Assessment 2 - Team Project
Team Creative Protocol
For Introduction to Information Technology
(COSC2196)

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Contact Details And Profiles

Samuel Ashton:

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GitHub link: https://samuelpaulashton.github.io/IIT/

Sam Ashton is a Brisbane based IT professional, working in the industry for the last 17 years. Having been interested in IT from an early age he has 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 his career he has performed roles in IT support, System Administration, Network Engineering and IT Management. When not in front of a computer he enjoys fishing with his two children, Japanese sports cars and collecting Phantom comics, even if he doesn't get time to read them all!

Ideal Job: CTO – Chief Technical Officer
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:

Student ID: s3407441
Student email: s3407441@student.rmit.edu.au
GitHub link: https://shanebunting.github.io/IIT/

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 costed 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 lead me instead to many physical related jobs which brings us to now where I am in 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
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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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 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 here I was able to secure employment 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
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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Hello, I am William Ericson, student ID s3866209, a member of the 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 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
Required Skills:

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

Matthew McCracken:

Student ID: s3864453
Student email s3864453@student.rmit.edu.au
GitHub link: https://aussiematt84.github.io/IIT/

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 the IT department, 6 years as an IT Administrator for a Hotel chain.

Ideal Job: OT Network Security Administrator
Required Skills:

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

Cameron McLaughlan:

Student ID: s3717363
Student email s3717363@student.rmit.edu.au
GitHub link: https://cammclaughlan.github.io/IT-project-1/

I am currently 20 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 in. My favourite activity to do in my spare time is canoe slalom, which a field of Whitewater 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 than 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 system work and connect to share data and information around the world securely and undetected.

Ideal Job: Software Engineer
Required Skills:

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

Part II
Team Profile

Personality Traits

Student	Test 1 Jung Typology Test	Test 2 Interpersonal Skills Self-Assessment	Test 3 What's Your Learning Style
Samuel Ashton	ESTP: Extraverted Sensing Thinking Percieving	Total Score: 69% Listening: 46% Emotional Intelligence:57% Verbal Communication: 93% Communicating in groups: 81%	Learning Style: Auditory Auditory: 45% Visual: 40% Tactile: 15%
Shane Bunting	ISTJ: Introverted Sensing Thinking Judging	Total Score: 62% Listening: 73% Emotional Intelligence: 55% Verbal Communication: 55% Communicating in groups: 66%	Learning Style: Tactile Auditory: 15% Visual: 40% Tactile: 45%
Jessica Delgado	INFP: Introverted Intuitive Feeling Perceiving	Total Score: 50% Listening: 50% Emotional Intelligence: 58% Verbal Communication: 55% Communicating in groups: 37%	Learning Style: Visual Auditory: 30% Visual: 40% Tactile: 30%
William Ericson	INTP: Introverted Intuitive Thinking Judging	Total Score: 50% Listening: 67% Emotional Intelligence: 34% Verbal Communication: 68% Communicating in groups: 44%	Learning Style: Auditory Auditory: 45% Visual: 30% Tactile: 25%
Matthew McCracken	ENTJ: Extraverted Intuitive Thinking Judging	Total Score: 59% Listening: 48% Emotional Intelligence: 55% Verbal Communication: 77% Communicating in groups: 58%	Learning Style: Auditory/Tactile Auditory: 35% Visual: 30% Tactile: 35%
Cameron McLaughlan	ENFJ: Extraverted Intuitive Feeling Judging	Total Score: 68% Listening: 60% Emotional Intelligence: 62% Verbal Communication: 80% Communicating in groups: 69%	Learning Style: Tactile Auditory: 30% Visual: 35% Tactile: 35%

Comparisons and Descriptions

When a team is first put together, it may take some time to work out each member's dynamics and skills in the team scenario. With the help of these types of tests, the results can assist us to find out certain things about our team members much quicker and allow them to use their skills optimally.

Teams are made up of a group of individuals, each individual in the team can take on one or more different roles, both formal (such as chairing or leading) and informal (such as interceding when there is any conflict). The most effective teams are diverse, and contain people with a wide range of skills and role preferences.

In terms of the above test results of our team, we have 3 introvert and 3 extrovert members. Generally the members who scored as extraverts in the Jung Typology Test scored higher in the Verbal Communication and Com-

municating in Groups sections of the Interpersonal Skills Self-Assessment and the introverted people did better with Emotional Intelligence and listening. This might mean that the members who scored higher in communication would need to ask the members who scored lower in communication more questions in order to get them to communicate their ideas more openly and clearly and involving them more in team discussions.

Working well in a team requires all the members to be understanding of the strengths and weaknesses of their team mates and also requires each member to do their best to work together well. Taking each members strengths and weaknesses into account could help the members work together towards the common goal.

In a team situation, sometimes conflict can arise, one of the best ways to resolve conflict is through communication. When one member of the team is struggling with certain tasks and maybe lagging a bit behind, the other team members could talk to that team member to find out what the problem is and perhaps see if they are able to assist that team member to get his task done. That way, the team is working together with the common purpose of completing the assignment in the best interest of the team as a whole.

As time goes on and the team works together more, the dynamic could change as the members get to know each other better and are able to communicate more openly and get to know each other well.

Part III
Industry Data

Ideal Jobs

What are the Job Titles for your group's ideal jobs?

- Samuel Ashton - Chief Technical Officer
- Shane Bunting - Senior Incident Response
- Jessica Delgado - IT Program Manager
- William Ericson - Robotics Engineer
- Matthew McCracken - OT Network Security Administrator
- Cameron McLaughlan - Software Engineer

How do each of these rank in terms of demand from employers?

