# MINIMAP MINI-UPDATE

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What is Minimap?

- **Problem Statement:** In crowded locations such as music festivals,sports games, or amusement parks cellular service drops due to network overuse. This makes it easier to lose friends and family and harder to find people in large crowds.
- **Our solution:** Minimap, an all-in-one wearable device that allows you to track your friends in crowded spaces.
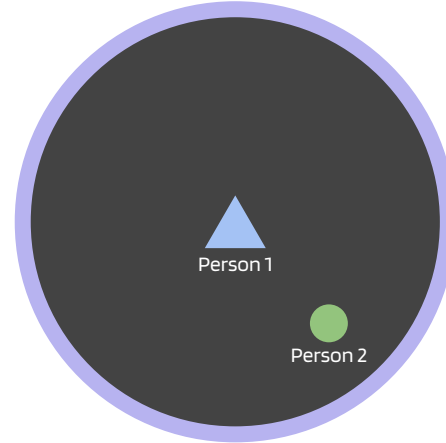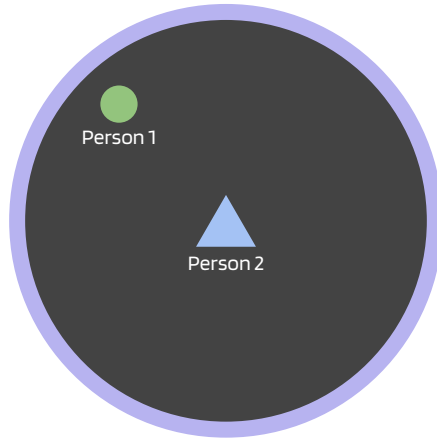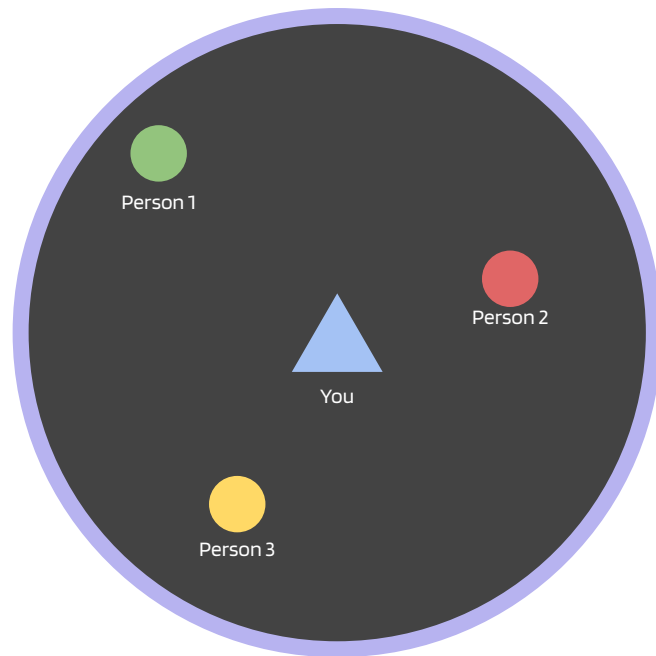
Functionality

Behavior

- Devices securely broadcast geolocation to other devices on the network via LoRa
- Displays a map of the all other devices on the network relative to the user

Features

- Ad-Hoc network over LoRa
- Magnetometer based heading calculation
- IMU to detect wrist position
- GPS Module to read global position
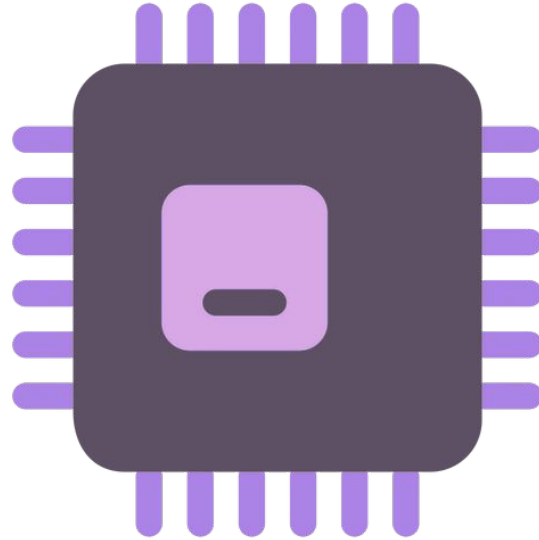- LCD Display

Course Topics

1. **Sensors and actuators**
    a. GPU, IMU, LoRa, Display
    b. Power Management

2. **Wireless communication**
    a. LoRA communication
    b. Clock synchronization
    c. Security & privacy

3. **Embedded Operating Systems**
    a. FreeRTOS + multithreading
    b. Symmetric multiprocessing
    c. Interrupt driven hardware access

