

**Deakin University**

Kelp the World

Project Handover

27/09/2019

Project Sponsor

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Project Team

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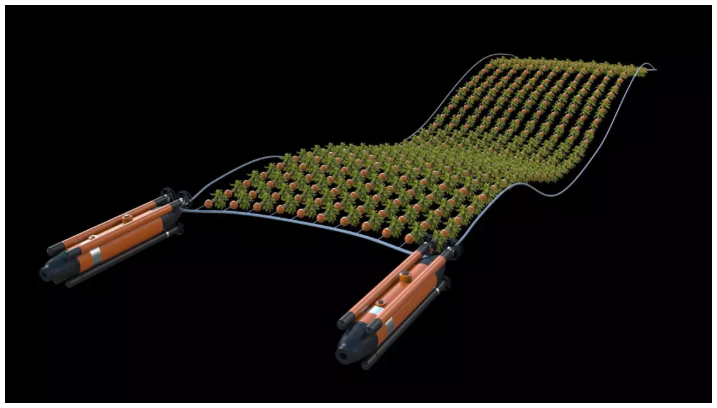
Document Version 2019-09-27

# Purpose

This document defines the transfer of all relevant information and artefacts produced during SIT209. With this document, a new member can identify all key aspects and artefacts of the project and have access to key systems or configurations.

# Project Description

* A floating kelp farm is a concept that would benefit from a real-life prototype.
* There is a concept to create frames of kelp farms that float just below the surface and constantly moved downward to accommodate the growth of the kelp, pressure changes at depth and the amount of buoyancy/water displacement will required will require constant management, the kelp requires a certain temperature of water, amount of light to remain healthy. An independent pump with its own buoyancy control will also be required to move cold water from the depths, mass monitoring will be useful for knowing when forests should be harvested/managed, location tracking will be important for management during storms and other emergencies.
* The ‘ultimate goal’ would be to create an opensource, robust, scalable, cost efficient, easily deployable, prototype of this frame, with mass sensors, light sensors, pressure sensors, gyroscopes, GPS. And have various interfaces for different roles to monitor huge numbers of frames; farmers, maintenance people, clients, environmental groups, press etc.
* This product is a concept only, this would be the first public prototype.



Fast Company Kelp Farm Concept [3]

References

1. <https://oceana.org/blog/seaweed-could-be-scrubbing-way-more-carbon-atmosphere-we-expected>
2. <https://carboninstitute.org/kelp-and-carbon-sequestration-bringing-terrestrial-carbon-accounting-to-the-deep-sea/>

# Artefacts List

|  |  |  |  |
| --- | --- | --- | --- |
| **Artefact Name** | **Artefact Type** | **Revision Number** | **Notes** |
| Source Code | GitHub Repository | 2019-09-27 | Live |
| MQTT Login | Image | 2019-09-27 |  |
| MQTT Topic format | Image | 2019-09-27 |  |
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |

