

Vehicular Tracking System for Quezon City Police District Mobile Patrol Unit

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INTRODUCTION

"The ultimate achievement of humankind's urge to know where he or she is at, at extraordinarily high levels of precision, is manifested in today's Global Positioning System. Those who have grown up with Star Trek may find the idea of simply flipping open a small device to locate where you are on the planet something of a yawner. The fact is this technology represents a true revolution, comparable in scope to the invention of the accurate ship-board clock that heralded the age of global circumnavigation of the 1700's." Gregory T. Finch, *"Understanding the GPS"*, GeoResearch Inc., 1996.

A **geographic information system (GIS)**, or more commonly referred to as a **geospatial information system** is a system for capturing, storing, analyzing and managing data and associated attributes which are spatially referenced to the earth. In the strictest sense, it is a computer system capable of integrating, storing, editing, analyzing, sharing, and displaying geographically-referenced information. In a more generic sense, GIS is a tool that allows users to create interactive queries (user created searches), analyze the spatial information, edit data, and present the results of all these operations. **Geographic information science** is the science underlying the applications and systems, taught as a degree program by several universities.

Geographic information system technology can be used for scientific investigations, resource management, asset management, Environmental Impact Assessment, Urban planning, cartography, criminology, history, sales, marketing, and route planning. For example, a GIS might allow emergency planners to easily calculate emergency response times in the event of a natural disaster. GIS may also be used to find wetlands that need protection from pollution, or it can be used by a company to find new potential customers similar to the existing ones they already have and project sales based on planned market expansion.

Background of the Study

The Vehicle Tracking System (VTS) for Quezon City Police District Mobile Patrol Unit (QCPDMPU) may help the institution track down and monitor vehicles used for detaining, patrolling speeders, apprehending traffic violators and transporting.

The QCPDMPU is within the vicinity of Camp Karingal in Sikatuna Village which according to the current mayor Feliciano Belmonte Jr., as expressed during his speech in a turnover ceremony held last January 30, 2007 at the Quezon City Hall quadrangle, is the best police district in National Capital Region (NCR). The said ceremony pertains to the turnover of forty (40) brand new Toyota VIOS with full communications equipment and two Hilux model pickup trucks, also equipped fully, to the QCPDMPU. In addition to the patrol cars donated by the City to the QCPD, Mayor Belmonte committed to give additional mobile units and equipment to the QC Police Force to enable them to promptly and fully respond to the security needs of QC residents such as peace and order, and public safety.

Statement of the Problem

Specifically, this study seeks to answer the following questions:

- *How can the real time location of the mobile patrol used by the QCPDMPU be effectively monitored?*

The use of handheld radios is the typical way of determining the location of patrols in a specific area in need. The accuracy rate is considered low for there are times when the actual location can be misleading.

- *What is the most efficient way of monitoring vehicle logistics?*

Petrol or gasoline usage is one of the major expenses in terms of vehicle maintenance. By monitoring the whereabouts of the vehicle, it would give detailed information on how it was used and define the efficiency of the driver in terms of driving.

- *How can location reports be generated?*

QCPDMPU is expected to submit reports as required by the government for monitoring purposes.

Objectives of the Study

The study aims to lessen the current problem of the QCPDMPU in monitoring their patrol cars.

Specifically this study aims to:

- Provide real time location of a vehicle in use;
- Produce accurate data regarding vehicle logistics; and
- Generate needed reports.

Significance of the Study

The proposed system for QCPDMPU will benefit the following:

- **Government**

The system will provide better vehicle management system. The efficient use of government-owned vehicles will be maximized and will put the institution in a better position to protect its people.

- **Nation and its People**

The prompt response in case of emergencies is greatly beneficial to the people involved. Search and rescue operations will be promptly delivered.

- **Institution (QCPDMPU)**

The system will help lift the image of the Quezon City Police District force in delivering quality services.

- **Researchers**

The development of the system is a new avenue in technology that was opened for the researchers.

- **Future Researchers**

The system can be used by future researchers and inspire them to develop an upgraded system with the same field of study.

Scope and Limitation of the Study

1.5.1 Scope of the study

- Vehicle tracking

- Detailed location information for
 - Time
 - Date
 - Speed
 - Location
- Secured access
 - Username and password for each authorized user
- User defined tracking options
 - Vehicle can be tracked based on a preset interval or demand

1.5.2 Limitation of the study

- Tracking device will be unable to monitor the location of a vehicle that passes through a blind spot area.

DOCUMENTATION OF THE CURRENT SYSTEM

Description of Current System

Currently QCPDMPU is monitoring more or less 100 patrol units in operation, not to mention the forty (40) newly-donated patrol vehicles from the Quezon City hall by the current mayor Sonny Belmonte. The process of monitoring begins in the mobile patrol division headed by Chief superintendent Ramon Perez in coordination with the Operation Control Division under the supervision of Police Inspector Romeo Patenio Bermudez.

