eRhODIS™

Requirement Specification
Functional & Non Functional Requirements

RhODIS® Android Development : eRhODIS™ Application

Version 1.3

This document contains the requirements specification of the eRhODIS™ application and a detailed description of the functional and non-functional requirements.

Change History

Date	Version	Description	Updated By
05 August 2013	1.0	Created document.	Gideon
05 August 2013	1.0	Added main sections as discussed.	Gideon
30 October 2013	1.0	Changed the Scalability and Performance sections. Added AWS details.	Gideon
14 November 2013	1.2	Added Requirements	Gideon
7 February	1.3	Added Requirements regarding security.	Gideon

**Changes will be displayed in red throughout the document.*

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Introduction

RhODIS® (Rhino DNA Index System) is a project that was initiated by the Veterinary Genetics Laboratory of the University of Pretoria in order to help with the plight of the rhinos. The Veterinary Genetics Laboratory is collecting DNA samples of rhinos across the country to create a database using the unique DNA profile of individual rhinos.
The goal is for all rhinos to be on the system. This will deter poachers and assist in forensic prosecutions.

RhODIS® was first used in a rhino poaching case in 2010 and resulted in a Vietnamese citizen being sentenced to 10 years imprisonment for having rhinoceros horns from poached rhinos in his baggage when he was apprehended at OR Thambo International Airport. South African National Parks (SANParks) have partnered with RhODIS since 2010 and in association with the Forensics Science Laboratory of the South African Police Services have played a key role in the development and implementation of the RhODIS Kit for sample collection.

The South African Department of Environmental Affairs introduced amendments to the norms and standards for sample collection and identification of live and poached rhinos under the National Environmental Management: Biodiversity Act 10 of 2004 which requires that samples are collected from all poached rhinos and other rhinos that are immobilized or die using RhODIS® kits which then have to be submitted to the Veterinary Genetics Laboratory for inclusion on the RhODIS® database. A number of other bodies including the South African National Parks Honorary Rangers, the World Wildlife Fund, corporates and individuals have donated funds to support the development and implementation of RhODIS®. eRhODIS™ has been developed as an adjunct for RhODIS® to aid in the collection of samples and information relevant to the RhODIS® project and Samsung is the exclusive technology partner associated with this development.

Organizational Structure

This application is intended to cater for the end-user in the field collecting samples and for RhODIS® officials. The police, Environmental Management Inspectors of the Department of Environmental Affairs, Veterinarians, Nature conservation officials who are trained to investigate rhino poaching scenes or to collect sample from rhinos during routine interventions will be the users of the application. Users are specifically authorised to use the application and can only do so if they have been trained and have the necessary clearances to do so.

It should, however, be noted that any framework with which any part of this application interacts with has its own organisational structure and terms and conditions.

Purpose

The purpose of this document is to provide a comprehensive overview of the eRhODIS™ application that the Veterinary Genetics Laboratory of the University of Pretoria together with RhODIS® will be developing.

This document will give a detailed description of the requirements of the system and formally stipulate functional and non-functional requirements of the eRhODIS™ android application. Further, it will list data requirements, quality requirements and the constraints under which the android application should operate.

The intended audience of this document would be any person interested in the development life-cycle of the eRhODIS™ android application. This document will serve as a guideline for intended android application functionality.

Document Conventions

Conventions used in this document:

> Use-Case notation using the Unified Modelling Language (UML).
> Crow's foot notation is used to document entity relationship diagrams.

Project Scope

The main idea of the application is that it ensures that all information needed to ensure that DNA samples are collected from poached and live rhinos are collected in a standard way and that all the necessary information to provide details of the chain of custody for these samples are automatically collected and uploaded to a secure database for future use should the need arise. All information, including GPS coordinates, photos, sample information is uploaded and stored on the cloud server.

It also ensures that key required data is always collected and uploaded. Use of the application also enhances data accuracy and does away with the need to manually enter any of the data after receipt of the samples in the Laboratory.

The application also uses the S-Pen to capture the authorised person’s signature which therefore provides further integrity for the chain of custody features incorporated into the application.

References

UML standard specification http://www.uml.org/#UML2.0
Amazon Web Services http://aws.amazon.com/what-is-cloud-computing/?navclick=true
Android standards and developer references http://developer.android.com/index.html

System Description

The eRhODIS™ application will serve as a utility tool for end-users to collect samples and relevant data in the field in the event of a rhino poaching or related incident, where after the data will be stored and uploaded to a secure cloud server.

