PALESTINE POLYTECHNIC UNIVERSITY

COLLEGE OF
ADMINISTRATIVE SCIENCE AND INFORMATICS

FLEET MANAGEMENT

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A GRADUATION PROJECT SUBMITTED TO THE DEPARTMENT OF INFORMATION SYSTEMS, THE UNIVERSITY OF PALESTINE POLYTECHNIC IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE GRADUATION.

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ABSTRACT

A Fleet Management is a software project that introduces a technology to manage and control vehicles remotely. This system let the user know the position of vehicles through entering the coordinates which is received from the SMS, the location of the vehicle will appear on geographical map which contains road map about the west bank and Gaza. The Project allows the users to track the vehicles and achieve good control over them resulting in an efficient and effective way of their use.

The goal of this project is to program software that runs as a web application on the internet. The system given the name fleet management, is developed using Microsoft Visual Basic.NET, and the database was created using Microsoft SQL Server.

Dedication

To my loving and supportive parents I am what I am today because of your care, love and support throughout those years.

To my sister…it was hard for you to understand what I was going through sometimes, yet you helped me through it.

To my best part who I choused her to continue our live together which she encouraged me to continue when I thought I couldn't handle anymore stress …

To my friend and partner whose ideas never stopped to Advice me…

Thank you all for everything

Hanna Younan

Dedication

To my parents who always cares about me,

To my brothers who helped me through the sleepless nights,

To my friends who were always ready for helping me.

To all person who helped me in my hard times.

This work is dedicated to all of you as a part of my gratitude

Hamza Qafeshah

ACKNOWLEDGMENT

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We would like to thank Dr. Mahmud Elsaheb and Mr. Suhail Slultan for their efforts when we started working on this project.

Since no project is ever the outcome of the teamwork alone, our gratitude also goes to the Company GSE (Good Shepherd Engineering and Computing) who assisted us through various stages, especially by supporting us with maps of Palestine which were needed for the project, and also supporting us with special Original Software which is not available in the market like ArcGIS ArcIMS from ESRI (www.esri.com).

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1.1 INTRODUCTION

- **WHAT IS FLEET MANAGEMENT?**

Fleet Management is a Software Project that introduces a technology which helps people manages and controls their vehicles remotely (like cars, bus or any other types of transportation methods). This project has the ability to locate locations of the vehicles and show them on a geographical situation viewing on a map directly and/or linking it to a website. The Project allows the users to track the vehicles and achieve good control over them resulting in an efficient and effective way of their use.

This project will discuss the case of a number of bus companies that are available in a certain city, that will let the owners of these companies have full control of their assets and make sure that the drivers are using the companies busses in a reliable way that minimizes the company losses and increase profits, and not to loose any opportunity. This project allows the owners to reduce the unnecessarily cost that they can avoid, so they will increase the profits and use more advanced steps to improve their services.

1.2 Overview about GSE Company

Good Shepherd Engineering and Computing Co (GSE), is a Palestinian company that specializes in high technology in the Computer Aided Design (CAD), Geographical Information Systems (GIS) and Remote Sensing software and consultation as well as specialized hardware peripherals that are directly connected to CAD/CAM and GIS applications.

GSE was founded by the Engineer Michael Younan in Bethlehem in 1981. The main office of the GSE is situated in Bethlehem with two branches in East Jerusalem and Gaza Palestine.

GSE Services:

1. Computer Aided Design and Drafting (CAD).
2. Computer Aided Mapping (CAM).
3. Geographic Information System (GIS).
4. Remote Sensing and Photogrammetry.
5. Automation.
6. Computerized Town Planning.

Geographical Information Systems (GIS): is a technology that is used to view and analyze data digitaly from a geographic perspective. The technology is a piece of an organization's allover information system framework.

Active Server Pages (ASP.NET): a new and powerful server –side technology for creating dynamic web pages that allows the use of any fully fledged programming language supported by .NET

ArcGIS ArcIMS, GIS Image Maangement System: is the solution for delivering dynamic maps and GIS data and services over the web. It provides a highly scalable framework for GIS web publishing that meets the needs of corporate intranets and demands of worldwide internet access. ArcIMS services can be used by a wide range of clients including custom web applications.

1.3 Project Overview

This project completely depends on geographical maps to define the location of the vehicles, and be able to track vehicles. The working on maps needs special studies in addition to specific tools and experiences, we as Information Systems Team don't have the ability to work and design maps thus we requested the support of the GSE Company to provide us with the maps. GSE accepted the idea and they were ready to help us in our project. We as a team took these ready maps and worked on them using the programming languages to achieve the project requirements.

Our work is mainly concentrating on specifying the location of the vehicles which are provided with Global Positioning System (GPS) units, enter the locations on the digital maps and publish them on a special secure website. After building the database structure and collecting the needed maps, the data will be connected to the internet through ASP.NET, and then the authorized persons will enter the website and browse it contents to view the location of their vehicles.

1.4 Objectives:

The Fleet Control is a fleet management solution that allows real time remote monitoring of vehicles and equipment-using advance developed software, GPS and mobile data communication. This service enables real time comprehensive information on equipments and vehicles for each separately. The control can be made for both positioning and mechanical status (engine, temperature, oil pressure, on/off, speed, alarms ... etc) in real time and recording the history of the vehicles locations. Many options exist to control via an application that can control remotely. For example, an automated control and data recording system that provides full supervision and control over the use of fleet vehicles and equipment.

An I-Checkbox locate unit is installed in a vehicle or equipment piece (static or mobile) and is connected to the various sensors. These sensors can provide the status of the tool connected to it for example if door is open, engine is on or off, fire or smoke detection and even if glass is broken or movement of the object. The movement of the object is detected in real time via an installed GPS unit and a communication unit within the I-Checkbox. The GPS is a standard GPS system that obtains its bearings from satellite communication 24 hours a day.

Connection is established with the I-Checkbox locate unit via the GPS and a transmission to a central using the SMS or the GPRS communication protocol of a GSM mobile phone network. The fleet management software running on a high-availability Internet server receives the data and information and shows vehicle position on maps of West Bank and Gaza. The maps can be at different scales and contain roads or street maps.

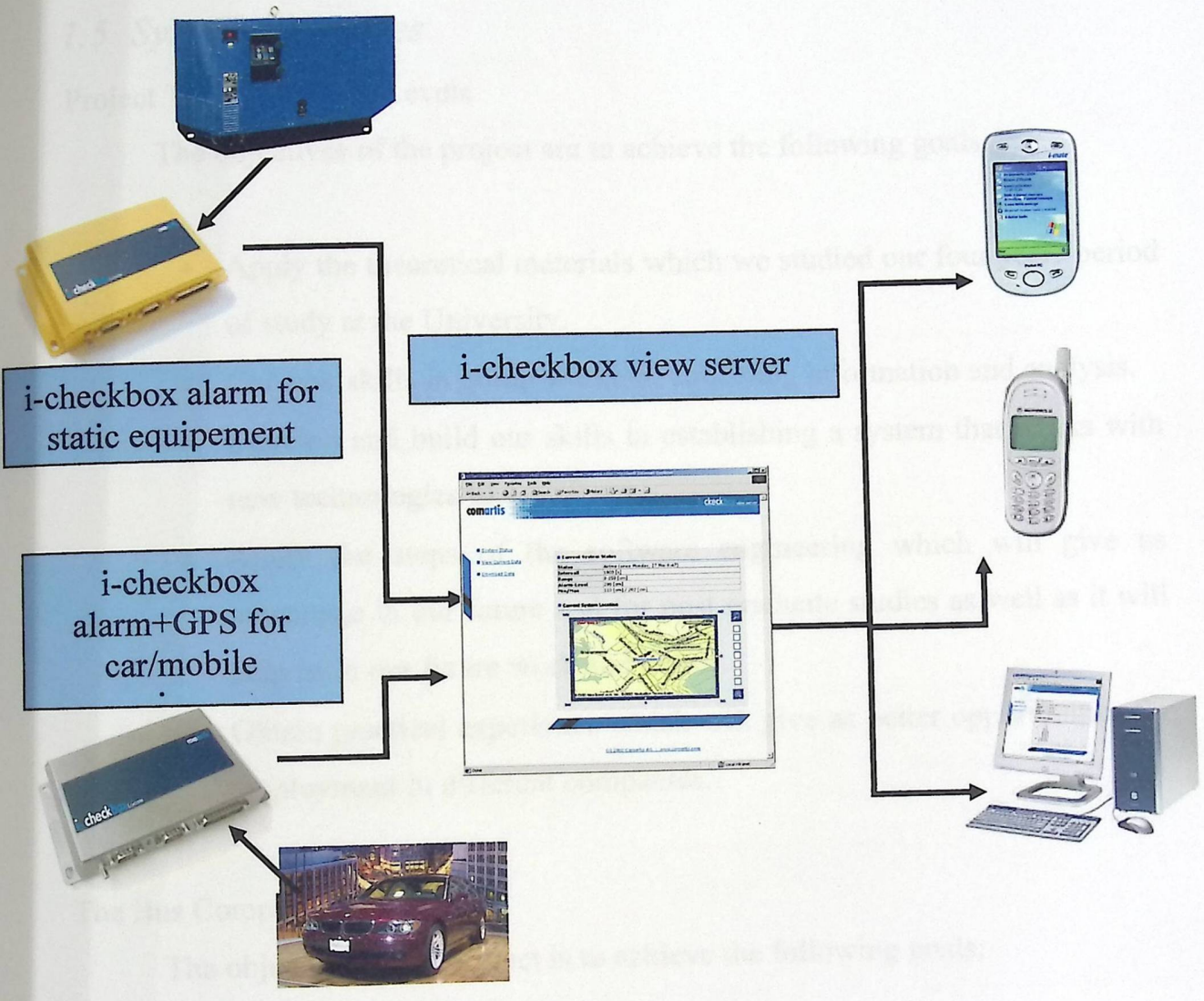

Figure 1.1. I-checkbox

An I-Checkbox locate unit connected to a GPS unit is installed on the vehicle. The Box is installed within the vehicle in a concealed place and the GPS unit is installed magnetically on the car body to view the satellite, and the GSM transmitter/receiver is installed on the front or back panel of the car below the window panel to transmit freely to the GSM network

1.5 System Objectives

Project Team Objective Levels

The objectives of the project are to achieve the following goals:

- Apply the theoretical materials which we studied our four years period of study at the University.
- Get new skills in group working, collecting information and analysis.
- Develop and build our skills in establishing a system that works with new technologies like ASP.net.
- Apply the steps of the software engineering which will give us advantage in our future and for post graduate studies as well as it will help us in our future work and career.
- Obtain practical experience which will give us better opportunities for employment in different companies.

The Bus Companies Level:

The objectives if the project is to achieve the following goals:

- To have a full control of the companies' assets which leads to an increase in profits and reduce overhead costs?
- To have direct communications between the company and their drivers.
- To give better service to customer.
- Introducing new technological systems in these companies.

1.6 Organizational Structure

In this figure we will show the organizational structure of the GSE Company, Bethlehem.

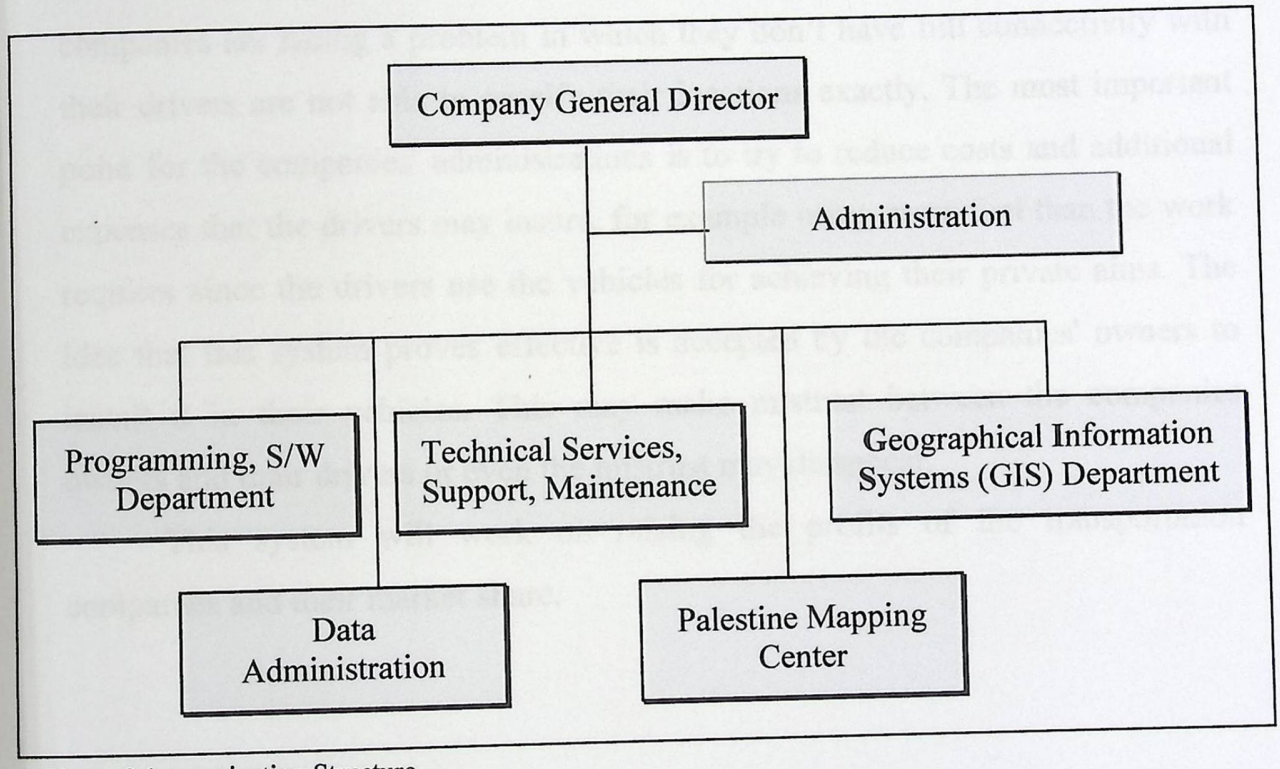

Figure 2.1.organization Structure

1.7 Problem Statement

The goal of this project is to develop a software application for *Fleet Management,* programmed primarily in VisualBasic.Net. The work will start from building database and end with a professional website that lets the authorized persons to control and manage their assets via the web. The bus companies are facing a problem in which they don't have full connectivity with their drivers are not able to specify their locations exactly. The most important point for the companies' administrations is to try to reduce costs and additional expenses that the drivers may insure, for example using more fuel than the work requires since the drivers use the vehicles for achieving their private aims. The idea that this system proves effective is accepted by the companies' owners to install it in their vehicles. This may make mistrust between the companies owners and their drivers or even the mistrust may disappear.

This system will work on raising the profits of the transportation companies and their market share.

1.7 Problem Statement

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	Dollars
	100.00
	500.00
	100.00
	200.00
	$ 900.00

This system will work on raising the profits of the companies and their market share.

	Device Cost in USD
	1,100.00
	100.00
	$1,200.00

1.8 Feasibility Study

Cost of Required Programs, Applications and also the devices that are needed to complete the project, in addition to the cost that is required for the Team:

- *Technical and Economical Feasibility Study*

Software Requirements Costs:

Program/Application	*Cost in US Dollars*
Windows XP Professional SP2 (OEM)	100.00
Microsoft Office 2003	500.00
Norton Anti Virus	100.00
Visual Studio.NET	200.00
Total:	**$ 900.00**

Table 1.1 Software Requirement cost

Hardware Requirements Costs:

Device Name	*Device Cost in USD*
Personal Computer(PC) Pentium 4	1,100.00
Printer HP DeskJet	100.00
	$1,200.00

Table 2.1 Hardware Requirements Cost

Hardware requirements specification:

technical specifications	
Processor type	Intel® Xeon processor standard
Number of processors	1 processor
Processor speed	3.00 GHz
Processor upgrade	Up to 2 processors supported
Internal hard disk drive	2 x 36GB SCSI
Hard disk drive speed	10k RPM
Hard disk controller	Single Channel Ultra320 SCSI Adapter in a PCI slot
Back UP	HP DAT 72i (36/72)GB Internal
Internal cache	Integrated 1 MB Level 2 cache
Chipset	Intel® E7320 Chipset with 800 MHz Front Side Bus
Standard memory	1GB standard memory
Memory type	PC2700 DDR SDRAM running at 333 MHz
Maximum memory	8 GB maximum memory
Memory slots	4 slots
External i/o ports	Parallel - 1; Serial - 1; Pointing Device (Mouse, PS2) - 1; Graphics - 1; Keyboard (PS2) - 1; USB - 2; Network RJ-45 (Ethernet) - 1
Internal mass storage	880.8 GB maximum
Expansion slots	(6) total: (1) PCI-Express x 4; (4) 64-bit/66MHz 3.3V PCI-X (3 available); (1) 32-bit/33MHz 5.0V PCI
Cd-rom/dvd	DVD+RW 8x
floppy disk drive	1.44 MB Diskette Drive
chassis type	(5U) Tower; Rack enabling kit
video adapter	Integrated ATI RAGE XL Video Controller
video ram	8 MB SDRAM Video Memory
network interface	Broadcom 5721 PCI-Express Gigabit NIC (embedded) 10/100/1000 WOL (Wake on LAN)
internal drive bays	(6) 1" SCSI HDDs (Hot-Plug or non-Hot-Plug), or (4)

	Hot-Plug SATA HDDs
dimensions (w x d x h)	20.4 x 54.1 x 44.6 cm
Weight	17 kg
Monitor	HP CRT 17"

Table 3.1.Hardware requirements specification

Human Costs (for Buss Company)

Human	*Cost in USD per month*
Data Base Administrator(DBA)	900.00
Programmer	1000.00
	$1,900.00

Table 4.1.Human Costs

Cost on the Team:

Cost Type	*Cost in US Dollars*
Transportation Cost	100.00
Photocopy from books and other references	10.00
Internet cost	20.00
Printing Cost	150.00
Other Costs	20.00
Total:	**$ 300.00**

Table 5.1.Cost on the Team

1.8.1 Cost – Benefit Analysis

As a careful study for this project we found that if any company implements it on its fleet many benefits will return to them, but at the same time applying this project require an initial overhead cost which maybe a little costly. If we compare the cost with the benefits and the gain from applying it we will find that this system saves a lot of money, resources and provide a high level of security on the vehicles.

1.9 Time Schedule

The scheduling is an important issue that must be measured very carefully. As a team on the project we will put an initial scheduling program as we know that future is full of surprises, so we don't know what our future hides for us, and latter we will report the differences between the planned and the actual scheduling.

The Task	*Time In Days*
Data & Information Collections	25
1. Requirements Definition	
System Specifications	7
Requirements Analysis	13
2. System & S/W Design	
Design System Architecture	15
Interface Application Design	10
3. Implementation and Unit Testing	
Programming and Debugging	15
4. Integration and System Testing	
Module Testing	5
System Testing, Acceptance Testing	10
5. Operation and Maintenance	10

Table 6.1 Time schedule

Task	*Task Symbol*	*Duration(days)*
Data & Info Collections	T1	25
Requirements Definition	T2	20
System & S/W Design	T3	25
Implementation and Unit Testing	T4	15
Integration and System Testing	T5	15
Operation and Maintenance	T6	10

Table 7.1Tasks schedule

Estimated Time Schedule

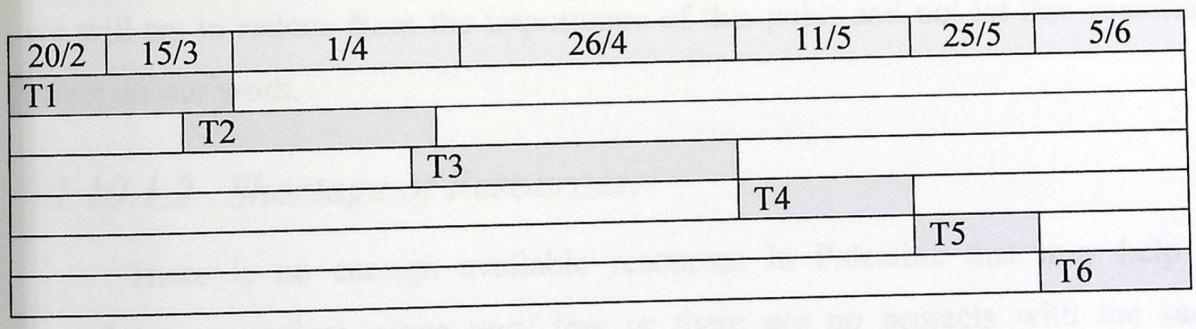


Table 8.1 Time Schedule2

1.10Risk and Constraint Analysis

It is expected that we may face some constraints during the work on this project; we will try to deal with these constraints as much as we can to make sure that they will not affect our working on this project and reach our aim.

1.10.1 Constraints on the Team

There is a number of expected constrains that the team may face during the work on this project. Some of these constraints are:

1.10.1.1 Varying Living places of the team:

This is a real constraint that may affect our meetings and work on the project because the team is living far from each other, but in the will of the God we will try to reduce from the importance of this point and not let this constraint affect on our work.

1.10.1.2 Shortage of Resources:

There is no enough available resources In Palestine that may help us complete our project, since very few or there are no projects with the same specifications like our project implemented in past years.

1.10.1.3 Fields of specializations

The subject of this project contains a big number of fields and needs to be studied widely and for sure this may take a long time. We will work to achieve the work but in small dedicated and specialized fields.

1.10.1.4 Time constraint

Time constraint is a main and important issue, the academic and social commitments of the team may hinder our project activities.

1.10.2 Constraints on the vehicles company

Vehicles companies do not have previous feasibility studies on fleet management but see it as a big necessity for their companies.

1.10.2.1 The Resistance of the drivers

The drivers within bus companies will consider that the fleet management is a control over their activities and will constrains their freedom of movement. They also may consider it as mistrust between them and the owners of the companies. This becomes problematic when the companies enforce this system on their vehicles.

1.10.2.2 Costs required by Bus companies

The project requires high overhead costs as shown in the costs table which the company may consider as very high in conjunction with the current situation of bad economical period. Yet, the companies will have to budget for such a project.

2 CHAPTER TWO

2

REQUIREMENTS DEFINITION

Introduction
System Specifications
    Functional Requirements
    Non Functional Requirements
Validation criteria
Information Descriptions
    Data flow diagram
    Database requirement
    System context model

2.1. INTRODUCTION

Based on the project plan and from the constraints specified in Chapter 1 above which was collected from careful study and people who work in the private sector who have the direct and indirect relation to this project, we made analysis to this data and information to cover the software requirements specifications. This chapter will discuss the functional and nonfunctional requirements for the project.

2.2. System Specifications

Functional requirements

- Fined Vehicle Location
- Fined Vehicle Tracking

Database Requirements:

- Table for Vehicles
- Table for Drivers
- Table For Username and password
- Table for User Type
- Driver_Add Tabel
- Table for Shift
- Table for Sim
- Table for Diver Vehicles
- Table for Driver Tel
- Table for Vehicle Tracking

Applications Requirements:

- Procedure Checks Username & Password
- Add Point Procedure
- Get map Procedure
- Show Map As image on the website
- Zoom in / zoom out map

2.2.1. *Functional* Requirements

2.2.1.1. Database Requirements

2.2.1.1.1. Vehicles Table

This table includes information about the vehicles. The information we collected is important in defining the vehicle identification.

Task: Add information about the vehicles.

Object: Identify all the vehicles related to the company and are included in this project.

Descriptions:

- This table contains information needed about the vehicles, without this table we can not specify the location of any vehicle since all its details are required to be identified.
- Contains all Vehicle numbers in a field.
- Vehicle type, Vehicle model are information related to the vehicle which give details of vehicle identification
- In the vehicle table there must be also a field for SIM number which allows us to identify the location of the vehicle.

  Note: The SIM card is available in the device which is installed in the vehicle.

Related Table: The Vehicle table will be connected with both the Tracking and the driver tables.

Inputs: Vehicle number, vehicle model, vehicle type, SIM number.

Resource: A specific user will enter this information by a special form, according to the authorization given to the user.

Output: Report contains information about the vehicle identification.

2.2.1.1.2. Table for Drivers

This table contains information about the drivers that work in the company.

Task: Add Drivers information

Object: This table contains information about the drivers' details.

Descriptions:

- This table contains the driver number, driver ID, Driver Address and the driver name which declare the driver identification.
- Also it includes some descriptions on the driver.
- According to this information of the drivers and through connecting it with another table related tables (see below), we can specify different outputs e.g. to define which driver is in a certain vehicle at a specific date and time.

