12.0.0 Assessment Task 3: Our IT Project

Raspberry Pi Fridge and Freezer Temperature Monitoring System

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1. Team Profile

a. Personal Information

i.

ii. Glenn - s3794630

I have lived in Melbourne for almost 3 years having originally moved from Perth.
In Perth I studied a Bachelor of Commerce and have worked in the hospitality industry for almost 10 years - I currently work as a function and event sales coordinator.
I play piano and have been in a number of bands all my life including a 12-piece big band and currently a 5-piece cover band playing all kinds of events and venues.

The industry of IT is constantly evolving and becoming a bigger part of our lives.
We are becoming more reliant on technology to keep us connected, do our jobs and be entertained.
My interest in this field is in the area of security and how we can protect our information from those who want to take advantage of our rising reliance on technology.

I've always been interested in computers and using technology in my own life.
From something as simple as an electronic calendar to building miniature robots (from a step-by-step box!).
I've chosen RMIT because of its great reputation in this field as well as being able to study online – another great aspect of our current age of technology.
From my studies, I expect to learn the fundamentals of the industry to allow me to get a job in my field of interest where I can continue to learn.

iii. Sam B - s3768719

I am currently completing my Bachelor of Information Technology through RMIT via Open Universities Australia.
I am working full time as a warehouse storeperson for PC Case Gear. Have interests in things such as working with computers (building and upgrading) PC games, tabletop wargames such as Warhammer 40k and also enjoy playing guitar.

In an ideal scenario, I would like to run my own development company, building and maintaining websites and software. This is very idealistic and difficult to achieve, I will need much more knowledge and experience to achieve this and this degree is my beginning to this.
I have always worked in physical roles all my working life and as I start to get older my body is starting to let me down. I have always be a natural when it comes to technology with very little instruction and training. I have always found solutions and pathways where others would not.
IT in general interests me a great deal and can see it being a great option for myself to support my family.
Avenues that I would need to take to reach my goals will include working in the industry. Jobs such as Front end developer or Database Administrator are the kinds of jobs that would put me in good stead to gain the knowledge of the industry
Started a degree years ago at a different uni that was a double degree in Game Design and Computer Science.
Had to put that aside to go back to work full time. But I do have experience now in some programming and coding theory.

iv. Cameron - s3760335

I was born at my home in Buderim in QLD, I have grown up my whole life on the sunshine coast and went to school to both Kuluin state school in Kuluin and also St Johns College in Nambour in which I completed grade 12, over the years I have had many pets, but one of my most favourite is the pet I currently own with my partner as it is a nice big Oscar fish called Wesley which will bite your finger off if you put your finger in his water!
Although my main interest currently is focused on the financial industry, IT does play a large part of how the industry functions, in an expanding and ever growing technological era, knowing how IT affects and promotes not only an individual business but also entire markets is paramount, this is why I have chosen RMIT to study for an IT course, I believe that by the time I finish this course, I will have a much better understanding on how IT can affect my future.

v. Tim - s3485124

My interest was first piqued when I was 5, watching my older brother (who was 7) build websites using HTML on a platform called Matmice. From simple beginnings like learning how to hyperlink and setting the favicon, to designing templates in MS Paint and embedding flash games from other websites we both had a lot of fun learning the early web together.

This was not always going or be the case however, as my interest in web development would soon be consumed by sports and music, hence IT was on the backbench. As for the next number of years, when I wasn't playing sport or music, my interest in IT swayed more towards video games and setting up servers from unused PCs for friends to play on (mainly Source Engine games).

Having never delved too much in to the actual code and software side of things, it wasn't until I was in the tail end of my Chemical Engineering degree that I developed an affinity for programming, somehow finding myself in the world of .NET and C#. More recently, my interests have been overtaken by the strange and wacky domain of Bitcoin and Cryptocurrency.

