.1
15m
Starry Night
Room - 2.1
15m
Portrait of T.Little
Room - 2.1
15m
Scream
Room - 2.1
15m
Filter
Filter
Reset


25
0
2.1
2.2
2.3
3.1
3.2
3.3
View all
Battery Status
TourTagl

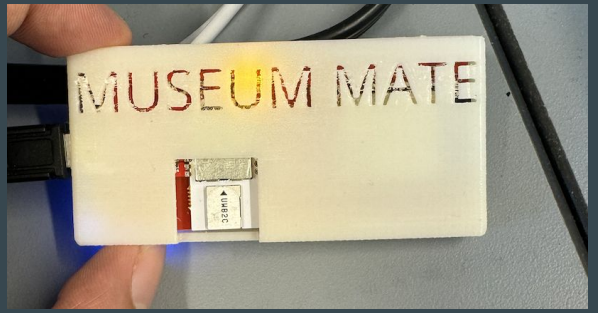
ChatGPT Server

- Used Gin framework to create a REST API service
- Implemented OpenAI's ChatGPT API (3.5 turbo)
- API receives a prompt, passes it to the ChatGPT API, then returns the response
- Developed in memory cache to store frequent prompts and improve performance

Next step: implement a persistent cache so that it is no longer in memory

Beacon and TourTag Enclosures

- Beacon enclosure completed
- Tested out different materials
- Able to be used without any difference with tracking

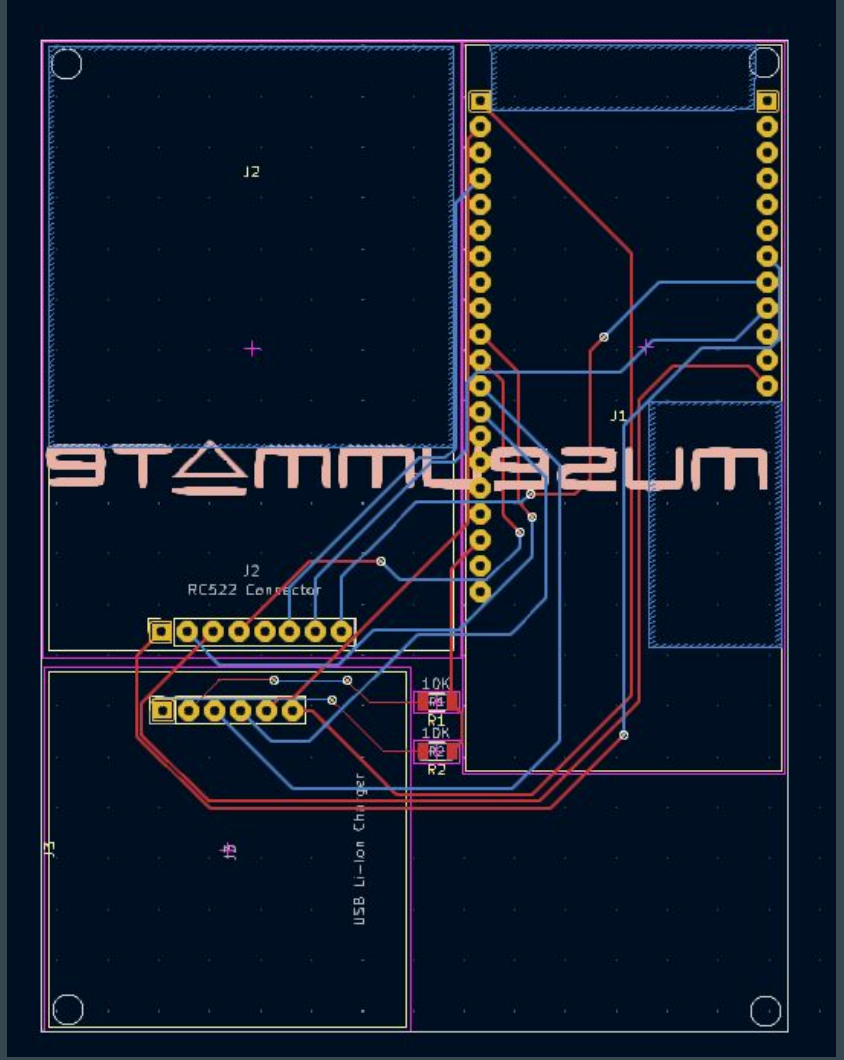


- Tour tag prototype done
- Will be attached to phone using magsafe
- Final design to be made when PCB comes in