Related Table: The driver table will be connected with the vehicle table and the shift table through the Driver vehicle table.

Inputs: Driver Number, Driver ID, Driver name, Descriptions

Resource: Data entry or user who has the authorization to enter data.

Output: Report contains information about driver.

2.2.1.1.3. Table for User Name and password:

Task: Save in this table new accounts, compare information inside with entered data

Object: Give the user the ability to access to the system

Descriptions: allow new information about new users to be added in this table and the make comparison between the data which is entered with the information which is available in this table.

Related Table: It is related to usertype table

Inputs: username, password and usertype

Resource: user administrator can only enter the accounts

Output: data saved, and to move to the page which the user has a permeation on it

2.2.1.1.4. Table for User Type

As team work we made the decision to add this table which includes the different types of users and their security levels which is related to their authorization which is given to different types of users for using this program.

Task: Get the users authorizations and security levels.

Object: Identify users' type's authorizations to give each user view his specific type of information

Descriptions: We built this table to divide the users into a number of categories, to ensure the systems security.

Related Table: the user type table is related to the user table which will be described later on.

Inputs: User_ID, User Type, Description

Resource: Data entry or user who has the authorization to enter data

Output: Give the type of user authorization to another table to be used for advanced steps in this project like data display.

2.2.1.1.5. Table for Shifts

The shifts table contains the schedule of works of all drivers during the working days, nights and weeks.

Task: Provide the system with driver working schedule

Object: to divide the work of the drivers and provide better service.

Descriptions: This table contains three working periods per day for each driver.

- Shift time contains three periods as mentioned above, this type of working division is to give more service to customers, and make it more comfortable for the drivers so they will give better quality of work.
- The driver can work in more than one different shift during the day depending on the working requirements.
- In the table it is mentioned the shift number which is a distention for the shift time for example the shift number one is related to the first shift time which is between six o'clock and twelve o'clock.

Related Table: Driver Vehicles table

Inputs: The data is already written and mentioned in the table as three shifts so there is no need to enter more data temporarily because it is fixed data and related to the company

Resource: as mentioned before the data is entered according to the company which applies this system, if there is a need to make addition the administrator will be the only authoirised person who can make any addition.

2.2.1.1.6. Table for SIM

This table is built in the database and helps in achieving the project objectives by defining the location of the vehicles.

Task: Provide the system with the coordinates from the Data SIM

Object: Define each SIM to which company it is related, and to have direct connection with the vehicle

Descriptions:

- SIM table contains the SIM number and as we know each SIM has a unique number and this number will be added into the table, then it will be connected into another table like vehicles, each vehicle has a single SIM card, which enables us to define the location of the vehicle according to the coordinates sent by that SIM.
- SIM descriptions are also an attribute in the SIM table that is built in the database, and shows the name of the company which the SIM is related, like JAWWAL.
- Note the SIM is available in the vehicle I-Checkbox which is placed in that vehicle and connected to GPS unit. The SIM may be placed and shifted between vehicles.

Related Table: It is related to the vehicles table

Inputs: SIM number

Company name

Resource: Data entry or user who has the authorization to enter data.

Output: Send SIM information to table vehicles to define its location.

2.2.1.1.7. Table for Diver Vehicles

This table is built by combining three different tables together to make the database normalized which will enable the database to work in the proper manner that it is required to achieve.

Task: Combine data between three tables.

Object: To make communication between three tables and have control over the redundancy within the database .

Descriptions:

- This table combines three tables: the shifts, drivers and the vehicles tables. This combination must be available because nothing fixes the three attributes in the table that is interchangable. For example each vehicle can be driven by two or more drivers according to the change of shifts and each driver can work on the same vehicle but in different shifts.

Related Table: This table is connected with the three tables of drivers, shifts and vehicles.

Inputs: Shift Number, Vehicle Number, Driver Number

Resource: Entering data to this table is based on the changing or adding data into the related tables which is mentioned above.

Output: Report and information support.

2.2.1.1.8. Table for Driver Tel

This table is available to provide the company with the driver details of phone numbers that helps in reaching the drivers at anytime.

Task: Provide the company with the driver's details of telephone numbers.

Object: to make the data more normalized.

Descriptions: This table contains the telephone numbers field that is important to the company to reach its drivers in a direct way.

Related Table: This table is related only with the driver table.

Inputs: Driver number

Tel Number

Resource: the driver number will be taken from the driver table and the telephone number will be entered to the database by the employee.

2.2.1.1.9. Table for Vehicle Tracking

To complete the project requirements this table must be available in the database since this table contains the major items that the work will depend on.

Task: Save the coordinates, the coordinates are received from the vehicle with a date and a time.

Object: Make history of the entered coordinates.

Descriptions:

- Coordinate Points X and Y are two fields in this table which is taken from the data SIM, and these coordinates will be saved in this table for later use like making history about the point which is taken in the different times and dates.
- Point dates and point times are also fields that will work on saving the exact time and date for each point entered.
- User Name field is important for giving the authorization for users to enter points into the database website, since not all users will have the same ability to make changes or enter points to the tables.
- Note: these all will help in providing additional services, for example if there was some mistake with an unknown driver we can view this table to know that driver.

Related Table: Connected with both the user and vehicle tables

Inputs:

- PointX
- PointY
- Point Date
- Point Time
- UserName

Resource: Users who have an authority to work on this service.

Output: Report, Give location to of the vehicle.

2.2.1.2. Applications Requirements

2.2.1.2.1. Procedure Checks Username & Password

Task: Login and Compare username and password entery in the database.

Object: compare information entered in the database to let the user access to the pages which he is authorized to enter.

Descriptions: *Procedure works after* the user enters his username and password to compare the entered information with the information which is available in the database.

Inputs: username, password.

Resource: User enter the information

Output: Load user page depending on authorization.

2.2.1.2.2. Add Point Procedure

Task: Add point.

Object: Add points to save it in the database.

Descriptions: Procedure adds the coordinates X and Y which is entered by the user to the database.

Inputs: Point X, Point Y.

Resource: User enter the information

Output: Save Points to database.

2.2.1.2.3. Get map Procedure

Task: Get the requested map.

Object: Get the map to position the vehicle location

Descriptions: Procedure gets the map from the ArcGIS ArcIMS program to show it on the map, the user will locate the vehicle position on the map.

Inputs: Request Map.

Resource: system request map from ArcGIS ArcIMS.

Output: Map is ready to be used.

2.2.1.2.4. Show Map As image on the website

Task: Show map.

Object: View the map on the website and locate the vehicle position on the map

Descriptions: Service shows the map on the website as an image after taking it from the ArcGIS ArcIMS program, and view the vehicle location on it.

Inputs: Request Map.

Resource: User request map to see the vehicle location on it.

2.2.1.2.5. Zoom in / Zoom out map

Task: Zoom in/Zoom out.

Object: Zooms to the requested scale of the map to show the user the details of the area being viewed

Descriptions: make zoom in and out on the area which the vehicle is available on it and let the user see the vehicle position in more clear way.

Inputs: click on bottom.

Resource: User clicks on the zoom in or out bottom.

Output: Do the zoom.

2.2.2. *Non functional requirements*

The non-functional requirements form the basic element in the system. The non-functional requirements are constraints on the services or functions offered by the system such as timing constraints, development process constraints, standards, etc.

2.2.2.1. External Requirements

- Language to be used
- Consistent Security System.
- Ease of use.
- Contains all the companies' requirements.
- Speed of executing different tasks.
- Reliability and Accuracy.
- Friendly User interface.
- Future expansion and improvement:
- The system's ability to use the devices in the best manner.

The following is a description of the points that are listed under the nonfunctional and external requirements above:

2.2.2.1.1. Language to be used:

The system will use the English language in the interface design, including the buttons, tables, forms etc.

2.2.2.1.2. Consistent Security System:

For the same company there is a difference between the authorizations for the various employees: one employee will have different responsibilities than another can do. For this reason our system will protect the information and data that is available within the company and to give the employees different authorizations, we will give each employee the level of authorization that he should be able to view within the system.

The system we are working on will include a user name and password which give each user the ability to enter his own view of information as exactly needed, so each user will enter his information logging-in through a user name and password, and without proper entry the user will not have the ability to access any type data for the company. For example some users will have the ability to data entry, where as others will have the ability to only view the information.

2.2.2.1.3. Ease of use:

The system will be built in a profound manner so as to interact with the user and his needs, the visual user interface will make it easier to enter data, view information, and make modifications on the data. This component will make the users more satisfied from the system and will give the system a fast way of acceptance for its use.

2.2.2.1.4. Contains all the companies' requirements:

This is an important component that we focus on: each company has its own working procedures and ways of achieving works, so there may be some specific rules and requirements that must be applied. We have to make sure that we should not forget single point from the requirements since it may affect the system performance and let the company or its users are unsatisfied from the system with a probability of rejecting the system thereafter. As a team work we made our plans which will help us in avoiding any forgotton requirements.

We will do our utmost to make sure that we can give the best quality and include all the requirements to ensure that we will reach our aim in properly developing the system.

2.2.2.1.5. Speed of executing tasks.

Another important component which we have to focus on: the speed of executing the tasks is one of the nonfunctional requirements that are required from the team work to achieve within the system which may also be a criterion for the acceptance or rejection of the system. Nowadays the speed is the first priority in any work and it is required from any system to work in the fastest speed as well as achieve the best quality of work and standards.

Speed is important for such a project because it deals with instant location of vehicles and specifying locations online on maps. On entering the coordinates location of a vehicle and immediately on clicking the submit button the map must be show instantaneously. The server response on the ArcGIS ArcIMS server has to be fast and the representation on the map from the server will be in the JPG format since it contains a high resolution at the same time a small size, thus the browsing will be fast.

2.2.2.1.6. Reliability and Accuracy

The reliability and accuracy of the system is relational with the programming and the main working of the system to obtain the exact and requested realistic information. When the user enters the coordinates to view the location of a certain vehicle, the result of entering these coordinates must be accurate which means the vehicle must be in the street and not above a tree.

Another example, each user has different authorization than other users which means when the user enters his user name and the password the page to be viewed must be exactly the same page that is related with his authorization.

2.2.2.1.7. Friendly user interface

User interface is also an important element that plays a basic role in accepting or resisting and even rejecting the system, since the interface is the major component that the user interacts with.

Poor user interface design is the reason why so many software systems are never used in addition that the poorly designed interface can cause a user to make catastrophic errors.

The system also will achieve the user familiarity that means the interface should be based on user-oriented terms and concepts rather than computer concepts.

The minimal surprise will be supported in this system, we mean that users should never be surprised with the behavior of the system; the users should be able to predict the operation of comparable commands.

Our system will include the GUI. One of the attributes of the GUI is the colors, and color adds an extra dimension to an interface and can assist the user to understand the complex information structures; at the same time the color will be used in a comfortable way that will let the users feel comfortable and satisfied.

2.2.2.1.8. Future expansion and improvements

The language which will be used in this system helps the developers understand the system easily, and allow for future expansion of the system adding more features and developments as needed.

2.3. Information Descriptions

2.3.1. Validation criteria

Administrator Login:

The administrator can access to the web through entering his username and password which provides him with full control over the system.

Users Login:

This type of account is built for managers to have the ability to add coordinate points, make tracking and generate reports. This user can't delete any point which has been entered.

The username and password must be:

- User name and password is preferred alpha numeric combination
- The password is preferred to contain both capital and small letters
- Password must be between 6 and 12 letters.

2.4. Information Descriptions

2.4.1. System Data flow diagram

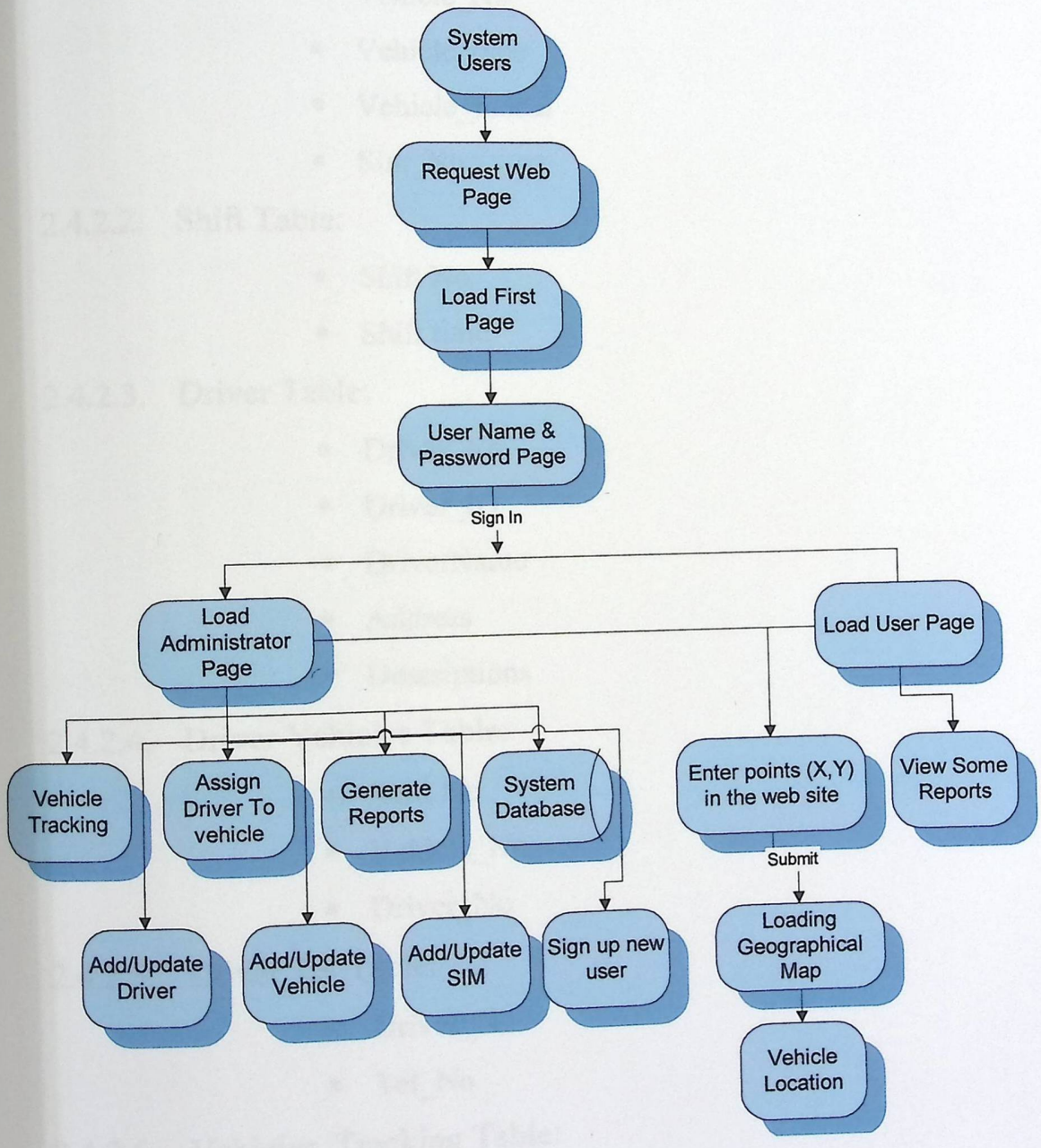


Figure 3.2 System data flow diagram

2.4.2. *Database requirements*

2.4.2.1. Vehicles Table:

- Vehicle_No
- Vehicle_type
- Vehicle_model
- Sim_No

2.4.2.2. Shift Table:

- Shift No
- Shift time

2.4.2.3. Driver Table:

- Driver_No
- Driver_ID
- DriverName
- Address
- Descriptions

2.4.2.4. Driver Vehicles Table:

- Shift No
- Vehicle_No
- Driver_No

2.4.2.5. Driver Tel Table:

- Driver_No
- Tel_No

2.4.2.6. Vehicles_Tracking Table:

- Vehicle_No
- PointX
- PointY
- Point_Date
- Point_Time

- UserName
- Date
- Time

2.4.2.7. User Table:

- Username
- Password
- User_ID

2.4.2.8. User Types Table:

- User_ID
- UserType
- Descriptions

2.4.2.9. SIMs Table:

- Sim_No
- Sim_Company

2.4.2.10. Driver Address Table:

- Driver_ No
- House Number
- Area Name
- City Name

2.4.3. System Context Diagram:

This diagram shows and illustrates the boundaries of the system; the diagram is schematic and has no details to the relationship with other systems.

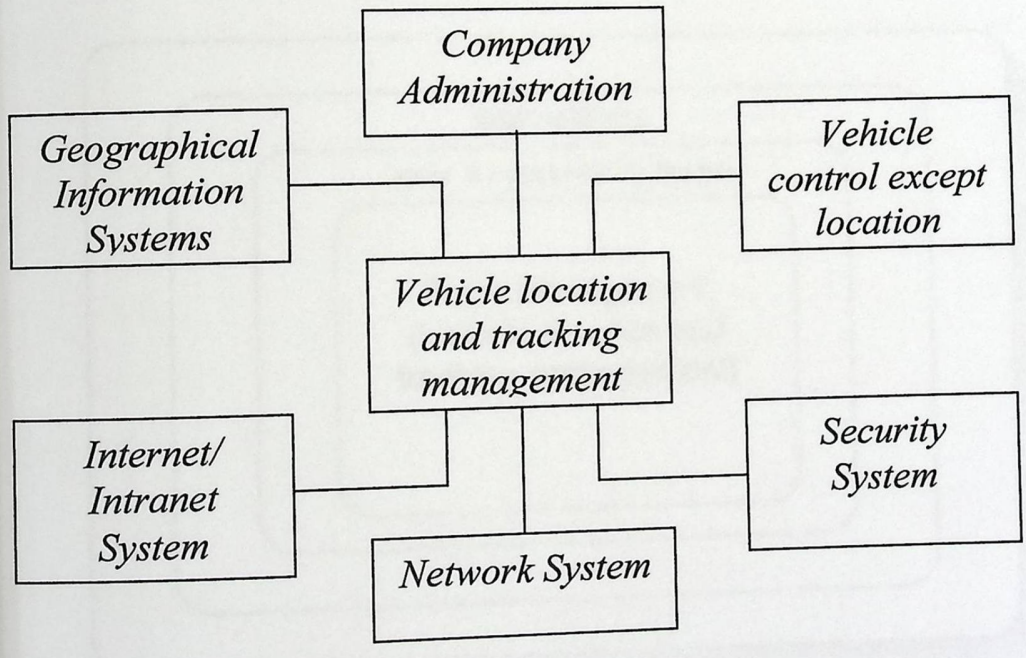


Figure 4.2 System Context Diagram

2.4.4. *Sides affecting the system*

This model shows the layers that affect on this system, and it is sorted according to its size and the degree of affecting on the system.

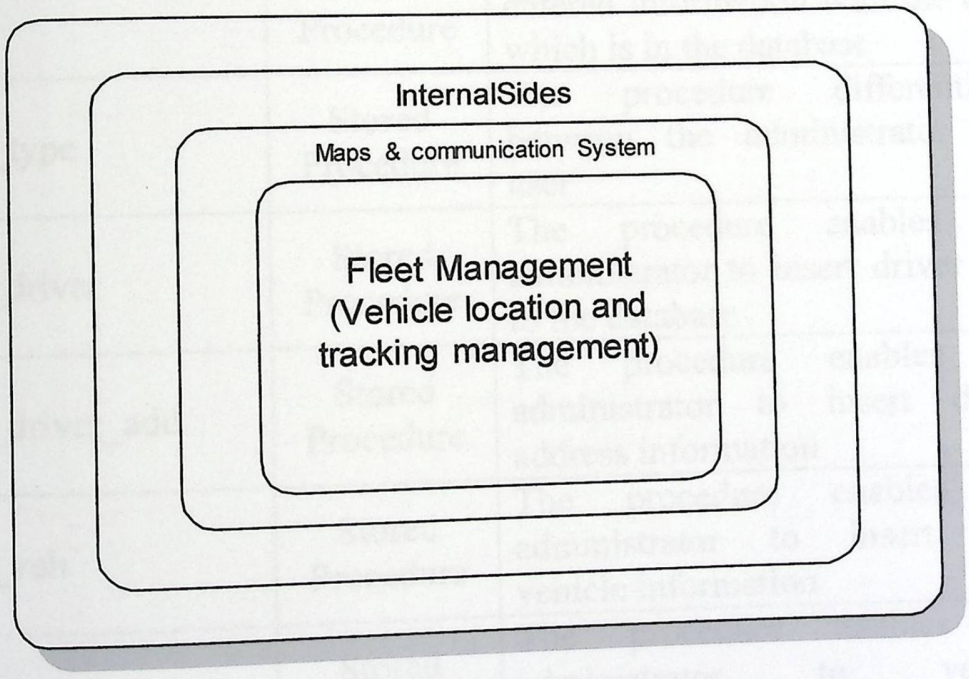


Figure 5.2 Sides affecting the system

2.5. Data Dictionary

2.5.1. System data dictionary

Entity Type	Type	Description
Login	Stored Procedure	The procedure compares the entered information with the ones which is in the database
check_type	Stored Procedure	The procedure differentiates between the administrator and user
insert_driver	Stored Procedure	The procedure enables the administrator to insert driver info to the database
insert_driver_add	Stored Procedure	The procedure enables the administrator to insert driver address information
insert_veh	Stored Procedure	The procedure enables the administrator to insert new vehicle information
update_vehicle	Stored Procedure	The procedure enables the administrator to vehicle information

Table 9.2 System data dictionary

Term	Description
Data	A collection of bits that represent some values per collection of values.
Database	A combination of software, data and computer hardware that implements a specific data model.
Information	Data that have a specific interpretation or meaning.
Internet	World wide network of computer that includes strategies for naming and locating specific computers and transferring information
Browser	A graphical computer program that display pages and it can take place between the user and the server side
Constraints	A restriction on the content of table
Foreign key	A set of attributes of a relation table that references the key of another table
Form	A window that let user access to database information.
User interface	Any graphical or text display that provides information to users or gives users ways to modify and create DB content
ASP	Active Service Provider: a web programming style that adds code segments to HTML document, the code segment are executed in the web server
Try catch statement	Ways for error handling, to make the errors appear in a good appearance.
Active Server Pages (ASP.NET)	A new and powerful server–side technology for creating dynamic web pages
GPRS	General Packet Radio Service
Geographical Information Systems (GIS)	A technology that is used to view and analyze data from a geographic perspective
GPS (Global Positioning Systems)	A Unit that locates a point on the earths surface using Sattelite and their technologies
I-Checkbox	An electronic unit that is programmed to contain a SIM card for data collection and transmission and is connected to a GPS and Trasmitter to send and receive data on the location of a vehicle

Table 1 0.2 System data dictionary

3 CHAPTER THREE

3

SYSTEM & S/W DESIGN

Introduction
Functional Design
I/O Design
Database Design
Test Plan

3.1 Introduction

This chapter has two important components: System Functional Design and Interface Design. These components are the basic interaction between the user and the system, this chapter will clarify the main and important parts that are built in the system and will help any person to understand the system's designs.

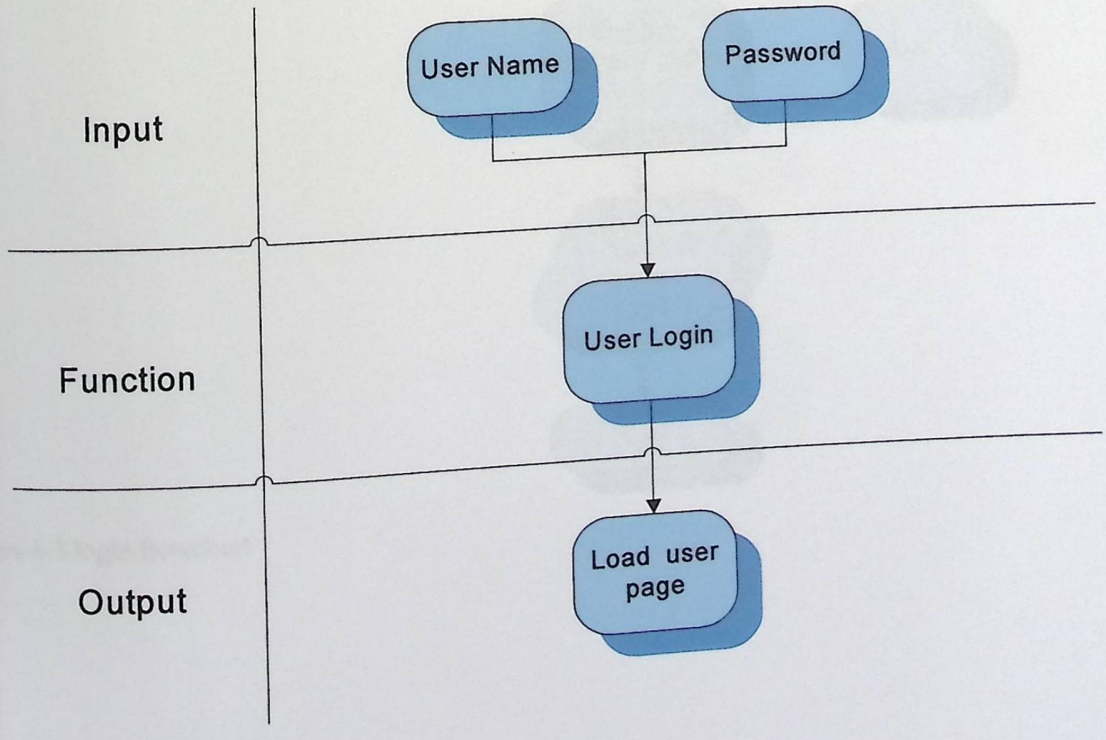
3.2 *Functional Design*

3.2.1 *Login:*

- Description:

  This is a function that is only a method to let the users enter their accounts to through the user name and the password.