Undertaking a Bachelor of IT felt very natural to me, for a newly kindled interest in IT and programming left me wanting more in terms of an education, and RMIT was a logical choice I was already in my final year of Chemical Engineering with RMIT. My expectations of this course are to hone in on the skills I have taught myself in my spare time, learn what skills I would need to develop to sustain a career in IT, and to gain the ability to adapt to the ever-changing landscape that is modern software and technology.

vi. Austin - s3788792

My name is Austin, I am 19 years of Age and currently studying a Bachelor of Information Technology to broaden my understanding and add additional documentation to extend my resume, in hopes of expanding my career beyond Desktop Support. I chose RMIT as i see it as a much more reputable university than VU, which i had to move on from as i was offered this permanent position at Western Health and they had no IT related courses that I could take at night or in my spare time Online. I hope in my time in this course i have the ability to learn many Database related systems and that I can expand this into using it in the real world in the workforce.

vii. Sam J - s3795053

As a team, our personalities are a broad mix, there will be no clashes in the way in which we will learn due to the personality types with Mediator personalities working hand in hand with all other personalities as they have no interest in having power over others, also, the learning styles will fit hand in hand, the majority of the learning styles is tactile learning however there is a few members which are auditory learners, what this means is that whether the task involves sitting down and practically learning or listening while multitasking, there will be a strong amount of people in the group who will pick up on the information and share it accordingly.

The third test that was taken was more so of an extra test, in this test, the creativity and reasoning of each person was tested, in this area it is clear to see that each person is very different, however due to the other personality and learning traits, there will be no problems in people with more expertise and creativity helping those who do not know the way or are struggling to come up with ideas.

b. Group Processes

Our group worked well together on the second assignment, everyone was willing to contribute and delegation of tasks worked well.
We found that due to only having online communication responses were delayed. For this assignment we'll be working on this by improving our communication, having designated 'team meetings' so that everyone can discuss ideas at one time. From this, we'll write 'meeting minutes' that will be distributed to the team with the delegated tasks to work on for the week.

c. Career Plans

Lifehack, 2018

The ideal jobs of this group are actually quite similar, both Sam J and Glenn have the ideal job of becoming a security analyst and Sam B and Tim both wishing to become stack developers, this is interesting as it shows that these people have a common goal in mind and will essentially work better together as they know what they want, the difference in these two types of jobs however is quite large, a security analyst will look into protecting a company through implementing different types of software which will recognise potentials threat to that business and be able to protect their information whereas a stack developer is somebody who can develop the entire system pipeline, these would include databases, servers and involve system engineering. There is however over a few outliers of the group, Including Cameron who wishes to become a Financial Planner, this job is in a completely different direction to the other members of the group who wish to pursue a job in the IT industry as it is in the Financial industry and the job focuses on helping people from all different backgrounds reaching their financial goals, however in times where technology is growing at a rapid pace, you need to be able to adapt to any changes otherwise you will be at risk of falling behind the competition who can implement various types of IT to their advantage. As a whole the group definitely has different pathways which they wish to travel down with completely different industries however the group all has a common interest in understanding and learning more about technology as in today's age, it is very important to keep up.

i. Glenn

Since the start of this unit my career goals have remained much the same, though I feel I have a better understanding of how I am going to reach those goals.

Previously, I did not have much of an idea of where to begin the IT industry as I have no previous experience in this field. Now I feel as though I have an entry point and a clear path to head down for my career goals.

ii. Sam B

Career goals are not as simple as "I want to be a programmer" anymore, I am looking into finding my footing with development, but not necessarily pigeon hole myself to a particular field. I enjoy working in different systems and environments and I can see myself growing into a career rather than having a specific job.
As I do find I am more productive as gain new knowledge and new skills, I find myself being more productive. So I will always want to be expanding my options professionally.

iii. Cameron

My career goals have only slightly varied due to finding a job along the same line which interests me more, I feel compared to the rest of the group my career plan is on a different road as the majority of the group is heading down the IT routes whereas I am heading down the financial route.

