**Project Tender**

# **Project:** Keep Calm and Save the Rhino
# **Client:** University of Pretoria


## **Team:** Anarchy
Edwin Fullard 12048675
Jaco Bezuidenhoudt 11013878
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# 1 The Team

## 1.1 Edwin Fullard

Edwin Reece Fullard

- Interests
  - Problem Solving (puzzles, riddles, complex scenarios, etc.)
  - Web Development
  - Working with programmable devices
  - Outdoors (Camping, Nature, etc.)
- Technical Skills

  Java, C++, C#, Python (a bit), HTML, Javascript, PHP and Linux.
- Past Experience

  I Created a few websites and played around with coding in my spare time, but didn't do something for a client before.
- Non-technical Strengths

  I am very creative and good with problem solving. I also like to think of myself as a people person and I was told that I can be funny.
- Motivation for Project

  The ideas and possibilities that this project can and will achieve gets me excited and I would like to contribute my innovation and creativeness.

## 1.2 Jaco Bezuidenhoudt

Jacobus Bezuidenhout

- Interests
  - Arduino
  - Internet of Things (IoT)
  - Electronics
  - Remote Monitoring
  - I like tracking things remotely and programming interaction with hardware.
- Technical Skills

  C, C++, Python, NodeJS, HTML(+js), Arduino and Microprocessors, PCB Design and Linux.
- Past Experience

  I have created a few websites from scratch, and I'm currently hosting them on a VPS in Amsterdam, New York and London. My company is working on an animal tracking solution for the past 6 months. I also give training on the Intel Edison platform and electronics for Intel clients.
- Non-technical Strengths

  I have good presentation and people skills, and I'm good with finding creative solutions.
- Motivation for Project

I have a soft spot for Rhinos and the conservation thereof. I also have a huge passion for remote monitoring and the IoT (Internet of Things) movement. This project and the technologies will not be so new to me because of the tracking solution I have developed for my company. My dream for this project is to know I have helped to keep the rhinos as part of our legacy.

## 1.3 Jandre Coetzee

Johannes Adriaan Coetzee

- Interests

  Computer Security, Web Development, Android Application Development and Computer Graphics.

- Technical Skills

  Java, C, C++, HTML, JavaScript, PHP, Python(the basics), SQL and Linux.

- Past Experience

  I have done several project during my time at the University. Most of the projects was done in Java. I have not yet done a project for an external client.

- Non-technical Strengths

  I like to solve problems in a creative manner and I am a fast learner. I am a easy person to work with and work well in groups. I am able to communicate effectively with people I work with.

- Motivation for Project

  This project is a combination of different technologies and programming languages where I can contribute to an area where I have expertise and learn new technologies.

## 1.4 Maret Stoffberg

Margaret Stoffberg

- Interests
  - Web Development
  - Music Recording, Producing and Mastering
  - Design
  - Mathematics
  - Crafts
  - Outdoors
- Technical Skills

  Java, C++, PHP, Javascript, HTML and Linux.
- Past Experience

  Building websites for clients.
- Non-technical Strengths

  I have good people skills, I am a logical thinker and I am very creative.
- Motivation for Project

  It looks interesting to work with the technologies and I want to contribute to the project.

## 1.5 Ryno Pierce

Ryno Casper Pierce

- Interests
  - Games Development
  - Web Development
  - Android App Development
- Technical Skills

  PHP, HTML, Javascript, Java and C++.
- Past Experience

  I have done a lot of Java programming for University projects, and have created some websites for external clients.
- Non-technical Strengths
  - Analytical thinker
  - Logical thinker
  - Great communication skills
  - Teamwork
  - Tenacity
- Motivation for Project

  The system use multiple coding languages. The integration of these languages is what made me want to work on this project.

# 2 Project Execution

- Initial ideas around technical challenges

  To start off, we would implement a server that would be hosted in a cloud. The server will be accessed via the client's computer or mobile device. The server will also act as the sender of alerts (SMS and emails) to the client. It will then communicate with a gateway devices over GSM (sockets). Each gateway device will be equipped with a BLE (Bluetooth 4.0 Low Energy Radio) to enable us to log the position of tracker devices in range of the gateway. We found that there should be the possibility for more than one tracker device to be tracked at a time in range of the same node and therefor we decided that BLE devices would be better for the tracking than RFID. (1. BLE range is between 50m-100m vs RFID 1cm-25m. 2. BLE Require less power than a strong RFID receiver. 3. Less/No collisions when using BLE over RFID). When a tracker passes in range of the gateway, the location of the device will be calculated and pushed to the cloud server where there could be decided to alert the client.

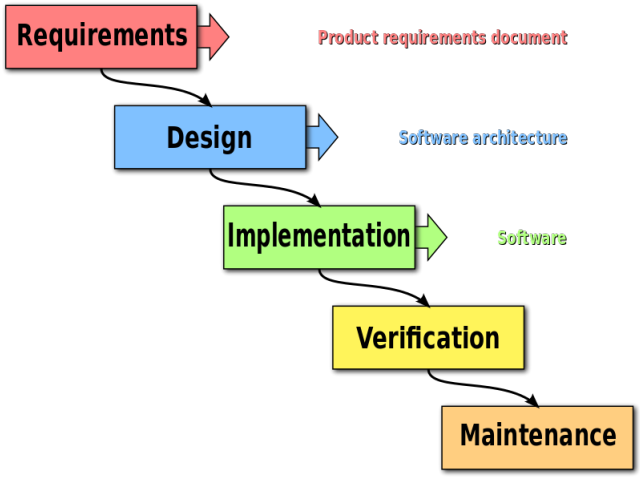
  The true power of this system will come in with the analytics of the big data captured over time. This will give park rangers a much better idea of the movement of the animals and where the vulnerable areas are.

  The security of this system should be of a very high quality. We would recommend only allowing access to the server via a secure VPN connection.

- Progress Reporting

  We will schedule regular meetings on a set interval (possibly two weeks) to ensure that we keep the momentum from the start of the project. This will create mini deadlines for us and thus we can achieve small victories throughout the development phase to ensure the project as a whole will succeed.

- Development Methodology




We will use a sequential design process, used in software development processes, in which progress is seen as flowing steadily downwards through the phases of:

* conception
* initiation
* analysis
* design
* construction
* testing
* production/implementation
* maintenance

This is also known as the waterfall methodology.

- Potential Technologies

  The technologies we plan to use are:

  * On the Cloud Server
    - NodeJS
    - MongoDB for the database
    - AngularJS for the client MVC framework
    - OpenLayers 3 for the mapping of the locations of trackers
  * On the Gateway
    - Arduino Platform
    - Serial GSM Modules
    - WebSockets for communication to server

        - Bluetooth 4.0 (BLE) Receiver
        - Serial GPS used for gateway positioning
    * On the Tracker
        - Bluetooth 4.0 (BLE Beacon) with TI Chip CC2540

- Outcome of the Project
    - The developed gateway/tracker application should include the following:
        - BLE communication
        - Socket Communication to the server
        - Positioning of trackers in range
        - GSM Connectivity
        - GPS Positioning
        - Rugged/Weather-proof containers
    - The developed alerting system should include the following:
        - SMS Notifications
        - Email Alerts
        - Local Buzzer Alerts
    - The developed web server application should include the following:
        - User friendly GUI
        - The ability to check the last location and the movement of trackers
        - The ability to specify who should have access to the client GUI and which trackers