Referring to the Burning Glass data, the only ideal job title that our team have chosen that are ranked is a Software Engineer which is medium ranked in terms of demand. We believe this is due to the majority of the ideal jobs we have chosen are reasonably senior roles which are not in huge demand as there is typically less placements, or that the jobs chosen are industry specific. This said the OT Network Security Administrator & Senior Incident Response roles may fit under Systems administrator or Network Engineer classifications. Both these roles are in more demand than Software Engineers, but not by a huge margin

The CTO and Program Manager roles both involve the delivery of products or services, on one hand the CTO is tasked with ensuring that new technology is used in an effective manner to deliver new ideas or continually improve existing technology, whereas a Program Manager ensure the effective delivery of multiple projects across an organisation. The closest job title listed in the Burning Glass data that would align with these responsibilities would be a Service Delivery Manager, the typically a Service Delivery Manager is more involved in day to day operations rather than new projects and research and development of new technology. A Service Delivery Manager does not rank particularly high in demand, though again, this would be due to limited placements.

A Robotics Engineer is slightly more difficult to categorize into the job titles listed by Burning Data. On one hand, software engineering would definitely be part of the role but some form of mechanical engineering position may be more appropriate, depending on which direction a Robotics Engineer focuses on. Additionally, a Test Analyst role would also cover many

of the roles and responsibilities required by a successful Robotics Engineer. At this stage we feel that we are unable to accurately identify a demand ranking with the given Burning Glass Data.

Team Creative Protocol Group Required Skills

From your group's ideal jobs, you can identify a set of skills required for these jobs (we will refer to this as your group's required skill set). These can be divided into general skills (communication, problem solving, writing etc) and IT-specific skills (Javascript, SQL, etc).

General Skills

- Communication
- Leadership
- Teamwork
- Team Building
- Planning
- Decision Making
- Multi-tasking
- Analytical Skills
- Troubleshooting
- Management
- Mentoring
- Researching

Required Skills

- Software Engineering
- Systems Engineering
- Business Analysis
- Microsoft Windows
- Business Management
- Project Management
- Building Relationships
- ITIL
- SQL
- JavaScript

IT Skills

How do the IT-specific skills in your required skill set rank in terms of demand from employers?

The supplied Burning Glass Data indicates that the highest in demand IT skill is SQL. While this may not be directly required by the CTO & Program Manager roles, some understanding would be preferable. The Software Engineer and Robotics Engineer roles would most definitely require SQL knowledge at some point as it is a staple method of interacting with data in a database. Nearly all IT systems require or generate data at some point that will need to be stored, analysed or actioned.

Not being able to predict the future trends of programming languages we have specified JavaScript as key technical skill as it is very popular language used for web applications and starting to become even more popular with application development using asynchronous on demand compilers such as

Node.js. Being the second highest in demand IT skill it is highly beneficial to work towards understanding this technology as part of software engineering.

Although often overlooked by non management staff, ITIL is a core base for service delivery concepts. We have listed this as a requirement for all of us to ensure that we have consistent support & development methodology. ITIL does not rank particularly highly, funnily enough it sits alongside GIT, which in todays world, most IT staff should have an understanding. We believe that these skills are not in high demand as it is assumed that most people have these as a base.

How do the general skills in your required skill set rank in terms of demand from employers?

Several required general skills across our chosen ideal jobs are common, the biggest being Communication. Incidentally, according to the Burning Glass data this is the most required general skill of all, scoring more than twice the nearest ranking skill requirement, Problem Solving, which is also a common skill requirement.

Demand for Decision Making and Multitasking are not ranked particularly highly but are also a very common skill across all of our chosen ideal jobs. In fact, Decision Making is the lowest ranked general skill, which we believe would be one of the most important in our ideal jobs. What use is a Robotics Engineer, Software Engineer, Network Engineer or any IT Management role without the ability to make a decision?

Slightly higher ranked than these is Management, Team Building, Leadership & Mentoring which are required for the CTO & Program Manager roles.

What are the three highest ranked IT-specific skills which are not in your required skill set?

The highest three ranked IT Specific sills which are not in our required skill set are SAP, Graphic Design and Technical Support. SAP is a fairly application specific requirement and not listed in our requirements as we are focused on the skills required by our chosen professions, rather than the knowledge of a particular operational tool that a prospective employer may use. Many ERP solutions exist, SAP just happens to be one of the largest vendors. Often businesses may even use their own proprietary ERP.

None of our Ideal jobs require Graphic Design or Technical Support, in fact Idea jobs would involve having Graphic Designers and Technical Support Officers either reporting to us or working alongside us.

What are the three highest ranked general skills which are not in your required skill set?

The three highest ranked general skills that we have not included in our required skill set are Writing, Detail-Oriented & Quality Assurance and Control. In retrospect we will most likely find that this is a mistake, though these are lessons that typically have to be learnt on the job to truly understand. Not many people within IT believe that they need good writing skills to succeed. The unfortunate truth is that writing skills is much like communication. In order to communicate your ideas accurately it is highly beneficial to be able to write them down. Management roles involve reporting tasks that a better read when written well, and software development is a much smoother process when test cases can be accurately describe in documentation.

Detail Oriented and Quality Assurance and Control are also both skills that are requirements for any role in the IT industry. Sure, it can be assumed that a software testers are the main roles that require QA, but any engineer that does not QA their own work in some manner is a bad engineer. Likewise attention to detail is often overlooked at being a core requirement for good Information Technology.

