DALHOUSIE UNIVERSITY
FACULTY OF ENGINEERING

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Aquatron Smart Lab Phase II

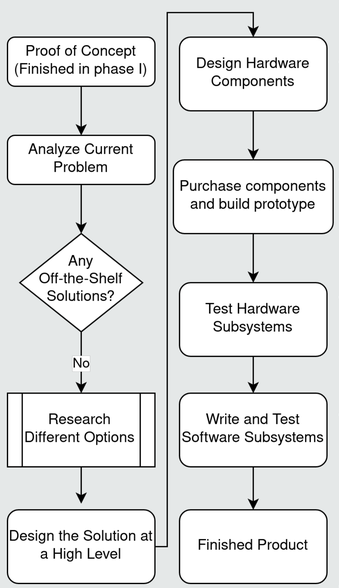
Introduction

The Aquatron Laboratory is an oceanography research centre on Dalhousie's main campus. Their research facilities include tanks of water, controllable lighting, and a constant supply of fresh and treated ocean water for running experiments involving ocean life.

Problem: Due to the sensitivity of some of the experiments run in these labs, it is not ideal to frequently enter the room to monitor the experiment.

Solution: To solve it, a solution was proposed to build a monitoring system contains sensors of water temperature, ambient temperature, humidity etc. where real-time data can be viewed from a mounted screen outside the room as well as remotely via the internet.

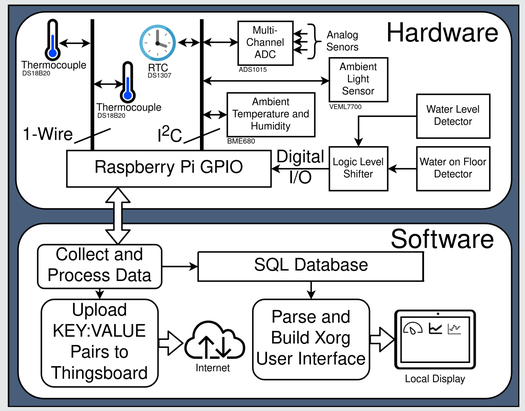
Design Process



- **Previous Work**: Previous group proof the concepts of this project and tested several sensors.
- **Initial Planning**: Based on the proved concept, collected and discussed the most demanded attributes with the client.
- **Problem Analysis**: Created a list of problems and searched for whether an off-the-shelf solution exists.
- **Brainstorm**: Evaluate different options based on performance and the cost. Designed a solution cooperates the most attributes.
- **Improvement of Design**: With the permission of the client, integrate functional components into a PCB board and change data storage method from JSON file to PostgreSQL database.
- **Prototype**: Order the parts and assemble the initial prototype. Test, debug and fix problems.

Detail of Designs

- **System Architecture**



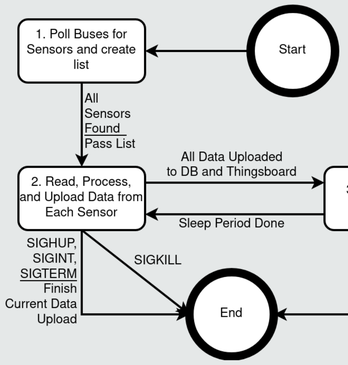
On the left is the scope of system architecture for this project:

Hardware: Design a PCB board to replace Arduino in previous plan

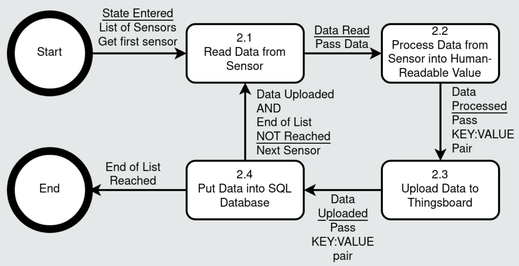
Software: Design the GUI on local display, connection with ThingsBoard for web display and data analyze on backend.