iv. Tim

Career goals for me have been based much on the assumption that what I have been working on in spare time between by chemical engineering studies is in fact the direction I want to be heading career wise. Upon the completion of this unit, I would now position myself as a blank canvas, ready to redirect my career goals upon learning new skills, becoming more familiar with formerly unknown industries or simply fine tuning my technical ability and knowledge to meet industry demand.

v. Austin

My Personal Career goals have not changed while doing this course drastically, i still focus interests on SQL and databases while also having interests in IT Security and management. The last two are something that i have inherited from my dad, and is something i have also been getting some exposure to at my workplace. While the Database interest is something self developed and thought of due to the high interest in work which i was able to learn more about in our first group assessment together.

vi. Sam J

My career goals have stayed very much the same throughout the duration of this course. I would still very much like to be a cyber security analyst. Whilst simultaneously studying introduction to programming I have had my interest piqued. I will be exploring the several avenues programming has to offer.

2. Tools

a. Link to Group Website

https://sambradburyrmit.github.io/GroupNineteen/
(Templated 2017)

b. Link to Groups Git Repository

https://github.com/SamBradburyRMIT/GroupNineteen

c. Audit Trail Comments

An audit trail is record that can trace work and transactions with the use of identifiers such as date and time stamps or identification numbers. Audit trails are used to verify and track many types of transactions. (Investopedia 2019)
There were 2 primary audit trail tools. The trello board not only kept the team on track for what needed to be completed, but also provides all the relevant information about who completed what tasks and when it was completed.
The other tool available is the commit trail in github. It shows all the work committed and pushed to the repository as well as information of who did the work and when it was done. A major positive in using the commit history as an audit trail is version control and being able to review previous iterations of the project. Being able to open previous versions of the code and revert back to older versions if there are problems with the current version.
Our audit trails does reveal our workflow. Lots of work being done primarily towards the deadline.

3. Projects Plan / Description

a. Overview

i. Topic

This Raspberry Pi Temperature Monitoring System will measure the temperatures of a number of different freezers and fridges being used to hold samples of fish being studied at a genetics lab.

PC Mag 2016

Once linked to the onsite equipment the temperatures will be able to be monitored by the user from anywhere using their own interface.
This gives the user real-time information on the fridge temperatures allowing them to make quick and important decisions if there are any errors or issues that suddenly arise.
If the freezer were to dip below a 'danger level' temperature the system will send an alert to the user with the current information.

ii. Motivation

Our motivation to undertake this project came from the need to fulfill a demand from scientists at Monash University who were in need of an affordable and reliable temperature monitoring system. This is important as it will assist in the work they are doing - freezing fish embryos so they can be stored and used at a later date.
This is an increasing need in the scientific community and with the growing trend of using the Internet of Things to create products we felt we were able to be a part of this.
Future employers would be able to see we are innovative and can translate our skills to different areas of research.

iii. Landscape

The market for competing microcontrollers is quite saturated, with the Raspberry Pi standing as a market leader among the rest. This is due to its modularity, and easily being able to attach modules to a Raspberry Pi to utilise those functions.

Companies can often use picaxe microcontrollers due to its much smaller size creating better portability and an easy to understand language, however, a picaxe does not have any possible complex tasks that cannot be done by adding modules to allow thermometers to work and is not as open source.

Sparkfun 2019

The Raspberry Pi also allows for easy Operating system installation which can enhance users experience. This is something that many other competitors for the Raspberry Pi cannot do. Currently on the market there are DIY Projects that feature a temperature sensor, but lack complex readings. For example, it is common to find these to only feature an LED light and Piezo modules that indicate basic understanding (for example, the fridge temperature is >30 degrees Celsius, it will make a noise) but this does not feature in depth analysis of temperature including exact temperature and any visual readings aside from an LED light.

b. Detailed Description

i. Aims

We were approached by researchers at Monash University to address a problem of currently having issues with their freezers and fridges fluctuating in temperatures and the researches not being notified in time.
Current wireless lab monitoring equipment can cost upwards of $1,800 for a single monitor, an expense that can prohibit access for smaller laboratories.
The laboratory that we will base our model on requires monitoring for twenty-six temperature sensitive pieces of equipment across seven different lab spaces.
The aim of this project is to develop a low-cost solution for temperature monitoring across the lab, safeguarding important samples as well as proving a more costly solution to this problem with a user-friendly interface.