The application ensures that all information needed to ensure that DNA samples are collected from poached and live rhinos are collected in a standard way and that all the necessary information to provide details of the chain of custody for these samples are automatically collected and uploaded to a secure database for future use should the need arise. All information, including GPS coordinates, photos, sample information is uploaded and stored on the cloud server.

It also ensures that key required data is always collected and uploaded. Use of the application also enhances data accuracy and does away with the need to manually enter any of the data after receipt of the samples in the Laboratory.

The application also uses the S-Pen to capture the authorised person’s signature which therefore provides further integrity for the chain of custody features incorporated into the application.

User account information are automatically set to a demo account upon the first installation of the application on the device. The specific user's account details are provided and preconfigured by RhODIS® officials and administrators before the device is used by the end user. These account details will also be used by the user to log into the erhodis backed to view their submissions.

The application provides online and off-line capabilities for areas where users have no internet connectivity i.e. cell phone reception or wi-fi coverage.

Functional Requirements

System Features

- Digital collection and storage of all forms of sample data.
- Camera usage.
- Barcode Scanning.
- Geo-Sensor usage.
- Geo-Sensor meta-data integration in photos.
- Touch sensitive capabilities. (S-Pen)
- Online and off-line usage.
- User specific roles and submissions.
- Integration with existing cloud platforms. (AWS)
- Bluetooth input capabilities for bar-code scanning.
- Bluetooth input capabilities for Microchip scanning.

Main System

The system must allow users to use the application online or off-line and provide full functionality of sample collection, GPS, camera and storage of the submission.

Priorities

Low	:	Not vital to the functioning of the system.
Medium	:	Standard system feature.
High	:	Critical feature.

Main system functional requirements

Requirement Number 001

Requirement Name	User Account Login
Priority	High
Description	Valid user account details need to be configured in the admin settings menu (password protected) by a RhODIS® official for a submission to be considered valid.
Motivation	We want to be able to control who has access to our application and exactly who creates a submission. This is extremely important to ensure and check that only official users approved by RhODIS® are creating submissions.
Dependencies	User Registration [002]

Requirement Number 002

Requirement Name	User Registration
Priority	High
Description	A user can only be registered by a RhODIS® official.
Motivation	We want have control over the user registration process to ensure that only trusted parties and members have accounts. We do not want anyone from the public or even non-public have access to our services. In the event that a device is stolen or lost, there will be no way of accessing user registration from an unknown individual or group and we can block the account instantly.
Dependencies	

Requirement Number 003

Requirement Name	Data Input and Collection
Priority	High
Description	A user must be able to make use of all the features in the application in order to successfully complete a submission.
Motivation	The application makes use of several advanced features, such as GPS location tracking, camera usage when collecting samples and touch events using the S-pen. The user should be able to make use of all these features to ensure all relevant data is complete and accurate.
Dependencies	GPS Location [004] , Camera Integration [005] ,

Requirement Number 004

Requirement Name	GPS Location
Priority	High
Description	A User must use a device that has a functioning GPS module installed and the application must prompt the user the switch on the gps where needed if it is not active.
Motivation	During sample collection, a lot of photos are taken and stored. To ensure that these photos are actually taken at the crime scene or location, we georeference all the photos. This will ensure that the meta-data of photos are accurate. Correct GPS coordinates is also necessary to pin the location of the incident on a map which will be used later for data visualisation and detecting patterns of similar cases and situations based on the location info.
Dependencies	

Requirement Number 005

Requirement Name	Camera Integration
Priority	High
Description	It is required to take photos of the samples collected and of the scene, sent and received bags and animal ear notches if applicable.
Motivation	This is part of the core functionality of the application.
Dependencies	

Requirement Number 005

Requirement Name	Signatures capture
Priority	Medium
Description	It is required to capture the authorized person's signature.
Motivation	This is part of the core functionality of the application, however, if a pen is not available at the time, a user can still make use of his fingers to touch the screen.
Dependencies	S-Pen Integration [006]

