Creative

Protocol

Assessment 3 - IT Project
Team Creative Protocol
For Introduction to Information Technology
(COSC2196)

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Matthew McCracken, Cameron McLaughlan

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Contents

Website Links

Group Git Repository

Assessment 2:   https://github.com/SamuelPaulAshton/2020SP2Group18A2

Assessment 3:   https://github.com/SamuelPaulAshton/2020SP2Group18A3

Other Links

Creative Protocol: https://

Prototype Dashboard: https://

Part I
Team Profile

Contact Details And Profiles

Samuel Ashton:

Student ID:	s3742249
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GitHub link:	https://samuelpaulashton.github.io/IIT/

Hi, I'm Samuel Ashton (s3742249)
Team: Creative Protocol
I am a Brisbane based IT professional, working in the industry for the last 17 years. Having been interested in IT from an early age I have interacted with technology from the late 80's Starting with an MSX2 microcomputer, watching computing evolve through generations of advancement to today's world of cloud computing and online mobile devices in everyone's pockets. Throughout my career I have performed roles in IT support, System Administration, Network Engineering and IT Management. When not in front of a computer, I enjoy fishing with my two children, Japanese sports cars and collecting Phantom comics, even if I don't get time to read them all!

Ideal Job: CTO – Chief Technical Officer - Not Ranked
Required Skills:

- Communication
- Technical Knowledge of Subject Matter
- Love of Learning
- Adaptability
- Big Picture Thinking
- Diplomacy and Patience
- People Skills
- Strategic Thinking
- Listening
- Coding
- Time Management
- Security and Privacy Management
- Mentoring

Shane Bunting:

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Hi, I'm Shane Bunting (s3407441)
Team: Creative Protocol
I am a 27 year old, Melbourne born Libra with my general interests being fitness, cars (Subaru all the way), computers, gaming, animation and security. Straight out of year 12 I went on to complete my certificate 4 in fitness and begin the journey into personal training. It was a weird time for PTs back then and from there I continued to upskill where possible and work on the side where ever I could. I obtained my pre app in electrical, but was unable to land a job due to being of mature age, basically it cost more to hire me. I also attended university for Game Art and Animation, but financially living expenses where too much at the time, so I had to leave and gain full time employment. Moving forwards, this instead led me to many physical related jobs. This brings us to where I am now, I am on the hunt to pursue my hobbies and turn them into a career in something I am able to commit to long term, as my body has begun to give me signs that it's time to take it back a notch. When I was in year 10, about 15 years old, my parents took my brother and I out of school for a year and we travelled around Australia (Tasmania inc) and also the South island of New Zealand. It was a life changing experience that looking back on wasn't as bad as 15 year old me made it out to be.

Ideal Job:	Senior Incident Response - Not Ranked
Required Skills:	

- Skills probably very closely match Network Security Manager
- Mangement
- Communication
- Digital Forensics
- Cloud Analysis
- Reverse Engineering
- Penetration, Red Teaming
- Threat Hunting

Jessica Delgado:

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Hi, I'm Jessica Delgado (s3864357)
Team: Creative Protocol
I am a 28 year old transgender woman living in Sydney and I currently do
IT support for eHealth NSW. I am an amateur musician and have learned
how to learn play a new instrument every year since age 16. From the age
of 18 I completed a Cert IV in Network Administration, Programming and
a Diploma of Information Technology. From there I was able to secure em-
ployment in a helpdesk role, supporting the largest library of applications
used by a single organisation in the southern hemisphere. I have been able
to perform various roles within the same organization, moving to application
support for the eMR (electronic medical records) systems used in hospitals.
I now work as a senior support technician for eHealth.