Timeline + Workflow
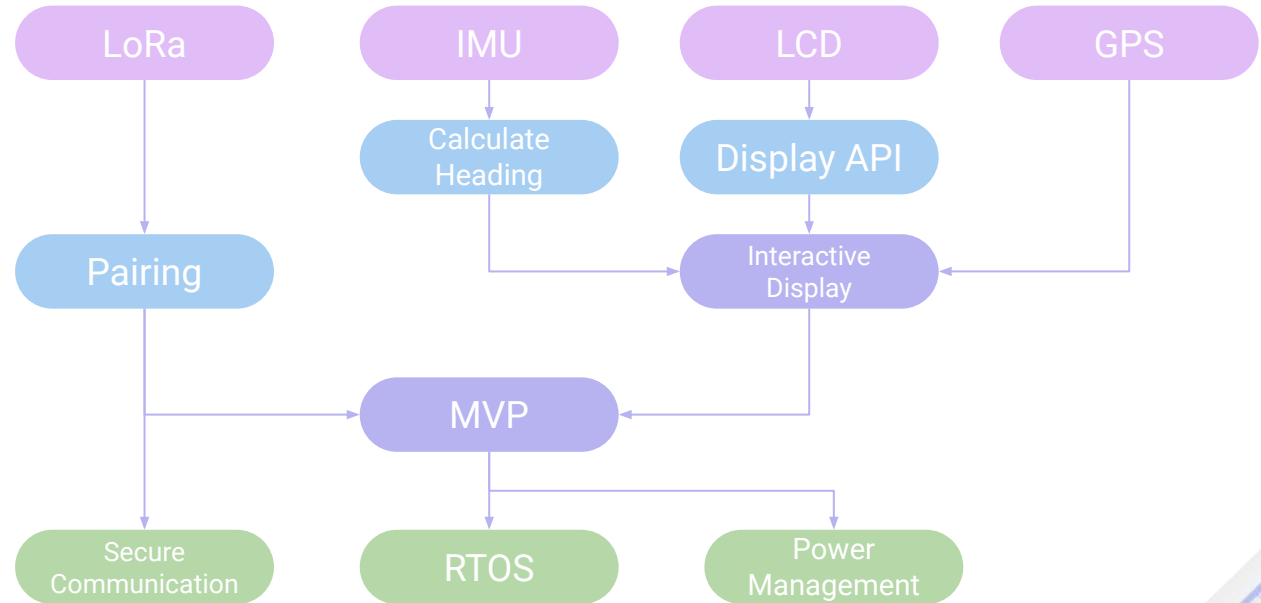
Basic Hardware Interface
Nov 18

Algorithms
Nov 25

Integration
Dec 3

Refinement
Dec 8

LoRa → Pairing

IMU → Calculate Heading

LCD → Display API

GPS

Calculate Heading → Interactive Display

Display API → Interactive Display

GPS → Interactive Display

Pairing → MVP

Interactive Display → MVP

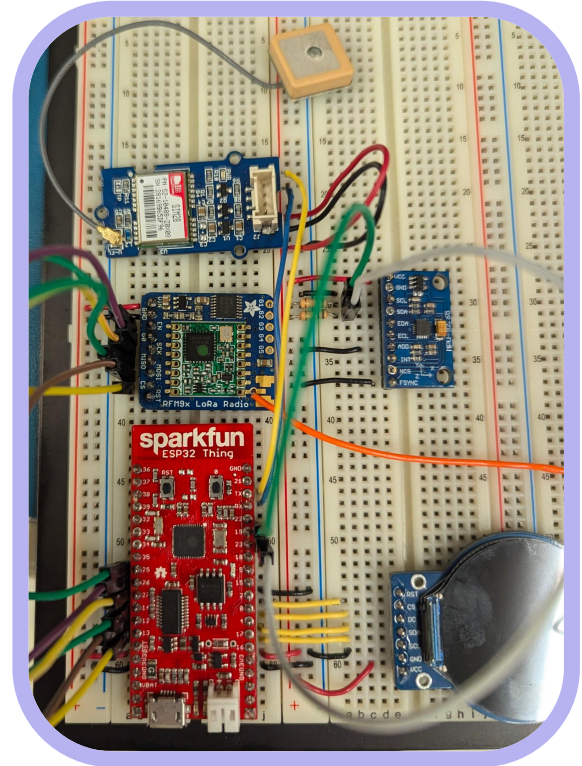Pairing → Secure Communication

MVP → RTOS

MVP → Power Management

Current Status

Completed

- Ordered/Reserved all hardware
- Started breadboard prototyping.
- Verified all hardware (except GPS)

In-Progress

- Designing secure LoRa communication.
- Designing LoRa pairing protocol
- Heading calculation from magnetometer
- RTOS Task development
- Integrating all hardware in one program

(Intended) Final Demo

1. Pairing and proper communication of 2 separate devices.
   a. Secure communication
   b. Synchronized position updates
2. Power saving optimizations:
   a. Display turning off when wrist down
   b. LoRa only when required
3. Demo device working in crowded environment

Current Problems/Challenges

- Dev environment is complex to setup – OS-specific configs.

- Need to program RTOS tasks to avoid synchronization issues over shared data and program both cores of the microcontroller to maximize resource performance.

- Implementing device pairing and communication.

- LoRa should be powered on only during transmission.

- We're also still waiting for a LoRa module before we can have 2 prototypes communicating

Questions