Part IV
Interview With An IT Professional

Interview with Cristian Atelj

Creative Protocol: Hi All, we have Cristian Atelj in the meeting here. Cristian, can you please tell us about your role

Cristian: Hi, I am currently the End User Services manager for eHealth and we support approximately eleven health agencies across NSW health, we have a team of 43 staff, so I have 4 team leaders under me and they have a cross mix of desktop analysts under each of these teams. So in terms of what we look after, hardware software, the SOE, we work with the engineering teams to develop those for the different entities and requirements, and we require 2nd and 3rd level support for approximately five to six thousand staff within those agencies. CP: That is quite a large scope

CA: Yea that is across NSW as well, NSW health is one of the largest employers of people in the southern hemisphere. eHealth have come on as a new entity, being established approximately 5 years ago. Each entity and LHD had its own support models and ICT components. eHealth was born out of a necessity to centralise that model, into something manageable that can set standards and offer services to the smaller agencies as some of the entities aren't as larger as the other LHD's however still require support. It wasn't cost-effective to have multiple teams across 10 different entities. Which is where that centralisation was born.

CP: Similar to an IT service provider would provide IT support to smaller businesses in the private sector

CA: Exactly, you would probably call us similar to a managed service provider, eHealth have a bunch of different services they offer in the ICT field from a service desk model, you have desktop teams and then End User Services (EUS), then moving to server environments and database support teams. We also have project managers and strategy/architect teams. We cover a large cross section of ICT

CP: And what kind of work would you say you do in your day-to-day

CA: It is quite an involving role as a group manager, leading the team leaders, and setting the expectation of the business to filter down is a big portion of the day. Managing staff at a certain level, moving away from some technical aspects, and be more of a people manager, more of it re-

volves around people and processes, and some politics. In health and the public sector, there are some politics in the process, as it can be in the private sector, whereas the public sector is more reporting to the public of Australia and NSW. Instead of shareholders, you have the public to respond to, in the health sector you are front-page news [if something goes wrong]. If there are issues in terms of a hospital network go down or the eMR (Electrical Medical Record) system going down, or the hospital losing support for 2 hours it is front-page news and you are reporting to Parliament, it is different than a private company

CP: You mentioned that you deal with a lot of the team leaders in other teams, what other IT professionals do you interact with in your Day to Day

CA: Sure, The end-user services team sits within customer service in eHealth and that customer service remit is part of that service delivery department, within that we have a demand delivery team. My direct peers entail a demand delivery team, which is more program management and project coordination. Then we have service management, which entails the service delivery managers, continual services improvement team. We also have, that sit under their remit is the operational vendor management team. We also have the change management team and the onboarding team, and the State-Wide Service Desk (level one helpdesk). As my direct colleagues, I deal with these different teams weekly to touch base and we have a fortnightly basis with the director to see how the team is progressing, what the pain points are. Trying to celebrate success. At that level, you have to portray that message across to senior management to ensure you are being well represented and the team is doing well. If you aren't advocating for your team it is difficult for someone else to do so.

CP: You would also deal with the likes of vendors and such?

CA: Correct, as a remit as well and by design, we have service offerings that we so call sponsor. Being an end-user computer support provider we deal with the likes of HP, Microsoft, and Toshiba for our managed print solutions. We need to maintain those relationships and ensure they are contract friendly and held accountable. Monthly or quarterly meetings with each vendor, and having that operational vendor manager keeping in touch with them as well. I am sure they keep to the contract and standards they signed up for.

CP: Thank you, and where would you say you spend most of your time?

CA: It's definitely difficult, I think one of the challenges is how you spend your time. At a certain level, you get invited to a lot of meetings, and you

need to allocate some of your time doing rather than participating in [Technical activities], so you need to be selective in that aspect. A lot of my time at the moment is onboarding a new solution, we have a couple of inflight projects that are highly visible that we need to deliver upon. COVID and other situations that impact NSW health quite intensively, making these projects highly visible at a senior management level and there is some effort in that area at the moment and the last 2 to 3 months that is where most of my time has been spent

CP: Very challenging during the COVID times

CA: Yea, it is a challenging space, especially with staff working from home you need to find a happy medium, especially being a frontline service. It is hard to fix a hardware issue over the phone, so we need to manage the expectation of the customer and manage our staff and their wellbeing, it is definitely a fine line we tread. Definitely some challenging times we have experienced over the past 2 to 3 months

CP: From the look of it and other companies it seems to be paying off. The last question of the day, what would you say is the most challenging part of your role?

CA: I spent a majority of my career in the private sector, so I recently moved into the public sector and I wasn't really prepared for the challenges that I would deal with, such as the unions and the was the structure is within the org and the public sector, I would say this is one of the biggest components and challenges, understanding that component, I had to overcome rather quickly. And understanding the policies in place within health, I've had to invest some time in that. It is very challenging keeping up to date with that and understanding that, which is a challenge when moving into the public sector. The other challenging one at the moment, I have stepped into the public sector and moved into this role approximately 8 months ago, I moved across from Ambulance which was supporting a single entity and was contained. Moving across to this role expanded my portfolio to multiple entities, each of those are unique, how we transition them and how we support them into a consolidated model, you kind of have to think outside of the box. You need to utilize expertise from colleagues I have had in the past, utilizing their experience. But I would say these are the two most challenging items on my list at the moment

Part V
IT Technologies

Autonomous Vehicles

What Does It Do?

Autonomous vehicles are cars or trucks where human drivers are not needed to safely operate the vehicle. They are also known as driverless cars and are controlled by the use of software and sensors which are capable of sensing their environment and moving safely with little or no human drivers.

