OceanPulse
Listening to the Earth's heartbeat

Marine Open Sensing Platform

Jaryd Dukes | Jorge Gutierrez | Nicholas Mabee | Aarogya Pandey | Camille Wardlaw
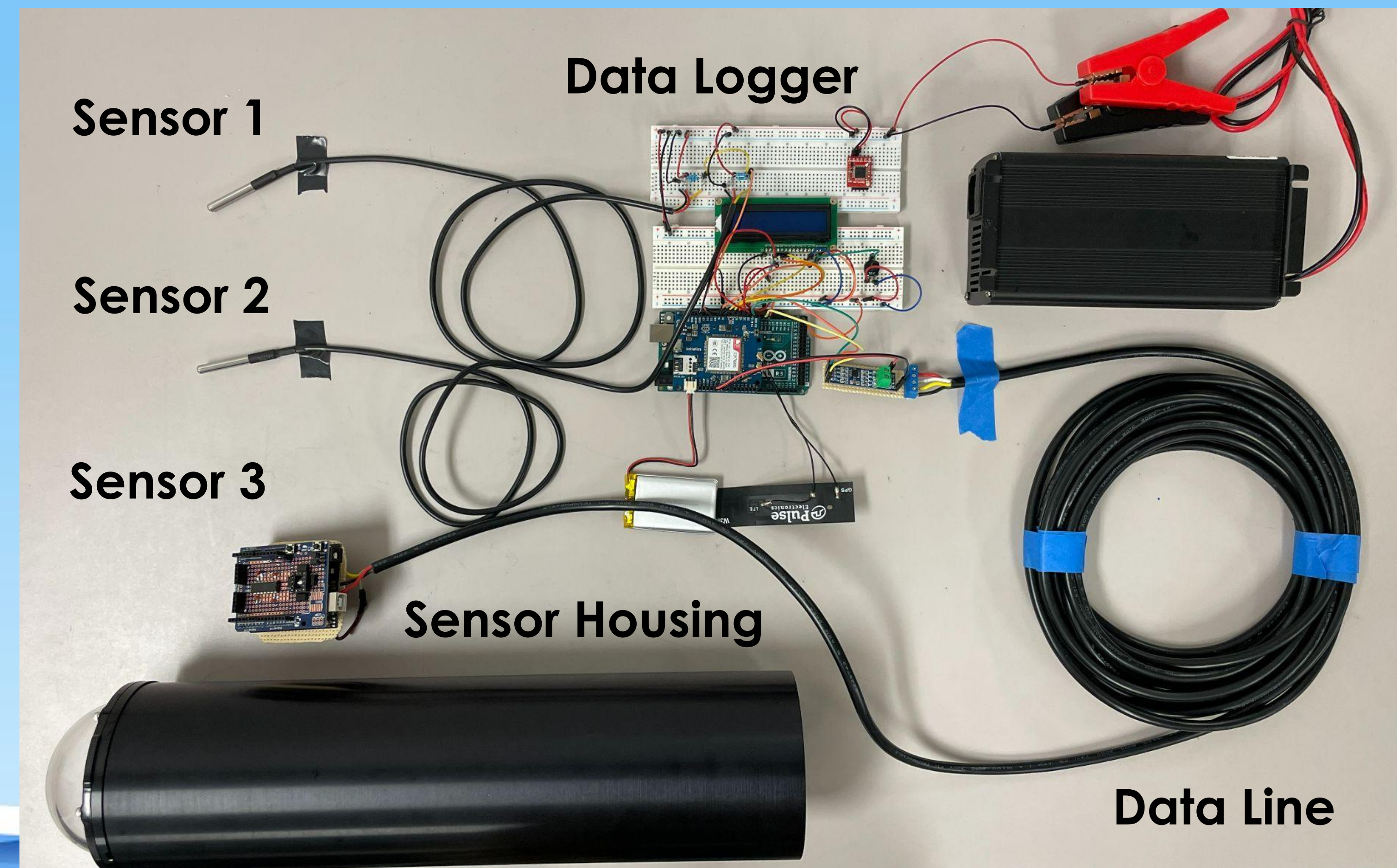
Background

Marine researchers and environmentalists suffer from difficult data acquisition, leading to a general lack of data for their research and hindering impactful studies. Our solution, OceanPulse gathers and delivers real-time marine data through a proprietary network of solar powered, self-sustaining buoys.

