

ASSIGNMENT COVER SHEET

ANU College of Engineering and
Computer Science

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Submission and assessment is anonymous where appropriate and possible. Please do not write your name on this coversheet.

This coversheet must be attached to the front of your assessment when submitted in hard copy. If you have elected to submit in hard copy rather than Turnitin, you must provide copies of all references included in the assessment item.

All assessment items submitted in hard copy are due at 5pm unless otherwise specified in the course outline.

Student ID

For group assignments, list
each student's ID

46043905

Course Code

ENGN 4200

Course Name

Individual project

Assignment number

2

Assignment Topic

Context document.

Lecturer

Wojciech Lipinski

Tutor

Tutorial (day and time)

Word count

Due Date

12/4/19

Date Submitted

12/4/19

Extension Granted

I declare that this work:

- ☒ upholds the principles of academic integrity, as defined in the ANU Policy: [Code of Practice for Student Academic Integrity](#);
- ☒ is original, except where collaboration (for example group work) has been authorised in writing by the course convener in the course outline and/or Wattle site;
- ☒ is produced for the purposes of this assessment task and has not been submitted for assessment in any other context, except where authorised in writing by the course convener;
- ☒ gives appropriate acknowledgement of the ideas, scholarship and intellectual property of others insofar as these have been used;
- ☒ in no part involves copying, cheating, collusion, fabrication, plagiarism or recycling.

Initials

For group assignments,
each student must initial.

MD

ENGN4200 - Individual Project

U6043905 | 12th of April, 2019

Context

What is the best approach to create a modular and upgradable sensor networking system?

I will join a team of students in working with EvoEnergy to aid in research related to their Hydrogen Test Facility (HTF). Their current aim is to determine the viability of using hydrogen as a fuel source to supplement other energy sources, either for home use or for electrical grid supply. Using hydrogen as fuel is not a new idea, as people have been trying to develop a safe method to use hydrogen for decades.

At the HTF, many pieces of equipment have sensors to monitor system parameters. Although, they are currently separate, and someone must physically go to each sensor around the facility to take a manual reading. My role within this project is to design, develop, and implement a system that allows logging and remote monitoring for every sensor in the facility, allowing someone to not only view all relevant sensor information in one place, but to keep a logged history of sensor states.

Scope

Deliverables

There are several deliverables that are critical for the successful completion of the project. These have been identified in conjunction with my supervisor and secondary supervisor.

1. Determine ways of reading data from each sensor type. (Electrolyser, Solar Inverter, Data Logger)
2. Create a networking system that allows sensor data to be accessed from a central location.
3. Create a GUI that showcases sensor data and various visualisations. (Graphs, charts, diagrams etc)
4. Ensure that the system hardware and software are modular, allowing for easy repairs and potential for system expansion in the future.
5. The system must be robust and be able to run for long periods without error..
6. Additional HTF system modelling based on data acquired by the monitoring solution. (TBA by supervisors once the network is complete)

Challenges

At this stage of the project, I have identified several challenges that must be overcome to allow me to successfully complete my deliverables.

1. Each sensor within the facility runs on a different protocol, and may not be compatible with each other.
2. Some sensors may not have a direct interface for outputting their data.
3. The sensors are located all over the facility, meaning that they cannot be physically wired together.

Project Progress

The HTF project has been underway well before my arrival, and as such there is a wealth of information that is available to me, including data sets, design parameters and project projections. These resources will become relevant as the project progresses towards its latter stages, as comparing the results derived from my network solution to existing data will be crucial for confirming its accuracy.

The design process of the network has begun, and some preliminary proof of concept testing has taken place. This consists of a variety of small code tasks on both Arduinos and Raspberry Pis that tackle small hurdles that must be overcome for the system to operate. As of the submission of this report, these include: ESP WiFi connectivity, serial communications, file downloads and manipulation, logging, system control over serial, error handling and basic GUI interaction.

The sensors for both the Electrolyser and the Solar Inverter have been researched and an appropriate solution for reading their data has been devised. Using an Arduino, a copy of the web interface can be saved, and 'scraped' for the relevant data. This data can then be sent onto a Raspberry Pi for logging, processing and display.

My research methods to propel the design process range from simple web searches for relevant forum posts, to reading data sheets from product manuals. An area that will require considerable research and time is my construction of a modular, well documented system.

Research that has been conducted has been logged through several short reports that I have written for both me and my Supervisors' convenience. It allows them to easily track my progress, and for me to maintain a catalogue of information relevant to the project. An area that I have identified that needs significant research is into effective software project management methods, and ways to ensure that the code is modular and upgradable.

