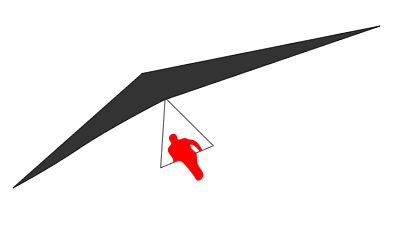
FlightAdvice

Project Proposal



8/3/2016

Wellington Institute of Technology

Nilu Herath

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# Executive Summary

There is an opportunity to develop and install a wireless weather station system. In New Zealand, weather could be varying within a day so public may not want to rely on weather information that public media give. People may want to find out real time weather data to engage in outdoor sports. Weather in micro climates may vary from the weather in the area. Due to safety reasons people would want to find out localized weather data. For example a person who wants to go hang gliding would want to find real time weather data to decide if the weather conditions are suitable for him to engage in hang gliding. Historical weather data would help him to make a better decision. He would mainly like to find out if wind speed and wind direction factors are suitable for him to go out there and engage in hang gliding.

Wireless weather stations will be installed in areas they would want to go hang gliding. Weather stations will be sending SMS messages to a dedicated phone. The data that the dedicated phone receives will be stored in a data base. The stored data will be displayed on a web page.

The client will be able to read weather information on a web page. Client will be able to use the cell phone or a personal computer to read the information. The web site will have information of real time weather data and historical weather data. This is a low cost solution because of usage of SMS compared to other long range data transmission methods.

The project is proposed to start on the 3/08/2016 and end on the 10/10/2016. The Arduino board, Sparkfun weathershield and the weather meter have been provided by the WelTec and the GSM wireless shield will be provided by the WelTec before the building of the wireless solution. The risks in this project will be hardware not performing according to the expectations. Time will be a constraint for the project. To overcome the risks and constraints DSDM (Dynamic Systems Development Method is followed for the implementation or the developing phase.

# Project Personnel

Stake holders:

* Chalinor Baliuag, Email Address: chalinor.baliuag@weltec.ac.nz (Client)
* Nilu Herath, Email Address: niluherath@hotmail.com(Project Manager and Developer)

Adviser:

* John Gould, Email Address: john. gould@weltec.ac.nz

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# Requirements

The client wants to read real time weather data and historical weather data of past three days on a web page. The web page will have to display weather data and historical weather data. Client’s highest requirement is to read information on wind speed and wind direction. Barometric pressure, temperature, rainfall, and light are optional weather factors that she wants to find information about. The optimum range for a flight is 22.00-33.00km/h. If the wind is more than 33.00km/h it is considered as gusty. The speed of the wind will be read in km/h, temperature will be read in "Celsius", rain fall will be read in "mm", barometric pressure in Pa (Pascal) and light in Lux (lx). The system should have a storage solution so the user can access historical weather information.

# Analysis

## Micro controller

An electronic weather monitoring device can be made using the Arduino Uno micro controller. This micro controller is efficient in reading real time data, it has both analogue and digital capabilities, it is cheap and has a low power draw, though at the same time lower processing power. The Uno also has many sensor and other after-market parts to expand its functionality.

Another option is the raspberry pi, which is another good micro controller. It is compatible with most of the equipment used by the Arduino, and has a lot more processing power allowing it to handle more complex and intensive tasks. The most recent version (Raspberry pi 3) includes a built in wireless adapter. However because of it’s more powerful equipment the raspberry Pi has a much higher power drain than the Arduino. Because of the reasons mentioned above it is suitable to use Arduino than Rasberry pi.

## Weather shield

The Arduino board reads one sensor at a time. It needs a weather shield to read weather data from many sensors. The SparkFun weather shield is compatible with the Uno board. The Sparkfun weather shield has inbuilt sensors to read barometric pressure, relative humidity, luminosity (light levels) and temperature. It contains interface connections for rain, wind speed and wind direction.

The sensors embedded in the weather shield are:

* HTU21D Humidity/temperature sensor
* MPL3115A2 Barometric pressure
* ALS-PT19 Light sensor

## Weather meter

Information about the weather meter will be notified later.

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## Controller Application

There will be a controller application to receive data from the Arduino board and the controller application will send data to the database where the data will be stored.

## Database

MYSQL data base will be used to store data from the controller application.

## Web Site

The website will be built using HTML. PHP will be used to retrieve data from the database.

## Development tools

* Arduino IDE will be used to programme the Arduino board.
* Eclipse IDE will be used write the controller application. Java language will be used to write the controller application.
* MYSQL will be used as the database
* Server for the database will be WAMP server.
* MYSQL Workbench 6.3CE will be used for SQL querying.
* Bit bucket will be used for version controlling.
* Microsoft Visio will be used for systems analysis and design.
* JUnit testing will be carried out by the tester and manual testing practices will be followed.