Overview

The buoy's structural and power systems were retained from the 2022 Mechanical Engineering Capstone Team, VizNet. The OceanPulse team was then tasked with building an apparatus able to provide power and telemetry to three sensors, one of which was specified to be a custom turbidity sensor designed by the team. To accomplish these goals, the project was split into three subsystems: the data logger, data line, and turbidity sensor.
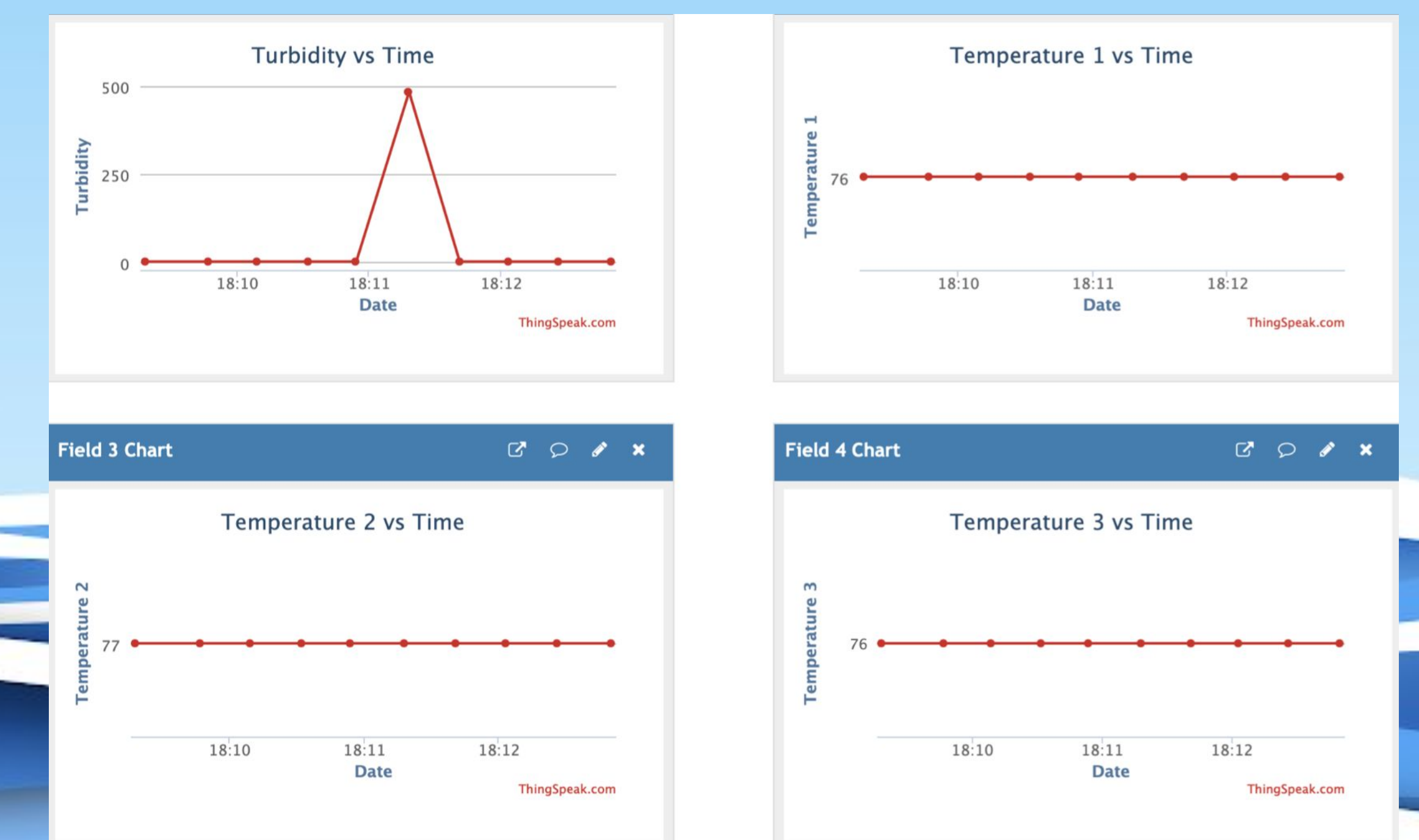
Block Diagram