ii. Plans and Progress

Our technology will be able to detect fluctuations in temperature inside fridges and cool rooms. Once these temperature movements are detected an alert will be sent to a designated smart phone notifying the user. It will be an efficient and cheap alternative to the expensive competitors already on the market. This idea was created by a few of us in a discord chat directly after the first weekly Collaborate Ultra session. We all decided we wanted to work with the raspberry pi technology and this idea was nominated as the best avenue to take to learn more about said tech. Glenn used his connections to set up a collaboration with Monash university in the Obstetrics and Gynaecology Department which means we now have access to multiple fridges and freezers to test our product. Whilst all this was being organized Glenn also attended a seminar dedicated to the raspberry pi, he learned a bit more about their functions and capabilities whilst the rest of us have been doing research on them as well. We are planning to buy a few of them within the next week to get started. We have decided to use a simple thermometer (ds18b20 temp sensor) within each of the Fridges/Freezers that is connected to a raspberry pi 3 via a single cable. We will be using the python to program them, luckily some of us are also studying intro to programming so learning the new syntax should be relatively straight forward.

iii. Roles

There will be four different roles utilized in the completion of this project:

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- The technical designer will take the project idea and turn it into a functioning product. He will create the entire design plan from start to finish. He will look after the lead programmer, the User Interface Designer and everyone else involved making sure they are following his vision as closely as possible.
- The lead programmer will oversee all coding projects. For this project these coding requirements will mostly be based in the python language, using this programming language to code the raspberry pi.
- The user interface engineer will work on the application connected to the users device. He will work specifically with Thingspeak using HTTP making sure that the data is delivered correctly and is able to be accessed by the user easily and efficiently.
- The IT Business Analyst takes care of the business side of things. He will help to improve the overall integrity of the technology by helping with the ideas/solutions part of the project design as well as the testing.

iv. Scope and Limits

Deliverables and Outcomes

In its most basic form, this system will consist of one (1) temperature monitor and a device to to read and monitor the outputs.

For someone wanting to see the results of the work this will be enough to understand the general premise. The reading device does not have to be a mobile apparatus, for the purposes of a prototype the user can access the information via ThingSpeak on their desktop, laptop, tablet or phone.

Scope

This is the most basic use of the technology, to address the issues at the lab there will need to be multiple monitors for all the fridges and incubators. These will all send their data to ThingSpeak which will have multiple modules showing current temperatures and temperature trends for each monitor.

From this there is an application users can access on their phone. This eliminates the need for a second device the user would have to carry around.

The application will have minimalist, easy to read interface allowing the user to read the data quickly and act accordingly. Notifications will be set up if temperatures reach a "danger zone".