- Interface:
  - Inputs: Username and password.
  - Outputs: Load user page.
- Constraints:
  - All fields are required and must be filled
  - Username and password must be the same as it is in the database.
- User interface design



Login Flow Chart:

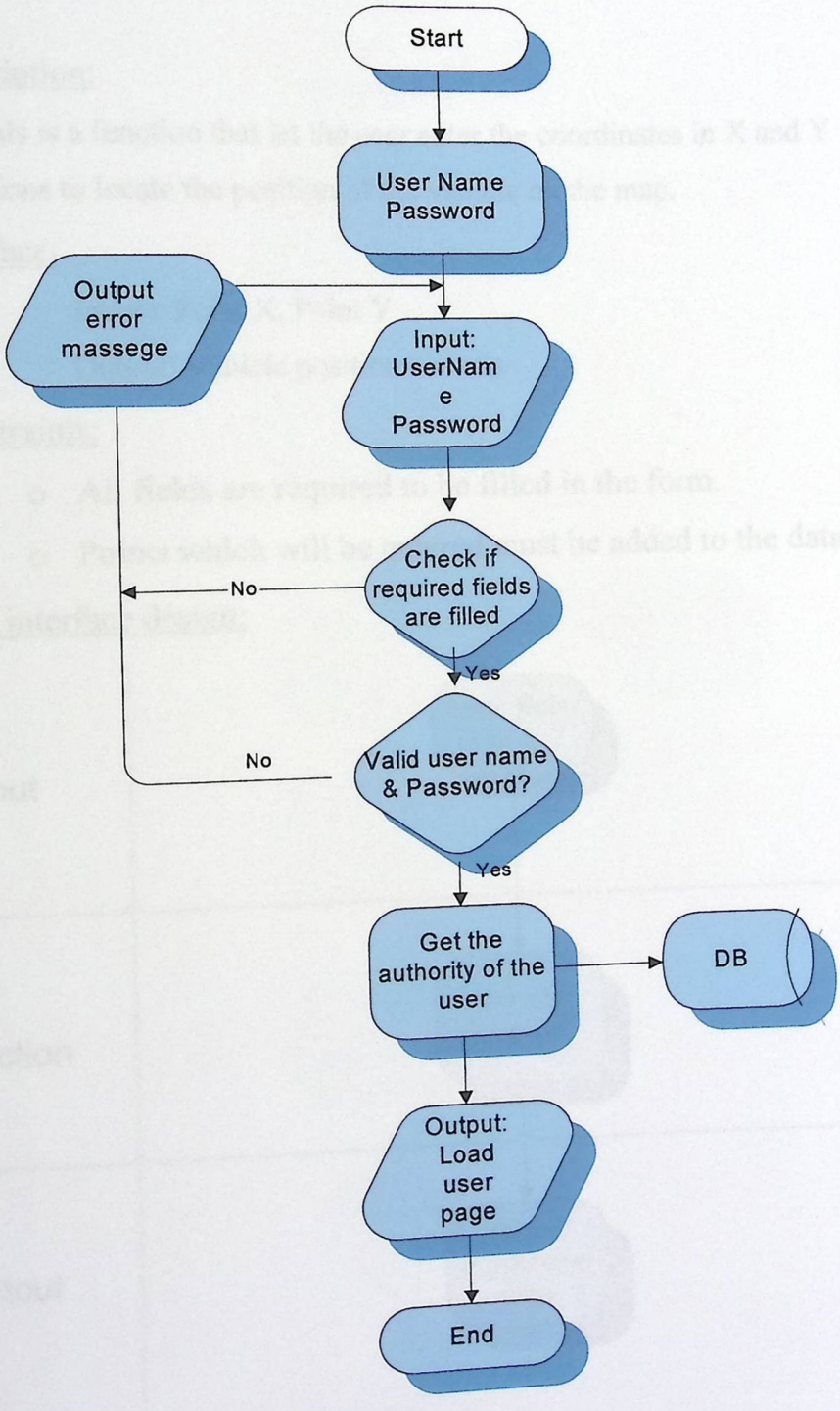


Figure 6.3 login flowchart

3.2.2 Vehicle location:

- Description:

  This is a function that let the user enter the coordinates in X and Y directions to locate the position of the vehicle on the map.

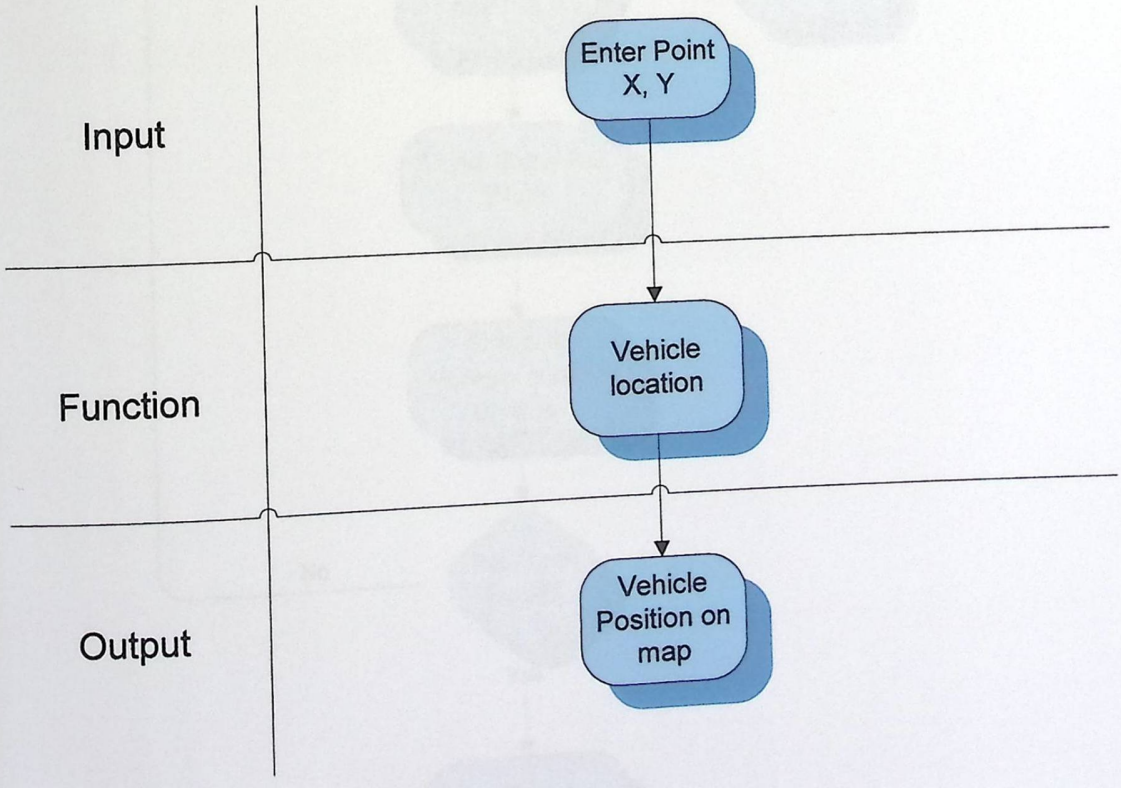
- Interface:

  Inputs: Point X, Point Y

  Output: Vehicle position on map

- Constraints:
  - All fields are required to be filled in the form.
  - Points which will be entered must be added to the database

- User interface design:



Vehicle location Flow chart:

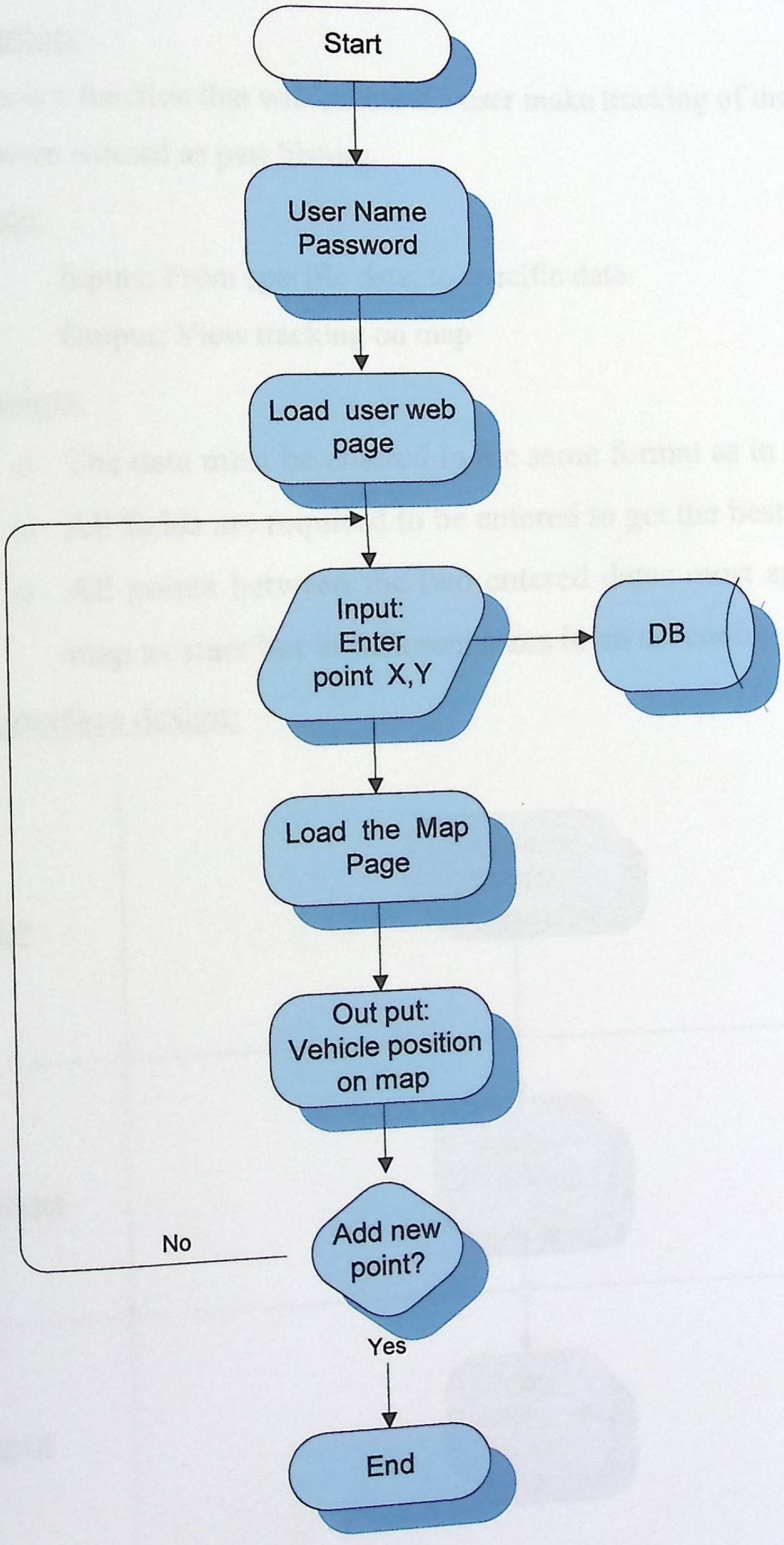


Figure 7.3 vehicle location flowchart

3.2.3 History (Tracking):

- Description:

  This is a function that will enable the user make tracking of the points which were entered as past history.

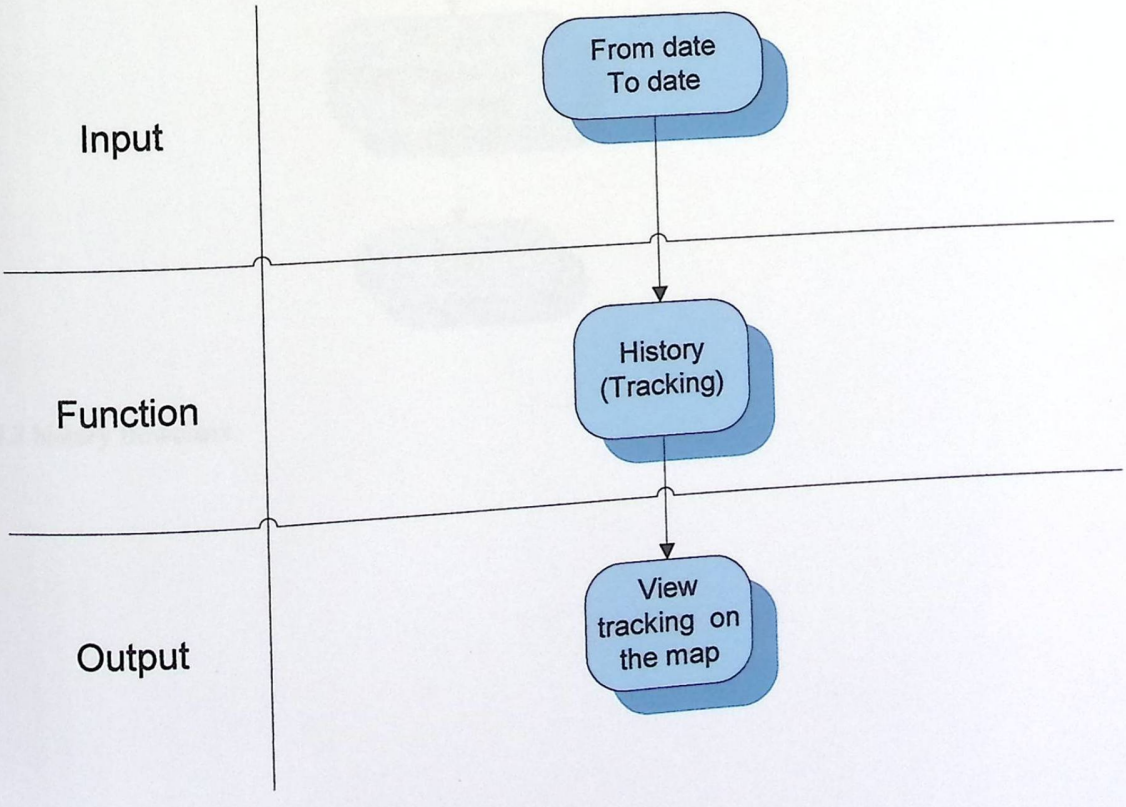
- Interface:

  Inputs: From specific date, to specific date

  Output: View tracking on map

- Constraints:
  - The data must be entered in the same format as in the DB
  - All fields are required to be entered to get the best results.
  - All points between the two entered dates must appear on the map as stars but in different sizes in an ascending manner.

- User interface design:



History (Tracking) Flow chart:

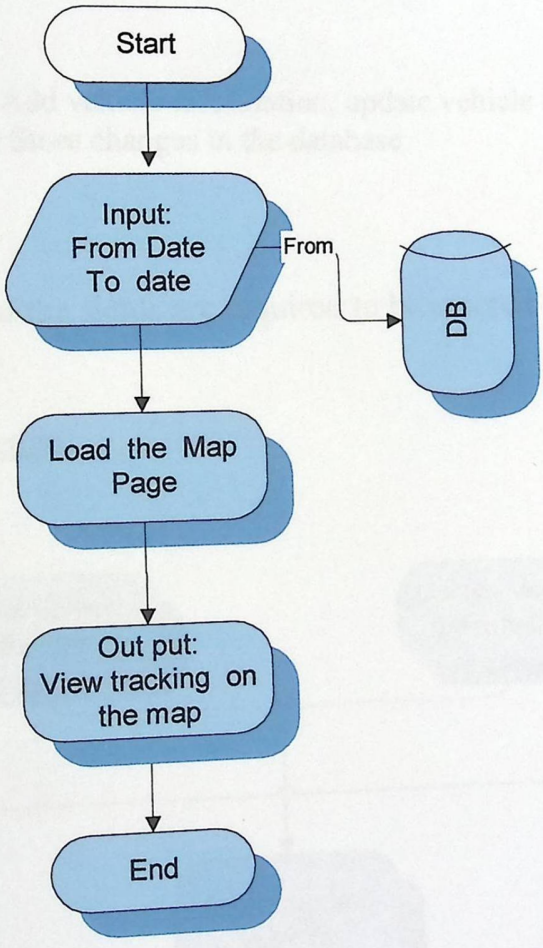


Figure 8.3 history flowchart

3.2.4 Add or update new Vehicles:

- Description:

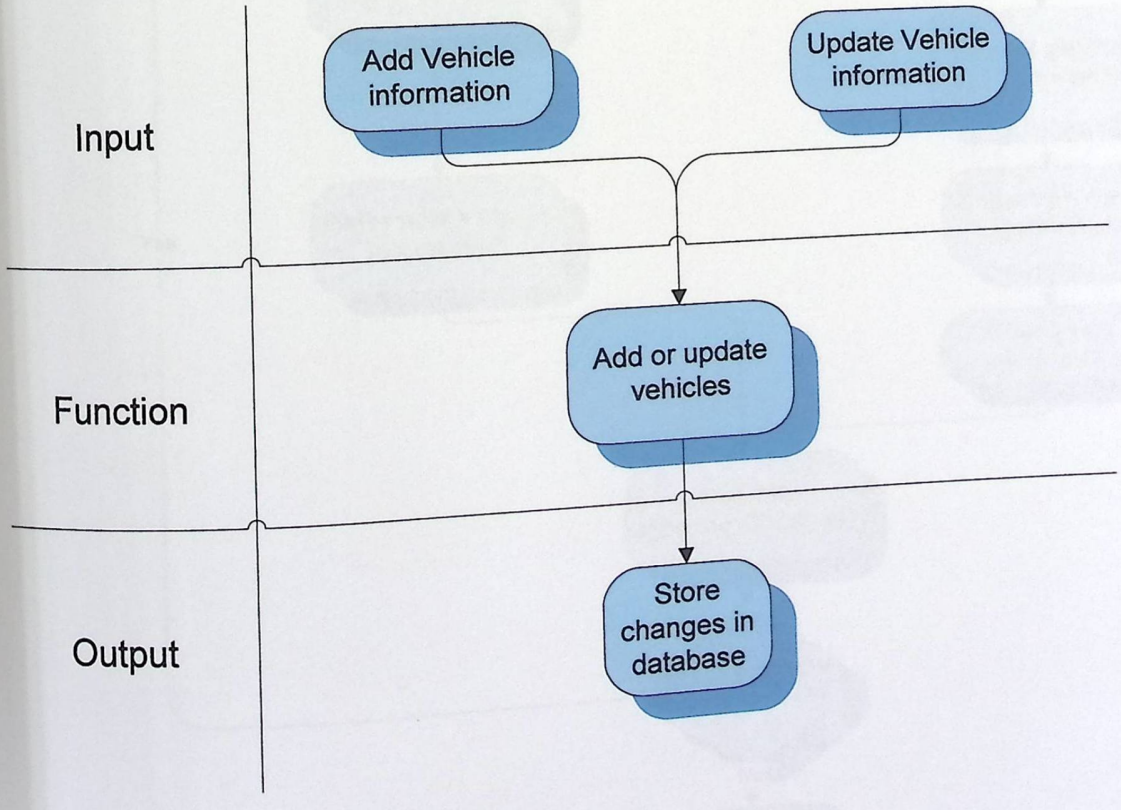
  This is a function that let the user have the ability to add a new vehicle or update the existing vehicles stored in the database

- Interface:

  Inputs: Add vehicle information, update vehicle information
  Output: Store changes in the database

- Constraints:
  - Most of the fields are required to be entered

- User interface design:



Add – update vehicle Flow Chart:

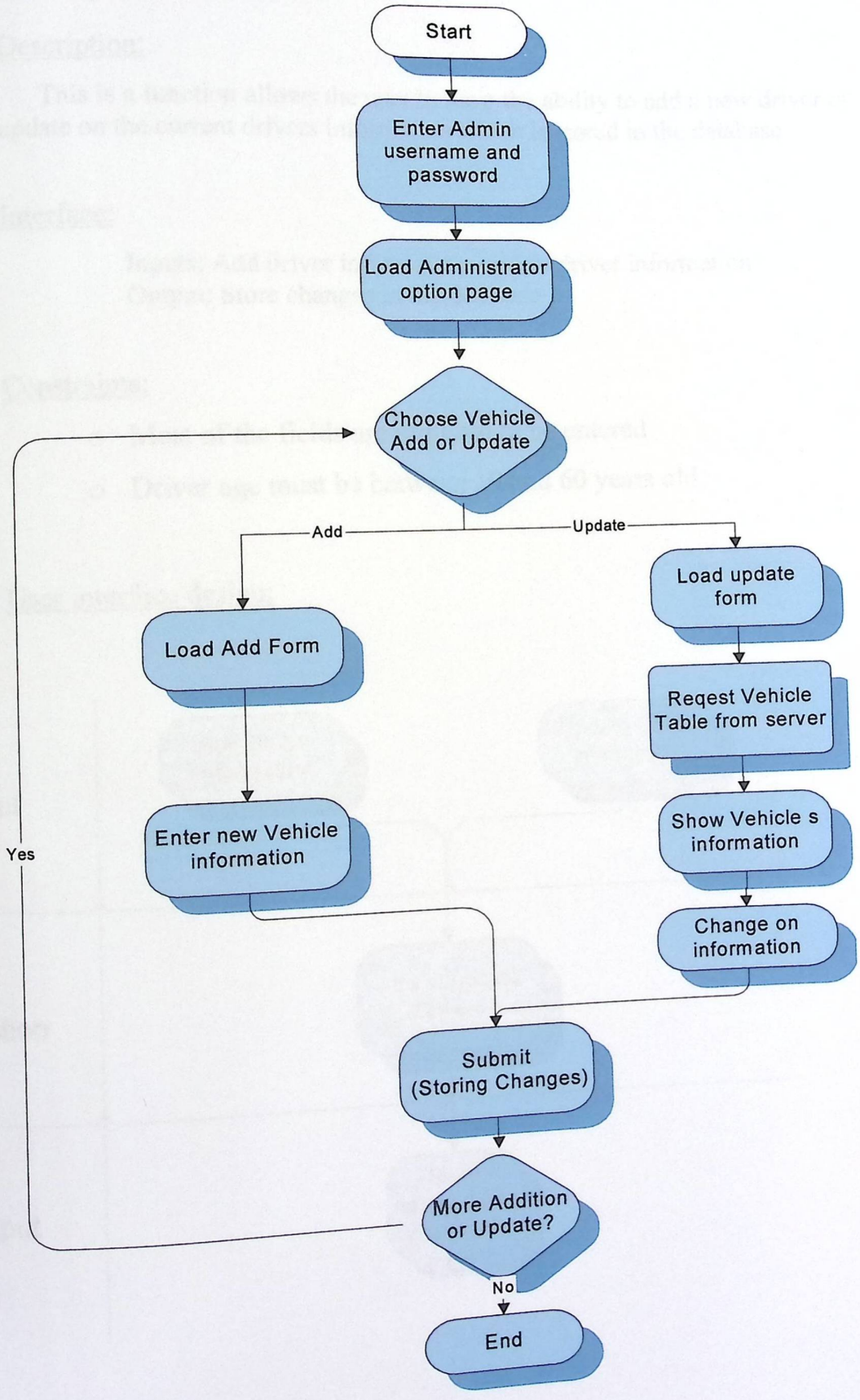


Figure 9.3 Add-update vehicle tracking flowchart

3.2.5 *Add or update Drivers:*

- Description:

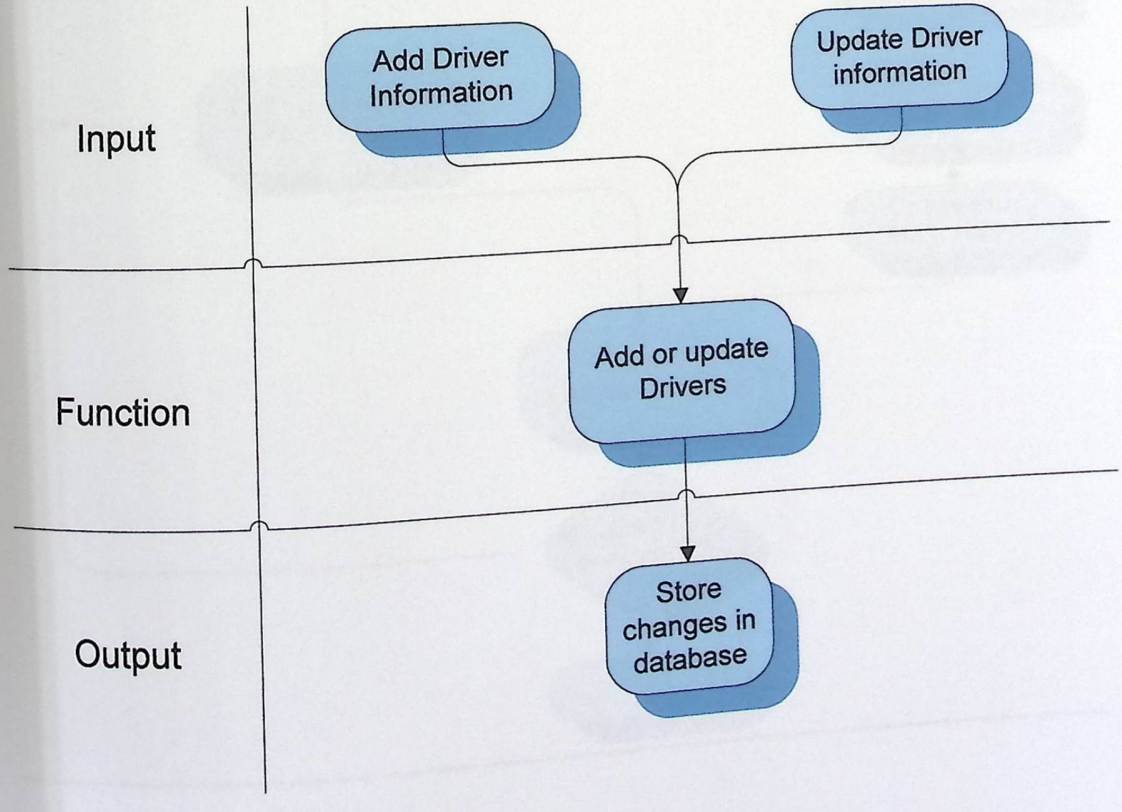
  This is a function allows the user to have the ability to add a new driver or update on the current drivers information which is stored in the database.

