

Fleet Management System

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Abstract - Web services have come definitive in web operation development. Peaceful web services are one way of furnishing interoperability between computer systems on the internet. REST biddable web services allow requesting systems to pierce and manipulate textual representations of web coffers using a livery and predefined set of stateless operations. These services, which are online APIs, can be penetrated from colorful operations and the results can be used to offer specific functionality to users. Vehicle Management System is software which is helpful for drivers, who wants to operate numerous passages in a day. Vehicle Management System is a windows operation written for 32-bit Windows operating systems which concentrated in the area of adding, editing and deleting the passengers, staff and the machine routes.

Keywords: REST, API, Web, Operation.

I. INTRODUCTION

This design consists of a garçon operation, a customer operation, and an Android app. The garçon operation exposes a REST API which provides all the functionalities to manage a Fleet of vehicles. This API is developed using the MVC architecture and uses the Hibernate frame to perform (Create, Read, Update and Delete) operations on the underpinning MySQL database. This API responds to the different types of HTTP requests and communicates. Basic authentication is handed using the Security module for the admin. The REST requests are secured using an API- key. The Android app is installed in the smart device available in each of the vehicles belonging to the line. This app is responsible to register the vehicles using the IMEI of the smart device or a defined Vehicle Id. Once the Vehicle is registered this app is responsible to shoot the current position data (co-ordinates) to the database using the API in a timely manner. The customer operation retrieves the current/ last known position data of all the vehicles registered with the system using the API also the data is rendered on a Chart using the Google Charts API. The director can track the real – time position data of all the vehicles registered in the line.

II. OBJECTIVE

The system must have the features like vehicle maintenance, repairing, employee assigning, team allocation,

licensing (revenue license), monitor fuel consumption, document archiving and so on.



There are Standard Features available in VMS:

Most VMS supports most type of vehicles – Passenger, truck, construction, and other commercial vehicles.

- 1) It really reduces vehicles cost while increasing performance and dependability.
- 2) Track miles and travel expenses.
- 3) Eliminate costly unscheduled maintenances.
- 4) Keep accurate records of any type of vehicles.
- 5) Help plan annual vehicle budget faster, easier and more accurately.
- 6) Keep track of drivers and other employee's ledgers.
- 7) Management of users, Type, Insurance, Maintenance, Accident and scheduling.
- 8) Expense management and cost allocation.
- 9) Electronic document storage.

Commercially available products are designed to a pre-defined business process where as it does not match the current process followed by client. These products expect client to be changed according to business processes they have designed in order to be implemented. In Sri Lanka several large companies who has the large number of motor vehicle owned, use bespoke vehicle management systems. Most of VMS functions which allow companies to remove or minimize the risks associated with vehicles owned by the companies. Generally, this software managing the vehicle includes the daily management of vehicles, fuels, service and drivers. When it comes to improving efficiency, productivity and reducing overall costs involved with a company's vehicles. It is essential to have VMS.

III. SETUP AND SOFTWARE REQUIREMENTS

The term system requirements mean the minimum hardware and software requirement of a computer. If the computer full fill this minimum requirement then the system will run smoothly from this computer. Appropriate style is still applied to each section, reapplying styles if necessary. Given below are the hardware requirements for optimum performance of the system.

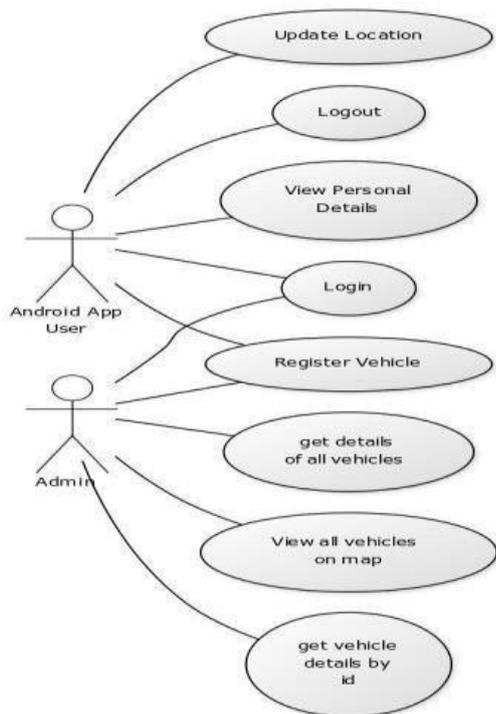


Figure 1: Use case diagram of working system

Table 1: Hardware details

Hardware Minimum	Requirement	Reason
Processor speed	2.0 GHz	Accommodate most PCs
Memory of user PC	1 GB RAM	Relatively fast
Disk Space of user PC	100 GB	Adequate Storage capacity
Bandwidth(network connection)	15 Mbps	Relatively Good
Disk space of server (Not essential)	200 GB	Adequate Storage for database and application