Limits

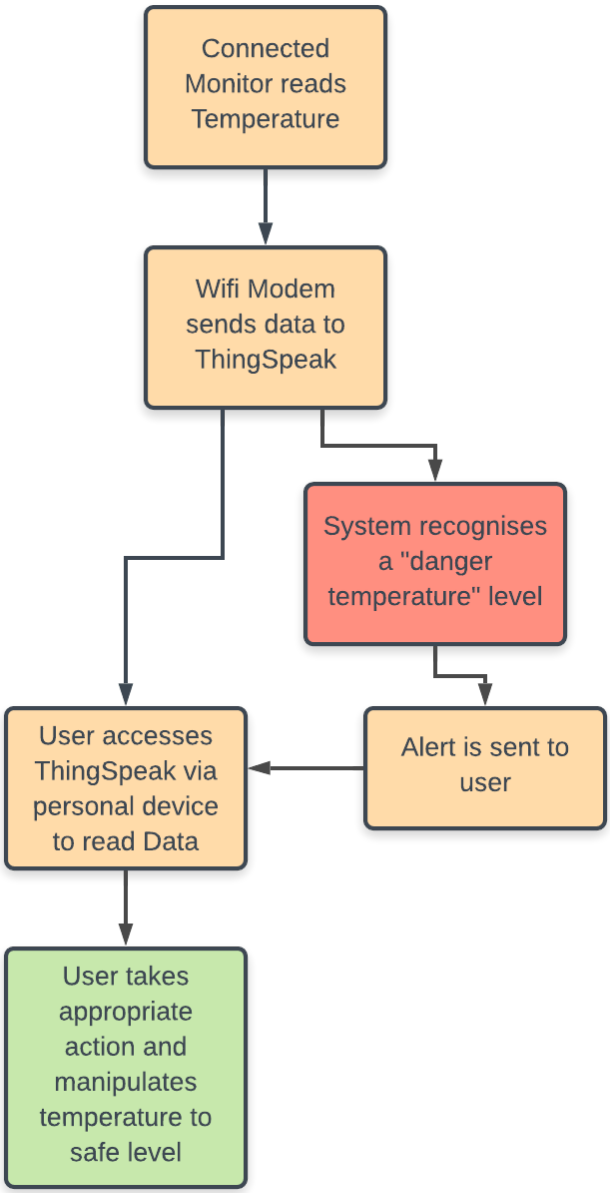
The current challenges and limits we face are to do with the Raspberry Pi and temperature monitor.

The monitor we have chosen can read temperatures down to minus 50 degrees celsius, whereas the freezers we aim to use this for has temperatures of minus 80 degrees celsius. This is why the first trials will be in the fridges (minus 4 degrees celsius) and incubators (37 degrees celsius).

This being said, we are yet to trial the Raspberry Pi in these cooler temperatures to see if it will work accurately. One possible workaround would be to develop a casing for the unit to protect it from the conditions.

The Future

This technology is not restricted to university labs. With its easy to read interface anyone will be able to access and understand the data. This gives it scope to be used in the hospitality industry, medical industry and even personal homes just to name a few.



Although this technology allows the user to read the data, if there is a problem they will still need to either go to the lab themselves or contact another staff member at the lab. In the future, it would be ideal if the user can read the data and manipulate the temperature remotely.

This will allow for a quicker response and eliminate the need to travel to the lab.

Further from this, an automated system can be developed to correct the temperature if it enters the danger level.

v. Tools and Technologies

There are several different equipment that will need to be monitored throughout the project. Including five -80ºC freezers, five -20ºC freezers, six standard fridges, one walk in fridge and nine warming incubators set between 26-39ºC.

Hardware would include a Raspberry Pi 3 (wifi), temperature sensors, resistors, breakout kit, breadboard and breadboard wire.

The main software we'll be utilising is a cloud based data platform called ThingSpeak.
With this, the raspBerry pi will send HTTPS requests to ThingSpeak which in turn sends a response. ThingSpeak will capture and store the data so it can be accessed at the user requests.
On the Raspberry Pi will be an ESP8622 Wifi Modem, an LCD Display for current temperature reading, a DS18B@) Temperature Sensor and a Breadboard.
The Wifi Modem was chosen as it's cost effective, around $10 per unit.
The temperature sensor is also cost effect and waterproof. It can read temperatures ranging from -55 degrees celsius to 125 degrees celsius.

vi. Testing

To test the product we will use our connections at Monash University. We will give them a sample of our temperature monitoring system and request that they implement it into a few fridges and freezers, in the early stages of testing - particularly the first trial - this will likely be just one monitor collecting information from one cooler. We will request that one of the staff takes daily readings of each of the units using our system. We will also send out one of our personnel to take daily readings manually from the thermometer. We will be testing this technology in fridges and freezers which will let us know whether it will work in extremely low

temperatures. After a two week testing period we will cross match the two data logs (One taken by Monash and One taken by us) and look for any issues Eg. Differences in temperature, inability to access proper data using our system. We will know it has worked when the temperatures match up perfectly, the equipment is in perfect working order and the feedback from the staff at Monash about their experience is positive.

vii. Timeframe

Defining the timeframe of our project will be critical to its success. Keeping a record of past, current and future milestones will ensure the deliverance of our final product. We have chosen to employ the use of a dynamic Gantt chart that can have progress updated on the fly, with deadlines pushed back or brought forward accordingly, per discretion of the project manager.