- Interface:

  Inputs: Add driver information, update driver information
  Output: Store changes in the database

- Constraints:
  - Most of the fields are required to be entered
  - Driver age must be between 19 and 60 years old.

- User interface design:



Add-update driver Flow chart:

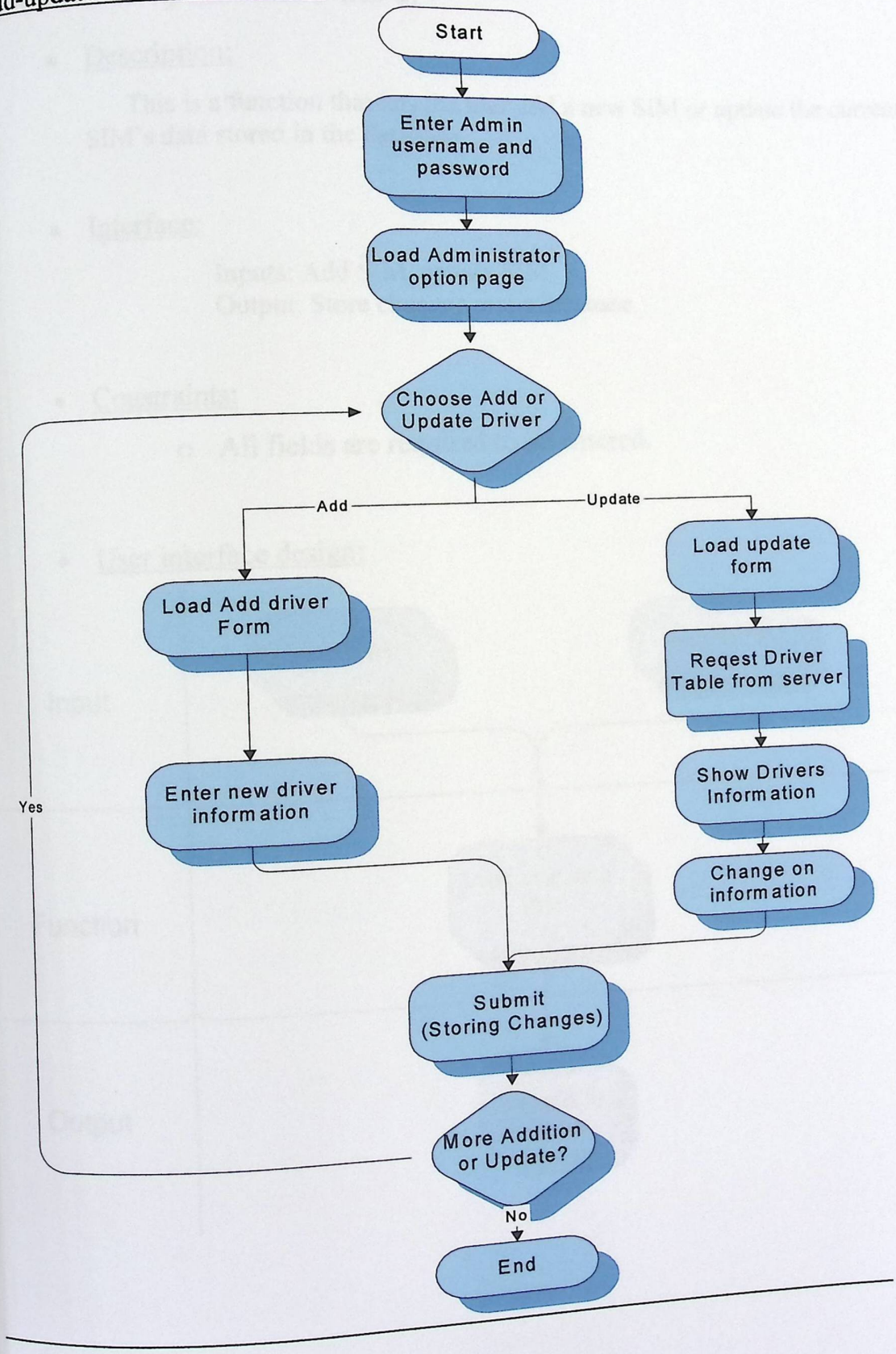


Figure 10.3 add or update flowchart

3.2.6 Add or update SIM Card:

- Description:

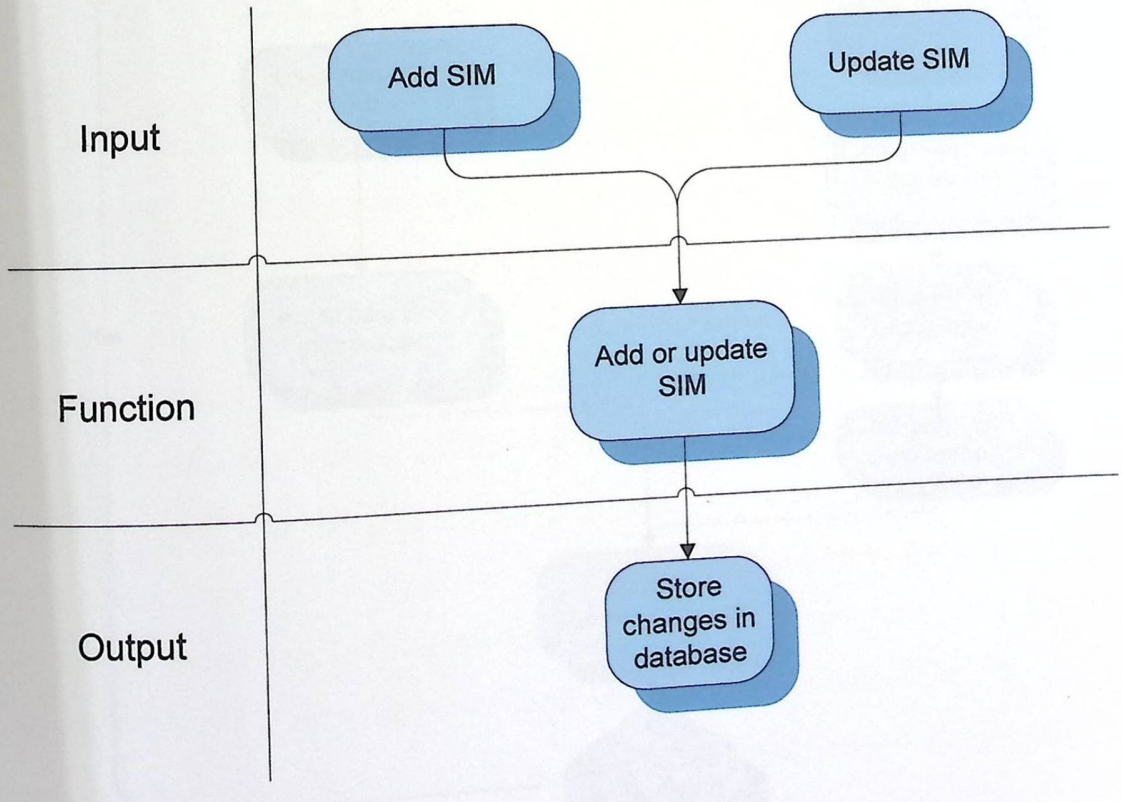
  This is a function that lets the user add a new SIM or update the current SIM's data stored in the database

- Interface:

  Inputs: Add SIM, update SIM
  Output: Store changes in the database

- Constraints:
  - All fields are required to be entered.

- User interface design:



Add – update Sim Flow chart:

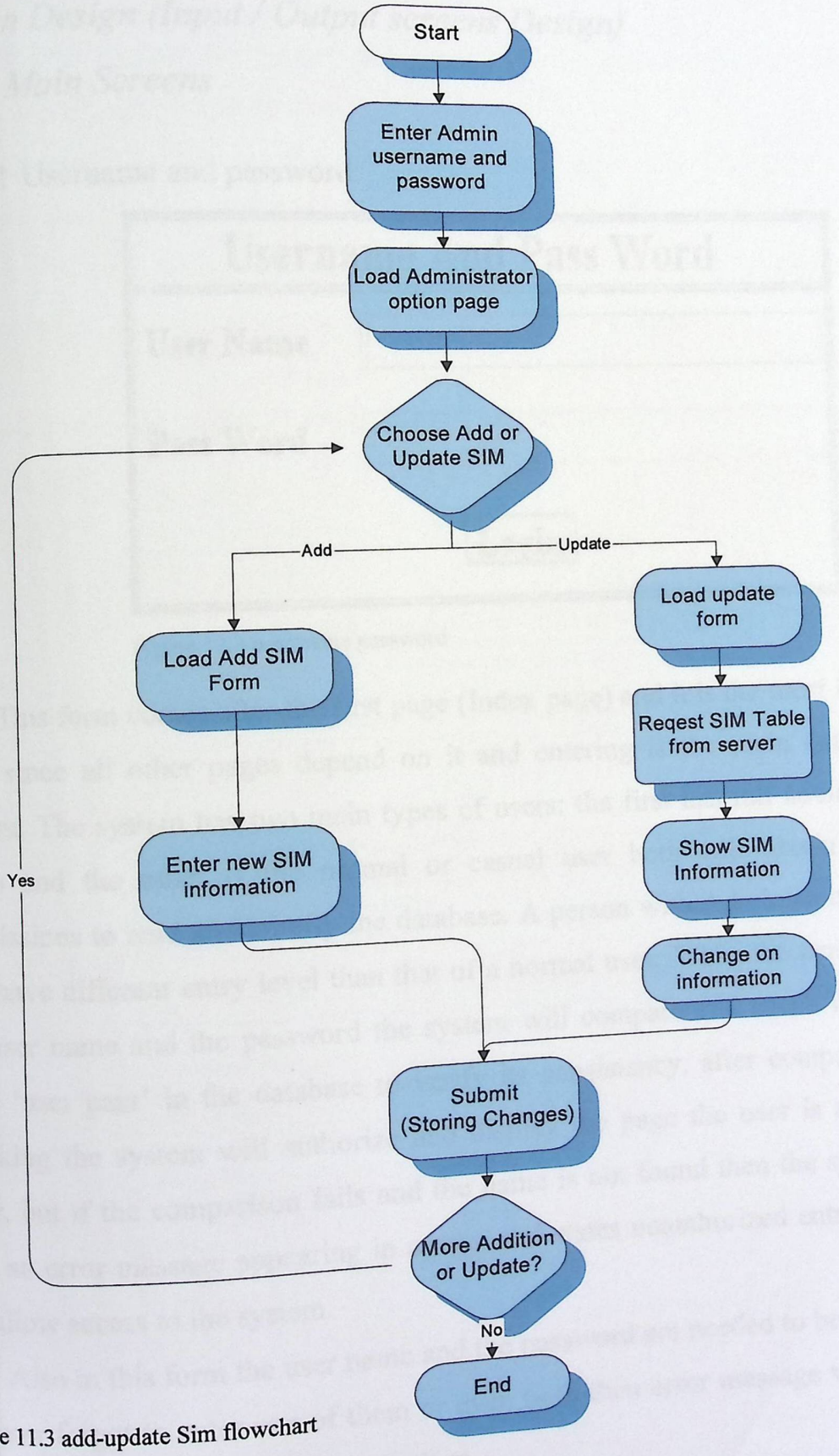


Figure 11.3 add-update Sim flowchart

Screen Design (Input / Output screens Design)

3.2.7 Main Screens

3.2.7.1 Username and password:

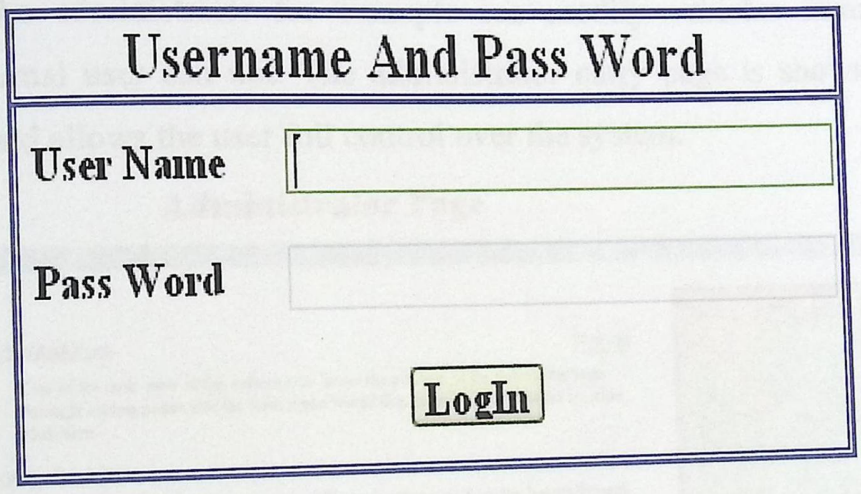


Figure 12.3 user name password

This form comes after the first page (Index page) and it is the most important page since all other pages depend on it and entering is the main entry to the system. The system has two main types of users: the first has full administrative rights and the other is the normal or casual user both will obtain different permissions to read and modify the database. A person with Administrative rights will have different entry level than that of a normal user. When the person enters the user name and the password the system will compare and check it with the table 'user pass' in the database to verify its consistency, after comparison and checking the system will authorize and display the page the user is allowed to enter, but if the comparison fails and the name is not found then the system will give an error massage appearing in a page and states unauthorized entry and will not allow access to the system.

Also in this form the user name and the password are needed to be entered, if the user forgot to enter one of them or even both then error massage will display and a star will appear near the error place

3.2.7.2 Option Admin

On entering the user name and password with an administrator rights the administrator page will be loaded.

This page is different than the normal user page since all options will be accessed and the administrator for example can modify vehicles information whereas the normal user can not. The administrator entry page is shown in the caption below and allows the user full control over the system.

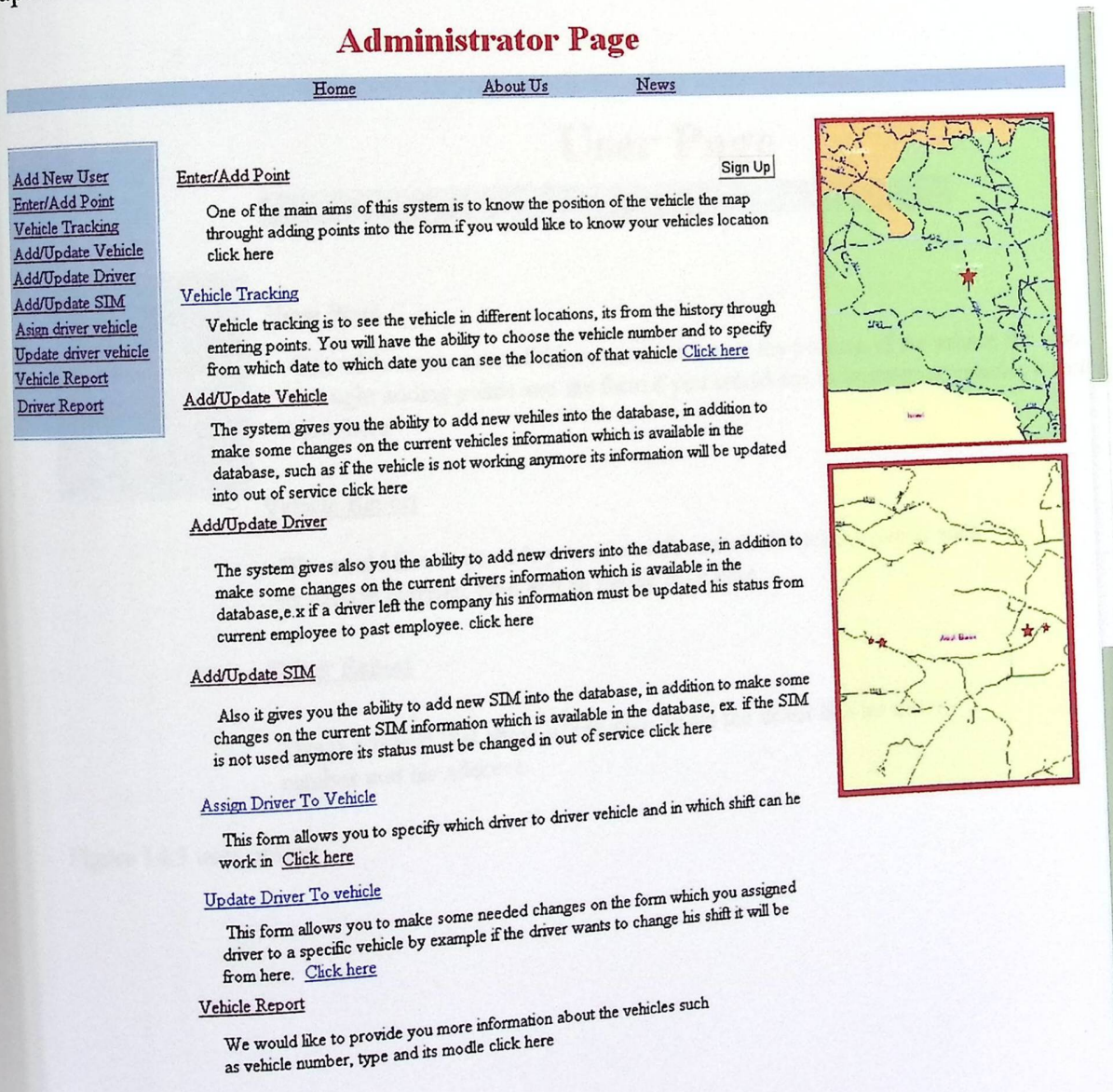


Figure 13.3 administrator option

3.2.7.3 Option User

On entering the user name and password with a normal user rights the casual user page will be loaded.

The normal user page accesses fewer functions than the administrator and is restricted to viewing.

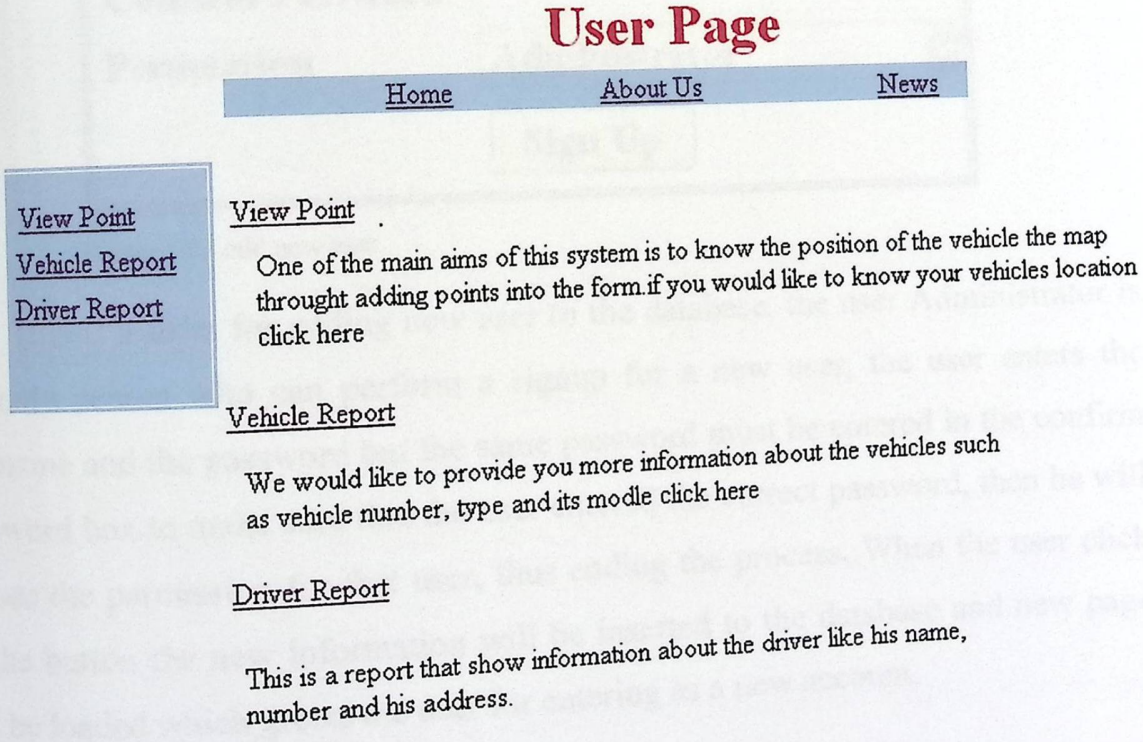


Figure 14.3 user option

Input / Output screens Design

3.2.8 Input screen design

3.2.8.1 Add New User:

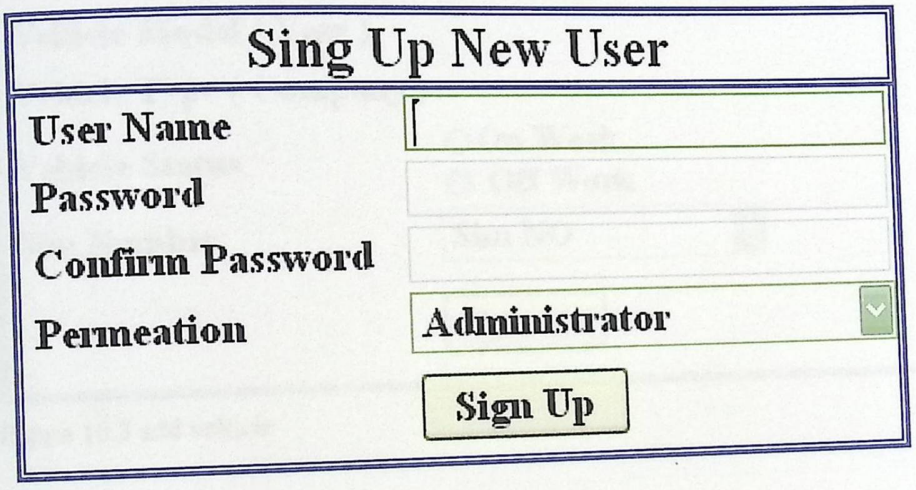


Figure 15.3 add new user

This is a form for adding new user to the database, the user Administrator is the only person who can perform a signup for a new user, the user enters the username and the password but the same password must be entered in the confirm password box to make sure that the user entered the correct password, then he will choose the permission for that user, thus ending the process. When the user click on the button the new information will be inserted to the database and new page will be loaded which greets the user for entering as a new account.