Ideal Job: IT Program Manager - Not Ranked
Required Skills:

- Communication
- Patience
- Technical Skills
- Flexibility
- Stress Tolerence
- Project Management Methodology (Waterfall, Agile, etc)
- People and Resource Management

William Ericson:

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Hi, I'm William Ericson (s3866209)
Team: Creative Protocol
For my hobbies, while I enjoy listening to music, I also used to make my own, I studied Music Performance and Technical Production, Yes, I have performed live, no, I will not show you the videos. Over the years, I have hoarded a fair bit of music, while the bulk of my collection is digital (it takes up less space), I also have a sizeable collection of CDs and cassette tapes (and a few records here and there). I've been interested in IT from a young age, it all started when one of my cousins showed me how to use Cheat Engine, while I had fun adding extra stuff to the games I played, I also enjoyed putting in random codes and seeing what it would do. Before joining RMIT, I studied Computing at Deakin College and then Computer Science at Deakin University, but it reached the point where rent was too expensive, so I had to leave.

Ideal Job:	Robotics Engineer - Not Ranked
Required Skills:	

- Coding
- Mathematics
- Active Learning
- Judgement and Decision Making
- Communication
- Technology Design
- Problem Solving
- Persistence

Matthew McCracken:

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Hi, I'm Matt McCracken (s3864453)

Team: Creative Protocol

I am a 35-year-old father of 2, who works full time for a hotel chain where I see to all their IT needs. I was born in Bundaberg, Queensland and, as a young boy, moved to Central West Queensland where I grew up. I currently live in Johannesburg, South Africa. I completed my school career at Barcaldine State School at the end of Grade 11, when I left to pursue a career in IT, as a trainee position opened up at the Department of Main Roads, this is also where I studied my Cert 2 in IT through Tafe. My personal interests are gaming, travel, golf, cricket, and rugby league. I have always had a keen interest in all things tech and like to keep up with what is happening in the world of Technology, both regarding hardware and software. I have always enjoyed understanding how things work, whether it was taking apart an old computer or looking at the source code of how a website was built. My experience in IT include 7 years at The Department of Main Roads following my initial traineeship in their IT department and 6 years as an IT Administrator for a Hotel chain.

Ideal Job: OT Network Security Administrator - Not Ranked

Required Skills:

- CISCO Professional
- Problem Solving
- Communication
- Analytics and Intelligence

Cameron McLaughlan:

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Hi, I'm Cameron McLaughlan (s3717363)
Team: Creative Protocol
I am currently 20 years old and working in the Australian army as a rifleman. I currently reside in Townsville but am originally from Melbourne. I completed year 12 in 2017 and have decided that I need to continue my learning and learn about something I am passionate about. My favourite activity to do in my spare time is canoe slalom, which is a field of white-water kayaking. My interest in IT started from a young age I had a relative who worked at apple and always had the newest computers and phones, from that young age I was hooked with all things technology. This love continued as I got into high school and was able to study multimedia in my earlier years, then during my VCE, study software engineering, which is when I realised that I wanted to make some sort of career out of it. My current career has lead me into signals and radios which has given me a different experience in networking and IP while also exposing me to how many different technologies and systems work and connect together to share data and information around the world securely and undetected.

Ideal Job:	Software Engineer - Medium Ranked
Required Skills:	

- Coding
- Teamwork
- Communication
- Problem Solving
- Multi-tasking
- Attention to Detail

Group Processess

How did your group work together in Assignment 2? Will you be introducing any changes in process for Assignment 3?

Based on the group reflection from Assignment 2, although there was a bit of a rocky start, as the group was spread across different tools, once a single collaboration platform was agreed upon things became a lot more smooth. It was found communication was best over Microsoft Teams while collaborating our work using Microsoft OneNote and Office365 worked well for the team and allowed us to work well to complete what needed to be done on the assignment.

Everybody's roles in the team was agreed on early, so each member was able to focus on their tasks and keep the team updated on their progress. Regular meetings were also held and minutes were made in the meetings which could be referred back to in subsequent meetings, which allowed group members to stay focused and updated. The minutes also allowed members who may have missed the meeting to stay informed.

In the beginning phases of the assignment, there was some lack in communication, this was due to various reasons, including location and work commitments. Once communication methods were improved the team worked well together to meet the deadlines.

We learned that in an online environment, where members have different commitments and schedules, it is of upmost importance that they communicate effectively. It is also vital that each member knows their role and what is expected from them so that deadlines are met or exceeded.

We thus feel that we have found a formula which works well for our team and we will continue to use this formula going forward in our assignments.