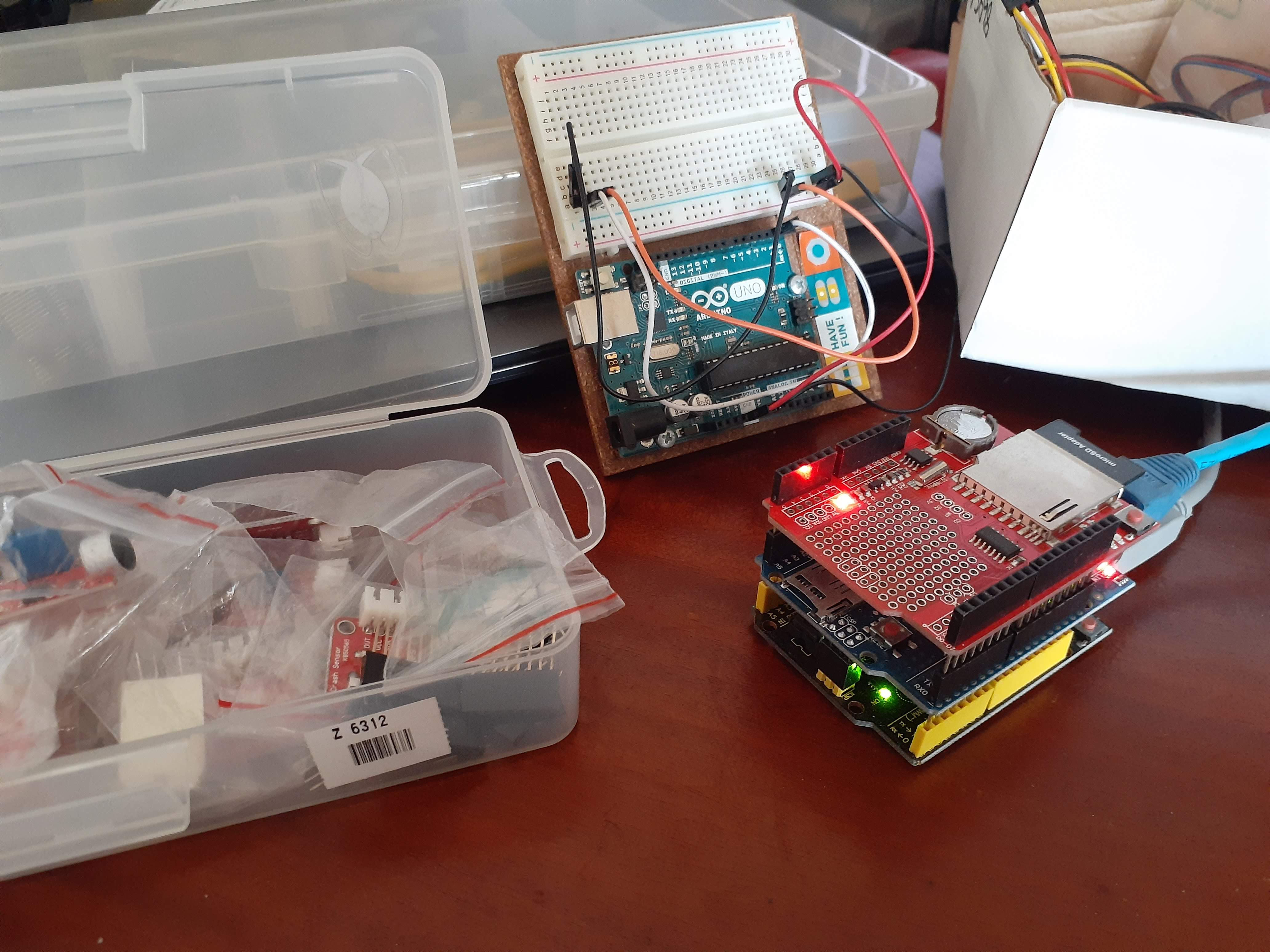
## Source Code

<https://github.com/gregorymcintyre/sit209-iot-app.git>

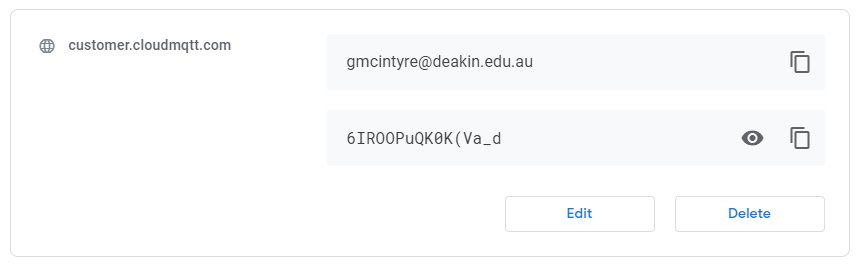
The source code for this project can be found at this git public repository, as this is a if you would like to contribute to this project or use it as a foundation please feel free to contact the git owner or credit the original authors.

