Dwight Look College of
ENGINEERING
TEXAS A&M UNIVERSITY

Team 08: Marching Band LPS
Bi-Weekly Update 4
Alex Flores, Vlad Lebedev
Sponsor: Troy Morris, Andrew Morris
TA: Vishwam Raval

Problem Statement & Solution

- Problem: Marching bands require very precise positioning for their shows. Currently, the only method of review for marcher positions is a band tower, which is only accessible to the band directors.
- Solution Proposal: We are developing a system of wearable transmitters that send signals to stationary receivers for location calculation. This data is then sent to a web application that is accessible to both marchers and the director for a true bird's eye view
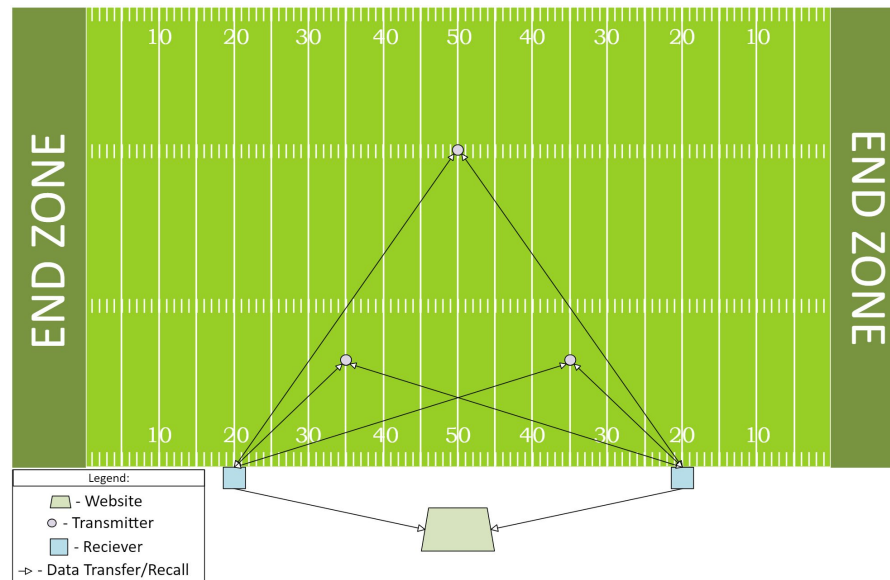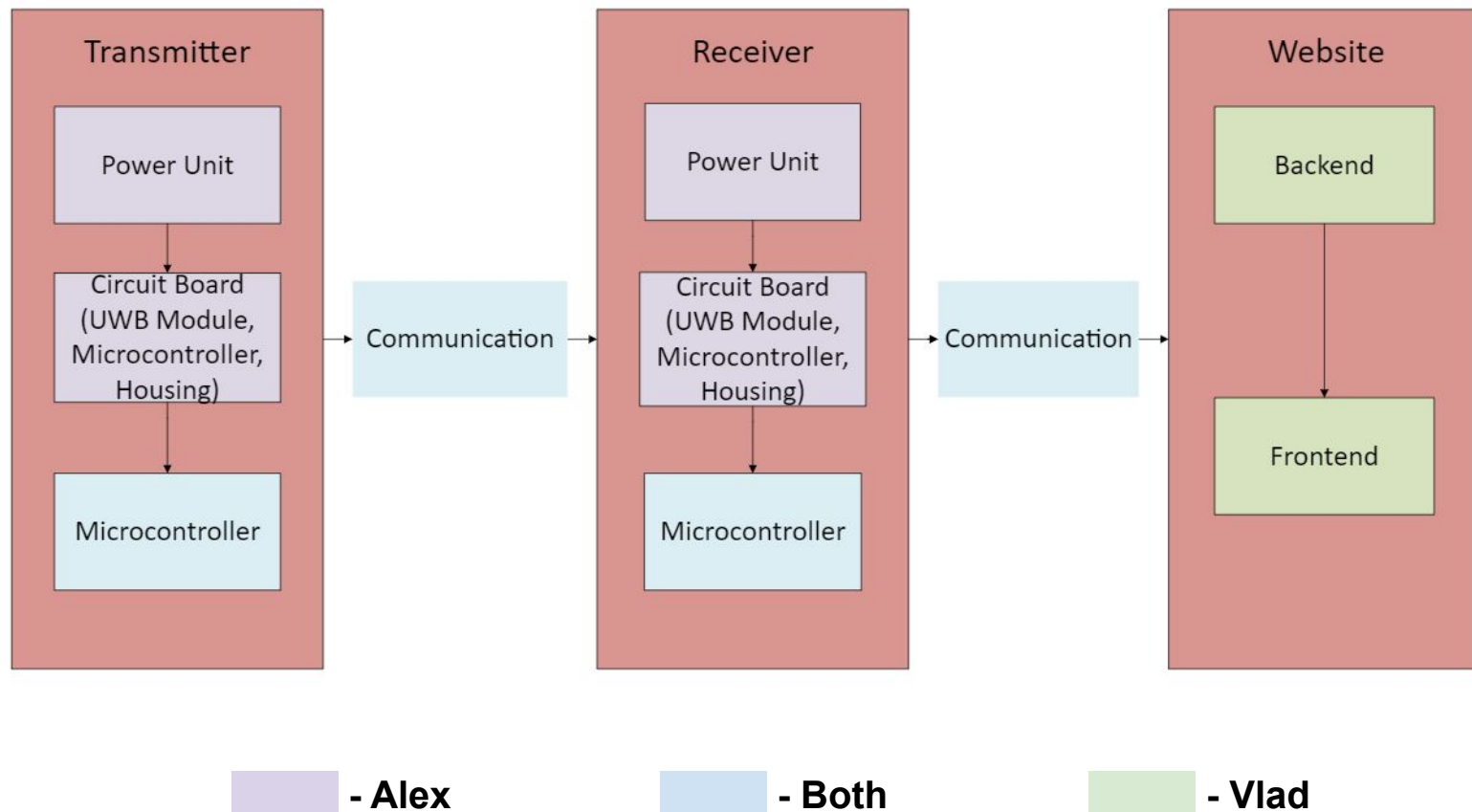
Diagram of Subsystem Division