Autonomous technology isn't an all or nothing type of technology. There is a whole spectrum from driver-enabled to fully-driverless vehicles. We still have some time to go to get to level 5 autonomous vehicles. There are 6 levels of autonomy as follows :

Level 0 - No Automation This describes your everyday car with no automation.

Level 1 - Driver Assistance On this level we find the introduction of Advanced Driver Assistance Systems (ADAS) that either control steering or speed to support the driver. An example of this is adaptive cruise control that automatically accelerates and decelerates based on other vehicles on the road.

Level 2 - Partial Automation This is where it gets a bit more interesting. Although the driver must have hands on the wheel and be ready to take control at any given moment, at this level, both steering and acceleration are simultaneously handled by the autonomous system. The human driver still monitors the environment and supervises the support functions.

Level 3 - Conditional Automation Level 3 autonomous vehicles are capable of driving themselves, but only under ideal conditions and with limitations, such as limited-access divided highways at a certain speed. However, the system might require the intervention of a human, so the driver must be able to take control at all times.

Level 4 - High Automation At level 4 autonomous vehicles have high automation and can fully drive themselves but only under certain conditions, for example terrain, weather and light conditions. The vehicle won't drive if not all conditions are met.

Level 5 - Full Automation Once we reach level 5 autonomy we have full automation and the vehicle can fully drive by itself. The vehicles on this level should be able to monitor and manoeuvre through all road conditions and require no human interventions whatsoever, which eliminates the need for a steering wheel and pedals.

The environment and circumstances needed for an autonomous vehicle to operate will greatly influence the level of autonomy that can be achieved, for instance the terrain, traffic or the weather. An autonomous vehicle may operate perfectly fine on a highway at level 4 but in a busy city centre may need to revert to level 3.

Level 5 autonomous vehicles have the same mobility as a human driver. Humans are able to perceive and sense a large amount of information, make a decision and act on it in a very quick time. A fully autonomous system should be able to, at the very least, match or even outperform this ability.

The main technology required for autonomous vehicles is interaction between predictive artificial intelligence and imaging technology. The sensors in and around the vehicle create 3D pictures around the vehicle and the artificial intelligence then interprets how the vehicle should respond. Although there has been significant progress in this area, the aim to bring the vehicles to be fully autonomous is to reduce the amount of time between image and response to near-zero.

Designing the autonomous vehicle to be able to adjust to all driving scenarios, in all road, weather and traffic conditions is the biggest technical challenge that needs to be achieved.

In the latest research and progress done with autonomous vehicles, the leading sensor technology approach is thermal imaging. A thermal imaging sensor can detect longer wavelengths than those in the visual spectrum, they can sense images below the visual spectrum, making it more able to detect humans, animals, and objects in different weather conditions, regardless of the time of day.

Due to the fact that the vibrations of the vehicle can make the LIDAR (Light Detection and Ranging) data unstable, thus making the reliability of the technology limited, this is a drawback of using it as a sensor for autonomous vehicles. LIDAR is a method used for measuring distances by illuminating the target with laser and measuring the reflection with a sensor. In response to this, MIT has designed a localising ground penetrating radar to solve the problem of sensing complex surfaces. This technology sends radio waves into the ground and creates a stable digital map of the area which is not affected by weather or light conditions. This, together with the sensors is the most accurate technology to date and Geophysical Survey Systems Inc. (GSSI) is continuing the development of this technology.

With all the advancement in autonomous technology, getting it to a point where it is fully autonomous can only go as fast as sensor technology will

allow. All of the sensor technology has limitations which restricts it in being able to take into account the unpredictable weather and human behaviour patterns which the vehicle may encounter. The best options thus far are thermal imaging and localised ground penetrating radar in as far as sensor types are concerned.

What Is The Likely Impact?

Autonomous vehicles are designed with the intention to simplify our lives and will come with their own set of advantages but, there will also be some disadvantages that come along with this technology.

Autonomous vehicles will prevent human error in a lot of situations as the system controls the vehicle. Thus there will be no opportunity for interruptions and distractions where human drivers are more susceptible to.

Due to the technologies used in the vehicles it will create algorithms that will determine the correct distance between vehicles, thus there is less likelihood of an accident occurring. Traffic jams will also become less prevalent when more driverless cars are on the road as they are able to communicate with each other, which will reduce congestion and improve traffic with increased lane capacity.

Autonomous cars will also have the ability to drop you off at your destination and then proceed to find a vacant parking spot, saving you time and money looking for parking. You will also be able to save more time with an autonomous car as it takes control of the driving, leaving the driver with spare time to continue work or make calls without having to worry about road safety.

For people with disabilities or elderly people who have difficulty driving, autonomous vehicles can help them to have access to safe transportation. This also leads the way to driverless taxi services for all.

Some of the disadvantages of autonomous vehicles could include things such as safety concerns. Although a vehicle may be successfully programmed, an unexpected glitch can occur, which could cause the malfunctioning of certain sensors or components.

Autonomous vehicles could also become a target for hackers, giving them the opportunity to collect personal data of the owner, thus further compromising there security.

The change to autonomous vehicles could also impact the employment rate as they take over the duties and responsibilities of humans such as taxi or truck drivers, who may lose their jobs as they are no longer needed.

How Will This Affect You?

At this stage the cost of a fully autonomous vehicle would be expensive, due to the cost of the technology needed, but this may change and over

time with the development of the technology and the mass production of driverless cars, giving a more average earner the opportunity to own one.

However, if autonomous cars are introduced into daily life too quickly, people could easily be overwhelmed by the advanced technology and our daily lives could change in various ways.