3.2.8.2 Add Vehicle:

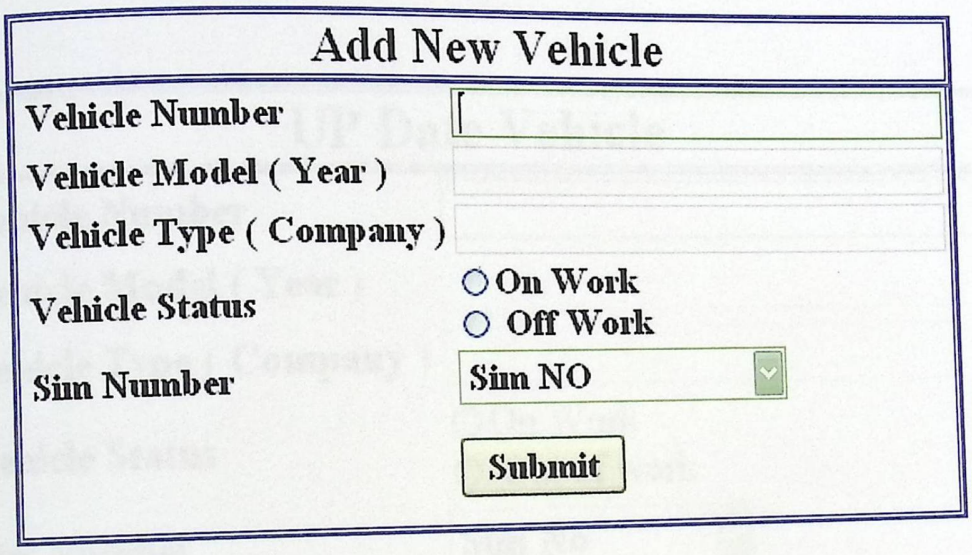


Figure 16.3 add vehicle

This form is for entering information about new vehicles to the database; this form appears after clicking on the link "Add Vehicle" from the 'option Admin'. After loading this page the user will have the ability to enter the vehicle number, vehicle model (Year), vehicle Type, vehicle status and SIM Number which is related to the vehicle. In this input form we have two items to be specified : the vehicle number and the vehicle model ; if one or both of these items were not entered then an error massage will appear and a star near the error box will appear to direct the user to enter the information in the suitable way to add to the database.

3.2.8.3 Update Vehicle

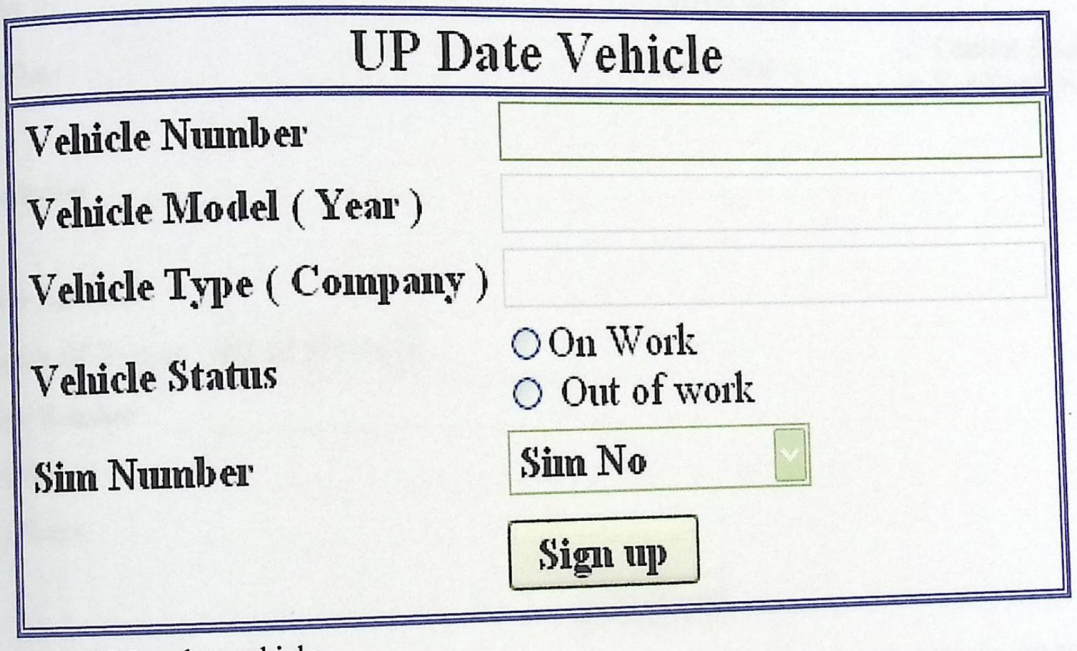


Figure 17.3 update vehicle

Updates on the vehicle information can be entered since changes can occur to vehicle information at anytime. Only the user with the administrator rights is allowed to make changes to the sensitive vehicle information

3.2.8.4 Add Drivers

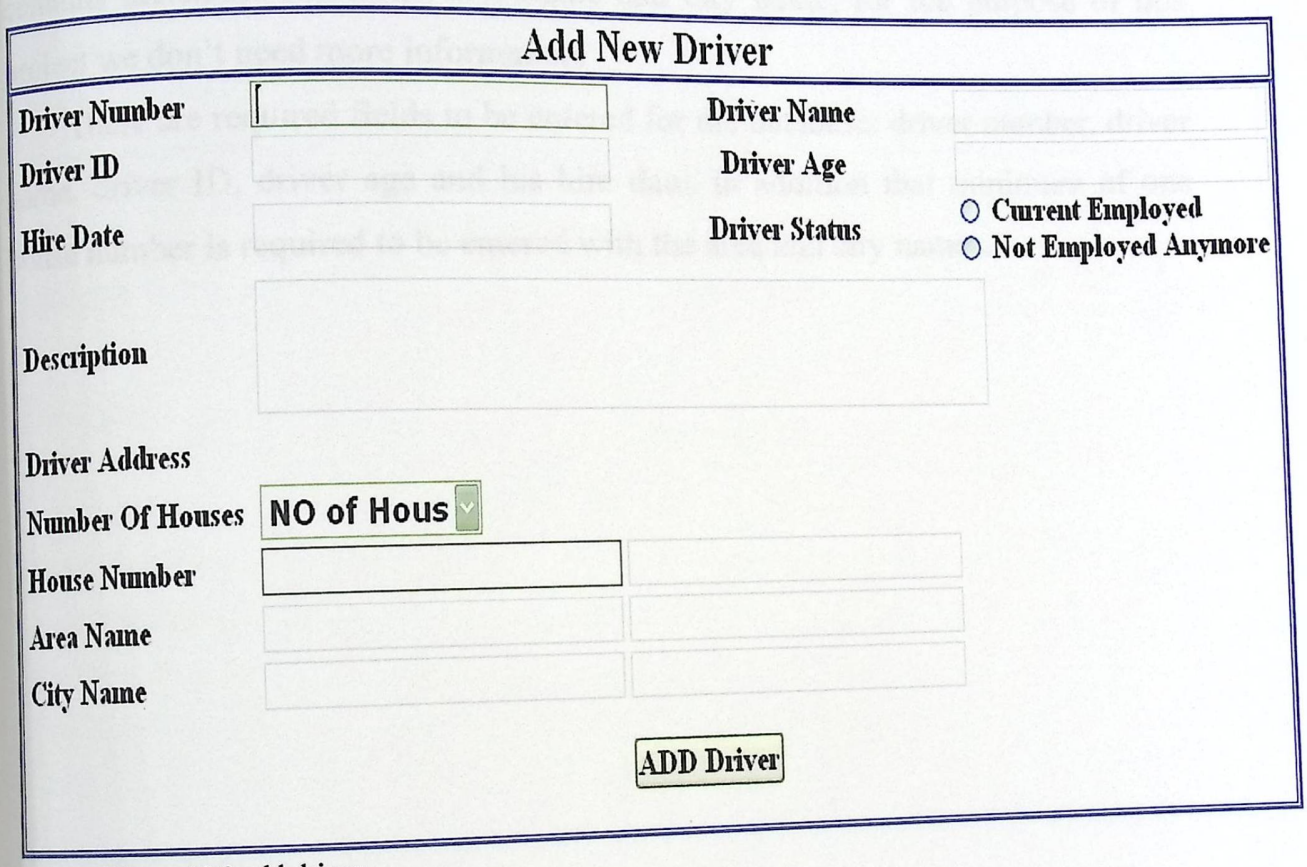


Figure 18.3 add driver

This form is for entering information new Driver and adding a new driver to the database. The form appears after clicking on the link "Add driver" from the 'option Admin'. After loading this page the user will have the ability to enter the driver number, driver name, driver identity number, driver age, hire date, driver status and descriptions, as a team work we saw that it is also important to enter more information about the drivers like his address, after thinking in this situation we found that each driver can have more than one house depending on that we made the driver choose between one and two houses, we could put the ability to chose more than two houses but here is for making type of scope on the project.

3.2.8.5 Update Driver

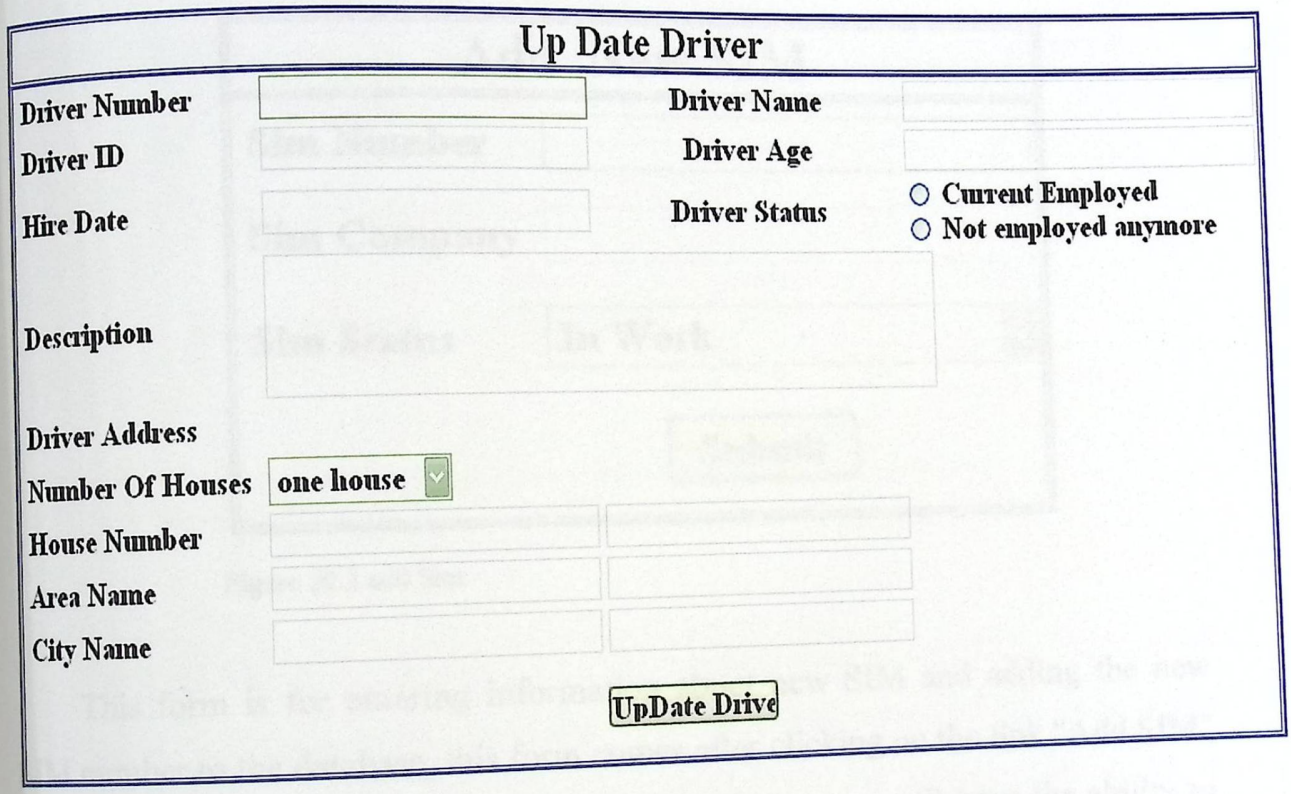


Figure 19.3 update driver

In this project we need also to make update on the driver information because drivers are not staying for ever in the company by example they may leave the company any time, for that reason we can make update on his information to make not like 'Old worker'. This very sensitive information is the responsibility of the administrator user type and he is the only one who can update the driver information.

3.2.8.6 Add SIM

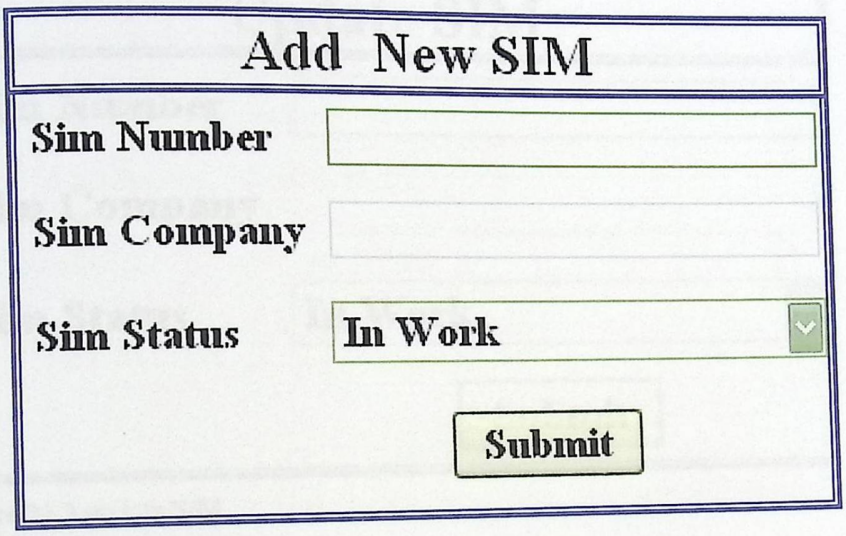


Figure 20.3 add Sim

This form is for entering information about new SIM and adding the new SIM number to the database, this form comes after clicking on the link "Add SIM" from the 'option Admin'. After loading this page the user will have the ability to enter the SIM number and its company vendor type, both fields are required to be entered to the database because they are essential information for this project.

3.2.8.7 Update SIM

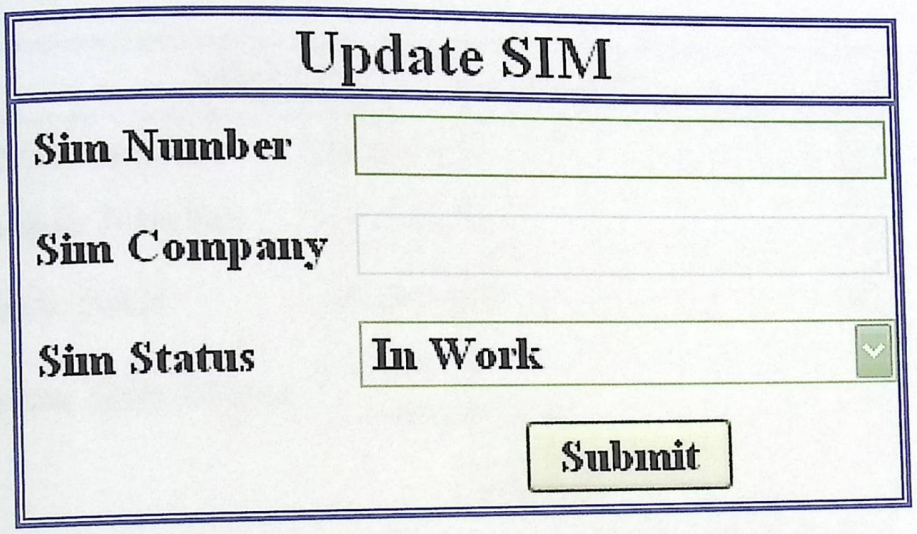


Figure 21.3 update SIM

The SIM also needs update on its information since some SIM's may not be working any more so we can note that in the database which is 'Out of Service' that is a simple reason for taking the decision to let the SIM be updatable.

3.2.8.8 Add Driver to Vehicle

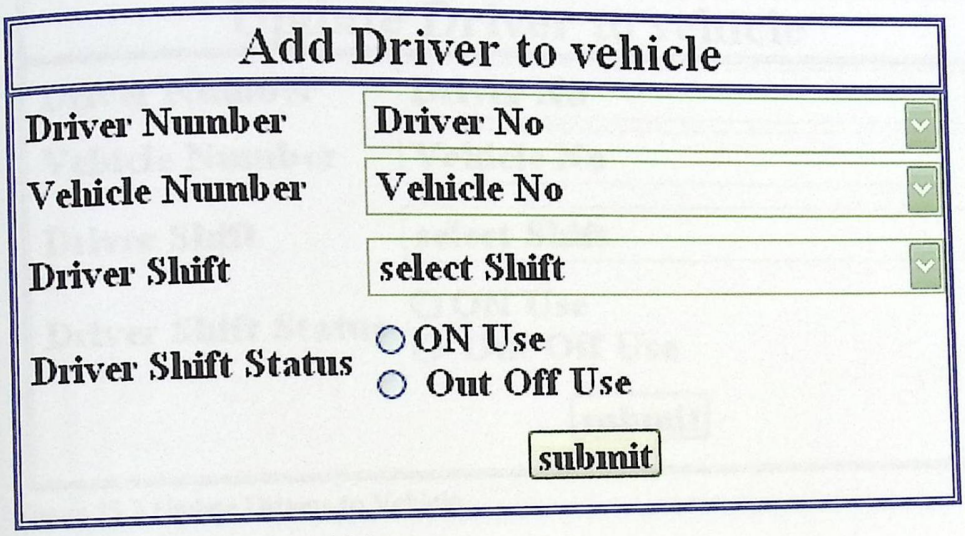


Figure 22.3 add driver to vehicle

This form is for assigning each driver to a special vehicle and its connected SIM, here the person will specify the vehicle and its driver with the name of the driver in addition to the SIM which is inside the I-Checkbox device in the vehicle. In this form there are three items required entry: the driver number, vehicle number and the SIM number. This form will help in making some important reports.

3.2.8.9 Update Driver to Vehicle

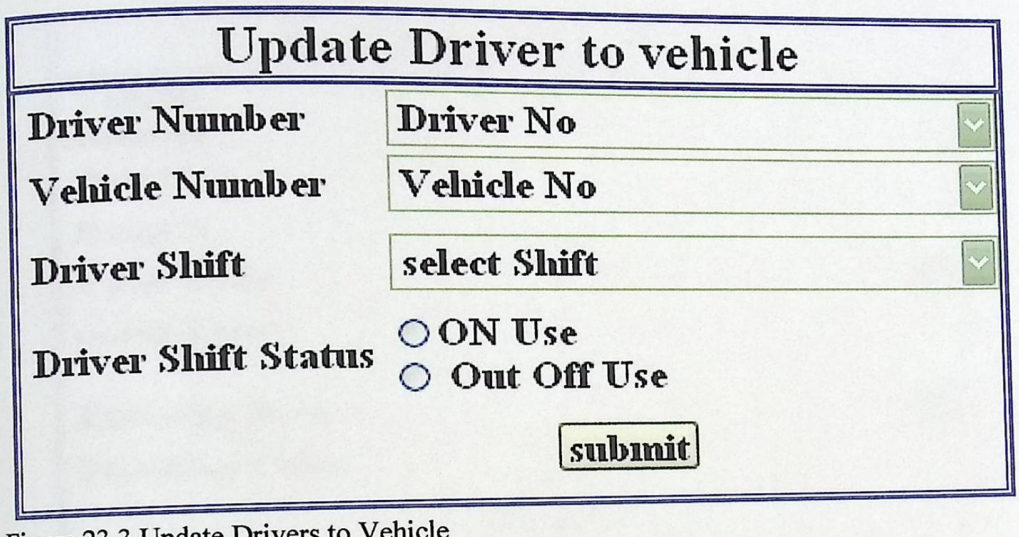


Figure 23.3 Update Drivers to Vehicle

This table needs to be updatable for a simple reason and that is the SIM can move between the different vehicles and not one driver is fixed to one vehicle we saw that it is important to make this table updatable.

3.2.8.10 Add Coordinate Points:

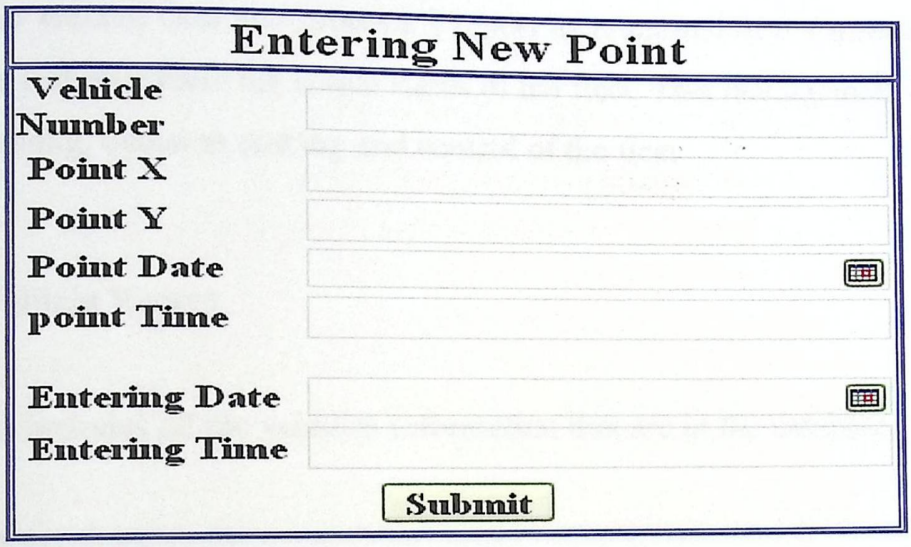


Figure 24.3 Add Points

This form is for entering coordinates point values of X and Y to the database so as to position the vehicle on the map; it is required to enter the coordinates of one point and its date and time of capture.

3.2.9 Output screen Design

The most important part of the system is the reporting component since it will use the entered data and produce a report as requested to the directors of the companies and give them the actual status of the fleet. This management tool helps in the financing, decision making and control of the fleet.

3.2.9.1 Vehicle Report

This report includes all the vehicles information that are in the database.

Vehicle Report				
Vehicle Number	Model (Year)	Type	Status	SIM No

Figure 25.3 vehicle report

3.2.9.2 Driver Report

This report includes all the driver information that are in the database.