Career Plans

Compare and contrast the career plans, including ideal jobs, for each person in the group. What common elements are there, if any? What differentiates each position from the others, if anything? How similar or different are your career plans across the group?

For each of the ideal jobs chosen by the group, a good foundation is a Bachelor's Degree in Information Technology as well as obtaining entry level experience in their chosen fields. Although all the ideal jobs start with a Bachelor's Degree, each one would branch out into their own specific field and specialize in the skills they require for their ideal job. It is also often recommended that an internship be done in the chosen field, this allows for some hands on training as well as being a good opportunity to network

which could lead to job offers and also give you good contacts in the IT industry. Another similarity, throughout the IT industry is that anyone in this industry are often expected to keep on top of the latest digital trends, and they should also know how said trends will impact their particular field.

Career Plans For Ideal Jobs

Samuel Ashton - Chief Technical Officer

A Chief Technical Officer's primary responsibility is to understand and implement technologies that help a business achieve its goals and objectives. Depending on the size of the organization. Typical Steps to Becoming a Chief Technical Officer are :

1. Earn a Bachelor's Degree. Nearly all Chief Technical Officers start their professional journeys by earning a bachelor's degree in a computer science-related field. With the knowledge of database design, digital forensics, cyber law, programming, and data integrity, graduates can move on to work in a variety of IT professions.

2. Aspiring Chief Technical Officers must build a strong educational base and gain experience in entry-level positions before taking the next step toward becoming a Chief Technical Officer. This type of experience can be gained by doing an internship and getting hands on experience in a number of IT areas.

3. On-the-Job Experience is vital in this position as new problems lead to new IT specialties and roles, the Chief Technical Officer's job becomes more complex. Organizations depend on their CTOs to have the experience to understand these complexities and to ensure that the right people are in place to address any concerns. CTOs gain this experience and understanding by working in a number of IT areas, such as Network architecture, Big data engineering, Information security management, Security engineering and Web software development.

4. Positions in the above areas may require only a few years of experience, but professionals need to have between five and 10 years of experience, total, before applying to a manager or director role. Once in a managerial position, an IT manager who wants to work as a CTO must spend an additional five to seven years honing his or her leadership and business skills. So typically a professional must work in the IT field for at least 15 years before seeking employment as a CTO.

5. After spending some time working in the technology field, IT professionals with the ultimate goal of becoming a CTO should consider pursuing a master's degree. A CTO needs to have the technological

expertise and a keen business sense to be successful in a leadership role.

Shane Bunting - Senior Incident Responder

Incident responders seek to protect and improve organizational security by preventing, averting, and mitigating security threats. Prevention duties include system monitoring, assessment, testing, and analysis designed to identify and correct potential security breaches. Incident responders often create security plans, policies, protocols, and training that prepare organizations to respond efficiently and effectively to incidents. Steps to become an incident responder :

1. Bachelor's or master's degrees in computer forensics, cybersecurity, or a related field often provide ideal educational preparation for incident responders careers. For those seeking a career transition, earning your master's degree in information security or incident response management can position you well for eventually getting upper-level roles such as senior incident responder, senior intrusion analyst, or CSIRT manager.

2. Many professionals in this skills-based field gain their cybersecurity education simply by earning relevant professional certifications such as certified incident handler, certified intrusion analyst, or certified forensic analyst. Regardless of the degree requirements, most incident responder jobs require some certifications. Keep in mind that certification requirements vary depending on position, employer, and industry.

3. Someone who wants to become a Senior Incident Responder can benefit from doing an internship, giving them some practical experience in their chosen field and also allowing them to network within the forensic and cybersecurity fields.

4. Most incident responder jobs require at least 2-3 years of prior relevant work experience in fields like computer forensics, cybersecurity, or network administration.

5. Incident responders need considerable applied knowledge and skills working with many kinds of systems. Comprehensive understanding of operating systems, hardware and software systems, and network systems are essential. Related hard skills include system monitoring tools, forensics software, and e-discovery tools. Incident responders also must understand programming languages to do the work often needed to address cybersecurity threats.

