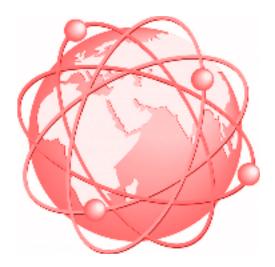# QuantumGPS

Multi-Point GPS Visualization System
Request for Proposal

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Version 1.1

1 Version History

Version	When	Who	What
0.9	January 15th 2019	QuantumGPS	Outline
1.0	January 19th 2019	QuantumGPS	Initial Drafting
1.1	January 22nd 2019	QuantumGPS	Revision

2 Table of Contents

3 Problem Description

QuantumGPS conducts ocean-based acoustic experiments with multiple floating sonobuoys and a permanent node network installed on the ocean floor. These experiments test the acoustic capabilities of the sonobuoys when around objects such as torpedos, boats, and marine mammals. To correctly interpret the acoustic data of the sonobuoys, we must know where they are, especially in relation to the objects of interest.

To know where the sonobuoys are, each sonobuoy is equipped with a GPS emitter whose signal is polled by receivers at our control centre and on our marine vessels. The receivers output the received data to a text file, which is polled by a simple application that visualizes all the sonobuoy locations and the path they have taken since the start of the experiment. This visualization software is no longer adequate for our operators and needs to be improved upon in three broad categories:

- Increasing the amount of data accessible from the system
- Increasing what can be done with the data from within the system
- Reducing the barrier to understanding the data in the system

4 Project Objectives

QuantumGPS aims to achieve the following with the requested project:

- **Maximize the amount of data users are able to view from the system**
  - The current system provides limited information from the GPS data which is needed for analysis of sonobuoy experiments. This information can be used to display to non-technical project stakeholders and assist in rapid analysis.
  - Users are not able to easily measure bearing and distances between objects
- **Maximize the configurability and customization the user has when viewing the GPS data-points**
  - The current system is not configurable enough, which slows down the operation and analysis of experiments
  - The current system does not allow users to filter GPS data over multiple parameters such as time, GPS source, and data type.
  - Users and clients are not able to configure which data fields or time periods they want to display on the current system
  - The current system is limited to only specific geographical locations and is not able to adapt to different locations
- **Minimize the time spent by users to quickly understand the visualized data**
  - The information provided by the current system is not usable and understandable by certain non-technical stakeholders. This creates barriers when trying to explain project goals and results.

5 Current System

Currently, QuantumGPS has a basic GUI application for viewing real-time locational data of sonobuoys, but it has proven insufficient for our developing needs. Features of the current system include:

- Overlays locations of up to 16 Sonobuoys onto a map in real-time
- An interactive GUI with support for zooming, panning, and rotating the view of the map

The new system must be able to provide all the functionality of the current system, plus support the new features which we require.

6 Intended Users Interactions

There are two classes of intended users: System Operators and Data Analysts.

- **System Operators:**
  System Operators will be the users who most frequently interact with the system itself, and will be very experienced with its use. They are technical people and are currently familiar with the current system. Operation of the system and management of the GPS and any system data will be performed by System Operators.

- **Data Analyst:**
  Data analysts are the users who will be looking at and using the system's output data rather than the system itself. They will not be interacting with the system itself but rather with the System operators who will use the system to show the data the analyst needs. The analysts are researchers and our clients who have not previously used similar systems.

7 Interaction with Other Systems

In the discussed system, GPS information will stream in real-time from an internal server to the host running the new system. The new system must be able to communicate with this server and properly decode this GPS data.

The system must support displaying arbitrary background map data so the system must be able to parse the required map formats to display the map.

8 Constraints

For the Multipoint GPS Visualization System there are multiple major constraints which must be correctly followed for a functional implementation of this system. The constraints must be followed within a 3-month project development timeline and a $30 000 budget.

- **Data Format:**
  The system needs to be able to visually display all valid data in the form of a NMEA string, specifically of the type GPRMC. Additionally these strings will be streamed in real-time over SSH.

- **Maintenance and Modification:**
  Once the system is in place it must be maintained internally or by the same contractors without proprietary licenses. Additionally, the system needs to be designed such that changes and updates to the source code can be made by QuantumGPS.

- **Security and Access:**
  The system must function on a closed network and use no proprietary intellectual property because all source code must be auditable by QuantumGPS. GPS data must be classified and not exposed externally

9 Project Schedule

Task Name	Start Date	End Date	Assigned to
RFP	01-15-2019	01-22-2019	QuantumGPS
Initial Client Meeting	01-29-2019	01-29-2019	QuantumGPS and Developer
Requirement Document 1.0	01-22-2019	02-05-2019	Developer
Requirement Document 1.1	02-05-2019	02-06-2019	QuantumGPS
Second Client Meeting	02-07-2019	02-07-2019	QuantumGPS and Developer
Requirement Specification Document 0.9	02-06-2019	03-12-2019	Developer
Third Client Meeting - Prototype Demonstration	03-14-2019	03-14-2019	QuantumGPS and Developer
Requirements Specification Document 1.0	03-12-2019	03-19-2019	Developer
Requirements Specification Document 1.1	03-19-2019	03-23-2019	QuantumGPS
Requirements Specification Document 2.0	03-23-2019	03-26-2019	Developer
Demonstration	03-26-2019	04-02-2019	Developer

10 Project Team

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Member	Role
Adam Kwan	CFO
Ahnaf Ahmed	Head of HR
Austin Smith	Head of PR
Darian Sampare	Web Development Lead
Hamzah Mansour	CEO
Jamie St Martin	Domain Expert
Julia Todorova	Founder
Sterling Laird	GPS Technician

11 Glossary

AIS   Automatic Identification System: An automatic tracking system for marine vessels

GPRMC   Recommended minimum specific GPS data. Major components include time, latitude, longitude, bearing, and variation

GPS   Global Positioning System

GUI   Graphical User Interface

NMEA   Data specification for communication between marine electronics including sonars and GPS data

Sonobuoy   A small buoy containing acoustic sensor equipment and a GPS tracker/emitter