This has been and will continue to be an invaluable reference for those involved to have a sense of where the project currently sits, and what amount of work is required in a set amount of time. Documenting the last 6 weeks of progress throughout our preliminary planning phase, we have also looked ahead 10 weeks from now and set future milestones to ensure our project meets production phase.

Commencement of the Development/Design phase begins immediately, with 2 technical focus areas (Hardware/Software development), 1 marketing/relations focus area and a final sub-area regarding the possibility of a trade show appearance (very much linked to marketing efforts). Development of hardware and software will be closely coupled and will share milestones for much of the Development phase. Business and market related milestones will rely heavily on our trial results with Monash University, sourcing feedback and testimonials for further marketing purposes.

The projected timeline is by no means a final say is subject to change throughout the development phase of our project. It has been produced ahead of time as a malleable record.

viii. Risks

When it comes to technology, there are always risks and this project is not exempt from them. One of the major risks which could affect this project is malfunction due to a programming or hardware error, this is quite possible as it is a new design and there are many different features which need to work together at once.
Should this project malfunction it will be in a way which could turn out to be catastrophic for whatever the storage unit using the system was holding, these could include everything from fruit and vegetables all the way to temperature sensitive medicines which even a fluctuation of

a few degrees could spoil the entire stock.
One of the ways in which this could fail would be if the alarm system to notify when a freezer was to dip below a danger level was to malfunction and not be sent, this would result with the issue being unchecked which in turn will result in a failure to keep the product inside at the desired temperature.

ix. Group Processes and Communications

To ensure our project is running smoothly our group will communicate using the computer and phone application Discord on a regular basis, this application will allow us to speak and exchange useful data over the course of the week in which we will then hold a weekly meeting with all members to attend with voice chat, this is the preferred method as Discord allows us to post data as we talk so we can clearly show what is happening with our project, each meeting will also have it's minutes recorded in the case that one of our team members are unable to attend, this will help them to catch up on what was talked about in which they can then over the course of the week actively talk to the rest of the team directly.

4. Skills and Jobs

To develop the project further over the next six months the following roles have been assigned to ensure successful development of the technology:

1. **Project Manager**

The Project Manager is responsible for ensuring the project is completed on time, within budget and within the scope. This is assisted by creating a project plan to monitor the progress and performance of the team members.

2. **Business Analyst**

The Business Analyst will work with the organisation, in our case Monash University, to conduct research and develop solution to problems and introduce systems to the client.
The Business Analyst is the link between the developing team and the client as they will be gathering data and implementing new procedures and technology to improve the business.

3. **Software Developer**

The Software Developer is responsible for the design and installation of software systems. In this project their focus will be on creating a system that allows the user to receive alerts and be able to adjust temperatures remotely.

4. **Computer Hardware Engineer**

Our Computer Hardware Engineer develops computer systems, networks and routers for the temperature monitoring system. This includes the Raspberry Pi, WiFi modem and temperature monitor.
Over the next six months their role will be focused on creating systems for multiple fridges and freezers, ensuring they can withstand the temperatures and be able to manipulate the fridge temperatures remotely.

5. Group Reflection

a. Glenn

All of our group members got along nicely and were keen to contribute as much as they could.

The overall project timing could have been improved - while we've been able to come together and complete the project it would have been more beneficial to lay down more foundational work at the very beginning.
This not only gives more time to gradually apply more details but for group members to gain a better understanding of the project as a whole.