Final Design

Sensor 1
Data Logger
Sensor 2
Sensor 3
Sensor Housing
Data Line

Subsystem Specifications

Data Logger Subsystem
Comprises of an Arduino Mega, SIM7000A, and Hologram.io SIM card. Our measured sensor data is transmitted to our IoT dashboard over cellular.
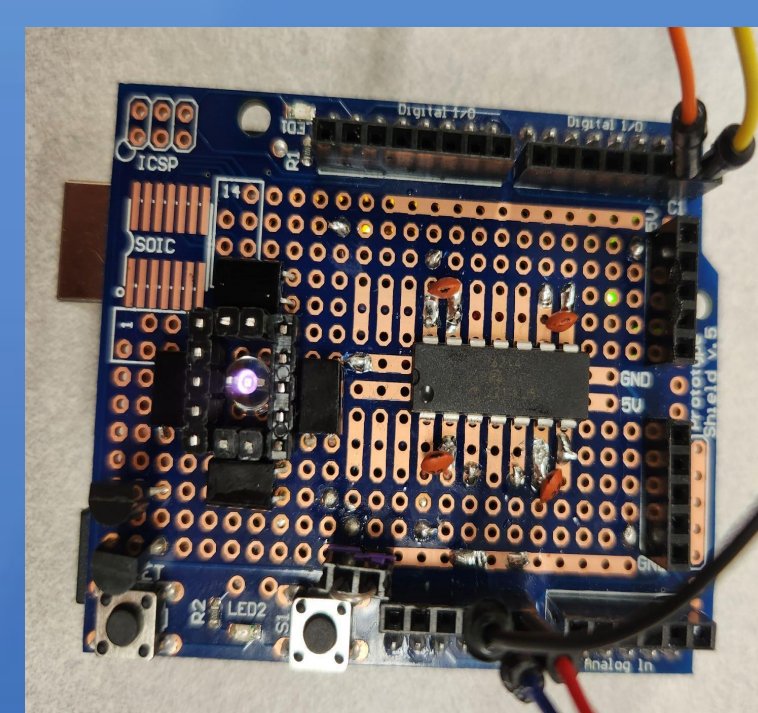
Data Line Subsystem
To support the data transfer, the cable has a CPE waterproof outer jacket and a tinned copper outer shield. The wires are rated at 16 AWG and are capable of sending differential serial data.

Turbidity Sensor Subsystem
An infrared LED surrounded by four photodetectors separated by an ambient light baffle. This is placed inside a water tight housing that only allows the reflected IR light from the particles in water to be detected by the four detectors.

Key Results

Data Logger Uploading

- Data logger system was able to successfully support four sensors at a given time, transmitting data to an IoT dashboard.
- Data transmission included temperature and turbidity.
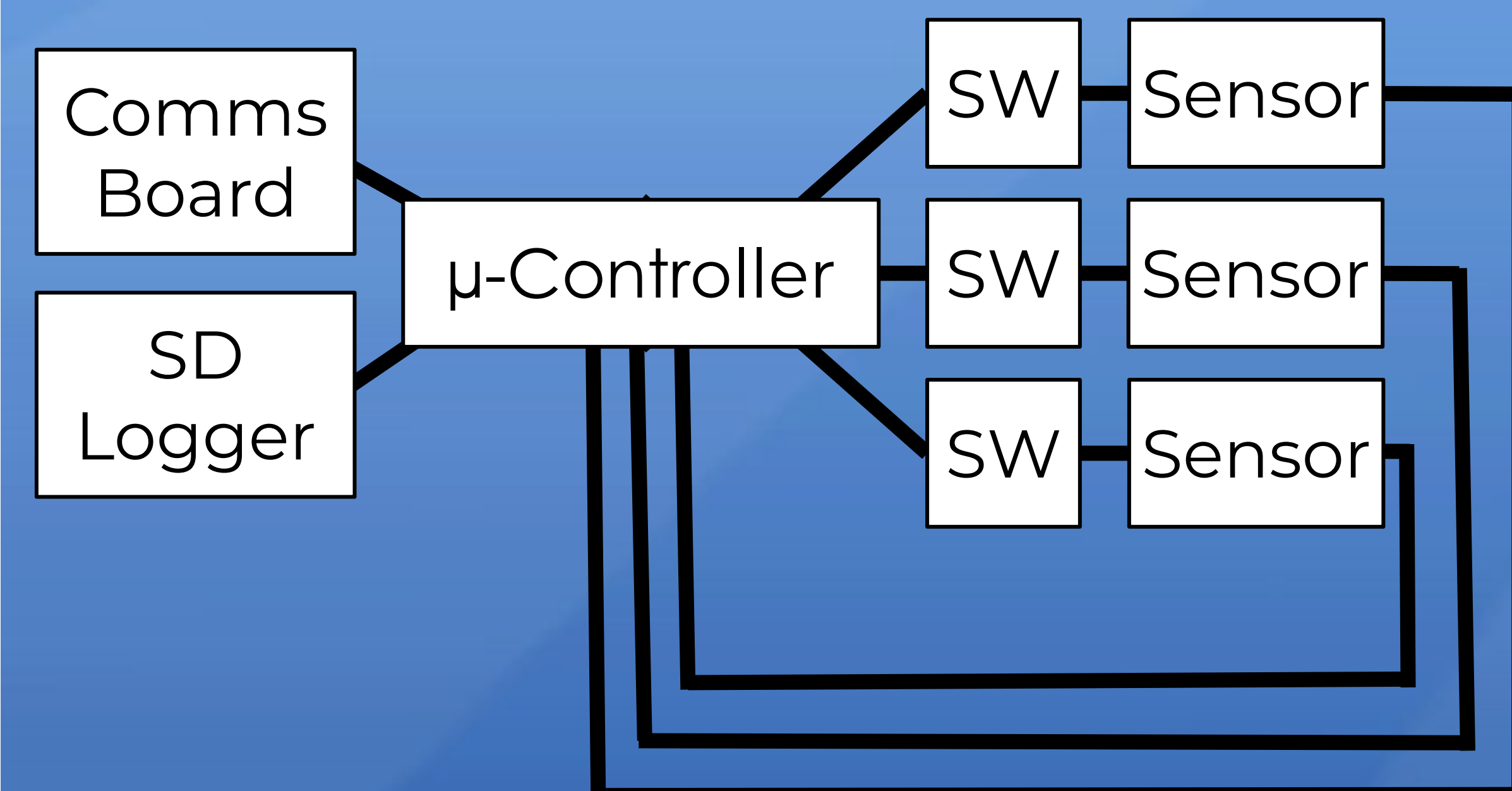