The use of driverless cars could however simplify our lives in many ways; there is the prospect of fewer accidents which will result in avoiding injuries and saving lives, we could also save money because they are more efficient when driving and reduce traffic congestion. We can furthermore look forward to the total elimination in terms of traffic fines and also reduce the cost of insurance associated with owning a car. Because Driverless cars are low maintenance they would save both time and money in respect of repairs. So, as can be seen, driverless cars can be a win all around.

The more common driverless cars become, the more we will rely on them in our day to day lives. They could be used as taxis or share drive options, simplifying commuting to school, work or even social and sporting events more easily. The convenience and safety of the driverless cars will also save us time as we can spend our time commuting more effectively doing other stuff as opposed to having to spend time stuck in traffic and concentrating on driving.

Autonomous vehicle could also be helpful to me and those around me when it comes to businesses that do deliveries, as you could order things online and it could be delivered using an autonomous vehicle, getting a contactless delivery to your door.

So all around, once driverless cars become more common place, it would have a general positive effect on my life and that of those around me.

Blockchain and Cryptocurrencies

What Does It Do?

Blockchain technology is a decentralized and distributed, digital ledger used to record transactions of any type whereas cryptocurrencies are a digital currency that operates independently of a central bank, cryptocurrencies commonly use blockchain technology to operate, maintain and distribute themselves. Blockchain has the option to use a public ledger which is why it is referred to as public. What makes blockchain technology state of the art is its decentralisation due to its distributed digital ledger, this means that instead of one database keeping a record of all its data or transactions that record is made public to everyone with the public key, this allows an indefinite number of copies of the records making it almost impossible to hack. Even if someone was to create a public record, the system would recognise its difference to all other existing records, and it would be changed to be the same as all others. The private key (which is an extension of the public key) is what allows users of a cryptocurrency or blockchain software product to interact with each other, ie in the case of bitcoin transfer bitcoin from one user to another user.

With the first cryptocurrency and the first use of blockchain technology being only in 2009 (bitcoin), these technologies are fairly new, and their potential has really yet to be explored. Currently, many large corporations are starting to use or are exploring blockchain technologies and the potential increase to productivity or efficiencies in their business, some of these include Shell, ANZ, DHL, and Bank of China. All of the corporations are looking at or are implementing blockchain in their transaction or record keeping.

In the next three years, it could be expected that many larger corporations that have the capital and willingness to invest in the technology and involve it in any part of their business. This could be a part of many different types of businesses and involve helping shorten their supply chain, medical record-keeping, transactional logs, stock movement with its implementation use up to the creativity of the designer.

In terms of banking, blockchain will allow for much faster and secure transactions, due to its decentralisation it would allow people to send or receive money and be approved quicker due to the algorithms running 24/7 and with no need for two or more banking institutions to approve a transaction. Currently, transactions can happen in a fraction of second but the actual process of verifying that either account exists and has access or is allowed to transfer the amounts being sent can take up to several business days and requires banks to have different arrangements and agreements all over the world. By removing this complicated verifying process blockchain has the ability to revolutionise not just the banking sector but many different finance sectors including stockbroking and land transfers which both

have a very similar issue when it comes to verifying transfers.

Cryptocurrencies, already a highly tradeable currency, have yet to make a big dint in traditional spending. In the next three years we could see a greater shift towards people not just trading cryptocurrency but using them as you would a traditional currency to purchase goods and services.

Ever increasing internet speeds and interconnectivity of the world is what fuels blockchains true ability and what makes any cryptocurrencies universal and a truly world wide currency. In the cryptocurrency world (especially shown with bitcoin) the ability to be a part of the system also known as "mining" makes the systems viable by allowing users to be a part of the verification process in reward for a small amount of the currency its self, this ability to "mine" is what allows the cryptocurrencies world to function and be so private and secure.

What Is The Likely Impact?

This technology could have important impacts on the operation of our financial services and additional follow on effects to our security and privacy. It may change the way our transactions are stored and accessed, also the speed that certain transactions are authorised and approved at. In the future businesses that integrate this technology into their business model will create improved efficiencies in the way certain data or certain processes are done internally. For example, stock changes or tracking supply chains across multiple subsidiaries or global companies. With some large corporations or certain industries, it will help the way data or records are shared, increasing their interoperability, ie. Government contractors that need to share a transaction that requires authorisation and approval will be able to have the technology run 24/7 and externally to either organisation.

An important impact of this technology that we are starting to see as cryptocurrencies become more known to us is their use in criminal activities and how authorities are adapting to this. Due to our current banking systems being centralised and compliant to a different countries laws and other international laws, transactions can easily be traced but with the decentralisation that blockchain and cryptocurrencies have, it allows them to transfer any cryptocurrencies and have their identity and details of their transaction kept private. This negative effect will need to be overcome to see cryptocurrency become an important part in our economy.

This technology could potentially affect people whose jobs revolve around record-keeping, whether that is physical or digital records. It may see some of them lose their jobs, but this will possibly be countered by the increase in jobs to build and maintain the blockchain system. Over the next few decades, blockchain technology could replace the current technologies and systems that currently support our information storage across the world wide web and centralised servers, whether for private or public business.

This process is slow because it does not provide an upfront cost-benefit but a long term efficiency benefit if the company/institution can implement it correctly.

How Will This Affect You?

In your daily life, this technology can change how your personal information and day to day transactions happen. You as an individual may not see the changes yourself but your privacy and security will be looked at in another way. You may have a greater sense of privacy and security when using online transactions with your private data especially in the areas of finance and medical data, which may see the biggest use of blockchain. These changes will see the basic background of all our interactions and storing of our data effected, you may no longer worry about the privacy concerns for such things as My health records in Australia if it were to use blockchain technology or loss of credit card information if platforms on the web are using blockchain or any type of cryptocurrency to make payments for goods and services.