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## Methodology

This project involves usage of hardware. Involvement of hardware increases risks of delivering the product with all the features. The developer is hoping to practice the DSDM Atern's approach to project management. It fixes time, cost and quality. When contingency is required it lets you drop low priority features. Under the Atern, MoSCoW Prioritization is used early at the requirements gathering phase with the client. As the developer is following the Atern, she is looking forward to deliver a viable solution. At the end of the project a minimum subset of features is guaranteed to be delivered.

DSDM features that will be followed are listed below.

* Time, cost and quality are fixed while the features of the product are changed as contingency.
* MoSCoW(M stands for must have, S stands for should have, C stands for could have and W stands for won’t have this time) prioritization is followed. Under this feature the developer agrees with a list of features that needs to be included in the product. This list has features prioritized. As time, cost and quality are fixed low prioritized features are dropped as contingency.
* Iterative development

## Wireless Option

The wireless weather monitor will have a GSM module with other devices mentioned. Data protocol will be SMS. Using SMS is a simple and low cost solution compared to other communication protocols.

## Cellular Network

The cellular network that is going to be used will be notified later.

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# Proposed System Outline

Development will occur in two phases.

Phase 01: In the phase 1 a hard wired option will be developed.

Hard wired Option will come with devices below.

* Arduino Uno micro controller
* Sparkfun weather shield
* Weather meter
* Laptop

Phase 02: In the phase 2 wireless option will be developed.

Wireless Option will come with devices below.

* Arduino Uno micro controller
* Sparkfun weather shield
* GSM module
* Laptop or cellular phone

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# Approach

## Software Development

The developer will be adopting DSDM Atern methodology to deliver the deliverables of the project. Iterative development process will be used to evolve to the final solution. The outcome or the deliverable of each iteration will be examined by the client and she will go into a process of accepting the deliverable or will suggest any changes that she would want the developer to make.

DSDM features that will be followed for project management are listed below.

* Time, cost and quality are fixed while the features of the product are changed as contingency.
* MoSCoW prioritization is followed. Under this feature the developer agrees with a list of features that needs to be included in the product. This list has features prioritized. As time, cost and quality are fixed low prioritized features are dropped as contingency.
* Iterative development.

## Test Approach

Test approach will cover verification and validation testing.

Test types carried are listed below.

* Configuration testing
* Unit testing
* Integration testing
* Database testing
* Website testing

Test documents produced are listed below.

* Test plan
* Test cases
* Test results
* Test report

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# Organization of Project

|  |  |  |  |
| --- | --- | --- | --- |
| Task | Nilu Herath | Client | Adviser |
| Project proposal | **R** | **C** | **C** |
| Systems Analysis and Design | **R** | **C** | **C** |
| Software Engineering | **R** |  | **C** |
| Hardware Engineering | **R** |  | **C** |
| Test Engineering | **R** |  | **C** |
| Configuration Management | **R** |  | **C** |
| Logistics Support | **R** |  | **A** |
| Training | **R** |  | **C** |

R Responsible

A Accountable

C Consult

I Inform

# Management

## Change control

All changes to requirements or deliverables must be approved by all parties. Please see the change control form in appendix b.

## Communication plan

Client meetings will be held bi-weekly (every two weeks), meetings will be organized through email. A meeting or a demonstration will be held at the end of each deliverable.

# Plans and Procedures

Please refer to appendix B for the project plan. The project plan includes information about deliverable.

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# Deliverables

## Documentation

Documentation is created in several phases over the course of the project.

Requirements Phase - During this phase, the initial version of the Project Proposal document is created, describing the system architecture to be validated in the Analysis and Design Phase.

Analysis and Design Phase - During this phase design documents are finalized by establishing a sound architectural foundation for the Development Phase.

These modeling diagrams will be produced in this phase:

* External interface diagram.
* Detailed block diagram.
* Documentation of database design.
* Documentation of web site design.

Prototype development phase - A demonstration of the prototype will be carried out at the end.

Development Phase of the wired solution - During this phase, the design documents are not expected to change radically. They are mainly updated to reflect changes in any interface design. A demonstration will be carried out at the end.

Development Phase of the wireless solution - During this phase, the design documents are not expected to change radically. They are mainly updated to reflect changes in any interface design. A demonstration will be carried out at the end.

Integration and Systems Testing Phase – During this phase, documentation of testing procedures and processes are produced. The documents below will be submitted.

* Test plan
* Test reports.

Closing phase - During this phase the deliverables are mentioned below.

* Hardware.
* Software.
* Systems configuration manual.
* User manual.
* Source code.
* Final design document.