Project Timeline

Feb 3 - 22:
Implement Arduino
Code for Hardware,
Finalize Website
Subsystem

Mar 10 - Mar 22:
Test accuracy
and range of
LPS system

Apr 21-28:
Final Demo, Final
Presentation,
Engineering Project
Showcase

Jan 20-Feb 1:
Finalize Hardware
Subsystems,
Implement Arduino
Code for Website

Feb 24 - Mar 8:
Test Total Subsystem
Integration, Complete
Integration

Mar 24 - Apr 19:
Create physical
casing and test
physical properties

Integration Process

Alex Flores

Accomplishments since last presentation 20 hrs of effort	Ongoing progress/problems and plans until the next presentation
Battery life tested (Approximately 6 hours) Adjusted firmware to be compatible with boards Confirmed WiFi connection	Need to work on location calculation code Test accuracy and range of devices Start designing physical casing in Solidworks

Integration Photos


```
..........
Wi-Fi is not connecting, please wait.

..........
Wi-Fi is not connecting, please wait.

........
 ESP32 is starting...
Initializing UWB sensor...
UWB sensor initialized!
Connecting to Wi-Fi...
...
Wi-Fi connected!
```
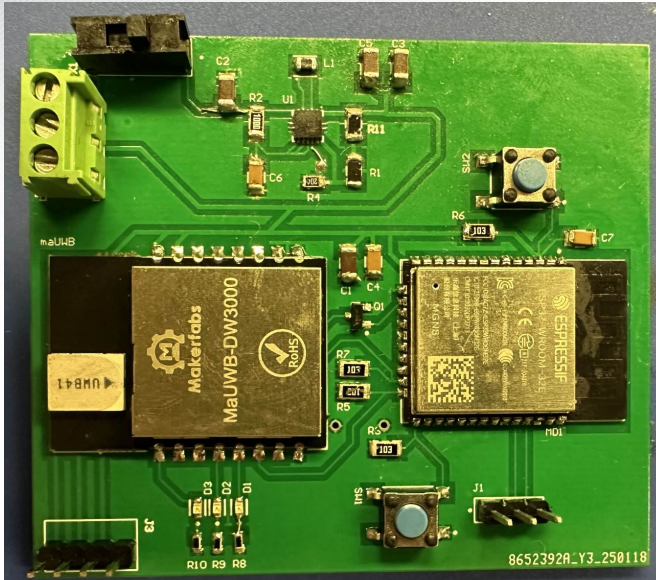
Integration Process