Even with the increasing use and potential changes into cryptocurrency, the way we make purchases and complete transactions won't likely change, we will most likely continue to use the currency we currently have, transitioning from a central bank system where all our transactions are processed to a blockchain system where we are still issued cryptocurrency and will more than likely have today's larger banks act in a similar fashion to what they do today as holders and lenders of the cryptocurrency. This may affect your friends and family if you are separated overseas as blockchain technology and cryptocurrency is very easy and quick to send over borders due to the decentralised nature of both technologies.

Cyber Security

What Does It Do?

In this ever-expanding world, while technology is a key driver for growing societal and economic benefits, it also brings about new security challenges, through the never-ending attempts of prominent, re-emerging cybersecurity risks and threats, 'hackers'. As of recent times, the world has provided some of the newest defense in the never-ending battle to protect the world from those unauthorized to access secured data. One notable development in the field is a new form of defense known as 'moving target defense (MTD)'. It is a new concept that was created by the Department of Human Services (DHS) and finally has the chance to potentially give cyber defenders, the good guys, the upper hand against the war on cybersecurity.

MTD introduces a process, that constantly changes the attack surface across systems to increase uncertainty and complicate attacks. This creates confusion for those who are attempting to attack as they are now unable to target what they cannot see. MTD can be implemented in different ways, including via platforms or application code and data. However, where MTD promptly works is through the distribution of decoys, which can range from a false endpoint to servers and even Internet of things (IoT) devices.

The distribution of distractions constantly shifts the online environment, prompting attackers to question if the vulnerabilities they find are real or not, and even if the systems are real or a decoy. Having the ability to force attackers into questioning their attacks along the way slows down their end game and gives the defenders the advantage in being able to deal with, implement defenses, and seize any attack opportunities.

There is a similar approach, another take on this concept, that was developed by an Israeli company 'Morphisec' who have developed what they also refer to as an MTD. This works similarly in the way that the DHS' take on MTD does but instead of seeing the results through distraction distribution, they have taken the idea of being able to keep data moving and harder to pinpoint by scrambling the names, references, and locations of files in the server's memory. This makes it incredibly difficult for cyber threats to attack maliciously and use malware to infect a system.

As an added security measure, and to reduce the likelihood of a successful attack even further, the moving target security was further developed, adding in a function that changes the scramble each time the computer is booted. This ensures that the system will never have the same file names or configuration as it did before making it even harder for breaches or attacks to occur. While both of these developments can reduce the need for threat detection, offer scalability, and a more level playing field, they need to be able to fit within any existing infrastructure which if not can leave possible back doors and vulnerabilities open. They are by no means a perfect way to

completely stop attacks from happening, instead, they both work in a way that assumes attacks will continue to happen.

As it is better to work on the assumption that there is no perfect security measure, it is more beneficial to simply try to provide an advantage in making attempts at attacking more difficult where possible and can be seen as just one of many strategies that can be implemented as part of the wider scale defense in cybersecurity.

As well as these new strategies, in the next few years we can expect the industry to continue to grow, and with that more security challenges to arise as new technology such as 5G continues to be implemented, and other technological advances such as AI and Biometrics continue to hit the market on a global scale. These advances will have a huge impact on the way we look at and view security across the world and provide some amazing opportunities to create an even stronger defense than we have at present. The technology for AI and Biometrics can be seen already in the world but in terms of cybersecurity, however, is still in the works as it requires some very in-depth understanding of the impact and roles that both will play moving forwards.

What Is The Likely Impact?

The potential impact of the new and emergent development in technology over the next few years will see criminals continue to try and seize what they can due to an increase in lack of understanding of how these technologies work. In turn the minds behind defending the digital future constantly needing to identify and understand the potential new risks in these new developments. All of this as well as continuing to see to it that our current cybersecurity landscape remains protected.

We will see millions of new devices that will be connected to the internet, posing many more opportunities than before for threats to attempt to steal what is not rightfully theirs. Advances such as AI and Biometrics whilst still being developed create both exciting opportunists in Cybersecurity defense and at the same time provide just as many risks and potential threats. Given the need for huge efficiencies in detection, the provision of situational awareness and real-time remediation of threats, automation, and AI-driven solutions are the future of Cybersecurity.

However as previous Cybercrime has shown us, the advances in any technological development in AI have significant fallbacks as they are usually quickly seized upon and exploited by the criminals. Whilst AI is something that we will need with future advances, it is not something that we can just openly hand over to the criminal community.

Such the same can be seen for Biometrics, being thought of by experts as the 3rd factor in authentication. The opportunity is there to create and run something phenomenal, but to do so would require the data of an

individual to be stored globally and will drive cybercriminals to target these high volumes of data. These advances in technology for the current time and over the next few years will, I believe, create more available jobs.

Those that are in charge of defending our digital future, will continue to need assistance as our drive for societal and economic growth brings the need for a greater understanding of how the security community believes the cyberthreat will change with technological advancement. AI for one will never be able to replace an analyst's insight and understanding of the field as without this we cannot move forward to an all automated procedure/strategy due to the potential for risks and attacks being too high.

How Will This Affect You?

In my daily life, I have no idea how any of these will affect myself, but as for my friends or family, some concerns could be raised. I can only hope that with the continued development, research, and understanding that we as a society do not need to follow suit of other countries and begin to monitor, restrict and ban certain applications and websites. If this were to happen it would then affect my life, in limiting my ability to do such daily tasks as browsing the internet, using Facebook, or potentially even what emails I can send.