Driver Information	
Driver Name: **Driver Number:** **Driver ID:** **Age:**	
Employment Information: **Hire Date:**	**Driver Status:**
Driver Address: **House Number:** **City Name:**	**Area Name:**

Figure 26.3 driver report

3.2.10 *Data Base Design (Database descriptions)*

3.2.10.1 Vehicle table:

Field	Type	Size	PK	FK	Reference	Description
Vehicle_No	Nvarchar	10	Yes			Vehicle Number
Vehicle_type	Nvarchar	15				Vehicle Type
Vehicle_Model	Int	4				Vehicle Model
Vehicle_status	Nvarchar	20				On service out of service
SIM_No	Nvarchar	15		Yes	SIM (SIM_No)	SIM Number

Table 11.3 vehicle table

3.2.10.2 Driver Table:

Field	Type	Size	PK	FK	Refer ence	Description
Driver_No	Int	4	Yes			Driver Number
Driver_ID	Decimal	9				Driver Identity
Diver_Name	Nvarchar	15				Driver Name
Driver_Age	Int	4				Driver Age
Hire_date	datetime	8				Hire Date
Driver_Status	Nvarchar	15				Driver Status
Descriptions	Nvarchar	50				More Descriptions

Table 11.3 Driver Table

3.2.10.3 Driver_Add Table:

Field	Type	Size	PK	FK	Reference	Description
driver_no	Int	4	PPK	Yes	Driver(driver_no)	Driver Number
House_no	Int	4	PPK			House Number
Area_Name	Nvarchar	20	PPK			Area Name
City_Name	Nvarchar	20				City Name

Table 13.3 Driver Add Table

3.2.10.4 DriverTel

Field	Type	Size	PK	FK	Reference	Description
Driver_No	Int	4	PPK	Yes	Driver(driver_no)	Driver Number
Tel_No	Nvarhar	15	PPK			Telephone Nmber
Mobile_No	Nvarchar	10				Mobile Number

Table 14.3 driver tel

3.2.10.5 Driver_Vehicle Table:

Field	Type	Size	PK	FK	Reference	Description
Shift_No	Int	4	PPK	FK	Shift(Shift_No)	Shift Number
Vehicle_No	Nvarchar	10	PPK	FK	Vehicle (Vehicle_No)	Vehicle Number
Driver_No	Int	4	PPK	FK	Driver (Driver_No)	Driver Number
Status	Nvarchar	5				Driver vehicle status

Table 15.3 Driver Vehicle Table

3.2.10.6 Shift Table:

Field	Type	Size	PK	FK	Reference	Description
Shift_No	Int	4	PPK			Shift Number
Shift_Time	Nvarchar	15	PPK			Shift Time

Table 12.3 Shift Table

3.2.10.7 SIM Table:

Field	Type	Size	PK	FK	Reference	Description
Sim_No	Nvarchar	15	Yes			SIM Number
Sim_Company	Nvarchar	20				SIM Company
Sim_Status	Nvarchar	10				SIM Stauts

Table 13.3 Sim table

3.2.10.8 User Table:

Field	Type	Size	PK	FK	Reference	Description
UserName	Nvarchar	15	Yes			User Name
Password	Nvarchar	15				Password
User_ID	Int	4		Yes	UserType(User_ID)	User Id

Table 14.3 User table

3.2.10.9 User Type Table:

Field	Type	Size	PK	FK	Reference	Description
User_ID	Int	4	Yes			User Id
UserType	nvarchar	15				User Type

Table 15.3 user type Table

3.2.10.10 Vehicles_Tracking Table:

Field	Type	Size	PK	FK	Reference	Description
Vehicle_No	Nvarchar	10	PPK	FK		Vehicle Number
PointX	Decimal	9				CoordinationX
PointY	Decimal	9				CoordinationY
Point_Date	Datetime	8	PPK			Point Date
Point_Time	Datetime	8	PPK			Point Time
Entering_Date	Datetime	8				Entering Date
Entering_Time	nvarchar	10				Entering Time

Table 20.3 Tracking Table

3.2.11 *Database Model:*

This model contains all the tables in the project database as UML design, and it shows the relationship between the tables that clarifies the primary and foreign keys.

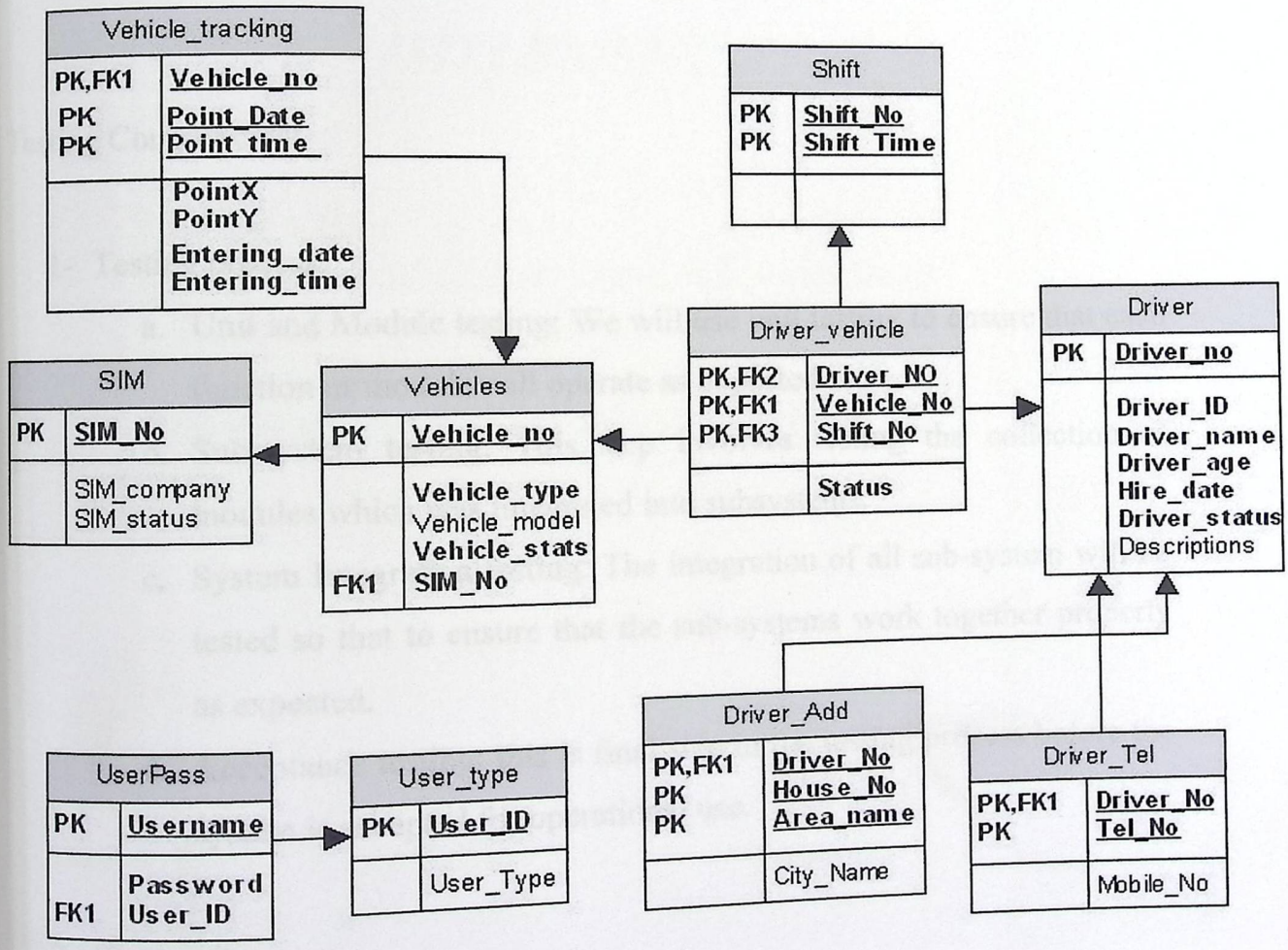


Figure 27.3 Database Model

3.2.12 *Test Plan*

Testing is one of the important steps in the project and provides quality control and quality assurance of the application; it is used to demonstrate the presence of bugs, errors and defects in the program if found. A Test plan also provides a mechanism to ensure the project group has covered the entire requirement for testing process.

Testing Components:

1- Testing process:

a. Unit and Module testing: We will use unit testing to ensure that each function or module will operate as expected.
b. Sub-system testing: This step involves testing the collection of modules which was integrated into subsystems.
c. System Integration testing: The integration of all sub-system will be tested so that to ensure that the sub-systems work together properly as expected.
d. Acceptance testing: this is final step in the testing process before the system is accepted for operational use.

2- Testing items:

a. Administrator:
    i. Testing login
    ii. Testing operations
b. User:
    i. Testing login
    ii. Testing operations

4 CHAPTER FOUR

4

IMPLEMENTATION

Introduction
Establishment of development Environment
Database implementation
Implementation of IO
Implementation of all objects / modules

4.1. Introduction

The requirements definition stage follows it the important component of the implementation stage and to show the environment and the programs which is needed to achieve the systems objectives.

4.2. *Establishment of development Environment*

5.1.1 *Hardware Environment*

1- One personal computer Pentium 4.

- 2.7 GHz speed
- Min 256 MB RAM
- 40 GHz H.D.
- Monitor
- Mouse
- Keyboard.
- CD-ROM R/W

2- Mobile.

3- Flash Memory.

4- Printer.

5.1.2 *Software Environment:*

1- Microsoft Windows XP Professional edition with IIS web server and server extensions:

While our system is built on Microsoft visual studion.NET we need these SW requirements. The MS Windows XP is the best operating system which our system can work through it.

2- Microsoft Visual studion.NET 2002 with ADO.NET.

New powerful technology program designed specially for the web applications and provide data access tools to database. It's known also as ASP.NET

3- ArcGIS ArcIMS from ESRI program :

ArcGIS ArcIMS is the GIS server software that supports our system and provides it with the interactive spatial data and its services; it's a program that links the GIS and the ASP.NET. and deals with the map as layers. It has functionalities to view and query maps interactively and on-line.

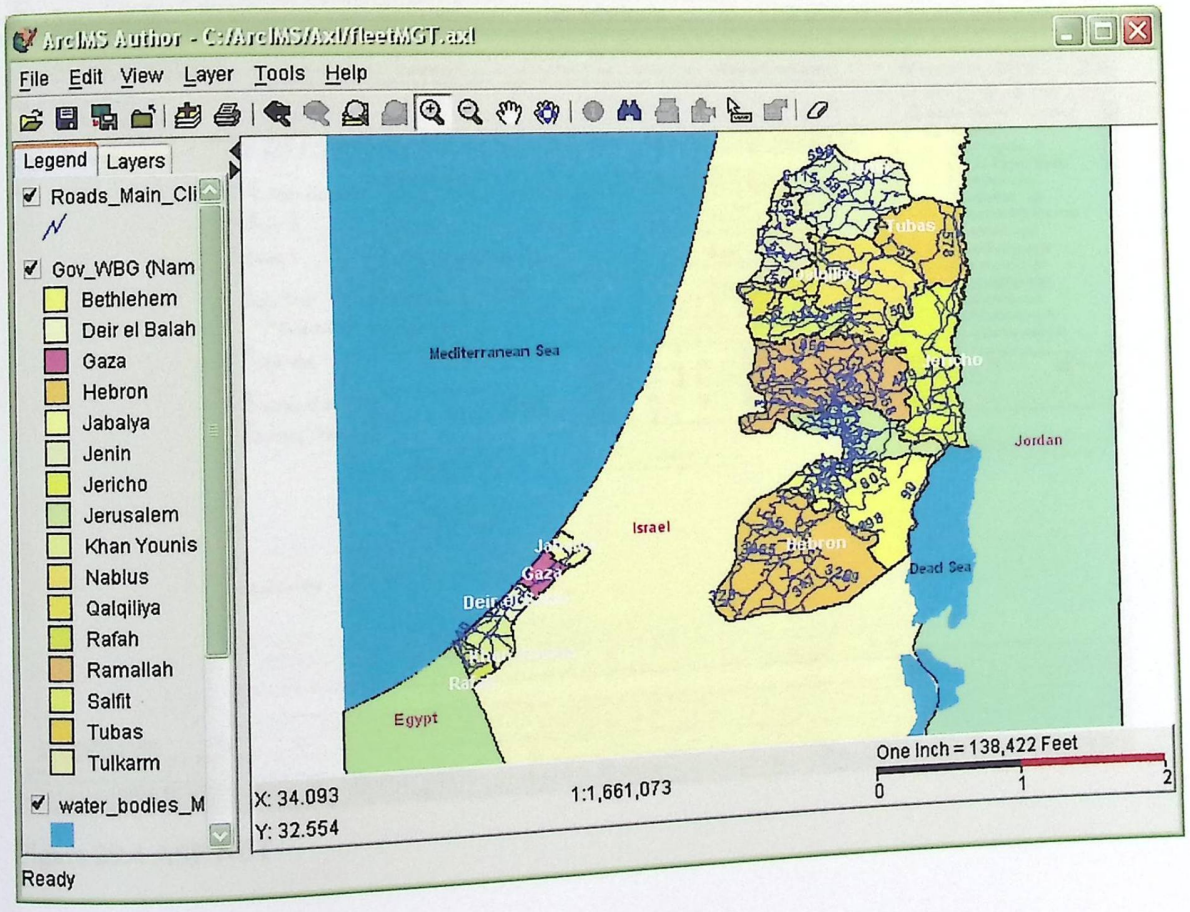


Figure 28.4 ARCGIS-ARCIMS

GSE provided us with this service as mentioned in the first chapter and they supported our project with the map and the road layer as can be seen in the caption above.

4- The reason of choosing ASP.NET

We made our decision to work by this programming environment because it has a high compatibility with the database, its ease of use, high compatibility with Windows environment and it reduces the development time.

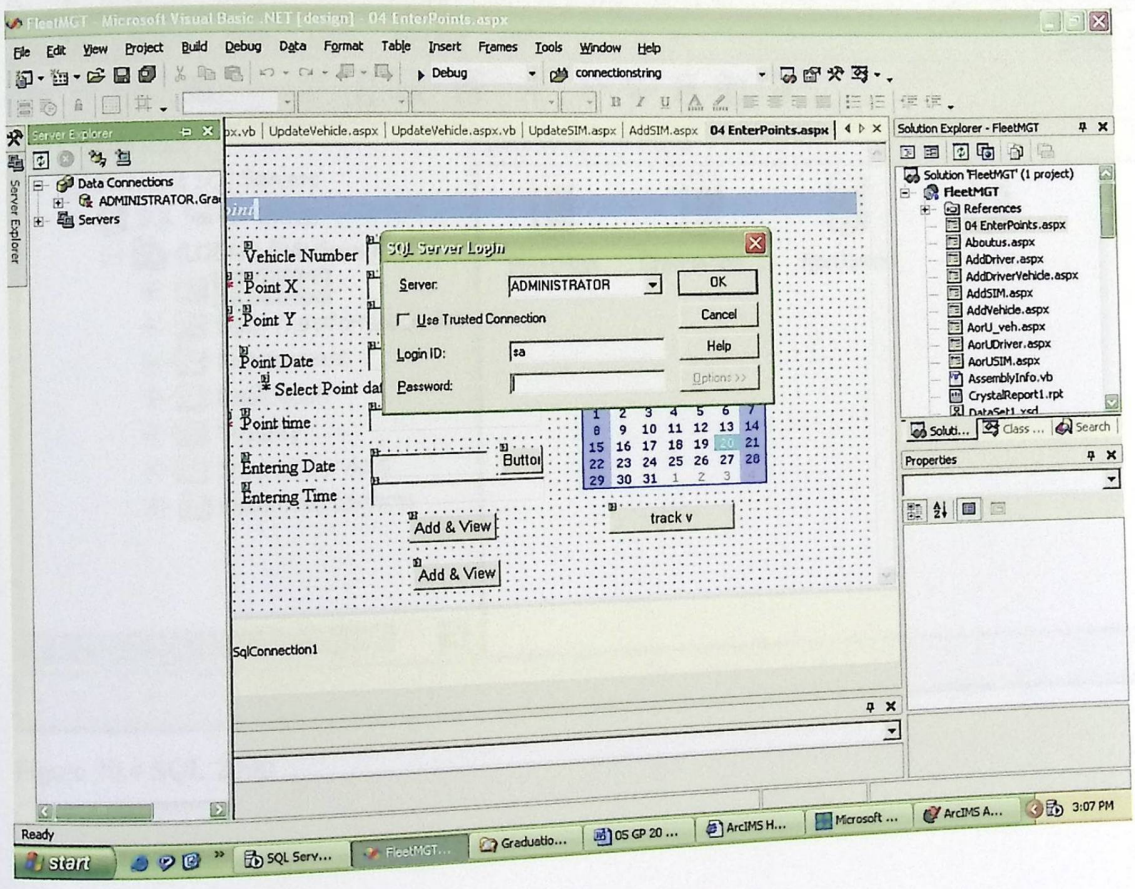


Figure 29.4 ASP.NET

5- Microsoft SQL Server 2000

We chose the Microsoft SQL Server since it meets our system requirements in creating, accessing and managing the system database and has a high compatibility and flexibility with ASP.NET.

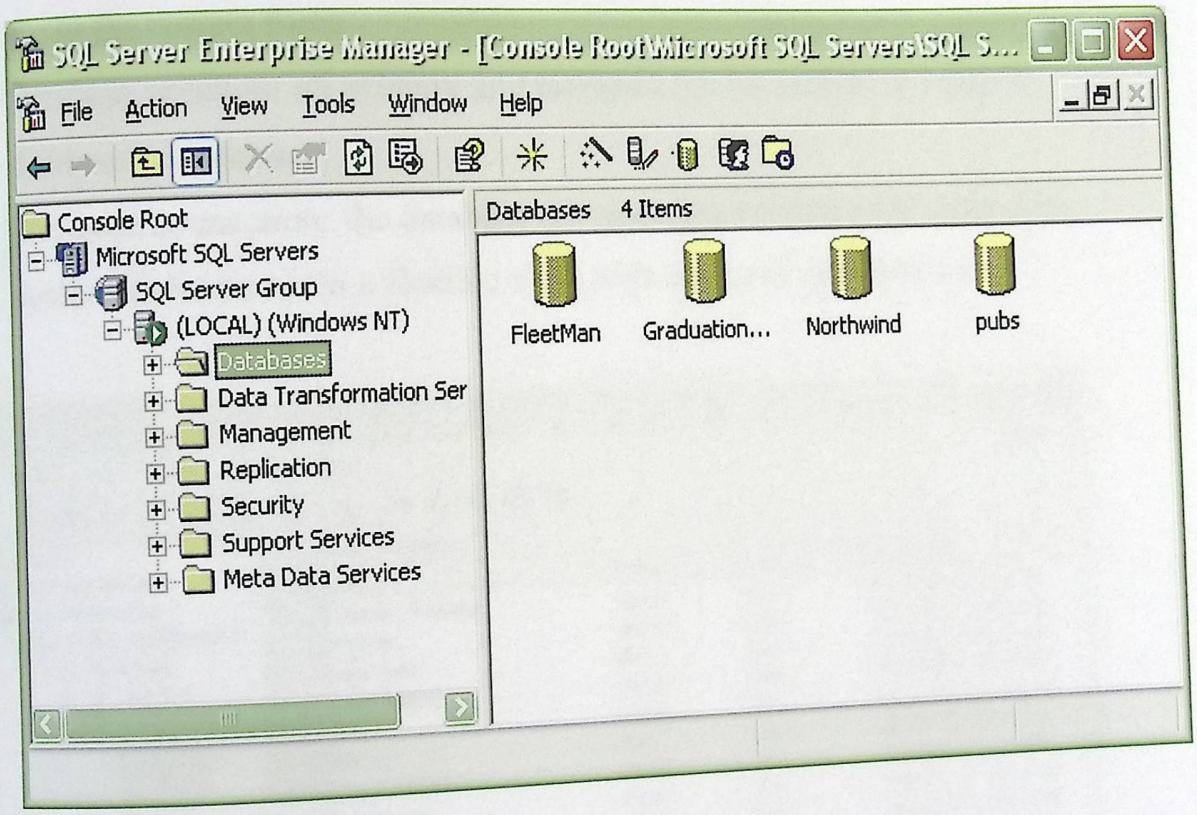


Figure 30.4 SQL 2000

4.3. *Database implementation*

The systems database is implemented using the MS SQL Server 2000 Enterprise Manager with the following properties:

- Database name: Graduation Project
- Database Normalization: it normalized to ensure that all table and relations are in the correct form.
- Database creation: all primary and foreign keys are created to make the database consistency.
- Database connection: the database is connected with the web application design environment in a flexible way, with a special authentication.

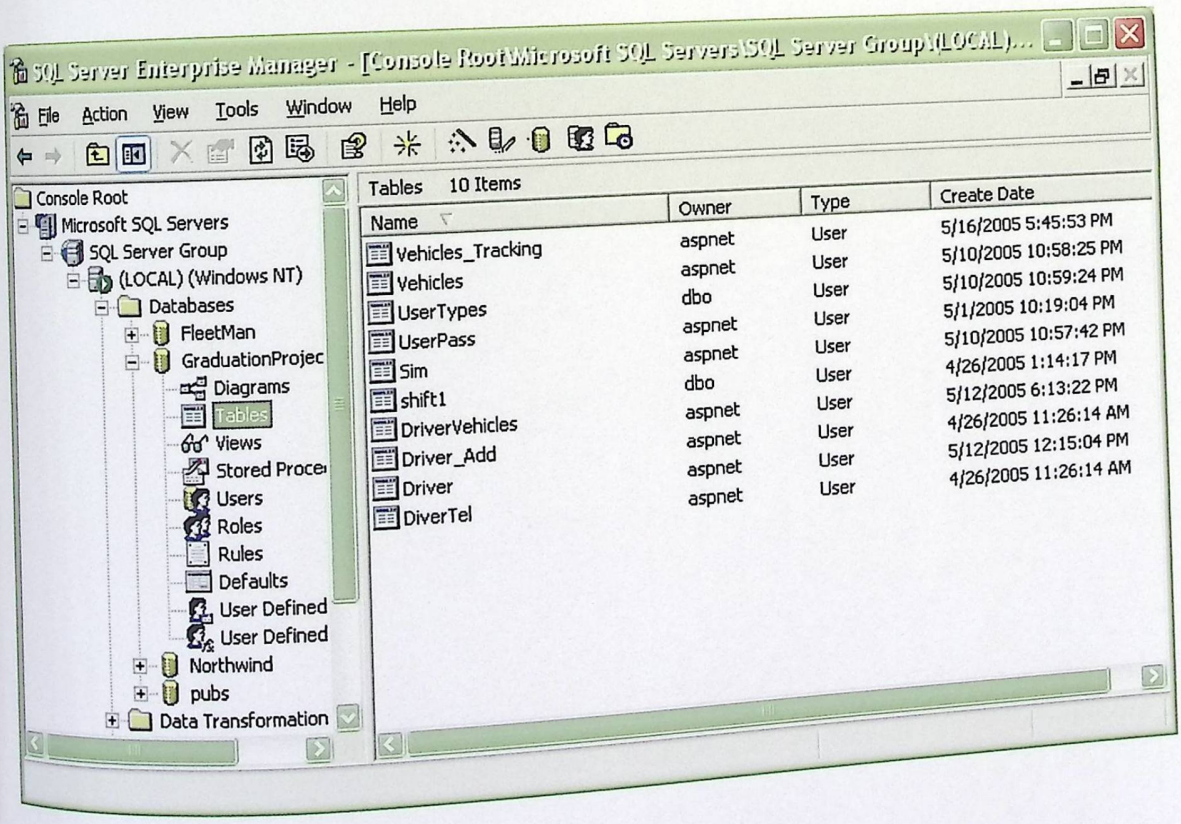


Figure 31.4 Database

4.4. *Implementation of I/O and modules:*

All the inputs and outputs in addition to the modules were programmed by Visual Basic.NET and Microsoft *I*nfoPath and the code will be shown in the appendix.

5 CHAPTER FIVE

5

SYSTEM TESTING

Introduction
Verification
Snapshots

5.1 *Introduction*

Testing is the step after finishing the coding and implementation phase, thus ensuring the system proper functionality as is required in the specifications and ensuring its quality. Testing the system is one of the most important steps in the system development. It requires a great effort to get the system to be reliable and requires much time.

Testing the system is to check its functions as it was designed and as expected, we cannot say that the system is free of defaults but it must be working good enough to satisfy its needs.

There are some testing steps :

1. System units
2. Module testing
3. Subsystem testing
4. Integration testing
5. System and acceptance testing

5.2 *Verification*

5.2.1 *System units testing:*

In this step individual components are tested to ensure that they operate in the correct manner.

Most of the operations that will be tested will be under the administrator operations because all the user operations is available in the administrator and they affect the system and its database.