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## Milestones

|  |  |  |
| --- | --- | --- |
| **No.** | **Milestone** | **Date for completion** |
|  | Acceptance of proposal by client | 3/8/2016 |
|  | Acceptance of systems analysis documents.  Deliverables are listed below.   * External interface diagram. * Detailed block diagram. * Documentation of database design. * Documentation of website design. | 12/8/2016 |
|  | Acceptance of prototype  Demonstration of prototype | 23/8/2016 |
| 1. T | Acceptance of wired solution  Demonstration of hard wired solution | 6/9/2016 |
|  | Acceptance of wireless solution  Demonstration of wireless solution. | 19/9/2016 |
|  | Acceptance of test report   * Test strategy * Test plan * Test cases * Test report | 30/09/2016 |
|  | Acceptance of hardware, software, manuals and final systems design documents.  Deliverables are listed below.   * Hardware. * Software. * Systems configuration manual. * User manual. * Source code. * Final design document. | 10/10/2016 |

**\*** If the completion of the implementation of the wireless option runs out of time the project will start working on the integration and systems testing phase.

# Resume

Nilu Herath, 10 Fernridge way, Tirohanga, 02040519503 [niluherath@hotmail.com](mailto:niluherath@hotmail.com)

Technical skills

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Programming** | **Testing** | **Database and data analysis** | **Web Programming** | **Systems analysis and Design** | **Embedded Systems** |
| Java, C++, PHP, Arduino programming, Android programming | Junit testing  Manual testing | SQL Developer, Oracle, MYSQL | HTML, CSS, XML | Microsoft Axure | Arduino Programming |

Areas of skills

* Software Development
* Arduino programming
* Manual testing and Junit testing
* Database creating, SQL querying, Database administration
* Data analysis, Dimensional modelling, Creating cube
* Web page designing
* Web programming
* Systems analysis and design
* Excellent written and verbal communication skills
* Team player
* Use Git and Git Hub for version controlling

Education

* Final year Bachelor of Information Technology at Wellington Institute of Technology (2014-2016)
* Graduate Diploma in Teaching Science at Victoria University of Wellington (2006)
* Bachelor of Science at Open University of Srilanka (2001)

Work Experience

* Assistant Teacher of Science at Sacred Heart College, Lower Hutt (June 2016-December 2016)
* Assistant Teacher of Mathematics (University of Cambridge Ordinary Level) at Lyceum International School, in Colombo, Srilanka
* Assistant Teacher of Chemistry at Naenae College, Lower Hutt
* Assistant Teacher of Science at Sacred Heart College, Lower Hutt
* Assistant Teacher of Mathematics at Sacred Heart College, Lower Hutt

**Interests**

* Walking, trekking, go new places and travel.
* Design and build applications using Java which I could one day present to the market. Learn how to use new technologies.

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# Bibliography

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* Freetronics.(n.d).Getting Started with Eleven. Retrieved from https://cdn.shopify.com/s/files/1/0045/8932/files/Eleven-GettingStarted.pdf?1503
* Sparkfun.(n.d).Weather Shield Hook up Guide. Retrieved from https://learn.sparkfun.com/tutorials/weather-shield-hookup-guide

# Resources

A list of hardware

* Arduino Uno Eleven

Delivered by John Gould on the 1st of July.

* Sparkfun Weather Shield

Delivered by John Gould on the 1st of July.

Information of the hardware for the wireless option will be notified later.

Refer to Appendices for full Data sheet information.

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# Client Acceptance

All parties agree that this project is conducted on a best efforts basis, and the Project Team or WelTec do not accept liability for the performance of this agreement. The project client agrees that they have read and understood the ‘Client Briefing’ document with regard to responsibilities and obligations.

It is agreed and undertaken that all Parties:

* will hold in confidence all `confidential information' and,
* will not disclose the `confidential information', or permit it to be disclosed to an external party and,
* agree that disclosures to other project participants will occur only with the written permission of the other party, and,
* will not use, or permit the use of, the `confidential information' for any purpose other than for joint operations without first obtaining written permission to do so from the other party,
* will upon request of the other party return all Confidential Information (together with all copies) in its possession or control or in the possession or control of any of its officers, employees, agents or advisors, and
* May choose to mark information as ‘confidential’ where necessary.

The Client also agrees to allow the Project Team to use project materials for academic purposes, with due regard to confidentiality.

The client agrees that, in cases where the project concept, process, specification or any other proposal was devised by WelTec’s staff or students, and the implementation or extension of the results of the project are expected/speculated to generate commercial returns (IP, trademarks, licenses, etc), an agreement covering benefit sharing is required, in all other situations the Client owns the Intellectual Property of the work undertaken. This agreement will be made between WelTec and the industry partner. The Student and supervisor of the project will bring this to the notice of the R and E office.

Signing authority to give permission for the advancement of the FlightAdvice project to move to the phase of Systems analysis and development.