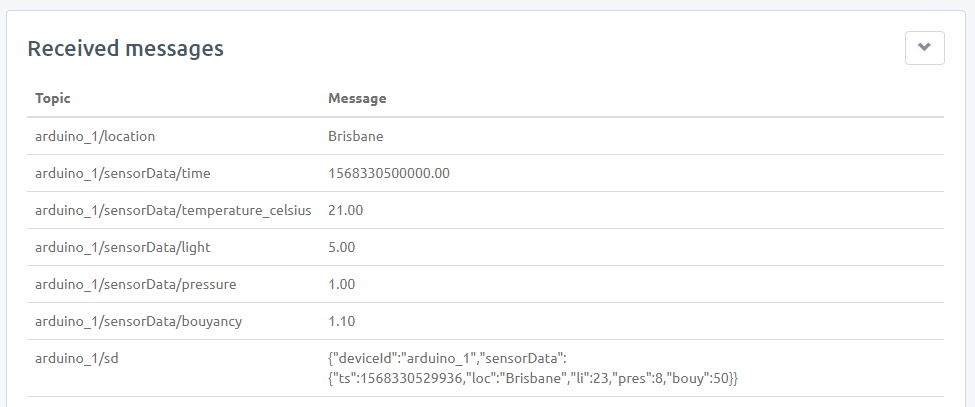
## Control Device

sit209-iot-app/Kelp Farm Control Units/



The initial concept control device (CD) was created as a local Arduino Uno, an ethernet board and a data logger. This was a simple prototype used to transmit a data stream to cloudMQTT. Login details are below. As well as the topics transmitted by the device





# Backend

# GUI

# Business Features

|  |  |  |  |
| --- | --- | --- | --- |
| **Feature** | **Client Sign-Off State** | **State** | **Notes** |
| API | 9-09-2019 | Complete | MQTT JSON |
| Arduino Concept Control Device | 27-09-2019 | In Progress | True sensors have not been implemented |
| Backend |  |  |  |
| GUI (Frontend) |  |  |  |

1. **Create a service API for KelpTheWorld**

A communication protocol was implemented using MQTT in a JSON format for passing information from control device to the backend. The CloudMQTT web service was used as a medium for this

1. **Create an Arduino frame concept to receive sensor data and transmit to web server**

A simple working Arduino control device was made, the device is currently only a publisher. The backend did not progress far enough to transmit buoyancy control information back to the control device. The Arduino CD has the capability to be connected to a light and pressure sensor quiet simply, the mass sensor usable in an under-water variable pressure environment has not be found at this point. The buoyancy control has not been developed.

1. **Create an Arduino control for water pump control**

The Arduino pump controller was not progressed on. It could be developed from the control device using a water temperature sensor and the same buoyancy control methods as implemented in the control device

1. **Create a web server to receive data from various farms**
   1. MQTT (farm/1, farm/2, pump/1, pump/2)
   2. Translation of raw data into usable information.
2. **Create a web interface to display data**
   1. Maintenance
   2. Farmers
   3. Public

# Planned Work

|  |  |  |  |
| --- | --- | --- | --- |
| **Planned Feature** | **State** | **Sprint** | **Notes** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## Control Device

Planned work for the control device would include, selection and addition of the appropriate hardware enabling the device to pass real life information. Other mediums such as Raspberry PI or other simple PCI controllers could also be programmed to work as control devices in the future as technology, price positions and hardware availability change.

The control device also needs to be developed to subscribe to a topic of buoyancy data in order to react to the backend logic, as the backend develops this will be more realistic. It is expected for data integrity that this would arrive as a JSON object possibly in a format such as below. For consistency it would be best to send an intended pressure value in atmospheres in order to reduce the amount of processing the CD would be required to perform, this would reduce the required processing ability of the device and possibly reduce costs.