5.2.1.1 User name and Password Testing

Case	*Input*		*Expected Result*	*Actual Result*	*Comments*
	User Name	Pass Word			
Administrator Login	Administrator	Admin	The administrator Option Page	The administrator Option Page	In This Case The User Name & Password are Correct
Administrator Login	PPU	Admin	The administrator Option Page	The User Name Is False	In This Case The User Name is Error
User Login	User	User	The User Option Page	The User Option Page	In This Case The User Name & Password are Correct
User Login	User	Halo	The User Option Page	The Password Is False	In This Case The Password is Error

Table 21.5 username password testing

5.2.1.2 Add Driver

Case	Input	Expected Result	Actual result	Comment
Driver Number	10	10	10	The new Driver Will Be Added to the Database
Driver Name	Ali	Ali	Ali	
Driver ID	123456789	123456789	123456789	
Driver Age	27	27	27	
Hire Date	1/1/2005	1/1/2005	1/1/2005	
Driver Status	On Work	On Work	On Work	
Description				
Number Of House	1	1	1	
House Number	25	25	25	
Area Name	Aen-Sara	Aen-Sara	Aen-Sara	
City name	Hebron	Hebron	Hebron	

Table 22.5 driver testing

5.2.1.3 Add Vehicles

Case	Input	Expected Result	Actual result	Comment
Vehicle Number	20-111-09	20-111-09	20-111-09	Add New Vehicle To the Database
Vehicle Model	2004	2004	2004	
Vehicle Type	Toyota	Toyota	Toyota	
Vehicle Status	On Work	On Work	On Work	
Sim No	1111	1111	1111	

Table 23.5 vehicle testing

5.2.1.4 Add Sim

Case	Input			Expected Result			Actual Result			Comment
	Sim No	Sim Company	Sim Status	Sim No	Sim Company	Sim Status	Sim No	Sim Company	Sim Status	
Add Sim	1111	Jawal	On Work	1111	Jawal	On Work	1111	Jawal	On Work	Add New Sim To Database
Add Sim	2222	Orange	Off Work	2222	Orange	Off Work	2222	Orange	Off Work	Add New Sim To Database

Table 24.5 sim testing

5.2.1.5 Add New User

Case	Input			Expected Result			Actual Result			Comment
	User Name	Pass word	Permeation	User Name	Pass word	Permeation	User Name	Pass word	Permeation	
Add user	Hanna	Hanna	Administrator	Hanna	Hanna	Administrator	Hanna	Hanna	Administrator	Add new administrator User
Add user	Hamza	Hamza	User	Hamza	Hamza	User	Hamza	Hamza	User	Add new User

Table 25.5 new user testing

5.2.1.6 Add Driver to Vehicles

Case	Input	Expected Result	Actual Result	Comment
Driver Number	123	123	123	Give the driver vehicle on the shift
Vehicle Number	111	111	111	
Driver Shift	1	1	1	
Driver Shift Status	On work	On work	On work	

Table 26.5 add driver to vehicle testing

5.2.1.7 Update Driver

Case	Input	Expected Result	Actual result	Comment
Driver Number	10	10	10	Update the Address For Driver Ali
Driver Name	Ali	Ali	Ali	
Driver ID	123456789	123456789	123456789	
Driver Age	27	27	27	
Hire Date	1/1/2005	1/1/2005	1/1/2005	
Driver Status	On Work	On Work	On Work	
Description				
Number Of House	1	1	1	
House Number	50	50	50	
Area Name	Namera	Namera	Namera	
City name	Hebron	Hebron	Hebron	

Table 27.5 update driver testing

5.2.1.8 Update Vehicles

Case	Input	Expected Result	Actual result	Comment
Vehicle Number	20-111-09	20-111-09	20-111-09	Update the Vehicle Status And Sim
Vehicle Model	2004	2004	2004	
Vehicle Type	Toyota	Toyota	Toyota	
Vehicle Status	Off Work	Off Work	Off Work	
Sim No				

Table 28.5 update vehicle testing

5.2.1.9 Update Sim

Case	Input			Expected Result			Actual Result			Comment
	Sim No	Sim Company	Sim Status	Sim No	Sim Company	Sim Status	Sim No	Sim Company	Sim Status	
Add Sim	1111	Jawal	Off Work	1111	Jawal	Off Work	1111	Jawal	Off Work	Update the Sim Status

Table 29.5 update Sim testing

It was done for the rest of the function testing and all the results were as it is expected.

5.2.2 *Module testing:*

Is a collection of dependent component such as an object class, an abstract data type?

5.2.3 *The Administrator Subsystem module testing:*

Here we tested the procedures for each administrator page, to ensure that it works correctly. The interface was tested, in addition to the appearance of information and the process of the procedure in transferring data to the database, and the related interface procedures.

5.2.4 *The User subsystem module testing:*

Also in this part every procedure for the User was checked and tested to ensure that it is working correctly, in addition that all interfaces were tested.

5.2.5 *Integration Testing:*

Here in this type of testing we tested each collection of modules which have been integrated into subsystems and to ensure the interactions between the components is working correctly.

5.2.6 *System testing:*

The administrator and user accounts subsystems are integrated with each other to make up the system. On this process our concern was to find the errors and bugs that resulted from unanticipated interactions between subsystems and its interface problems, and to check if the system meets its functional and nonfunctional requirements, and testing the emergent system properties.

5.2.7 *Acceptance testing:*

This type of testing is for checking the consistency between the system and its environment.

- The test will ensure if the system achieves the functional requirements; for example check if the system allows the administrator to add and update vehicles information.
- The test also covered the nonfunctional requirement; like security.

5.3 *Snapshots*

5.3.1 *First Page (Index):*

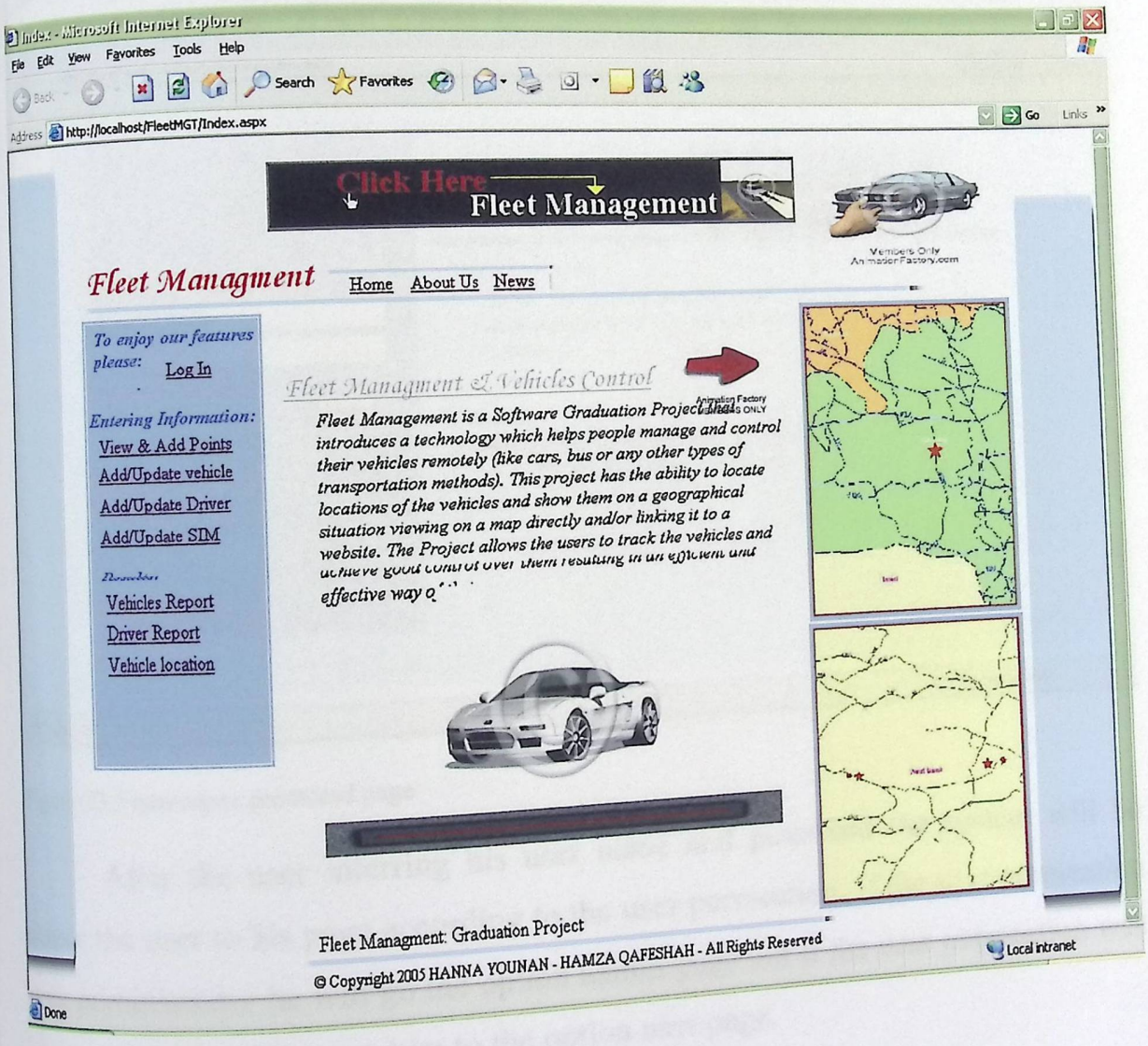


Figure 32.5 Index page

5.3.2 *Username and password:*

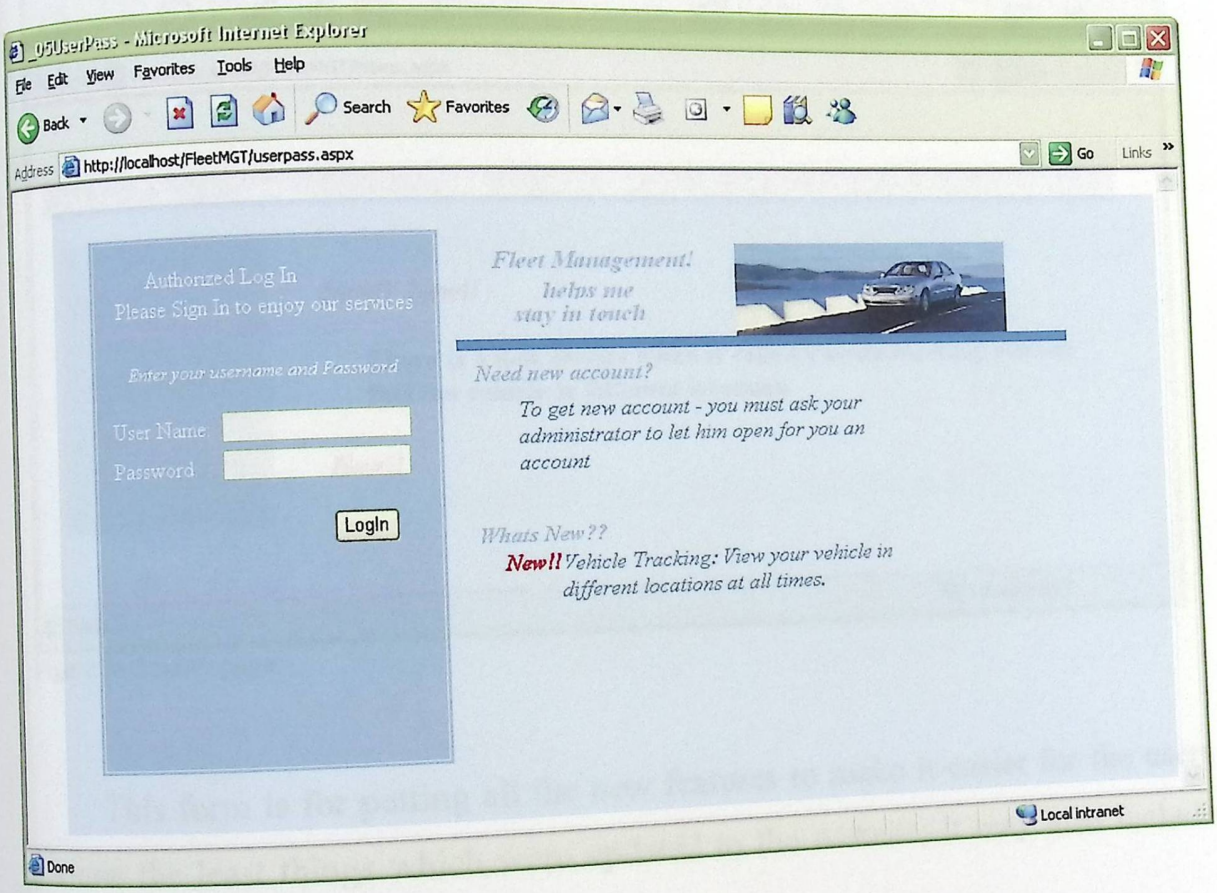


Figure 33.5 user name password page

After the user interring his user name and password the system will be move the user to his page according to the user permeation. If the user permeation was administrator he will go the option admin page but if the user permeation was user the system will move him to the option user page.

5.3.3 *News Form*

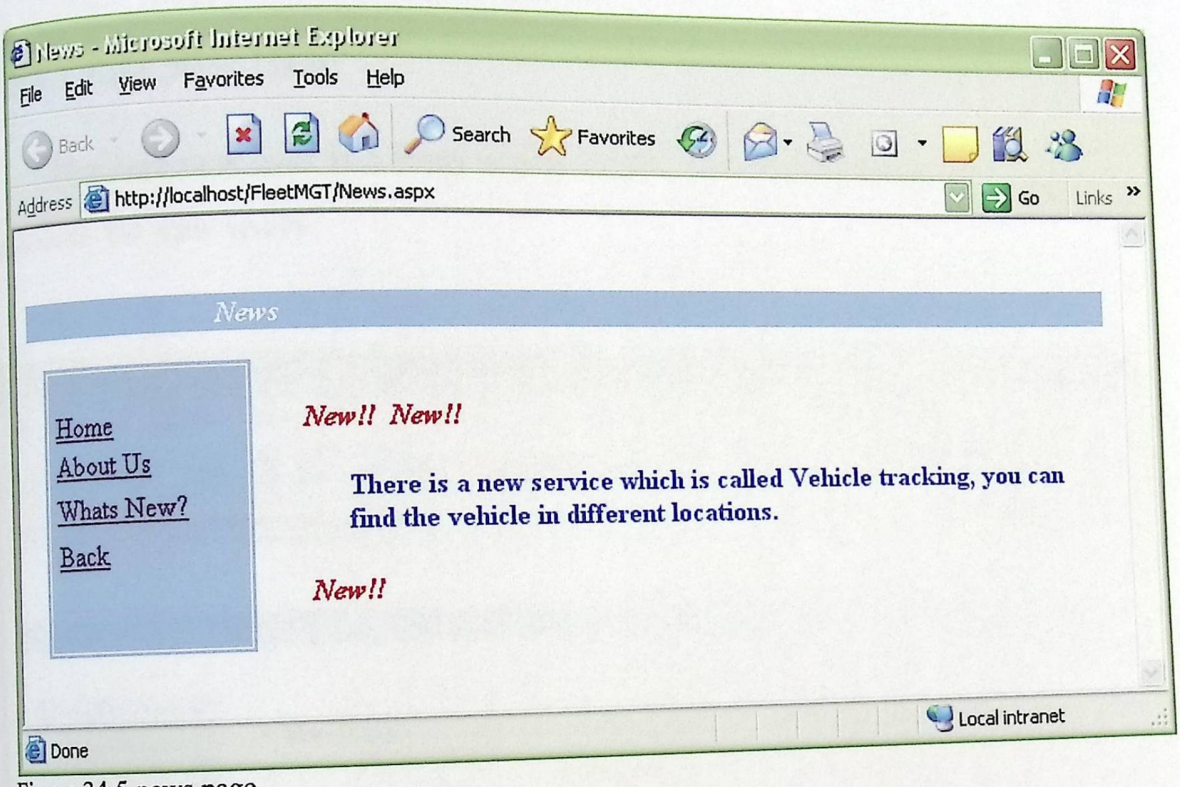


Figure 34.5 news page

This form is for putting all the new features to make it easier for the users to know the least things which were updated to the website; it may also include some information about the system.

5.3.4 *Input screens design*

5.3.4.1 Add New User:

The Add new user is a form which let the user administrator make new accounts for new users.

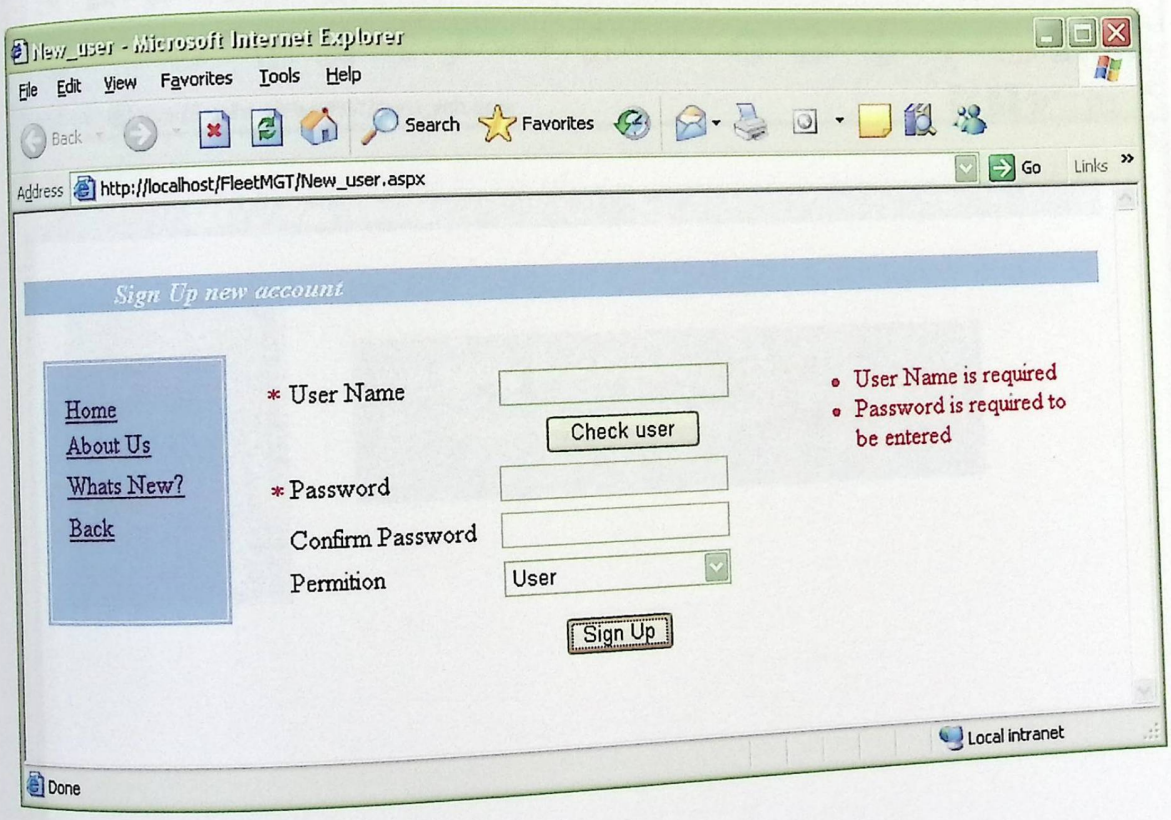


Figure 35.5 add user page

5.3.4.2 Add or Update Vehicle

This is a form which comes after the user clicks on its link from the option Admin form which lets the user choose between two options: add or update the vehicles information.

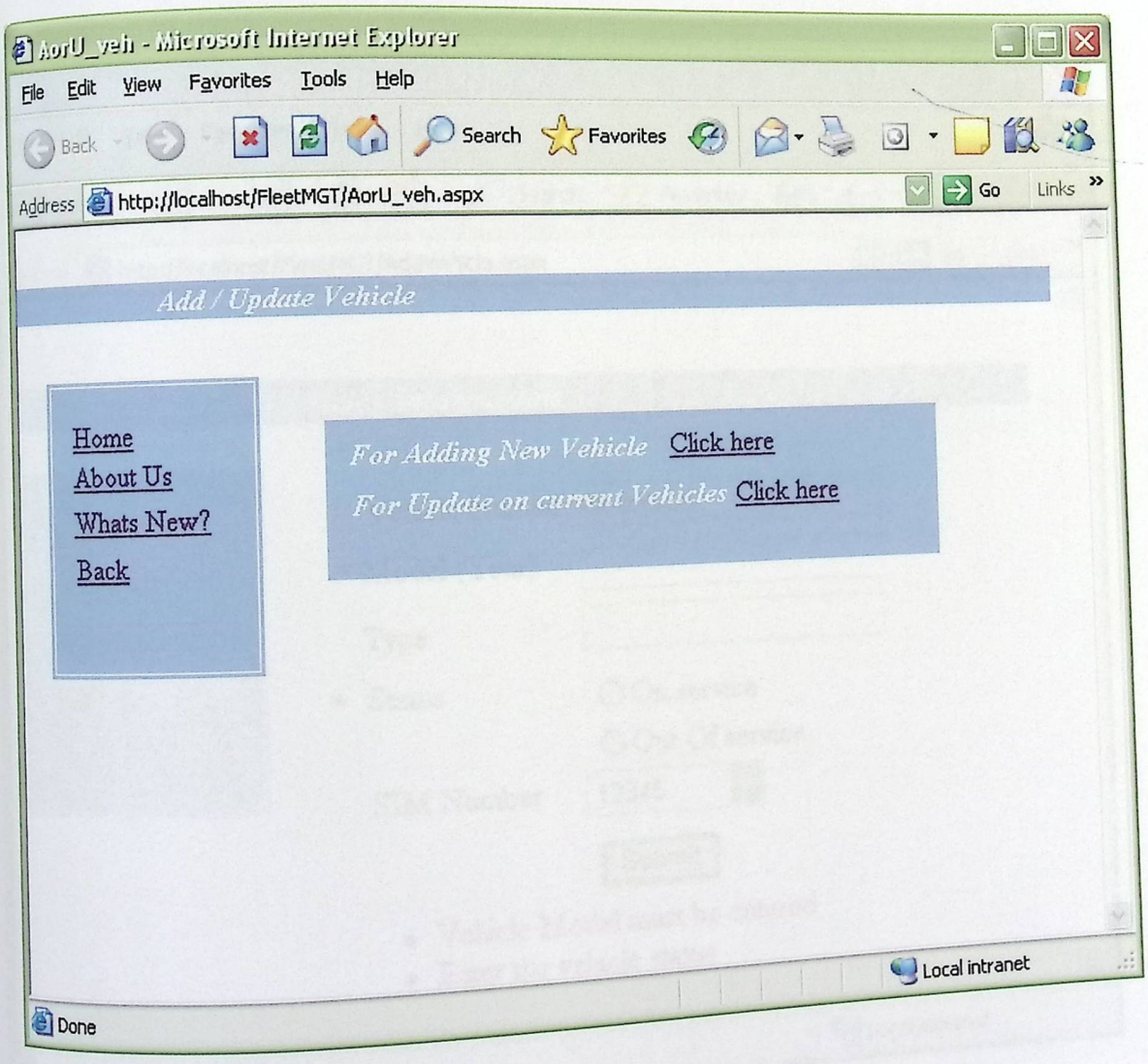


Figure 36.5 add/ update vehicle page

5.3.4.2.1 Add Vehicle:

This form allows the user of the system to enter a new vehicle to the database.

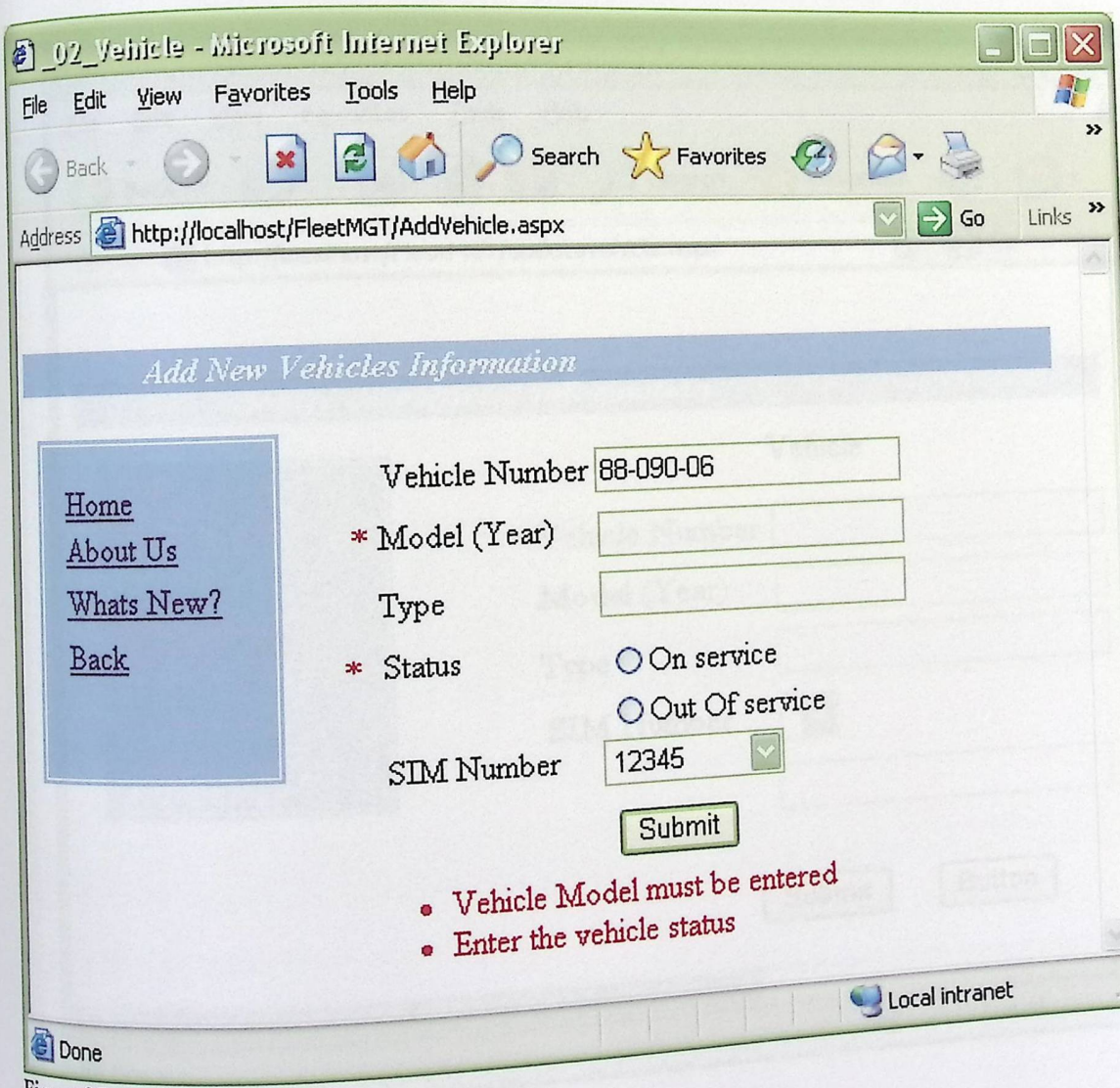


Figure 37.5 add vehicle page

5.3.4.2.2 Update Vehicle

The vehicle update form is needed to change the status of the vehicles if a vehicle is not working or sold we can change its status accordingly.