6. Cybersecurity degree programs cultivate skills through coursework in operating systems and information systems security, cybercrime forensics, and object-oriented programming. Aspiring incident responders interested in leadership positions benefit from courses on cybersecurity operations management, cybersecurity law and policy, and global trends. Other relevant courses include cyberwarfare and ethical hacking.

Jessica Delgado - IT Program Manager

IT project managers oversee and direct the activities of information technology projects, including managing personnel, overseeing budgets and schedules, and executing a project communication plan. Career Steps to Follow to become an IT project manager :

1. IT project managers must possess at least a bachelor's degree in computer science, information technology or IT project management. The courses in this program covers topics like Database management systems, IT security, Management information systems, Project procurement management and Principles of project management.

2. Complete an internship. An internship allows students to interact with experienced IT project managers and complete some of the same tasks they will perform when working in the field. This experience and these networking opportunities may make it easier to find a position in IT project management immediately after graduation.

3. Most computer and information systems managers have several years of work experience in the field of information technology. Employers often seek candidates who not only possess a bachelor's degree, but who also have experience working in project management or supervising individuals in an information technology department.

4. After 3-5 years of experience working in an area related to IT project management, many individuals may be able to advance in their careers. IT project managers oversee IT projects by planning the project and managing staff.

5. To improve employment prospects, consider earning a master's degree.

6. With enough management experience, IT project managers can advance and become chief technology officers or even chief executives.

William Ericson - Robotics Engineer

Robotics engineers design and build machines to do automated jobs in industries like manufacturing, aerospace and medicine. In order to pursue a career in Robotic Engineering the following steps should be followed :

1. Obtaining a Bachelor's degree in IT which offers concentration in robotics as well as Electronics engineering programs that teach you the fundamentals of electronics components and common electronic circuits. Mechanical engineering programs can also be a good qualification as they teach you to apply concepts from physics, mathematics and materials science to create machinery used in transportation, manufacturing, communication and other uses. These programs may also cover electronic, hydraulic and pneumatic systems.

2. Try to find an internships offered at engineering and robotics companies. An internship can provide you with work experience and help you network within the industry. Your internship might entail no more than observing work or you may be actively involved in a project.

3. Find a Job as a Robotics Engineer, a good place to start is in the government and technical services sectors. This will allow you to gain work experience and advancement within the robotics engineering field.

4. You can advance your career and earn a higher salary with a master's degree in robotics engineering.

Matthew McCracken - OT Network Security Administrator

A Network Security Administrator identifies what type of computer network an organization needs. They install network hardware and software programs, monitor networks, collect data to analyse a network's operation, and train individuals on how to use the network. A good career plan to become a Network Security Administrator is :

1. Obtain a Bachelor's Degree, this is the traditional minimum degree preferred by prospective employers. A Bachelor's Degree exposes students to a broader curriculum that provides a foundation in mathematics and computer science. Students also develop a comprehensive understanding of programming, software architecture, and software testing. In addition to a Batchelor's Degree, they can also take specialized courses in application areas, such as Network security, Information technology diagnostics, Network design and Network communications

2. To improve the chances of getting employment, an internship can be helpful. An internship can allow hands-on experience working with

computer networks and also give you the opportunity to network with other professionals in the field. This experience and the networking opportunities may make it easier to find employment after graduation.

3. Obtain a job and work in the system administrator position to gain the necessary employment in order to work your way up to Network Security Administrator. Security Administrators may backup data contained on an organization's computer network, implement network security measures, monitor network performance, and discuss how to resolve network problems with workers who use the network.

4. Earning professional certification demonstrates an individual's proficiency in managing specific computer network systems. Many companies prefer certifications, so this will open the door to more job opportunities. Industry companies, such as Cisco and CompTIA, offer certifications to network managers. These certifications, which include the Cisco Certified Network Professional and CompTIA Network+ certification, usually require passing an exam.

5. It is also important to maintain technical skills. The hardware and software programs and computer systems used in network technology and management are constantly changing. Network Security Administrators can remain competitive by staying abreast of the latest technology.