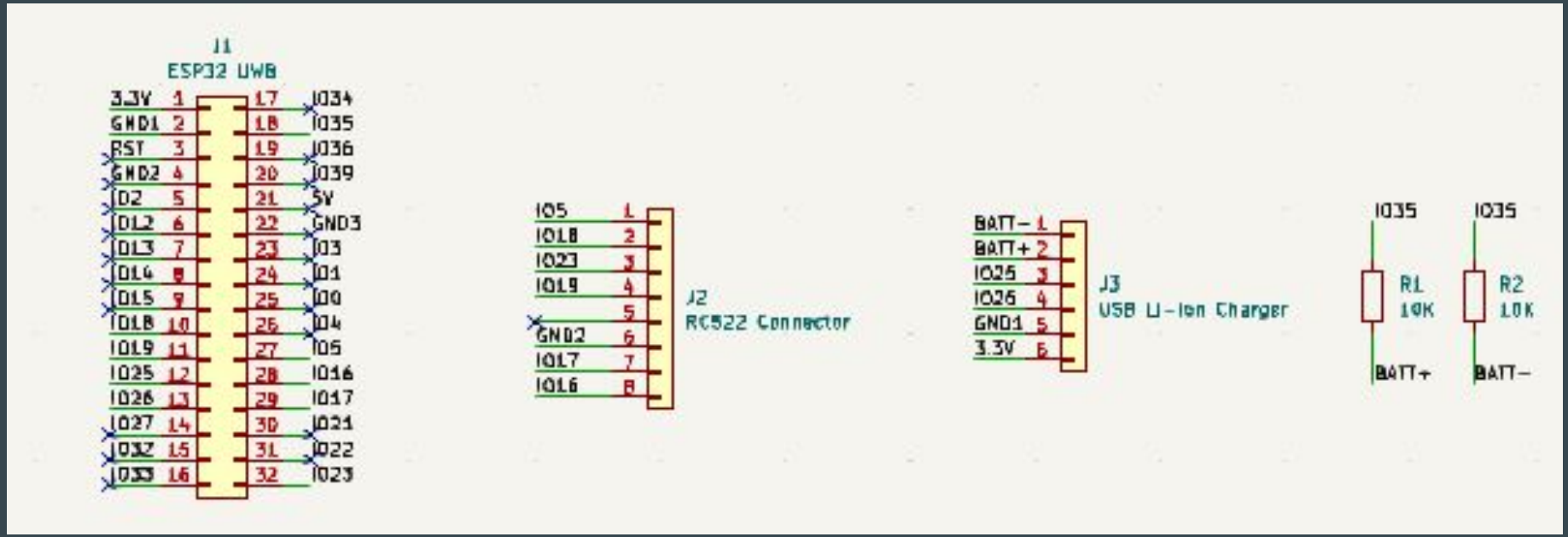
PCB

Current design:

- Rectangular-shaped PCB
- Designed to be attached to the back of an iPhone with Magsafe
- To be contained in 3D printed enclosure



PCB Schematic



PCB - To be completed

Troubleshooting most recent iteration

- ESP32 footprint slightly narrow
- Screw holes not aligned
- Flipped port numbering
- Inclusion of battery status pads
- Traces over exclusion zones

Next steps

- Reorder final PCB iteration
- Add voltage divider circuit to PCB
- Experiment with smaller, minimal designs

Thank You!

Any Questions?