a) Internal System Architecture

Users of the web application include; Clients and system administrator. When a client comes to the system (Web application), he/she is able to book a car available and reserved, to read the FAQ, about us a without registration or signing in and he/she can create an account on the system by registering through providing his/her full name, email, password, if he/she is an existing user he can just sign in using

his/her email address and password. What system administrator are able to do on the system he/she is able to manage all users in the web application such as add a new user, update, delete a user, to view the detail information of client, managing booking information, updating, viewing different type of parking cancel the booking and also managing the system administrator setting. The logged in user can update his/her password by providing the current password and can log off the system.

b) Components and objective of system

Using GPS technology, a line operation result allows line directors to see where vehicles are at any time, efficiently plan routes and minimize vehicle time-out. Depending on how you reuse this data, vehicle shadowing can be active or unresistant. Passive shadowing is the data collected using an installed device in a truck, similar as the position history of a vehicle.

In its turn, real- time line position data allows active shadowing, indeed in videotape format. In other words, FMS provides line drivers with accurate information on what happens to exchanges between loading and unloading. With similar perceptivity at hand, line drivers can make quick opinions that ameliorate effectiveness and safety on a 24/7 base.

Route operation is essential for companies willing to organize effective communication between motorists and line drivers. For case, some GPS trackers can automatically determine the position of vehicles closest to any address which facilitates the work of line drivers. In addition to planning routes and trip times, some line operation platforms give real-time business updates. Fleet dispatchers use this perceptivity to warn motorists of unanticipated business conditions, similar as risk roads, and deflect them if necessary. All by each, effective route operation measures help ameliorate motorist and vehicle safety, save energy costs, and optimize motorists' schedules, performing in a better client experience thanks to on- time deliveries.

IV. PERFORMANCE TESTING

It is important that we need to test the application for performance. Good performance ensures that the user has good availability of the services even under the load. I have used Apache JMeter tool for load and performance testing. This tool simulates a group of users sending requests to the application server and returns various statistics that show the performance of the server in the form of table data and corresponding graphs.

A Test Plan in JMeter has the configurations required for running a test, in test plan we specify the thread group or the

number of users, the number of times to loop, the ramp up time, the url to hit, the path to the exact resource, the port number, the parameters to be passed to the request, headers if any, the type of request and the type of content. Once all the parameters are configured we can execute this test plan whenever we want.

I have performed performance testing to the most important service in my project, i.e., the service to retrieve the data of all the vehicles. I have chosen this service as it requires the most database resources and deals with relatively more amount of data. I have used a laptop with 8GB RAM and ran an instance of the project in the tomcat server. I have used one of the campus computers to perform load testing, by sending the request over the Wi-Fi. The data transferred per request is 11.14 kb.

Table 2: Depicting the throughput for different configurations

No. of Users	Ramp up period	Loop Count	Throughput
100	1	10	3043.831/minute
200	1	10	2906.132/minute
500	1	10	3211.991/minute