Requirement Number 006

Requirement Name	S-Pen Integration
Priority	Medium
Description	The S-Pen will be an alternative input device to use instead of the on-screen touch sensitive keyboard. The S-Pen can be used to fill in any of the fields throughout the submission process.
Motivation	This is not a core function, however is still essential, especially when capturing signatures. It is also a great tool for users who are use to filling in the old paper based forms with a pen. The S-Pen converts and written handwriting into input on any of the fields. This is also essential for user acceptance of newer technology and provides a easier transition for some users who are dependent on older technology such as pen and paper based submissions.
Dependencies	

Requirement Number 007

Requirement Name	Online and Off-line Use
Priority	High
Description	The application should be usable when there is no internet connection.
Motivation	This is part of the core functionality of the application and is important because the wi-fi coverage and cell reception in some of the locations where users will be using the application is very low.
Dependencies	

Requirement Number 008

Requirement Name	Saving Data
Priority	High
Description	The application saves data onto the device where after it is uploaded automatically to a cloud server and removed from the device.
Motivation	This is part of the core functionality of the application.
Dependencies	Online and Off-line Use [007]

Requirement Number 009

Requirement Name	Admin Section
Priority	Medium
Description	This is feature which allows administrators to configure the core settings of the application.
Motivation	Users/Submitters should not be concerned about the account settings and server settings of the application and for security reasons, should not have access to this feature. However, administrators still need access to these settings to configure devices and change accounts / server settings on the device if needed.
Dependencies	

Requirement Number 010

Requirement Name	Bar code Scanning
Priority	Medium
Description	The user needs to scan in the bar code as it is printed on the kit.
Motivation	This is a requirement that is part of a process we are working on to make the use of the app easier and faster and ensuring that correct input is given.
Dependencies	Camera Integration [005]

Requirement Number 011

Requirement Name	Admin Requirements : View As
Priority	Low
Description	The admin users need to be able to view the system as a different user to make it easier to keep track of submissions made to the system by submitters or the demo user.
Motivation	This is needed to prevent admin users from logging in and out of accounts to test a specific users view on the system
Dependencies	

Requirement Number 012

Requirement Name	Admin Requirements : Log
Priority	Medium
Description	A Log is to be kept of all the actions made on the server/web interface.
Motivation	This is needed to keep track of any changes made by users to the system and content saved on the system.
Dependencies	

Requirement Number 013

Requirement Name	Demo Submission
Priority	Medium
Description	There must be an option to make demo submissions.
Motivation	This is needed so that users/submitters can test and practice using the application. Also used for demonstration purposes to 3rd parties.
Dependencies	

Requirement Number 014

Requirement Name	Online System : View Submissions Map
Priority	Medium
Description	Submissions that are uploaded to the system needs to be viewable on a Map with a default map and satellite view.
Motivation	This is needed to ensure that the GPS co ordinates are accurate and to be used for recognising patterns in a visual representation.
Dependencies	

Requirement Number 015

Requirement Name	Online System : View Content/Submissions
Priority	High
Description	Submissions that are uploaded to the system needs to be viewable only by admins or by the submitter who made that particular submission.
Motivation	This is needed to see what each user has uploaded individually and further to use the data for further investigation/documentation and as an evidence report and archive.
Dependencies	

Requirement Number 016

Requirement Name	Online System : Edit Content/Submissions
Priority	Medium
Description	Submissions that are uploaded to the system needs to be editable only by admins or by the submitter who made that particular submission.
Motivation	This is needed to make changes to some of the fields that might need changing or content that will only be provided at a later stage that can then be added.
Dependencies	

Requirement Number 017

Requirement Name	Bar code Scanning
Priority	Medium
Description	The user needs to scan in the bar code as it is printed on the kit.
Motivation	This is a requirement that is part of a process we are working on to make the use of the app easier and faster and ensuring that correct input is given.
Dependencies	Camera Integration [005]

Requirement Number 018

Requirement Name	Asynchronous Syncing
Priority	High
Description	The user's submissions has to run seamlessly and asynchronously in the background and should not depend on user interaction. Also, the submissions has to sync, even when the application has been closed.
Motivation	This is a requirement that is needed to remove user error from our upload/syncing process and improve the sync method and sync speed of our submissions to the server.
Dependencies	

Requirement Number 019

Requirement Name	Security – Device Restrictions
Priority	High
Description	The application may not run on any other android device than the ones we provide, more specifically the Samsung Galaxy Note 8.
Motivation	This is a requirement from Samsung, as they are our technology partner, however this also helps with security and ensures that we only run the application from devices that we allow. Adding this control also adds another layer of security.
Dependencies	

