Opportunity and Significance
Weather conditions can be difficult to accurately track for remote locations and very specific areas. Our client, the Department of Defense, is often in areas without readily available weather data. This data is extremely important for the day to day activities of the military.

Technical Objectives
- Allow up to 20 stations to be connected concurrently.
- Stations send temperature, humidity, pressure, and GPS data every 5 seconds.
- Use GPS data to access additional weather data from the web should it be available.
- View where the station is located on a map.
- Average weather data within a location radius.
- Station still records data if loss of internet connection occurs and sends the data once reconnected.
- Set weather alerts for conditions and receive them via email, SMS, and on the web page.

Accomplishments and Results
All technical objectives were completed by the end of the project. The project was built with four working Raspberry Pi weather stations but tests were run by duplicating the client running on each station to ensure at least 20 stations could work concurrently. Two different sensor configurations were included in the project which are shown in Figure 1. The first one is the Sense Hat sensor which is connected directly on top of the Raspberry Pi. The second configuration contains a temperature and humidity sensor with a separate pressure sensor.

Next Steps for Development and Test
Future plans for the continued development of this product would be building protection for each individual weather station. Because these stations will be outside, a certain amount of waterproofing and protection from debris should be added. Further testing can also be done to find a maximum number of weather stations the server can support for various server configurations.

Technical Approach
- Python client on the Raspberry Pi to obtain sensor data, send data, and handle data storage.
- Node.js + Express API to handle asynchronous communication from weather stations and users.
- React (Javascript) frontend website to handle dynamically updating content and display data to users.

Commercialization Plan & Partners
- Handed off to the Department of Defense to be adapted and expanded upon.
- Designed for use by non-technical military personnel.
- Hardware was selected with the goal of striking a balance of effectiveness to inexpensiveness. Different temperature, humidity, and pressure sensor types can be easily added on later.