Cameron McLaughlan - Software Engineer

Software engineering is an ever-changing profession, one that adapts as new technologies are developed. Because of its shifting nature, there are multiple entry points into the profession. A good career plan to become a software engineer is :

1. Obtain a Bachelor's Degree, this is the traditional minimum degree preferred by prospective employers. A Bachelor's Degree exposes students to a broader curriculum that provides a foundation in mathematics and computer science. Students also develop a comprehensive understanding of programming, software architecture, and software testing. In addition to a Batchelor's Degree, they can also take specialized courses in application areas, such as networking or embedded systems.

2. Doing an internship, this can provide students with real world experience. Technology companies may offer internships for students with a bachelor's who want to expand their skills in specific areas, such as Java, XML or SQL. Internships normally last between three and six

months and allow students to work on specific projects or products related to their skills.

3. Generally speaking, there are two specializations within software engineering: applications and software/systems development. However, distinct areas of practice exist within each of these areas. Software engineers may choose to become experts in a single programming language or type of development. Some examples of speciality areas are Web development, DevOps, Mobile development and Technical stack (e.g., Python, Ruby).

4. After earning the necessary degree the next step would be to find an entry level job where there are prospects to gain experience.

5. Software engineering is precise and technical, thus gaining certification verifies an applicant's knowledge and abilities. Along with experience, certification can improve a person's marketability. Certifications are available from technology vendors (e.g., Microsoft, Cisco and Oracle) as well as professional organizations (e.g., IEEE) and are tailored to specific areas of practice.

6. Following up with a Master's Degree will offer opportunities to qualify for management and leadership positions in the industry.

Part II
Tools and Technologies

For our Home Aquaponics Monitoring System (H.A.M.S) there will be two forms of hardware that are required outside the basic laptop/desktop computer which most people have access too. One will be a Raspberry Pi device and the other temperature sensors, which are very cheap and obtainable through many online stores. These two will be the basis for allowing us to create, with further software implementations, a basic set up for monitoring environment variables.

Alongside the hardware components we will require software and tools such as listed below.

- Raspbian OS

- Python

- RRDTool

- Git

- Chart.js Library

- Linux Distribution - Debian

- SSH Protocol

- Nginx

All of these tools/resources/software's are open source and readily available to anyone making them ideal for us to use in our product/project without the need for purchasing anything.

There will be no software licenses needed at present in order to get our H.A.M.S into the initial set up.

Our group as a whole have had some prior experience in the tools and software listed such as Python, but many of us have not had to deal with software and tools such as RRDTool or Nagios. Through the setup of H.A.M.S, Sam has created, implemented and got the hardware and software set up through the use of a Raspberry Pi device. From this, team members have been able to learn along the way and research topics that we were newly introduced too, expanding our knowledge of devices, software and hardware in relation to our project.

Part III
Project Description

Project Plan

Overview

Our project is to build to develop an affordable, scalable aquaponics monitoring and automation solution for back yard hobbyists. This product will delivered as a cloud platform, known as HAMS (Home Aquaponics Monitoring System), with the long term goal of native mobile to be integrated into the system. It will involve client devices reporting back to a cloud service, allowing easy monitoring of environment variables and a customisable alerting system

Large scale automated systems exist for commercial aqua farming but the cost of these solutions make them unviable for the backyard farmer. Conversely, "do it yourself" style projects for monitoring and automating home aquariums also exist, typically using a Raspberry Pi or Arduino board and other consumer electronics to measure different environment factors and present this information on a web-based dashboard. We intend to expand on this idea, targeting environment variables that are core to combining aqua culture and hydroponics, either in a single back yard system or for multiple units on a larger property.

Motivation

Two of the biggest issues in the world today are food security and climate change. Both these issues are significantly related. As land is cleared for farming, the balance of nature is upset. Crops of plants absorb significantly less carbon dioxide from the atmosphere than the forests that preceded them. Additionally, rainfall is effected by the clearing of forests, resulting in extended droughts in some areas. Traditional plant farming requires lots of water, with additional chemicals used for various reasons, this water tends to run out into local river systems along with trace chemicals causing further issues.