Chalinor Baliuag

Nilu Herath

Date:

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Appendix A – Data Sheet

1. Arduino Uno Eleven



Features*:*

Uses the ATmega 328P Microcontroller and works with all Arduino shiled designs and software. The Eleven can be powered automatically by the USB connection or powered separately by your project via the DC jack or header. It provides a balanced combination of general-purpose digital I/O pins, analog inputs, pulse width modulated outputs and communications support to allow it to directly control, read and communicate with sensors, drive servos and other external devices.

#### Information:

**Microcontroller**

MCU Type Atmel ATmega328P

Operating Voltage 5V

MCU Clock Speed 16 MHz

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**Eleven**

Input Voltage 7-12V DC recommended

6-20V DC maximum

Digital I/O pins 14 (6 provide PWM output)

Analog Input Pins 6 (analog input pins also support digital I/O,

giving 20 digital I/O total if required)

Analog Resolution 10 bits, 0-1023 at 5V AREF is approx 0.00488V; 4.88mV per step

Current Per I/O Pin 40 mA maximum

Total Current For All I/O Pins 200mA maximum

Current For 3.3V Output 50mA maximum

**Memory**

Flash Memory 32 KB Flash Memory, of which less than 1 KB is used by bootloader

SRAM, EEPROM 2 KB SRAM, 1 KB EEPROM

**Communications**

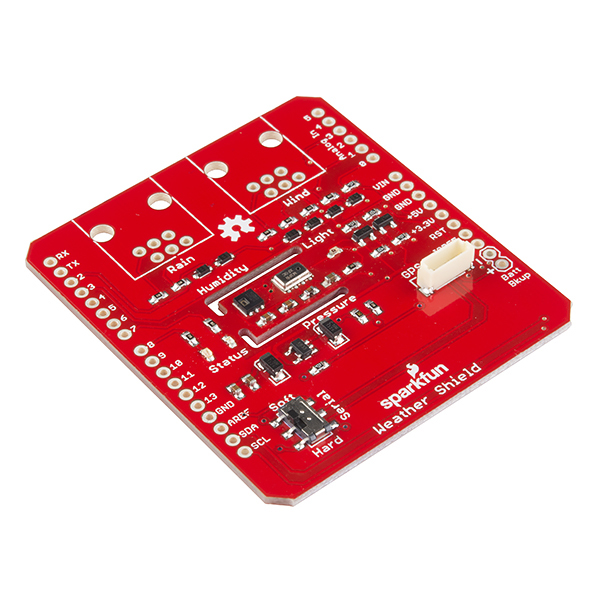
Serial 1 x hardware USART, SPI (Serial Peripheral Interface), I2C

Other Integrated USB programming and communication port. Many other one-wire,

multi-wire, LCD and expansion devices supported by free code and libraries

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2. Sparkfun Weather Shield



Features***:***

The Weather Shield is an easy to use Arduino shield that grants you access to barometric pressure, relative humidity, luminosity and temperature. There are also connections on this shield to optional sensors such as wind speed, direction, rain gauge and GPS for location and super accurate timing.

These Weather Shields utilize the HTU21D humidity, MPL3115A2 barometric pressure, and ALS-PT19 light sensors and relies on the HTU21D and MPL3115A2 Arduino libraries. Each shield comes with two unpopulated RJ11 connector spaces (for optional hook up of rain and wind sensors) and a 6-pin GPS connector (for optional hook up of a GP635T GPS module). Finally, each Weather Shield can operate from 3.3V up to 16V and has built in voltage regulators and signal translators.

**Note:** The Weather Shield comes as a stand-alone board. Headers, connectors, and additional sensors will need to be purchased separately, check the related items or wish list below!

**Note:** This shield was designed for the SparkFun Redboard and Arduino Uno and will not work with other boards (like the Arduino Yun, for example) without modification.

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# Appendix B

# Change Control Form

**Project FlightAdvice**

|  |  |
| --- | --- |
| **Section A** |  |
| **Project** |  |
| **Change Number** |  |
| **Controlled Item** |  |
| **Item Version** |  |
| **Identification of Aspect to be Changed** |  |
| **Change Details** |  |
| **Requester of Change** |  |
| **Date Raised** |  |
| **Section B** |  |
| **Investigator of Change** |  |
| **Impact, give details of other items affected** |  |
| **Investigation Outcome**  **Reject/Action at No Cost/Action at Cost** |  |
| **Date Investigated** |  |
| **Section C** |  |
| **Implementer** |  |
| **Date Scheduled** |  |
| **Section D** |  |
| **Change Implemented** |  |
| **Date Implemented** |  |
| **Implementer** |  |
| **Project Manager** |  |
| **Section E** |  |
| **Acceptor** |  |
| **Date** |  |

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# Appendix C - Project Plan

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