Pictured in *Figure 1 (Right)* is a preliminary System Network Architecture diagram. It displays one possible network layout, which is the current method that I am pursuing. This is completely subject to change based on research through literary reference, and through experimental results.

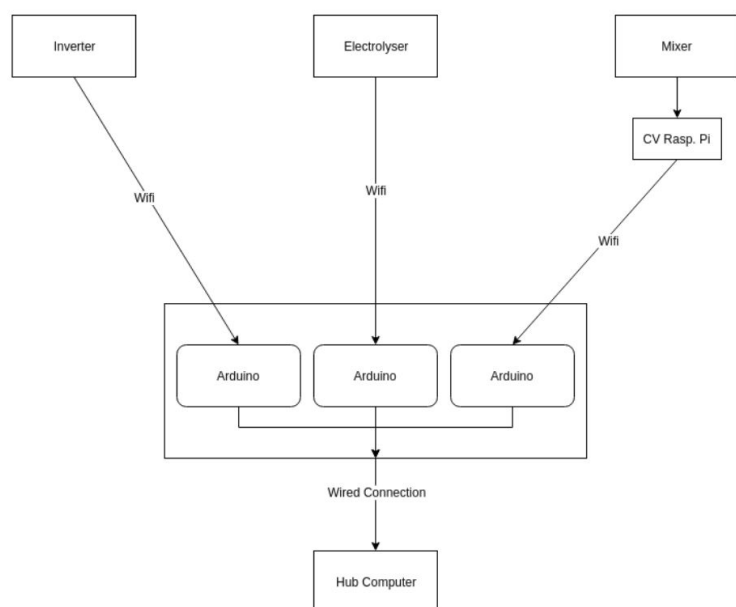


Figure 1: System Network Architecture

Microgrant Application

There will be several expenses related to my project to allow the development and testing of the system. As discussed with my Supervisor, any expenses related to a direct implementation of my system will be covered by EvoEnergy, and are *NOT* subject to the microgrant.

The following items are required for development and testing of this project:

- [Raspberry Pi](#)
 - Cost: \$85
 - Reasoning: I do not own a Raspberry Pi. Due to the Raspberry Pi's GPIO capabilities, it gives me much more flexibility when it comes to data collection, not to mention it's low power consumption and ease of installation compared to a regular desktop computer.
- [ESP8266 Mini Arduino](#)
 - Cost: \$25
 - Reasoning: I do not already own a WiFi compatible Arduino, and it is required for the wireless interfacing with the sensors within the HTF
- Additional Electronics Supplies
 - Cost: \$20
 - Reasoning: Throughout the project, I may come across an issue that requires extra hardware or components. \$20 is an arbitrary price selection. I am willing to return this part of the grant if I do not use it.

**Please note, I have already purchased the Raspberry Pi and the ESP Arduino. Receipts are available on request to verify my purchase.*



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Individual Project Study Contract

(ENGN4200)

SECTION A (Students and Supervisors)

UnilD: 46043905

Contact Phone #: 0412 273 808

SURNAME: Breitfuss

FIRST NAMES: Mitchell

Primary Supervisor:

Ed Gymer

Second Supervisor/Examiner:

Igor Skryabin

COURSE CODE, TITLE AND UNIT: ENGN4200: Individual Project

SEMESTER YOU PLAN TO COMMENCE YOUR PROJECT ☒ S1 ☐ S2 YEAR: 2019

PROJECT TITLE: EvoEnergy Hydrogen test facility monitoring solution

PROJECT AND LEARNING OBJECTIVES/DELIVERABLES (A short description of the project objectives to achieve):

- log data from sensors
- Centralised data access
- create GUI monitoring system

- Ensure modular design of system, utilising open source components & allow for easy future upgrades.

PROJECT DESCRIPTION: I will join a team of students in working with EvoEnergy to aid in research related to their Hydrogen Test Facility (HTF). My role within the project is to design, develop & implement a system that allows logging & remote monitoring for every sensor throughout the facility, providing both real time readouts & a logged history of sensor data.

SECTION B (Project Deliverable Deadlines)

Key Deadlines for Project Starting in S1 2019: Please Refer to the Course Outline or Wattle page.