As our population increases more food is required, further increasing the need for farming and agriculture. Aquaponics is a resource efficient method of growing food, requiring less water than traditional farming, and the symbiotic relationship between the plants and sh results in less chemical additions, such as is the case with separate hydroponics and aquaculture methods. We hope that this project will allow enthusiasts an easy way to understand what is going on with their backyard hobby aquaponics.

Even if this project does not result in a financially viable product for

home aquaponics use, we have specifically chosen to use technologies that are in common use in the IT industry right now. Some are mature, while others relativity new to the IT industry. This way, as a group we will give ourselves exposure to technology that future employers may be interested in and even use it as a demonstration of our ability .

Landscape

Currently the market for aquaponics monitoring systems has limited solutions for smaller operations, however the market is starting to expand in recent years to accommodate the increased popularity of the agriculture technique. Even more so, aquaponics enthusiasts starting out have limited affordable options available to them. Companies such as Bluelab and Gro-Line have monitoring systems available, with prices usually being $500 or more for a basic model with pH and temperature gauges, with limited customizability to the user experience and how data is accessed/stored. Some high end device models have the ability to send your data to a computer or email, however this comes at an increased cost.

The monitoring system we are suggesting will provide an affordable solution for enthusiasts and small businesses who are wanting to start using aquaponics, with scalability for future expansion. Information is stored in the cloud which is accessible by the user anywhere they have an internet connection via a web browser. The addition cloud technology will allow for expansion into additional features, such as sending a notification of a temperature change to a mobile app.

Detailed Description

For this project, a home-made flood and drain aquaponics system will be used as the 'test subject'. To properly describe the scope of the project, a brief background in Aquaponics is required. Diagram A show the basic concept of how this works. Fish are grown in a fish tank, with their waste turning into ammonia as a by-product. Water is continually being pumped into the grow bed, which is typically above the fish tank, or at least higher. The grow bed is filled with a hydroponics medium such as clay balls, which acts as a biological filter for the fish tank. The ammonia in the water is converted to nitrites and then nitrates as in a typical fish tank filter, but rather than having to regularly change the water to remove the nitrates, the plants within the grow bed absorb them as part of their natural growth.

The bell siphon ensures that once the water level in the grow bed reaches a pre-determined top level, it siphons the entire grow beds water bac into the fish tank. This ensures that the plants roots are not continually submerged, preventing rot and damage. How often the grow bed is drained is controlled by the flow of water into the grow bed.

Environment Variables

In order to maintain a healthy aquaponics system and truly understand the science behind it the following environment variables should be monitored and controlled (where possible).

Water Temperature

A consistent water temperature is paramount for the health of sh. Increased growth rates is observed over the warmer months, though too hot a temperature (or too cold) can result in death.

Water Levels

Both Fish and Plants require water to grow, measuring the water levels will not only allow the food and drain cycle to be timed and adjusted accordingly but would also indicate a pumping failure or excess loss of water.

PH

The acidity/alkalinity of the water is also very important to ensure it is in a consistent state, both fish and plants have different PH tolerances depending on the species. Understanding the PH of the water will allow accurate decisions around what plants should be grown.

Nitrate/Nitrite

If an aquaponics systems is working and properly balanced there should be little to no nitrate within the water of the fish tank. If there is, then this would indicate that either the biological filtering of the grow bed is not working or there are not enough plants to absorb the nitrate. Excessive nitrate within the fish tank water is detrimental to fish health and needs to be monitored. Unfortunately this environment variable is one of the most difficult to measure electronically. Some investigation will have to be done to determine whether this measurement is viable. A stop gap solution is to measure this using a chemical test kit and entering the result into the system manually at regular interviews.

Sunlight

Measuring the amount of sunlight the aquaponics system receives will help in analysing growth during the different seasons.

Aims

The aim of this project will be to produce multiple client devices that record environment variables at regular intervals and communicate these to a cloud based service, with a web based dashboard to review this information. We will use Raspberry Pi's as our client devices and IaaS provider such as Amazon Web Service to host cloud the cloud infrastructure required.

This project can be broken up into several smaller aims, which are listed in approximate order.

Concept Pi Client

Firstly a single stand alone client device will be created, measuring only one variable, water temperature. Temperature sensors are incredibly cheap and easy to obtain to get started and documentation on how to get these working is easy to find. This will host a local web service simply displaying the temperature history.