Vlad Lebedev

Accomplishments since last presentation 15 hrs of effort	Ongoing progress/problems and plans until the next presentation
- Adjusted firmware code for compatibility with the boards - Adjusted code website code to read the formatted data it's receiving - Adjusted CSS code for styling - Tested website functionality	- Send data from ESP32 to the website - Compare data pinpointed on the electronic field to the real location of the device

Website Before
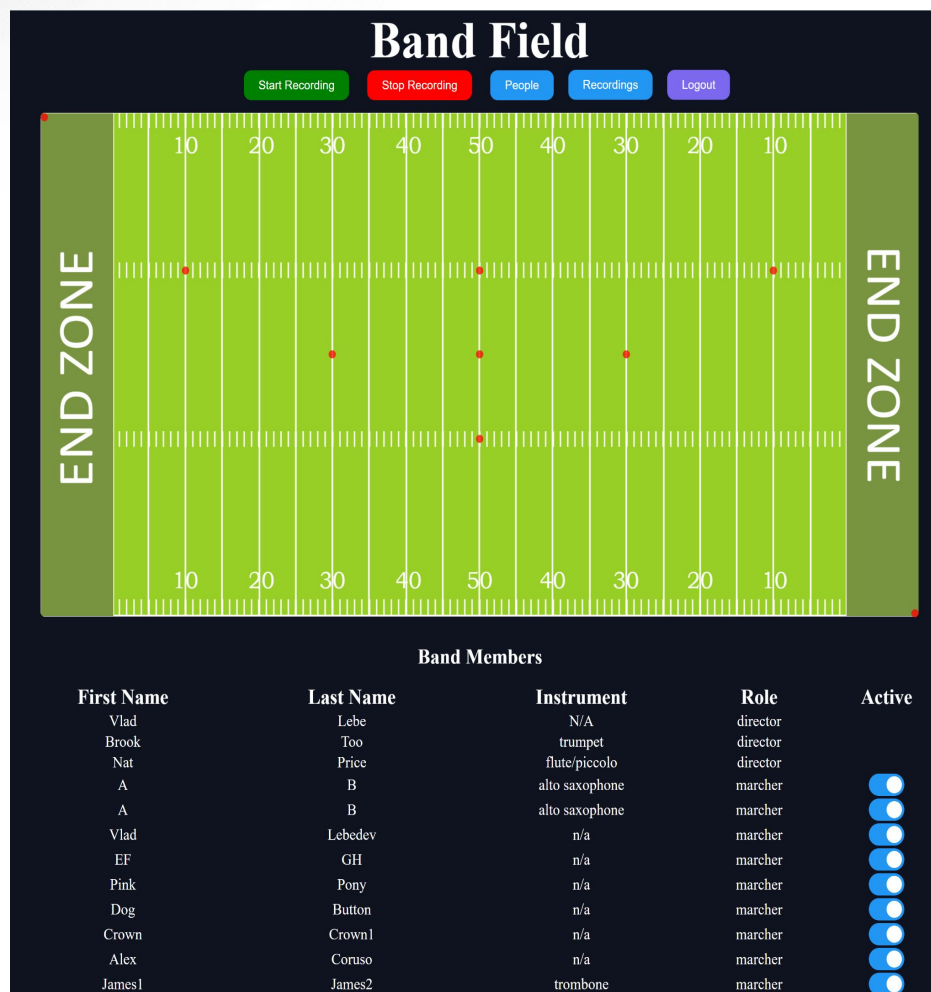
Website After

Execution Plan

Items	Owner	1/27/25	2/3/25	2/10/25	2/17/25	2/24/25	3/3/25	3/10/25	3/17/25	3/24/25	3/31/25	4/7/25	4/14/25	4/21/25	4/28/25
Redesign Board and Order New Parts and Board	Alex	Completed													
Bi-Weekly Update #1	Both	Completed													
Use Arduino to Create Firmware	Vlad	Completed	Completed												
Finalize Arduino Details	Both		Completed												
Solder New Boards and Test	Alex		Completed	Completed											
Test Arduino Code Implementation	Alex			Completed											
Bi-Weekly Update #2	Both			Completed											
Make Changes to Code for Hardware Implementation	Alex			Completed	Completed										
Finalize Website Subsystem	Vlad				Completed										
Bi-Weekly Update #3	Both					Completed									
Test Website Connectivity	Vlad					Completed									
Finalize Integration	Both					Completed									
Test Range of Detection	Both						In Progress	In Progress	In Progress						
Test Precision of Detection	Both						In Progress	In Progress	In Progress						
Spring Break (If needed, catch up if behind)	Both							Completed							
Bi-Weekly Update #4	Both								In Progress						
Participate in Design Blitz	Both								In Progress						
Implement Design Changes if Needed	Both									Not Started					
Bi-Weekly Update #5	Both										Not Started				
Work on Physical Casing	Alex										Not Started	Not Started			
Test Physical Properties (Thermal, Weight, etc)	Alex											Not Started			
Final Presentation	Both												Not Started		
Final Demo	Both													Not Started	
Final Report	Both														Not Started

Legend:
- Not Started
- In Progress
- Completed
- Behind Schedule

Validation Plan

Paragraph #	Test Name	Success Criteria	Methodology	Status	Owner(s)
3.2.1.1	Location Precision	The Marching Band LPS will be able to provide the location of each marcher with an accuracy of +/- 1 meter.	Establish reference points with known positions and compare LPS data to calculate the precision error.	UNTESTED	Full Team