V. FLOW CHART

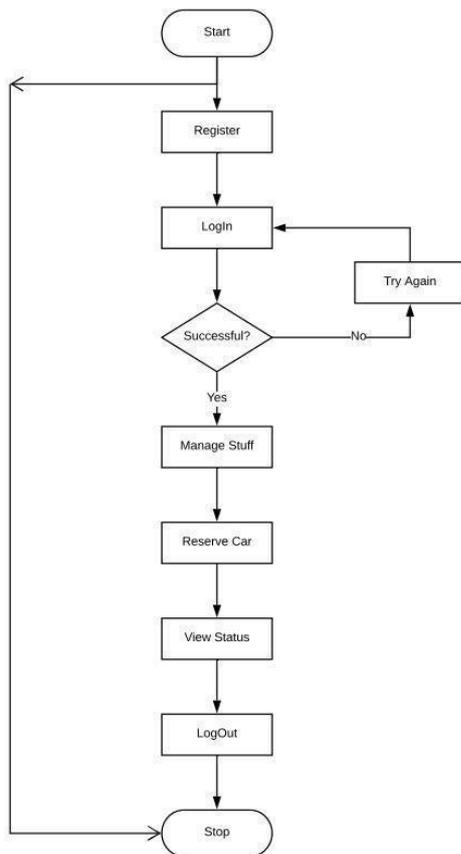


Figure 2: Flow chart

VI. COMMUNICATION SYSTEM

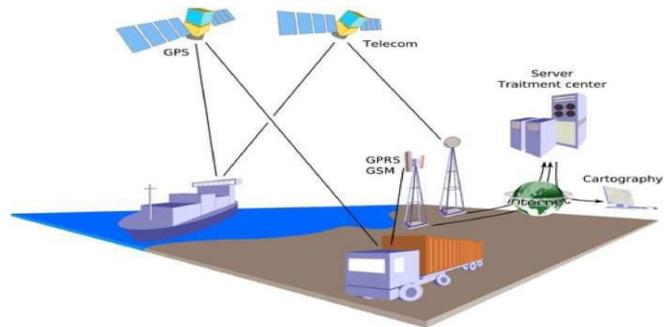


Figure 3: Communication system

VII. HARDWARE USED IN THE SYSTEM



Figure 4: GPRS Module



Figure 5: GPS modem

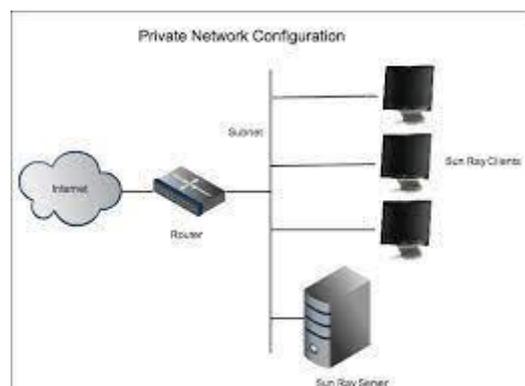


Figure 6: Private Network

VIII. COMMUNICATION SYSTEM

Table 3: Communication system

OSI model	Used protocol or service
Physical layer	GSM, 100BASE-TX
Data link layer	GPRS, Ethernet
Network layer	Internet Protocol (IP)
Transport layer	Transmission Control Protocol (TCP)
Session layer	TCP socket
Presentation layer	UTF8
Application layer	XML based protocol

IX. COMPARATIVE STUDY

Table 4: Comparative study

	Trimple Transportation (Peoplenet)	Element Fleet Management	Verizon Connect	Omnitracs GPS
Price Per Vehicle	\$1,400 per an EDL device + the monthly subscription of \$49. Each solution requires additional subscription.	A custom subscription, the EDL device's price is already included (about \$60 for each device per month).	The EDL device costs \$100-150 and the monthly subscription is about \$50.	\$22.95 - \$45.95
Real-Time Tracking	Yes	Yes	Yes	Yes
Fuel Consumption	Yes	Yes	Yes *But requires additional subscription	Yes
Engine Data Logging	Yes	Yes	Yes *It depends on the installed device type	Yes
Drivers Performance Report	Yes	Yes	Yes	Yes
Vehicle Trips Report	Yes	Yes	Yes	Yes
Vehicle Speed Violations Report	Yes	Yes	No	No
Routing	Yes	Depends on the plan	Yes * But comes at an additional price	No
Asset Tracking	Yes	Yes	No	Yes

X. CONCLUSION AND FUTURE SCOPE

The fleet management system could be used by anyone who owns a fleet of vehicles and would like to track each of the vehicles in real time. This way it is easy to keep track of the progress and have up to date information of each vehicle. This application also exposes an API that could be used by any developer to make use of the underlying features and develop his/her own application. For example, if a developer wants to develop an application, which tracks and shows each vehicle of a group of friends who are on a trip together going to the same destination, he can use the API and show all the vehicles of the group on a map. This project also avoids malicious updates by making use of a unique key for each of the user, which needs to be sent in the header. Thus, this project is a complete application, which could be used by a wide variety of users for various purposes. Developing this application has given me a good grip on web application development, as this project has end to end functionality and also has integration with an Android app. I have gained the required experience with the popular frameworks used in the industry for web application development such as Spring and

Hibernate, thus making me confident to start my career as a Developer.

Table 5 : Lines of Code

Language	Lines of Code
PH	1600
XML	250
CSS	300
Total	2150

The above table depicts the breakdown of the lines of code in my project with respect to the language.

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