This would also be an issue for those around me, close friends, family, and society ultimately. I would like to see and believe there is a future in which technological advances will make our lives better, rather than worse off, with more fulfillment, opportunities, and protected information/privacy. However I also realize that with this, there is a possibility that to achieve this, we as a society may need to be monitored and analyzed more so than ever through technological advances, should the need to ever arise.

It also raises the question of safety as if the good guys, the ones who are employed to protect us, our society, have access to these measures, what does it mean should these accesses ever fall into the hands of attackers? I would assume that is always going to be a fallback with any new concept, idea, or implementation. Hackers are becoming increasingly innovative with the techniques they use to access sensitive data.

In many cases, new technologies that have just hit the market are helpful to hackers, who take advantage of people's lack of understanding of how those technologies work. Threats will always remain active and more prominent than ever, so long as there is confidential information being used and stored throughout the world.

Robotics

What Does It Do?

Robots are able to do many things that can assist us and simplify our lives. Robots can be used to do tasks that would be incredibly boring and tedious for humans, they are also able to be used to access areas that would have been extremely dangerous or impossible to access for humans. Robots can furthermore assist humans to lift or do things that would have been difficult or impossible without any human assistance. There are also robots designed to entertain us and make us laugh (ASIMO falling when walking up stairs or NAO robots playing soccer). Robotic technology is quite advanced now and robots are able to balance by themselves and move autonomously (with the use of sensors).

SPOT, a robot from Boston Dynamics, builds upon its predecessors (BigDog and LS3) it is both smaller (dog-sized instead of mule-sized) and significantly lighter (24kgs compared to 450kgs). In contrast, SPOT cannot lift as much weight as its predecessors could. It makes up for it in its weight, size, and expandability. Some of the proposed applications for SPOT are building inspections for construction sites, tunnel inspection in the mining industry as well as healthcare, where SPOT can deliver food and medicine, as well as disinfect rooms. SPOT is currently being used in Singapore to help enforce social distancing during the Covid-19 outbreak. The military will more than likely use robots like these in the future. This is not the first time robots have been used by the military, LS3, a predecessor of SPOT, was used to help deployed squads.

With the advancements in microprocessors and the drop in the price of sensors, robots are getting cheaper and more powerful. Processors have also become more powerful and efficient than before. A high-end consumer CPU previously had between 4-8 cores, now there are CPUs that offer as many as 64 cores and 128 threads.

Robots are able to analyze and make decisions from sensor data faster than in the past, lidar sensors are used to make this possible, more companies are making lidars, competing against each other to make the most powerful lidar sensors while keeping the costs low, so low in fact, that lidar is now a feature in the 2020 iPad Pros, something that would have been impossible a few years ago. With the costs of these components going down, it has become cheaper than ever before to get into robotics.

Robots are also being used in the food industry. Spyce, a restaurant in Boston, MA, has the first robotic that can cook complex foods, they do have staff that prepares the ingredients and garnish the dishes, but the robots do all the cooking. People order the food on the store computers, and the robots make their meals. Creator is a San Francisco based burger join that makes burgers using a robot, the robot slices the bun, puts sauces on it,

cuts the burger toppings to order, grates cheese for the burger, and the meat gets ground and cooked to order, the robot then assembles that burger. It can make a burger in around 30 seconds, this robot does it without needing any human interaction. In CES 2019, a bread-baking robot was showed off, these sorts of robots could be used in bakeries so that bakers can focus on other things that are more challenging, like making different types of bread and pastries and leave the loaves of bread for the robots to bake.

These robots are amazing, but there are still some problems with them, while the Spyce robot can prepare food, it cannot prepare foods that it is not familiar with. In the case of the robot in Creator, it can only make burgers. Soon however, robots may become a staple in kitchens.

What Is The Likely Impact?

Robotics will lead to a loss of jobs in certain fields in the future, while mechanics and software developers may become more in demand. Farmhands, factory workers, bakers, cooks, and jobs that are repetitive and do not pay as much could possibly not exist anymore.

In the agriculture industry, some robots can target and spray weeds entirely autonomously. Since these robots run on solar power, they can keep working as long as the sun is out. There are also large machines that use machine learning and robotics to apply herbicide to only the weeds, and the developers claim that it uses only a tenth of the usual amount of herbicide used compared to traditional means. When it comes to picking fruits, there are robots that can pick citrus fruits and ones that can automatically harvest strawberries. While this is fantastic news for farmers, people who rely on fruit picking, or those that are farmhands, could be out of a job. It would not be surprising for farms to have less than ten people during harvest time in a few years.

In the food industry, jobs that were common just decades ago are being replaced by robots; there are robots that can ice cakes and muffins. In car manufacturing, robots have also replaced people. It allows cars to be built to a higher standard and lowers the cost for the company; hundreds of jobs have also been lost because of this. The people affected by robotics technology are usually those that do manual or unskilled work. A lot of these workers, especially ones that work in factories, have been replaced by robots and machines, and at this rate, it is only going to get worse.

How Will This Affect You?

Robots are becoming more common now than ever before, they can do many jobs, and in the future, many jobs that were done by humans may not exist anymore. However, robotics can also create new jobs and opportunities, as more people will be needed to develop and maintain these robots. This

means that there are more ways to get into this industry, and the fact that it keeps on growing means that it will not be as challenging to find employment in this field compared to in the past.

Robots will also be more commonplace in the home, and this means that people can do more important things and let the robots take care of the chores. Appliances like dishwashers save plenty of time, however, with robotics, tasks like cooking may become less of a necessity and more of a hobby.