- **Data Processing**

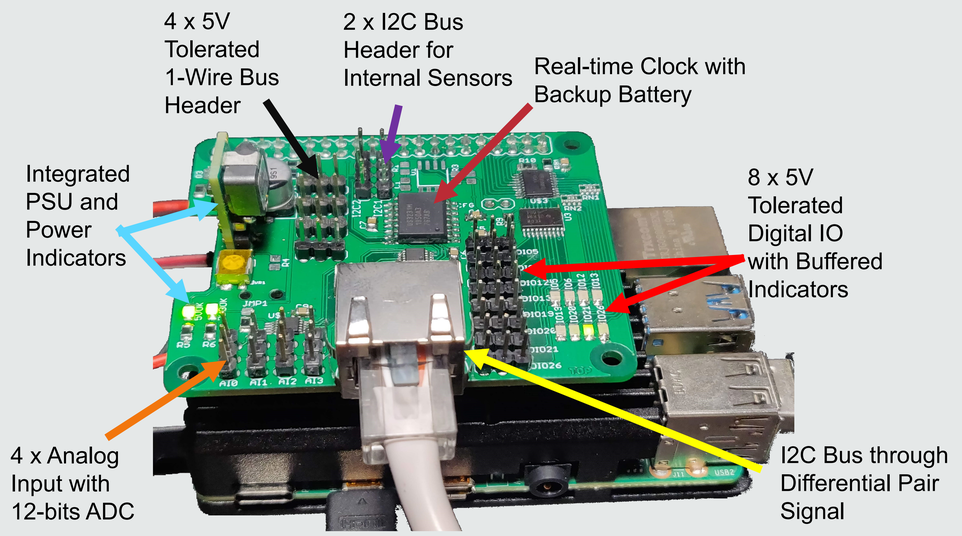
High Level Backend Overview



Sub-State Diagram for State 2

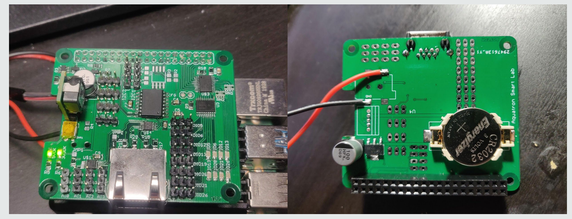


- **PCB Board Design**

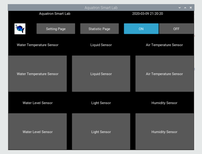


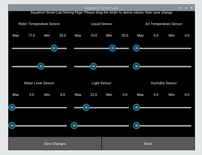
Preliminary Result

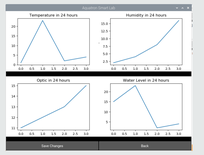
- Overall, the PCB design is done and obtained the prototype installed and worked well on Raspberry Pi



- Then the basic GUI framework on Raspberry Pi screen is built, contains three pages: Main, Setting and Statistic

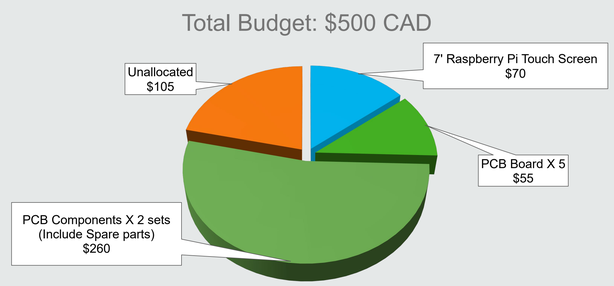


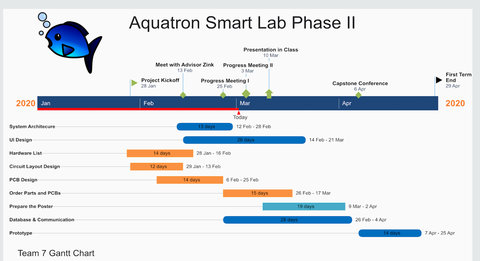




Project Management

- Project's budget is $500 CAD in total, currently there is still $100 CAD unallocated budget left for next term sensors





Reference

- Dalhousie University Aquatron Laboratory
  - https://www.dal.ca/dept/aquatron.html
- ThingsBoard IoT platform
  - https://thingsboard.io/