FireSpace

An innovative solution to provide shared situational awareness during wildfires

Problem

Wildfires have increased in frequency by nearly 25% in the last year. In 2020, 10.1 million acres were burned. According to the National Fire Protection Agency, suppression costs have increased from an annual average of nearly $425 million (1985-1999) to $1.6 billion (2000-2019). With the soaring costs of containing wildfires, less funding is going towards prevention efforts and research for improving current wildfire technology and tools.

I**n 2017, nearly 60% of firefighter injuries were the result of hazardous conditions, such as slipping or falling.** As fire seasons grow longer and more dangerous, wildland firefighters need **improved situational awareness for their safety** and for easier crew dynamics in the field.

Solution

Our solution is a **GPS tracking device** that utilizes T-Mobile's NB-IoT network and can switch to long range (LoRa) radio transmission in order to allow for data sharing in low to no coverage areas. The device pairs to a companion app via Bluetooth Low Energy in order show firefighter real-time locations on downloaded geospatial PDFs maps.

The app features **hazard marking and location tracking** of all responders at a wildfire incident. The tracking devices allow for real-time sharing of inputted markers and personnel locations through use of cell coverage or LoRa.

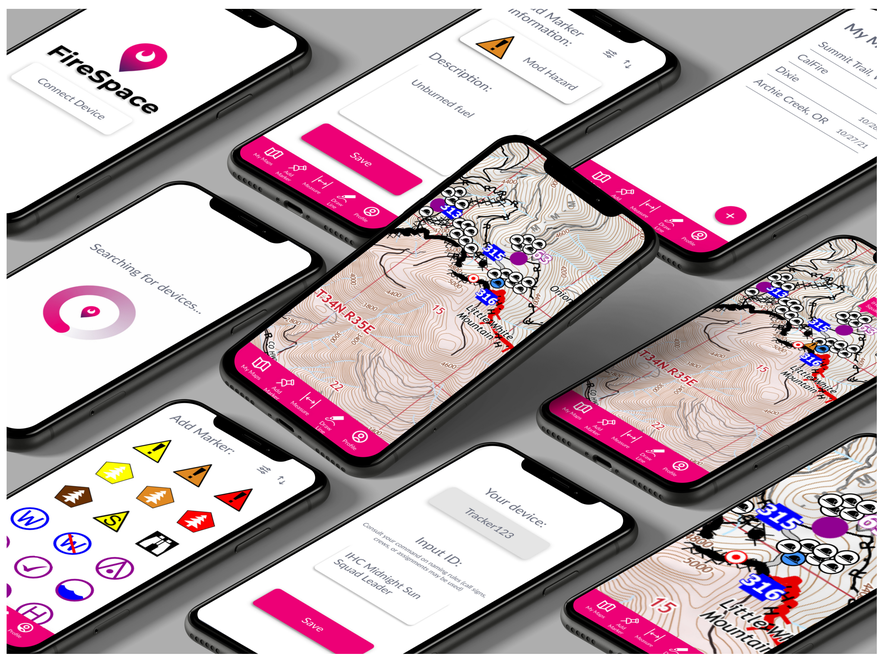
Cellular data is shared between devices and stored in table storage using the Azure IoT Hub. LoRa data is stored locally on the user's mobile app.

Future iterations and features will explore distance tracking, measuring, and drawing of ops lines, such as dozer and burnout lines (as previewed in the UI design on the right). The app will utilize standard Incident Command System (ICS) symbology implemented by the National Wildfire Coordinating Group to match provided GeoPDFs for incident response.

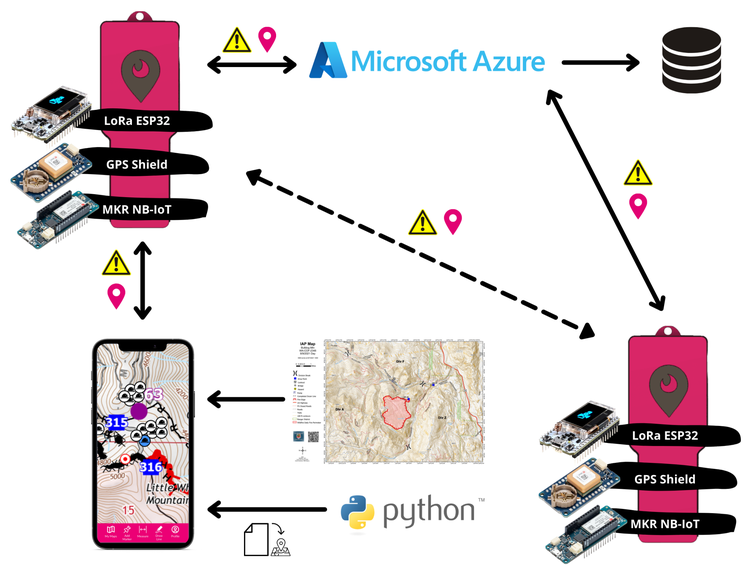
Hazard and Resource Marking provides quick visualization of surroundings and sharing of data.

Real-Time Firefighter Tracking allows for quick visualization of all crew members in the field.

Stored Data can be used for post-fire and incident analyses to improve responses.



Software



Process/Approach

Beginning with thorough secondary research, we explored research questions and existing solutions to better define our problem area. We conducted primary research through **expert interviews with active wildland firefighters** and supervisors who provided us with insight into user needs and pain points of current technologies.

We worked closely with our sponsors at T-Mobile to scope our project focus and determine the most effective way to implement 5G into our solution. We continued to build our hardware and software, while continuously testing our UI features and design with users in order to **prioritize critical functionalities** of the app. We were able to conduct usability testing remotely with firefighters from all around the country, and in-person with local Department of Natural Resources academy staff in local state parks to mock wildland conditions.

We continued to iterate and evaluate our prototypes in order to design and build a simple, data-driven solution that will require minimal interactivity from firefighters, but will provide **location tracking of all responders and offer map visualization and marking.**

Expert Interviews and Contextual Inquiry

- 5 hours of expert interviews with wildland firefighters and supervisors
- Reviewed 50+ articles and resources

Ideation and Brainstorming

- Re-visited research questions and assessed new user pain points
- Created personas and user journey maps

Design and Usability Studies

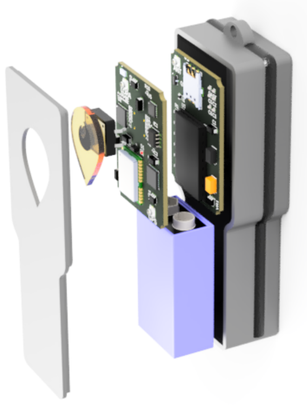
- Created 4 mobile mockups in Figma for usability testing
- Conducted usability tests with 15 wildland firefighters

Implementation and Field Tests

- Conducted 2 field tests with firefighters
- Deployed the app at GIX

Hardware

Current Prototype



Future Concept

GLOBAL INNOVATION EXCHANGE

This project is sponsored and mentored by T-Mobile

WASHINGTON STATE DEPT OF NATURAL RESOURCES

AI2

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MSTI, December 2021