The vehicle monitoring process is done manually from the Operation Control division. Just like the conventional way of finding the location of their mobile units, they are using two way radios. All

transactions to be made were done through a two-way radio communication.

The QCPDMPU allotted 30 liters of gasoline for each mobile patrol. However, a full tank gasoline was loaded for each mobile unit in case there is an emergency operation such as chasing bank robbers.

The current system is using a paper trail method in monitoring the itinerary list of each vehicle in the fields. The gasoline consumption can only be gauged in the written reports submitted by the personnel involved. In case of doubt, Chief superintendent Perez will require additional documents to confirm the excess in the gasoline usage. According to Perez, “most of the time, officers misuse the mobile car by attending to some unauthorized events and locations”.

To check the actual location of their mobile patrol, they employ the site inspector strategy wherein the inspector will call the mobile patrol (through two-way radios) and ask him/her to go to a certain location within the vicinity of the area assigned to him/her. The time frame usually is within 10 minutes. If the mobile patrol goes beyond the timeframe intervals, the inspector will submit a written report concluding that the patrol is not really in the assigned post. The chief superintendent will ask the officer caught up to submit a detailed report of his whereabouts to justify the conflict in the time frame interval allotted.

Hardware Setup

The QCPDMPU uses two-way radios in monitoring their mobile patrol units.

Software and Applications being used

There was no software used in monitoring their mobile patrol, only a simple communication (using two-way radios) is being utilized.

Personnel

The users involved in the system are the:

Chief of Mobile Police Division

The Chief of the mobile police division is responsible for monitoring the vehicles used by the QCPDMPU personnel.

Head Inspector of Operation Control Division

The inspector is responsible for an on site inspection of the deployed officers. He conducts preliminary investigation on the time frame discrepancy.

SYSTEM DESIGN SPECIFICATION

The researcher gathered all data to come up with the appropriate database design of the prototype that is reliable, accurate and normalized database design to ensure data integrity. It is composed of six (6) tables which are Mobile, Location, Mobile Location, Password, Operator and Audit Trail.

The researcher conducted an interview with Chief Superintendent Ramon Perez, Head, Quezon City Mobile Patrol Division, PO1 Bienvenido B. Probadora Jr., a PNP staff which happens to be a Master of Information (MIT) student of STI-Cubao, Inspector Romeo Joaquin of the I.T. (Information Technology) Department and Police Inspector Romeo Patenio Bermudez Head of the Operation Control Division.

From the data given by the personnel mentioned above, the researcher focused on the goal of coming up with solutions to the different problems given and providing faster and accurate data storage to ensure that

retrieval and updating of records can be more systematic and on- time. With this, the developer observed the current flow of the system to create the prototype that will satisfy the user.

The researcher followed a systematic approach in developing the system. The system is composed of several modules such as the user login, MDI form main menu, mobile location and password maintenance, tracking views, web prototype for internet access, followed by the reports module, audit trail and back-up features. These special features can only be accessed by the QCPDMPU registered personnel.

SYSTEM IMPLEMENTATION

VTS for QCPDMPU will support monitoring of their mobile patrol units. This is to ensure the exact location of the mobile cars when tracking them during operation.

Programming Considerations, Issues and Tools

The following software and application were used to develop the prototype:

- Windows 98 SE and Windows XP– used as the operating system
- Microsoft Visual Basic 6.0 – a programming language used to developed the system
- Microsoft Access 2000 – a windows application that was used to design the tables and database of the system.
- Microsoft Visio Professional and Microsoft Word – used in documenting the study and for the creation of the diagrams such as Context Free Diagram and Data Flow Diagram.

- Internet Information Services (IIS) – used for running the prototype web views
- Internet – used for research regarding related studies of the system

Vehicle Tracking System (VTS) for Quezon City Police District Mobile Patrol Unit (QCPDMPU) serves as a tool to speed up and make the monitoring operation accurate. The duly authorized personnel of QCPDMPU use the VTS. It provides an audit trail to monitor the actions taken, determine the system user, and ensure that only authorized personnel may access and use the system.

The system also provides fast data storage and retrieval mechanism and a more systematic and organized record keeping tool for future reference.

The VTS can also be accessed through internet.



System Requirement Specification

Hardware Requirements

The system requires the following components:

➤ **Rover**

A gadget used for tracking the vehicle that serves as a link for satellite communication.