Requirement Number 020

Requirement Name	Security HTTPS
Priority	High
Description	The connection protocol on the server must be a secure HTTPS protocol with a valid certificate.
Motivation	This is part of the core security requirements of the application required for accreditation.
Dependencies	

Requirement Number 021

Requirement Name	Security SQL Injection Prevention
Priority	High
Description	SQL injections are a common way of pulling information from a database without proper authentication by means of using syntax and causing the system to “fail” and result in gaining access to data without permission.
Motivation	Writing structures and code to prevent SQL injections not only makes our code more secure, but also makes the system more abstract, robust and also speeds up database queries.
Dependencies	

Requirement Number 022

Requirement Name	Security Encryption
Priority	High
Description	All the data that is uploaded to the server and inserted into the database needs to be encrypted using the AES 256 or 128 bit algorithms.
Motivation	This is to ensure that the data in the database remains garbage for anyone who manages to read it.
Dependencies	

Requirement Number 023

Requirement Name	Hashing of photos
Priority	High
Description	All the photos needs to be assigned hash values that are created by using the photos themselves.
Motivation	This is to ensure and verify authenticity / originality of our photos and to show that they have not been modified. This is also one of the checks that can be used in a court of law when evidence towards a case is needed and need to be validated for authenticity and to ensure that no modifications has been made to the photos.
Dependencies	

Use Cases

Main System

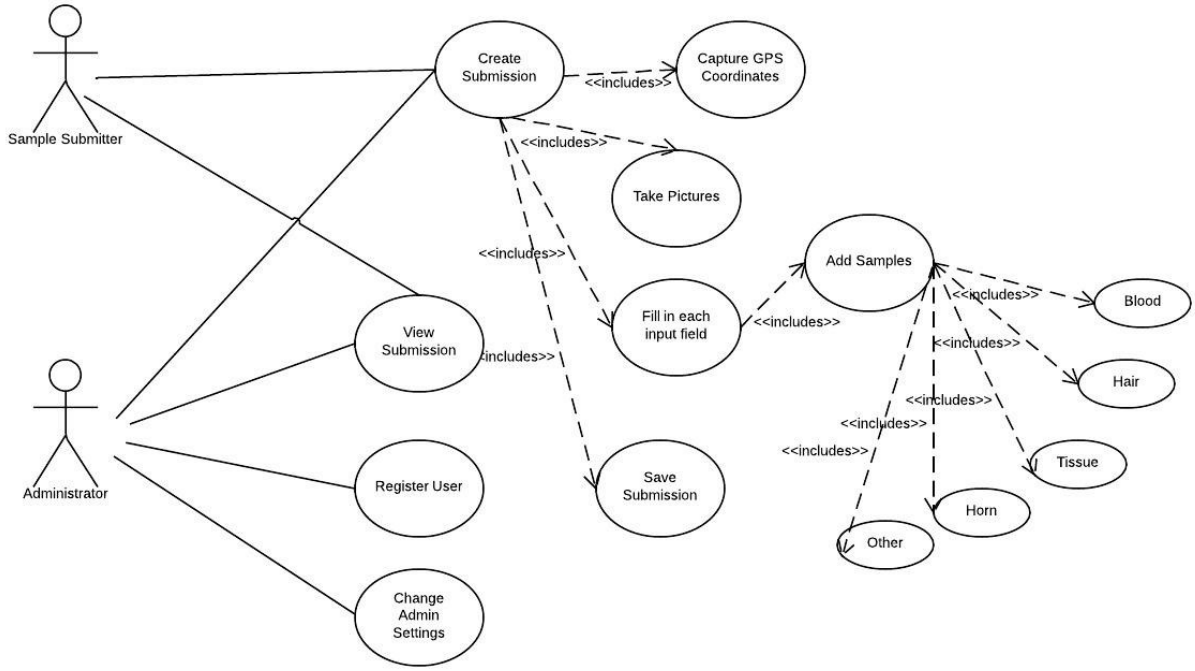

Figure 1 – Use Case Diagram of Main System. (Brief Overview)