Concept Dashboard

A concept dashboard can be developed independently of the pi client. This will not only allow us to envision what the end product will look like, but serve as a base for the cloud based platform once built. As RRDTool created graphs are static PNG images generated by RRD Tool itself, we will investigate using an additional library called Chart.js to create real time HTML graphs on our dashboard.

Project Documentation and Research

Throughout the project there is research and documentation required for several reasons. In order to properly market our project we need to ensure that we are across any other competitive or similar products. We will also need to completely understand what technical resources and knowledge we require, including possible staff that may be required if this project does get picked up by an investor and turned into more than a proof of concept. Additionally some technical documentation detailing how the client devices are to be set up and how the system is to be used will need to be created.

Initial Concept Pitch

An initial concept pitch will be created which not only marks the first major milestone in the project, but can also be used to show case what we are intending on developing to potential investors. This will briefly detail our motivation for starting the project and what we intend to achieve in the short term. By the time we get to finalising this Initial concept Pitch, we

will have a client concept demonstration, pending any unforeseen hurdles we will be able to move forward with developing the cloud based system.

Client Sensor Expansion / Client Duplication

With the original concept raspberry pi completed and tested we will then add further sensors such as water depth, ph, and if financially viable ammonia, and nitrate sensors. Though we do foresee that these will need to be manually entered environment variables into the dashboard for our first release.

It should now be fairly straight forward to duplicate the client for multiple Aquaponics systems, which can be configured to communicate with the cloud platform later

Cloud Setup

The cloud setup can be broken down into further tasks, some of which can happen alongside each other.

Communications Method

A secure communications method will need to be implemented or developed to ensure that data between the cloud and the client devices is encrypted. Environment variables of Aquaponics is not necessarily highly valuable data, but in today's world it is imperative that any Cloud or IoT type device is secured to protect against intrusion. We could develop our own client/server based comms method but in the time we have allocated it may be better to use the socket based communications method that RRDtool has built in, but tunnelled over an encrypted SSH connection.

Database Structure

A Simple database structure to store users data such as their login credentials, and their aquaponics systems setups will need to be created for the backend server application to interact with.

Server Application

A backend server application will be written in order to provide an application programming interface (API) to the front end dashboard for retrieval of information for display to the user. This will take care of database interaction and requesting environment variables in real time from the round robin databases to be fed into the real time graphs on the front end dashboard. Building the project with a backend application architecture, will ensure easy interoperability with native mobile applications in the future.

Cloud Deployment

Actual deployment of both the backend server application and the frontend dashboard to the cloud is a task on its own. Although IaaS services such as AWS make claims of being able to bring services online within minutes, we will need time to learn the toolset and be comfortable that we have a cloud based solution that not only works but is stable and supportable.

Testing

Testing all parts of the project is paramount to ensure success, hence has been broken up into several sections See Here for further details.

Currently, we have a functioning mock-up client device that is able to log temperature results gathered from a functional aquaponics system, which is then able to be accessed from a developer dashboard. The existing client device and dashboard will be tested and refined to better suit the end user, which will occur over the next two weeks, during which the server team will begin the development of secure communication methods and database structures. Following this testing, there are several weeks which will focus on additional server development and replication of the Pi client device.

Once the server application has been deployed to the cloud server, multiple Pi clients are then able to be configured to interface with the server application. Once this has been completed we are able to perform full scope testing and further client testing. The desired outcome is that multiple clients are able to log and retrieve their data, with the data reflecting correct temperature results. As the release client device will only feature temperature readings, the initial test group can include local aquariums and aquatic animal owners.

Final Project Pitch

Once we have our project finished and tested, we will want another pitch video in order to attract investors. This will focus more on the cloud based infrastructure and ability to scale the product as a possible subscription based service. This is where we will propose native mobile apps, which our backend API will already be ready for.

Chart A shows 16 week project plan, detailing the time frame for each of the above mentioned tasks, not that several of these tasks are dependant of each other and will push forward the time frame if the prior task runs over.

Part IV
Skills and Jobs

Part V
Group Reflection