3.2.1.2	Range of Detection	The Marching Band LPS will be able to detect marchers within a football field with the dimensions of 100 meters by 50 meters.	Move around a transmitter at the edges of the football field to ensure stable connection.	UNTESTED	Full Team
3.2.1.3	Website Data Process Time	Location data will be processed and displayed on the website associated with the Marching Band LPS in one second or less.	Add a timer on the display and count the time it takes to process 50 location coordinates.	UNTESTED	Full Team
3.2.1.4	Website Connection	The website will connect through WiFi to the receivers.	Be able to network through a local connection like a hotspot from one device on the python project.	Tested: Success. Connected to WiFi and displayed successul connection message	Vlad Lebedev
3.2.2.1	Mass	The total mass of the PCB and additional hardware will not exceed 1kg.	Measure mass of the hardware with a digital scale.	Partially Tested: Board is small, which leads me to assume casing will be compact enough to meet mass requirement	Alex Flores
3.2.2.2	Volume Envelope	The housing unit for the PCB will not exceed the dimensions of 80 x 80 x 160 mm.	Perform measurements on the hardware to ensure it fits into specified dimensions	Partially Tested: Board is small, which leads me to assume casing will be compact enough to meet volume requirement	Full Team
3.2.2.3	Receiver Mounting	The receiver can be mounted onto a pole similar in scale to that of a speaker stand. The transmitter can be mounted comfortable onto a person	The receiver will be mounted onto a stand and shaken lightly to ensure stability. The transmitter will be worn by and individual who will move to test comfortability	UNTESTED	Full Team
3.2.3.1.1	Power Consumption	The maximum peak power of the system shall not exceed 2 watt hours	Use mulitmeter to validate watt hours for the device	Tested: Success. Totally draw required is 0.78 Wh when adding up current draw from various parts	Alex Flores
3.2.3.1.2	Input Voltage Level	The input voltage level for the Marching Band LPS shall be within 3.0V-3.5V.	Use mulitmeter to validate input voltage levels	Tested: Success. Output is 3.25V	Alex Flores
3.2.4.2	Thermal	The system should be operational in environments that have temperatures within the range of 10°F and 120°F	System will be placed in a heating device and cooling device and be monitored to guarantee operation in the respective conditions.	Tested: Success. Heat was simulated by an oven. Cooling was simulated by being placed in a freezer	Alex Flores

Thank You!