Basic Save Procedure

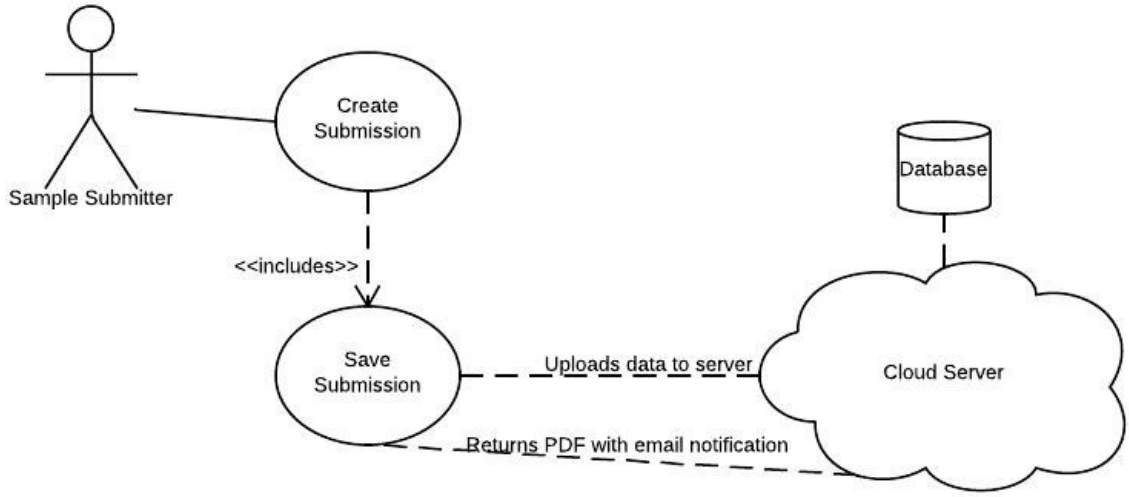

Figure 2 – Use Case Diagram of Saving Procedure.

User Interface Description

Our system will have two user interfaces, the one being the eRhODIS™ android application and the other being the web server. The users will use the android application to complete submissions and will use the web server interface to manage and view their submissions afterwards.

Non Functional Requirements

Performance

The application needs to be capable of handling large image files and any amount of images. Further, the application should be fast and should never let the user wait longer than a second for any data to be displayed on the screen. To accommodate these performance requirements, we will be using the Samsung Note 8 Tablets as they are capable of delivering such performance.

In terms of the server/web interface, we need a server that is capable of handling large amounts of data and requests, and which delivers these requests and data quickly. Therefore we have chosen Amazon Web Services, a cloud computing infrastructure, as a platform for our server.

Scalability

The system should be developed with scalability in mind, in a manner that supports code re-usability and extensibility. This requirement needs to be satisfied because the application needs to be updated each time pertinent extensions to the critical requirements are thought of. Scalability is also important because we are unable to predict the furture user base of the application. So far, by using Amazon Web Services, we are ready to seamlessly scale our server/web interface and database within minutes. As for the android application, scalability has been a key implementation focus up until now. The base of the application us written in such a way that adding or removing features will not affect or “break” the rest of the application.

We have recently upgraded our Amazon virtual server from a t1.micro to a m1.small server. We have upgraded from a single core system with minimal memory and only 8GB of storage to a multi core system with more memory and 160GB of storage space that is sitting on Amazons S3 Cloud Storage system.

Security

Users will always be required to use the application with a valid account and all information entered and stored by the users will have to be encrypted and saved in a secure location.

Maintainability

The system has been designed with architectural design patterns in place. Further, the development code will have to be well documented in order to ensure that the system is easy to understand and modify.

Usability

The interface should be easy to learn how to use it and should have a fast and efficient user interface with high memorability. We have implemented a step by step guide throughout the application to help users use the application and complete submissions. A more in depth help feature should still be developed for future use.

Availability

This application should be available at all times.

Off-line capabilities are included for areas where there is no cellular reception or wi-fi signal provided that the user has a valid account when using the application.

Open Issues

Glossary

Term	Meaning
AWS	Amazon Web Services
Cloud Server	A Server that is maintained within a cloud computing infrastructure.
Cloud Computing	Computing concepts that involve a large number of computers connected through a real-time communication networks such as the Internet.
Database	A database is an organized collection of data.
eRhODIS™	Electronic RhODIS®
GPS	Global Positioning System
RhODIS®	Rhino DNA Indexing System
PDF	Portable Document Format
Server	A computer system that runs one or multiple servers to provide services over a network and deliver content on demand.
Web Server	A Server providing web services such as retrieving web pages and/or data from a database.
UML	Unified Modelling Language