Topic /aruduno\_1/control

{“deviceid”:”arudino\_1”{“boyancy”:1.5}}

Implementing a dual subscription would allow us to change the topic data format from;

Arudino\_1/sd

{"deviceId":"arduino\_1","sensorData":

{"ts":1568330529936,"loc":"Brisbane","li":23,"pres":8,"bouy":50}}

To something more descriptive and detailed such as;

**Publish**

Arudino\_1/details

{"deviceId":"arduino\_1", ”loc":"Brisbane"}

Arudino\_1/sensorData

{"time":1568330529936,"light":23,"pressure":8,"bouyancy":1.5}}

Arudino\_1/pump

{"time":1568330529936,"temperature":10,"bouyancy":1.5}}

**Subscribe**

Arudino\_1/control/cd

{“deviceid”:”arudino\_1”{“{“buoyancy”:1.6}}

Arudino\_1/control/pump

{“deviceid”:”arudino\_1”{“{“buoyancy”:1.8}}

## Backend

## GUI

# Open Issues

## Control Device

The limitation of the MQTT data packet (128 Bytes) has been an issue since sprint 3. the backend required development to handle more topics than it currently does. this has already been elaborated on in the future work section.

## Backend

## GUI

# Lessons Learned

# Control Device

The Arduino was a great prototyping piece of hardware, but the limitations of the MQTT data format was an interesting hurdle to overcome.

# Backend

# GUI

# High-level architecture of the product

# 

Probably need to redo this, if you have input please add team -GM

# User Manual

## Control Device

sit209-iot-app/Kelp Farm Control Units/Arduino/**KelpFarmControlDevice/**README.md

### KelpFarmControlDevice.ino

Kelp Farm Control Device

/\*---------------------------------------------------- Program: KelpFarmControlDevice

Description: Basic MQTT node using Arduino Uno

Hardware: Arduino Uno R3, Ethernet Shield (W5100), DHT11.

Software: Developed using Arduino 1.8.5 IDE

Libraries: -PubSubClient -SPI -Ethernet -DHT

Date: 2/9/2019

Author: Greg McIntyre ----------------------------------------------------\*/

##Directions for use

* make sure ip reflects an appropriate ip address for the device IPAddress ip(192, 168, 20, 7); <<<<<<< HEAD
* update

#define PUB\_TIME "arduino\_1/sensorData/time" // MTTQ topic for temperature [C]

#define PUB\_TEMP "arduino\_1/sensorData/temperature\_celsius" // MTTQ topic for temperature [C]

#define PUB\_LIGHT "arduino\_1/sensorData/light" //

#define PUB\_PRESSURE "arduino\_1/sensorData/pressure" //

#define PUB\_BOUYANCY "arduino\_1/sensorData/bouyancy" //

=======

- update to reflect unique identifier for your control unit (eg. arduino\_2)

>>>>>>> 0dd07d7ce39c84d69a0939757aceb684cb95774b

```#define PUB\_LOC "arduino\_1/location"

#define PUB\_TIME "arduino\_1/sensorData/time"

#define PUB\_TEMP "arduino\_1/sensorData/temperature\_celsius"

#define PUB\_LIGHT "arduino\_1/sensorData/light"

#define PUB\_PRESSURE "arduino\_1/sensorData/pressure"

#define PUB\_BOUYANCY "arduino\_1/sensorData/bouyancy"

<<<<<<< HEAD

#define SUB\_LED "arduino\_1/led" // MTTQ topic for LED```

to reflect unique identifier for your control unit (eg. arduino\_2)

=======

#define SUB\_LED "arduino\_1/led"```

>>>>>>> 0dd07d7ce39c84d69a0939757aceb684cb95774b

## Backend

## GUI

# Other Documents

## Control Device

## Backend

## GUI

# Sign-off

We KelptheWorld have included all relevant material which is agreed to be included in this handover. If an artefact is not included, it is stipulated in the Planned Work section, or artefacts list.

Date:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signed

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