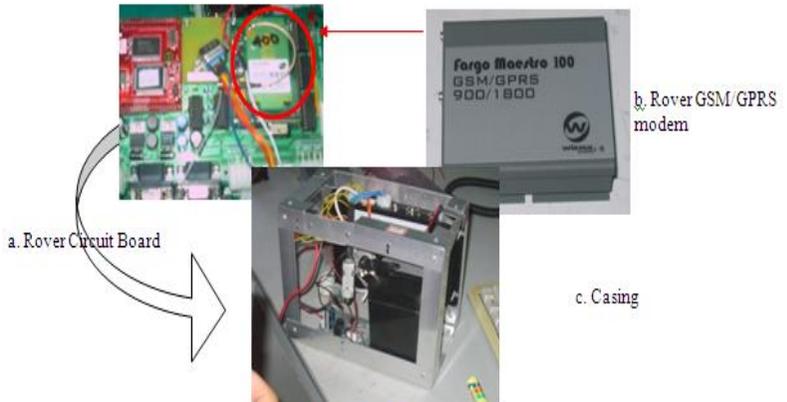


Figure 8.2 Rover

➤ **LAN**

- Hub
- LAN card latest (10/100MBPS)
- RJ45
- UTP Cable

➤ **SERVER**

- Pentium IV/ Celeron/ AMD equivalent or higher
- 256 MB DDRAM or higher
- SVGA monitor
- Speaker / Keyboard
- Mouse
- AVR
- 56x CD-ROM
- Printer HP/Epson

- CLIENT
 - Pentium IV/ Celeron/ AMD equivalent or higher
 - 128MB DDRAM or higher
 - SVGA monitor
 - Speaker / Keyboard
 - Mouse
 - AVR
 - 56x CD-ROM
 - Printer HP/Epson

Software Requirements

- LAN
 - Network drivers
- SERVER / CLIENT
 - Windows 98SE / ME / NT/ XP or higher
 - Microsoft Office2000 or higher
 - Microsoft Visual Basic 6.0 or higher

Human Resource Requirements

VTS is accessible to the mobile patrol division and operation control division..

Implementation Set-up

VTS will be implemented to ensure that it can help QCPDMPU. However a GSM network is needed for its full implementation (See Figure 8.1). In this regard, the researcher asked for the cooperation of the Webcast Technologies to provide the GSM network for satellite and other communication link needed, and at the

same time provide the Rover and complete Vehicle Tracking System for QCPDMPU.

Physical Environment

The system is installed on the computer unit for QCPDMPU authorized personnel. It will be located inside the QCPDMPU office.

Rovers will be installed in the mobile patrol. Signals that will be received will be transmitted to the base station.

Base station will record on the report regarding the exact location of the mobile patrol cars.

Interfaces

During the execution of the system, users will select username and encode password. The user may only be allowed three attempts to encode the required password, after which the system will automatically terminate due to password error. If the correct password cannot be given by the user, he/she cannot access the system.

Functionality

VTs is designed for QCPDMPU. Its purpose is to alleviate the problems of QCPDMPU in monitoring their mobile patrol cars.

Data

All data that enter the system will be recorded and kept in the system database. Daily transactions can be monitored by the system.

Testing Activities

The test is done to ensure the flexibility and accuracy of the prototype. After the implementation study went through a series of tests for the purpose of detecting errors in the implementation stage, the QCPDMPU can easily determine and appreciate the great advantage of using the VTS.

System Function

The system must be properly tested to determine whether or not the objective of the study has been met and achieved. If the developer found any lapses, the system must be modified to suit and satisfy the needs of the user and to ensure that it is error free. Using the detailed description as a guide, important control parts of the system have been tested to uncover errors within every module. The data structure was examined to make sure that the temporarily stored data maintain its integrity during the entire execution of the system.

Installation Process

The researcher, in cooperation with Webcast Technologies which provides the GSM network and rover, installed the VTS through the use of parallel system changeover.

The researcher, together with Webcast Technologies personnel, reached an agreement with the QCPDMPU that orientation and guidance will be provided to the users until they familiarize themselves with the system to be able to maximize its use. The QCPDMPU can determine for itself which of the two systems, manual or computerized, is better. Through parallel system changeover, the QCPDMPU could choose the system that would best fit their needs.

Results and Observation

The user of the system found out that the VTS will be beneficial to QCPDMPU. The system proved to be very useful and helpful in monitoring activities of the QCPDMPU. After a series of tests in comparison with the manual system is done, the VTS was found out to produce more accurate results than the manual system.

CONCLUSION AND JUSTIFICATION

After testing the VTS for QCPDMPU, the researcher concludes that:

- The problem in the monitoring of the real time location of the mobile patrol units will be resolved because the VTS provides a convenient, organized and feasible database for the location record files.
- The difficulty in logistics will be resolved because the VTS can accurately provide the necessary information.
- The time consumed in generating reports required by the division will be lessened because the VTS records the itinerary data of each mobile patrol car.

RECOMMENDATION

The VTS for QCPDMPU has met the requirements needed. The chief superintendent of QCPDMPU believes that the VTS will contribute in the productivity, efficiency and accuracy of monitoring the exact location of their mobile patrol.

The researcher recommends the use of the VTS because it will help the QCPDMPU, as well as the Quezon City government, in delivering prompt response to the security and other police services requirements of the residents

The researcher likewise recommends the continuous and regular upgrading of maps, including spots and landmarks, for accurate real time location.

Finally, the researcher recommends the use of a smaller version of the rover that would easily fit unnoticeably in the patrol cars.

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