Robots are being developed that try to identify different types of clothes, fold and sort them according to what type they could be, currently these robots fail at that task but in the future, it will not pose a problem for them. This will also make life a lot easier for many people.

However, on the flip side, the introduction of robotics in factories and other industries would be a negative for my family members, they have seen many people lose their jobs because a robot was introduced that was able to do their job faster and more efficiently. With faster, smarter, and more efficient robots, harder tasks can be done by robots. Amazon has been using robots in their sorting facilities to move packages around, but they still need to be monitored by humans. For postal services, large robots have been made that can sort packages and letters. Not as many people are needed in these sorting facilities anymore. For robots that can work in factories, robotic forklifts have been made, and while they may not be as common as some other robots, they will probably get cheaper and more accessible in time, potentially putting some friends and family of mine out of a job.

Part VI
Project Idea

Overview and Description

Overview

Our project idea is to develop an affordable, scalable aquaponics monitoring and automation solution for back yard hobbyists. 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 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 off 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 fish 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 and maybe in time become a viable solution for more people to get into commercial aquaculture, further promoting sustainable farming methods.

Description

For Proof of concept, a home made flood and drain aquaponics system will be used as the 'test subject'. Diagram A shows 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 back 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.

Due to the flood and drain nature of this system, majority of sensors will be in the fish tank. As a proof of concept we will start with measuring temperature as this is cheap and easy to do. Additional Information will require more expensive sensors or customised equipment but the general idea of measuring values will be proven. This environment variables can then be transmitted wirelessly to a central server to be logged and presented to a user via a web based dashboard.

The central server that logs the information and provides the web-based user interface will have its own logic built in with adjustable constraints. This will allow the user to setup alerts for when things are going wrong. Alerting can be setup using basic email alerts, but email alerts are not ideal. They are often lost within other email, picked up as spam or can flood an inbox altogether. As a stretch goal to this project, or even as a future add on, a mobile app could be developed that communicated with the central server. This is where this project could really stand out from other do it yourself solutions. In fact, most of the intellectual property involved would be in the Servers ability to process the appropriate information rather than the hardware itself. Additionally, an easy to use mobile app could in fact be turned into a viable product for commercial aquafarming, given enough consultation within the industry.

What to Measure?

Water Temperature

A consistent water temperature is paramount for the health of fish. 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 flood 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 is in a consistent state, both fish an 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.

Hardware/Software Requirements

The Hardware and/or Tools requirements can be broken up into clients side and server side. The client side defines the hardware/software required to measure the environment variables of an aquaponics system and can be replicated for additional systems. The server Side defines what is required by the central system that stores the log data and presents It via a dashboard.

Client Side Requirements

On the client side we require hardware that can either measure different variable or control devices to interact with each system.

Phase 1:

- A Raspberry Pi (A raspberry Pi Model B will be used as we have one available)
- A Wifi Nano USB Adaptor (For communications)

- Wireless connectivity to the internet and/or server (Wireless networking out of scope for this project)
- A waterproof DS18B20 temperature probe such as https://www.altronics.com.au/p/z6386-stainless-steel-housing-waterproof-ds18b20-temperature-probe/
- 1 x 4.7k Resistor (As required by the DS18B20)

Phase 2:

- A PH monitor
- A Sunlight sensor such as this: https://thepihut.com/products/grove-sunlight-sensor
- A water level sensor – more research on the best method required

Phase 3:

- Ammonia / Nitrate Level measurements. This is the most difficult and expensive and most likely out of scope for this subject but we could do some research and present some possible options. I have read of people suggesting some form of robotic testing using chemical testing strips and then a camera reading the colour of the results. In the first instance, we could just have a way to input manual tests in order to track results

Server Side Requirements

Currently much of the server side this project can already be done with a combination of readily available open source tools. Reporting and monitoring tools such as Nagios exist which can be deployed to measure temperature from a source device. The Nagios client can be installed on the Raspbian operating system, whilst the Nagios server can be installed on a number of Linux distributions. Addons such as RRDGraph can then display this information. As Nagios is a product more aimed at IT infrastructure we would be looking at developing our own unique solution. The RRDGraph/RRDTool open source logging tool can be used for this purpose. See https://oss.oetiker.ch/rrdtool/

- A custom communications client and server, most likely written in C, though RRDTool does have some network communication options that could be explored.
- A database engine to store definitions of Aquaponics Systems and user credentials etc..
- Environment variables will stored in RRDTools native round robin database format.
- A web server such as Apache or Nginx to serve the web dashboard

- HTML, CSS, PHP and other web technologies to build the interface
- A Server side scripting language to generate graphs on demand using RRDTool
- A mail server

Skills Required

Many of the skills required for this project are common among IT enthusiasts, though it is likely an experienced developer would be required to ensure reliability of the end product. Networking skills in both local wireless networks and cloud server security would be required, not only to ensure connectivity but also to protect the project from unwanted intrusions or outages due to denial of service attacks and the like. Although setup of Raspberry Pi & Arduino style devices is fairly straight forward, this project would require some basic knowledge in electronic circuits, soldering and safety.

If this project is successful, home aquaponics hobbyists and aspiring entrepreneurs will have a new tool making their life much easier and saving them time due to the lack of manual water quality testing required. This will allow them more time to either spend on other ventures, or allow them to increase their output by adding more tanks and grow beds to their operation. Additionally, making a sustainable farming method easier to understand and manage may get more people involved in an exciting way to progress our farming methods for a better future.

Part VII
Group Reflection

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