SECTION C (Responsibilities)

Primary Supervisors:

- Have a duty of care to the student and must ensure projects are scoped appropriately.
- Must establish regular (weekly or fortnightly) progress meetings with your student, which are agreed in writing (email is sufficient).
- Must maintain regular contact with the student. If a student under your supervision is unresponsive and/or does not attend 2 scheduled meetings in a row without prior explanation, the Supervisor must:
 - o Notify the student in writing that they are at risk of breaching their Individual Project Study Contact agreement and provide a deadline for response; and
 - o Contact the Course Convenor and CECS Student Services so a record can be made.
- Must provide regular feedback, assistance and guidance to students and ensure that the student has access to resources required to complete their project.
- Must advise the student, the Secondary Supervisor and the Course Convenor immediately if you are unable to continue supervision and/or if you planning travel for longer than 2 weeks and/or which could reasonably be expected to impact on your ability to supervise the student.
- Must collate all feedback and assessment marks for project deliverables from the Secondary Supervisor and provide final assessment marks to the Course Convenor in accordance with CECS result approval deadlines.
- Must communicate any known issues or concerns relating to the student's progress or welfare to the Course Convenor.
- Must attend the poster presentation
- Nominate the second supervisor / examiner – can be in discussion with student.

Secondary supervisors:

- Have a duty of care to the student
- Must liaise regularly with the Primary Supervisor regarding feedback of project deliverables and marking of assessment items.
- Must submit all assessment marks and feedback to the Primary Supervisor in accordance with CECS result approval deadlines.
- Must advise the student and the Primary Supervisor immediately if you are unable to continue in your role as secondary supervision and/or if you planning travel for longer than 2 weeks and/or which could reasonably be expected to impact on your ability to supervise the student and/or provide assessment marks.
- Must report any concerns which could be considered significant (e.g. harassment/bullying, Primary Supervisor becomes unresponsive) in relation to the student and/or their supervision directly to the Course Convenor.

Students:

- Must adhere to the deliverable deadlines set out in this agreement
- Must comply with the University's policies and procedures in terms of applying for assessment item/deliverable extensions and/or deferred assessments.

- Must attend all scheduled meetings with your Primary and/or Secondary Supervisor, as per your written agreement. If you are unable to attend a scheduled meeting, you will (where practicable) provide your supervisor with prior notice of your unavailability to attend.
- Must understand and exercise the Academic Integrity requirements of the ANU.
- Must provide regular feedback on your progress to your Primary Supervisor and report any challenges which could impact your ability to successfully complete your project (e.g. Health concern).
- Must report any concerns which could be considered significant (e.g. harassment/bullying, Primary Supervisor becomes unresponsive) directly to the Course Convenor.

Course Coordinator:

- Must communicate program and course expectations and requirements to students and supervisors
- Coordinate the deadline for submission of interim and/or final assessment results and feedback in accordance with CECS results approval deadlines.
- Must maintain the course Wattle site.
- Must organise poster presentations.
- Must assist with conflict/problem resolution.
- Must consider extensions up to three weeks to assignment deadlines (with input/endorsement from Primary/Secondary Supervisors).

SECTION D (Declarations)

STUDENT DECLARATION:

1. I certify that the information I have given in this contract is complete, accurate and truthful.
2. I have read and understood the obligations that apply to me as the student, as well as the requirements of my Supervisors and the Course Convenor.
3. I agree to fulfil the obligations of this contract.

.....
Signature

1/3/19
.....
Date

PRIMARY SUPERVISOR DECLARATION:

1. I certify that the information I have given in this contract is complete, accurate and truthful.
2. I have read and understood the obligations that apply to me as the Primary Supervisor, as well as the requirements of the Student, the Secondary Supervisor and the Course Convenor.
3. I have reviewed the aforementioned student's academic transcript and assess this student to be suitable to complete the project detailed above.
4. I agree to provide supervision and support to the aforementioned student for the duration of the project.
5. I agree to fulfil the obligations of this contract.

.....
Signature

1/3/19
.....
Date

SECONDARY SUPERVISOR DECLARATION:

1. I certify that the information I have given in this contract is complete, accurate and truthful.
2. I have read and understood the obligations that apply to me as the Secondary Supervisor, as well as the requirements of the Student, the Primary Supervisor and the Course Convenor.



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3. I have reviewed the aforementioned student's academic transcript and assess this student to be suitable to complete the project detailed above.
4. I agree to provide co-supervision and support to the aforementioned student for the duration of the project.
5. I agree to fulfil the obligations of this contract.

Signature

Date

SECTION E (Course Convenor Approval)

Signature

Date