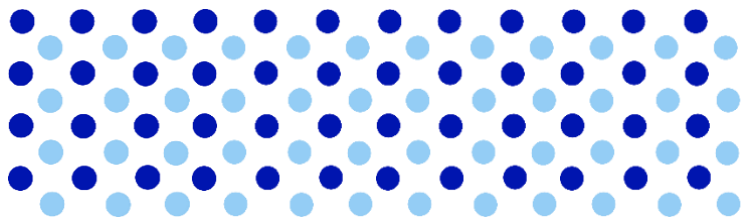


# Project Scope

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Sebastien, Eric, Kayleb and Braden





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## Concept

# User Controllable Modular Aquarium Monitoring and Control System

We are looking to build an aquarium monitoring solution, allowing consumers to build a system comprised of off the shelf components that can centrally manage all aspects of their fish ecosystem. At the heart of our control system is a modular design allowing for a consumer to purchase only the components they require, while being expandable to allow for growth and new aquariums. The system is centrally controlled by a base station with onboard storage and a display for status, warnings and user controllable options. The base station will connect to other nodes which will control and monitor peripheral devices such as temperature and utilize this information to implement fail-safes such as power control. All data and control will be accessible through a web app allowing for real time monitoring, historical data, direct system control as well as setting user defined limits and alarm values.

## Scope

The purpose of Project FishWorks is to prepare a prototype of the controls system to assess feasibility for potential future uses. This prototype will implement core technologies, and a small selection of devices directly related to monitoring and control of a typical consumer aquarium. This will allow us to test and demonstrate the capabilities of this type of system. This prototype will also provide a foundation for future prototypes, both in aquariums and other industries.

A set of requirements was chosen to limit project scope to ensure successful project completion given our limited time frame. Specifically, a smaller list of devices was chosen to demonstrate the capabilities of the control network and web app. As well, the base station and web app will be implemented with only basic pairing and login management control to manage development time. The following is a high-level overview of the requirements. These will also act as deliverables for this project:

- A base station that will communicate between devices and the app via WiFi and MQTT. As well it will handle data logging, providing historical data to the web app, and sending alerts to the user.



- A web app that allows the user to monitor, control and configure devices in the system.
- Node controller boards that will act as a common processor for all devices connected to the control system.
- We will be implementing multiple devices for the prototype aquarium including: lighting control, temperature and humidity sensors, water leak detection, AC outlet control, and Atlas Scientific sensor interface for sensors such as PH.
- Symposium Setup: Fishtank, Sump tank, pump, lighting all powered and controlled by our system.
- Supporting documentation: User Manual, Promotional Materials, Website, and any other needed documentation required by the Project.

## Market Research

There are several existing systems in the marketplace and are priced around \$1000 with a similar set of features. For example: the Neptune Systems A3 Apex Controller System costs around \$900 and it includes 8 outlet switchable power bar, pH and temperature monitoring, audible alarm buzzer, Wi-Fi, hard wired ethernet, analog leak detection, 3 1Link Outputs, 2 DC 24V outputs and 6 digital inputs.

Through our individual life experiences, we were inspired to make a modular monitoring and control system for any use case beside just aquariums, such as aquaponics, hydroponics or above ground fish farms. We believe that by making our system modular we set ourselves apart from other products. Through our initial set up we have already found a use for the hardware as a live weather monitoring station that is currently viewable online (Ask Sebastien).

## Cost

Tables 1, 2, and 3 outline an estimate of projects cost, both labour and materials. This includes materials to construct a few additional controllers and nodes to use for future prototypes outside the scope of this project. This budget does not include some costs incurred during R&D completed before the start of the project (September 2024) that will not be used in the final prototype.

Table 1 - Materials

Items	Price (CAD)
Base Stations	\$200
Node Controllers	\$300





Lighting Assembly and Control	\$150
Tank Mechanical	\$250
Temperature/Humidity	\$20
Leak Detector	\$10
A/C Outlet Control	\$100
<b><u>Total</u></b>	<b>\$1030</b>

**Table 2 - Labour**

Item	Rate	Hours	Cost (CAD)
Standard Labour	\$45/hr	2400	\$108,000
Overtime Allowance (10%)	\$67.5/hr	240	\$16,200
<b><u>Total</u></b>		<b>2640</b>	<b>\$124,200</b>

**Table 3 - Totals**

Items	Price (CAD)
Materials	\$1030
Labour	\$124,200
<b><u>Total</u></b>	<b>\$125,230</b>