Data Line Transmitting

- Converter boards were able to send serial data between microcontrollers.
- Data from sensor was sent to the data logger with low latency.
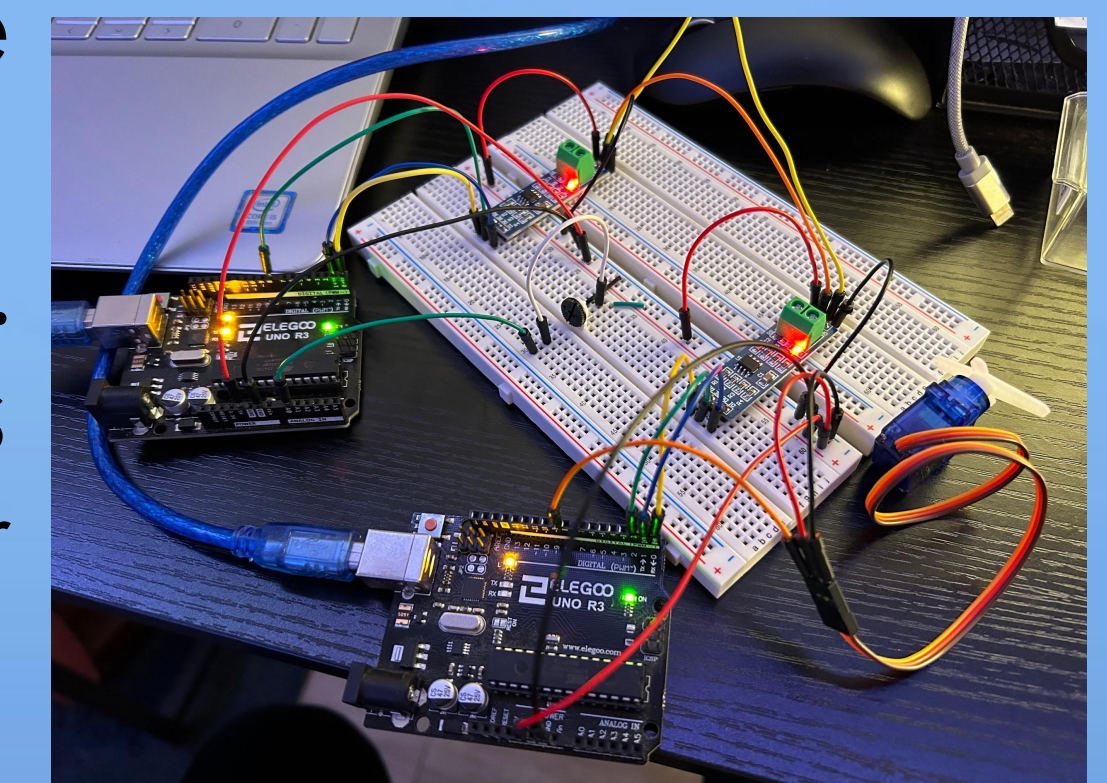
Turbidity Sensor Reading

- Custom turbidity sensor was able to distinguish between water clarity levels differing by mere mL's of dilution.
- Data outputted in National Turbidity Units.

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