We did have trouble with one group member who did not respond to emails in the initial formation stage of the group. Anthony was contacted who advised she was still an active student so we continued to try to contact her. She appeared for one day only a couple of days prior to the due date but then we never heard from her again. She unfortunately did not contribute anything to this assignment.

It's great to see how quickly everything can come together when everyone is able to be online at the same time and bounce ideas off each other.

It's important to find out everyone's strengths and weaknesses at the beginning of the project. Some people work better in certain situations and can focus their strengths in particular areas, to know about these early on would give a huge advantage in the long run.

b. Sam J

Working as an exclusively online group has been a bitter sweet experience. Getting the group consolidated and in to the same chat room was a difficult and slow process. Once we were all together though the workload started flowing seamlessly. Third party apps were being utilized for further organization and everyone apart from Asia pulled their weight. This was the experience for the first group assignment. The second one was a little different. Everyone vibed

and got their jobs done with a few people going a step further and organising our trello board and google doc to make the whole project much easier.

c. Sam B

Working as a group has had it's ups and downs, especially an online group. Trying to gather people from different locations, with different availabilities as well as the normal obstacles that life can throw your way, was always a bit of a challenge. However, everyone did manage to pull their weight and contribute.
All members have different experience and skills that could be applied to the task, like I for example, can be very capable with webpages (HTML, CSS and bits of JavaScript) so I took charge of making sure the website was of a high standard. I was not familiar at all with the project idea and Raspberry Pi in general. I did know what it was and capable of, I was learning along the way about how the project would operate.
As always with online groups, no one really wants to put their hand up at first and take charge. By the end, usually one or two people will fall into the leadership roll. I did not take active leadership in the group as I did not have a good enough grasp on the direction.
Something that we were all guilty of was not managing our time appropriately.

d. Cameron

I feel that my group has performed very well, we all seem to have our priorities pretty straight when it comes to the assignments.
I am actually quite surprised at how similar my team members are to me in the way of work ethic as nothing happens for the assignment then all within a day we start coordinating and getting it done at a very efficient pace.
One thing I have learned about groups is feeling of trusting people you haven't met face to face, it is definitely strange relying on people you have never met to pass a course but the feeling of satisfaction when you all hand in a joint assignment which looks great is very nice, for example, our Github's activity log is great, it has shown the work we have put into our assignments and is a great system.
I feel that as a group we could have improved on our time to start the assignment but really the speed in which we have completed it is amazing.
I am happy to have been put into a great group with a great team of people who all have passing this course as a team on their mind.

e. Austin

This group has been excellent in every aspect that is required to be an effective one. We have all worked and communicated around each others times and gotten to know each others interests in IT which have led us to this path today. Of the group i have probably self admittedly been the least helpful outside of an issue with a single member in the first group assessment task, but i do what i can to help pull my weight, and try to see if i can throw ideas and suggestions in to get the ball rolling. This group has helped me grow and idea that i might see myself personally going towards IT management. Going into this latest assessment task (3), i was content with our group worrying that we would have effective communication methods as well as planning and task execution being at something we all agree on. Our utilisation of Trello, Discord and Google drives have all been effective and efficient in getting our task done. Part of this new assessments growth as a group has been work timeframes, in our first group

f. Tim

Being a member of group 19 has been a very pleasant experience. Having never worked in a group solely connected online has been a first and learning about some of the nuances has been interesting. For instance, we had some trouble reaching a member of our group for some time only to have them “show-up” last minute and disappear simultaneously without warning. Despite the disrupting nature of an event like this, it was strengthening to see everyone else was not phased and continued to work on.

Enter assessment task 3, and it became clear to me that I was confident with the ability of everyone in the group to get the job done for the next submission. Overall rather happy with the direction our project took, saw worthwhile problems that the project was attempting to solve. Despite the limbo at the beginning of each assessment, (I’m happy to accept that as time spent on other study commitments, including myself) when it came to meeting deadlines I feel we were able to work very efficiently and cooperate well.

If efforts were to continue with the next stage of the project as a group, I would be more than happy to be a part of the team.

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7. Appendix