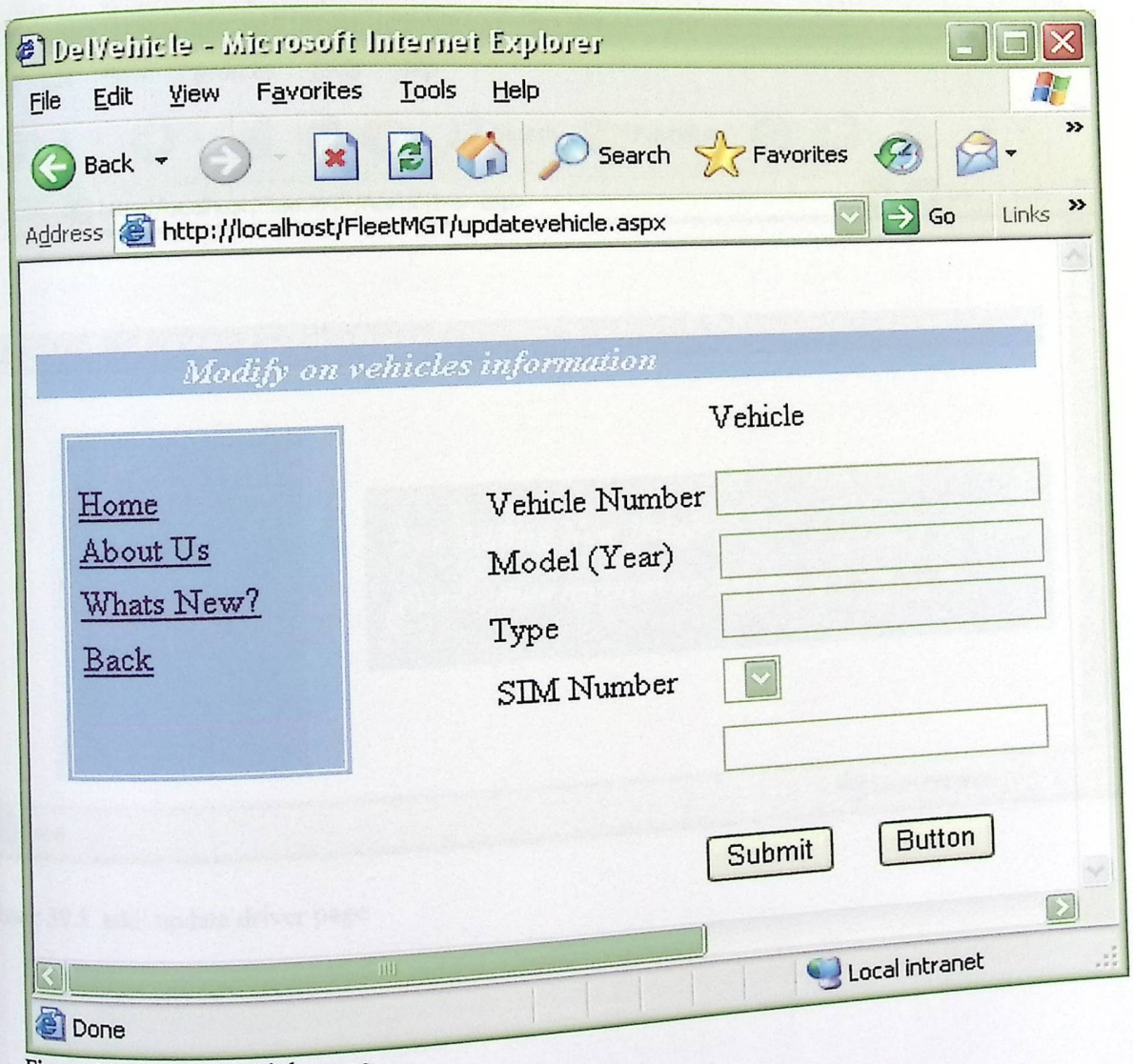


Figure 38.5 update vehicle page

5.3.4.3 Add or Update Driver

This form appears after the user clicks on its link from the option Admin form which lets the user choose between two options: add or update the driver information.

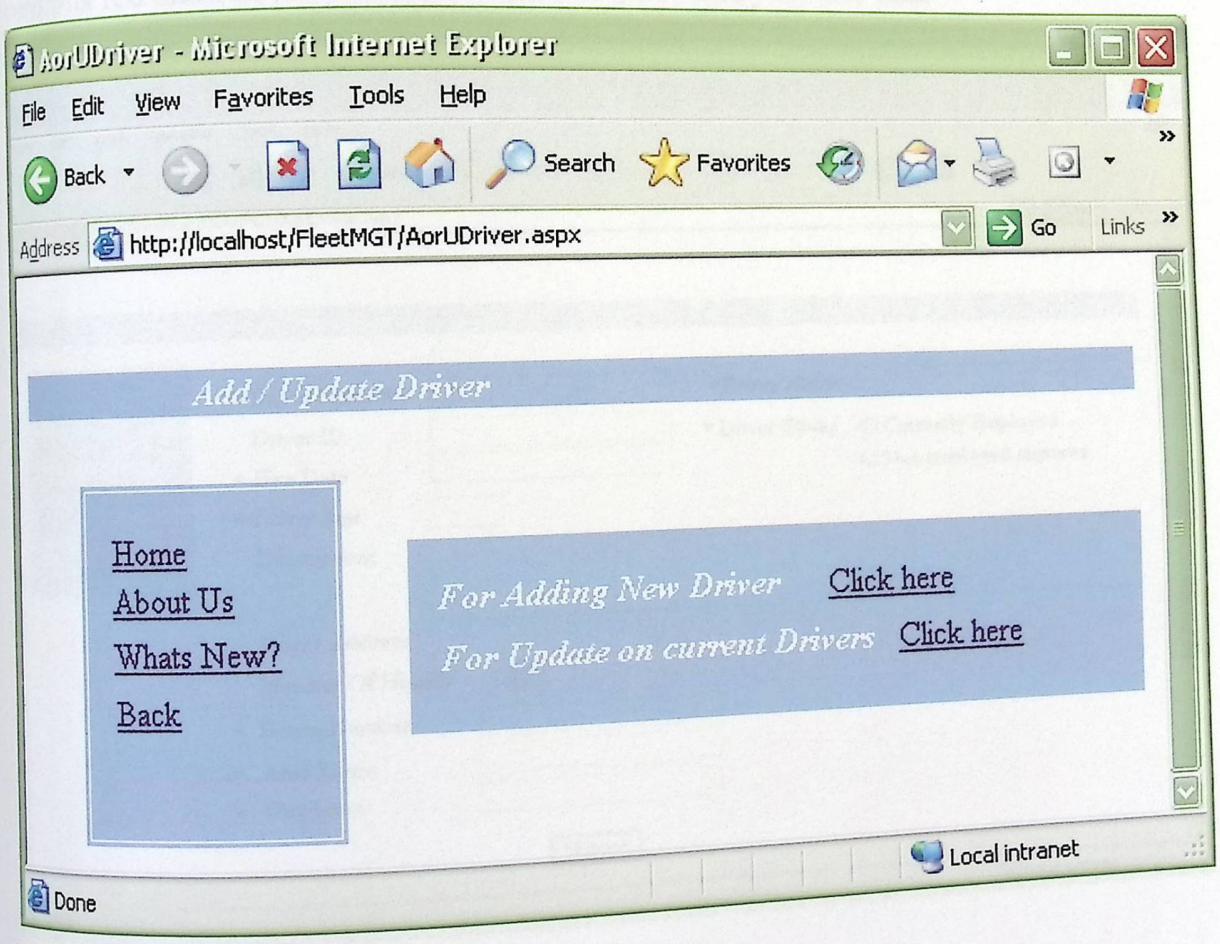


Figure 39.5 add/ update driver page

5.3.4.3.1 Add Drivers

The add drivers form is a form that lets the user of the system enter a new driver to the database, when the user clicks "Submit", the system checks if there is some required fields that have not been entered as we see below the massage contains red stars in all the fields which require entry by the user .

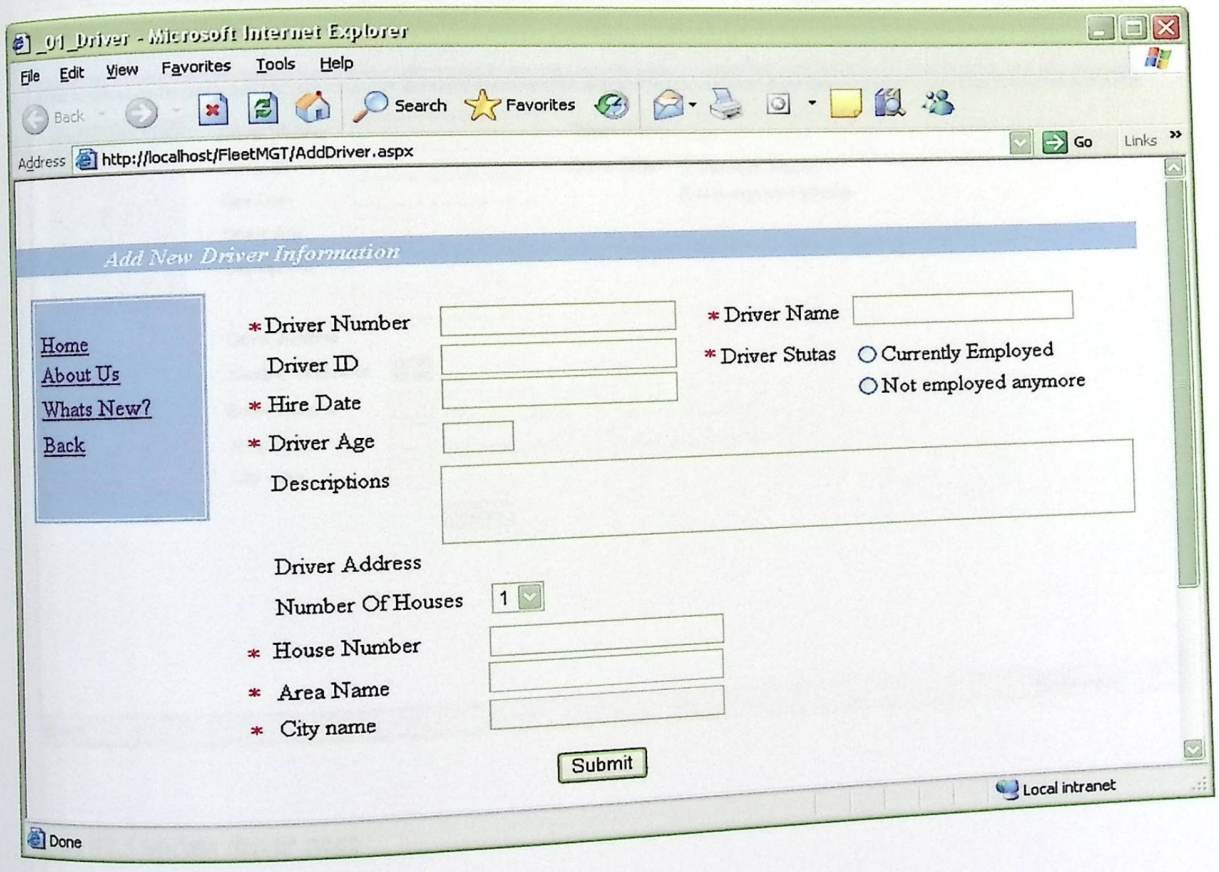


Figure 40.5 add driver page

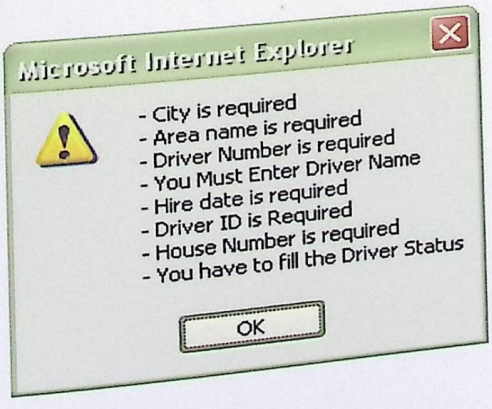


Figure 41.5 driver massage error

5.3.4.3.2 Update Driver

There is a need to update for the driver information since drivers frequently leave the companies: we can change his status from currently an employee to non-employee.

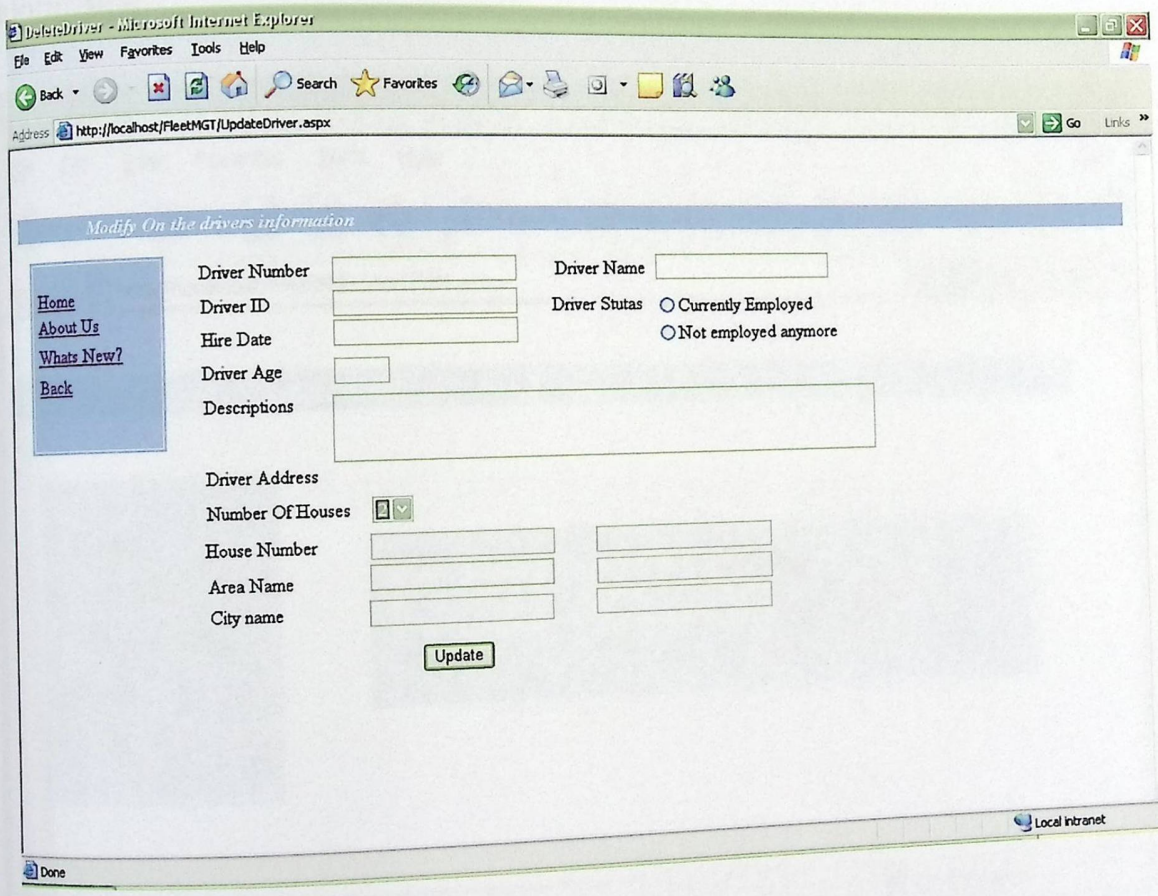


Figure 42.5 update driver page

5.3.4.4 Add or Update SIM:

This form appears after the user clicks on its link from the Option Admin form which lets the user choose between two options: add or update the driver information.

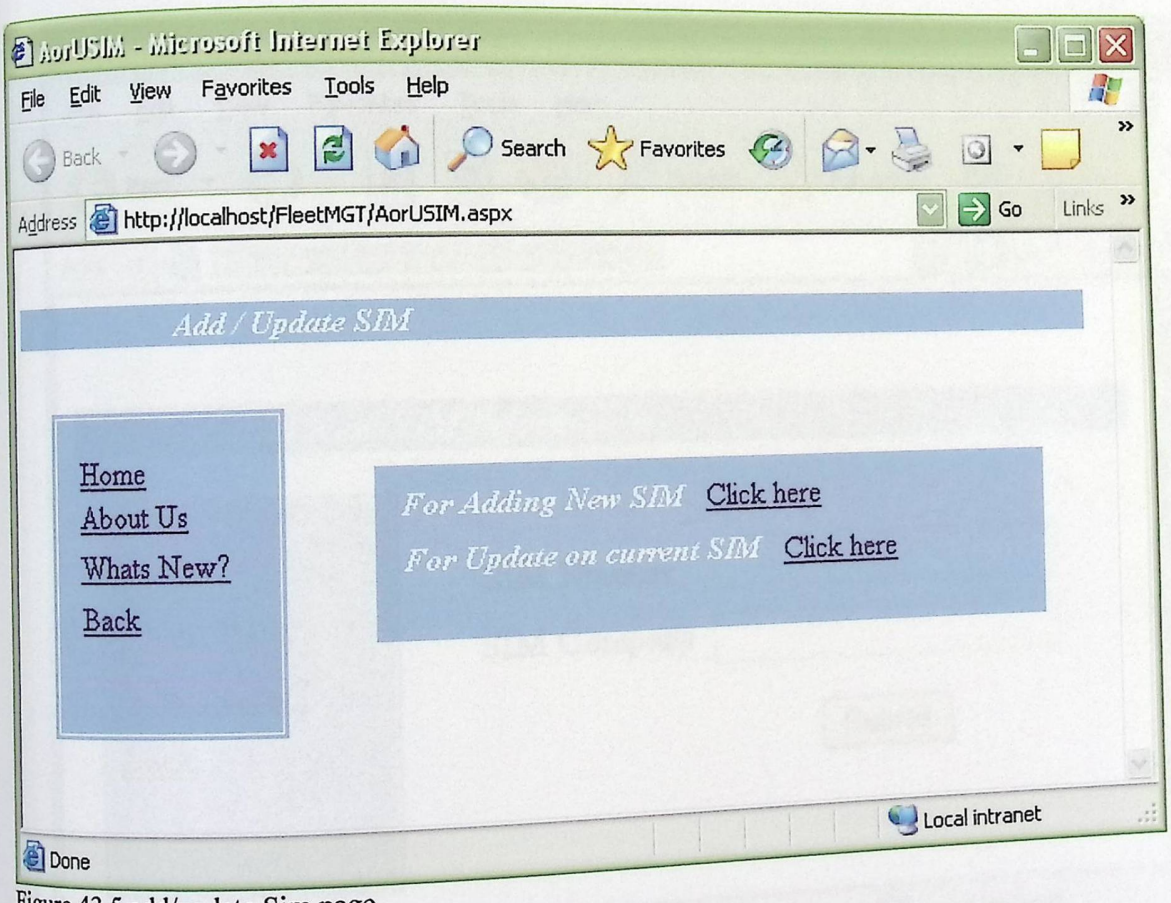


Figure 43.5 add/update Sim page

5.3.4.4.1 Add SIM

This form gives the user the ability to enter information of a new SIM which is related to the SIM Company Vendor which will be installed in the vehicle.

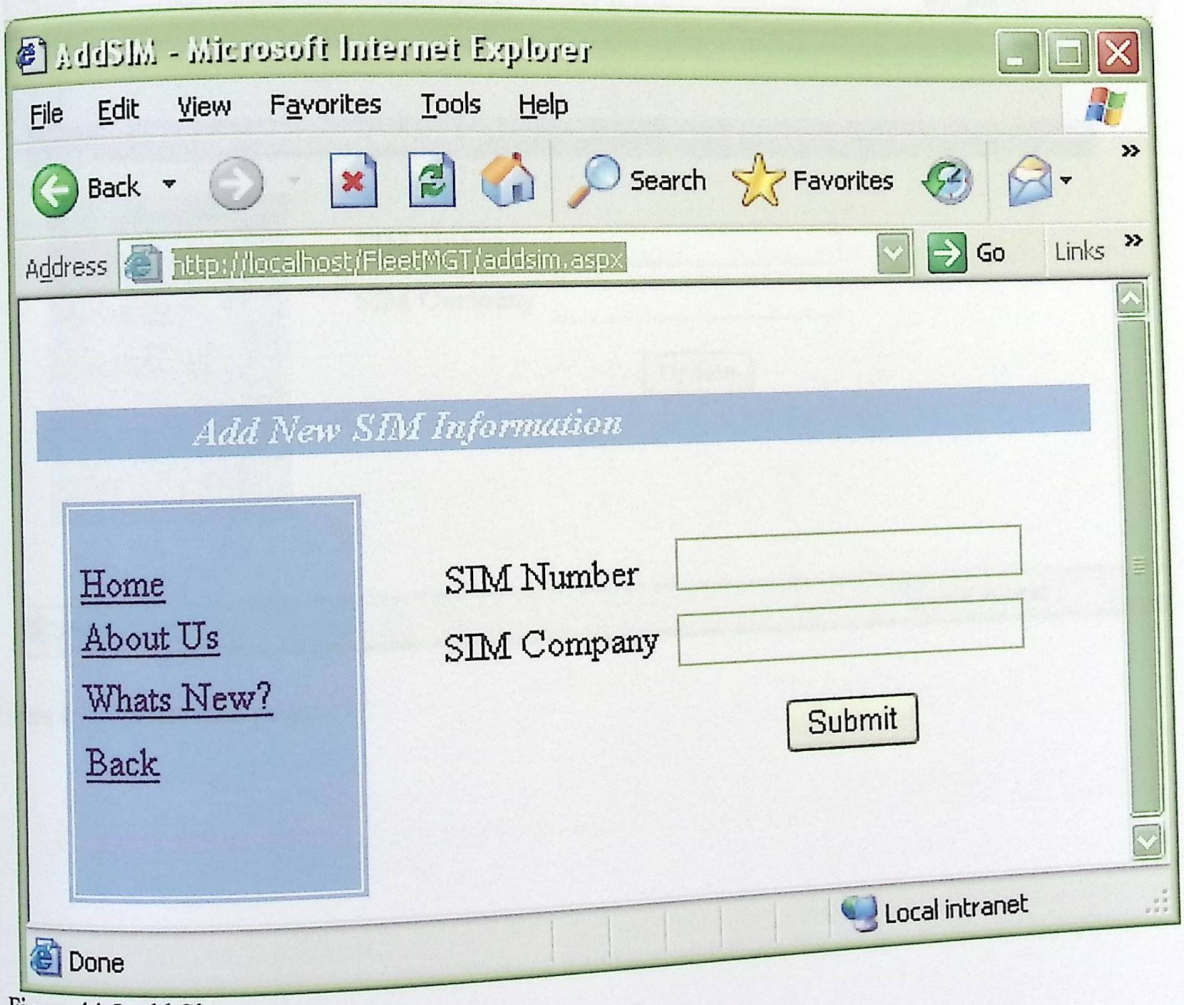


Figure 44.5 add Sim page

5.3.4.4.2 Update SIM

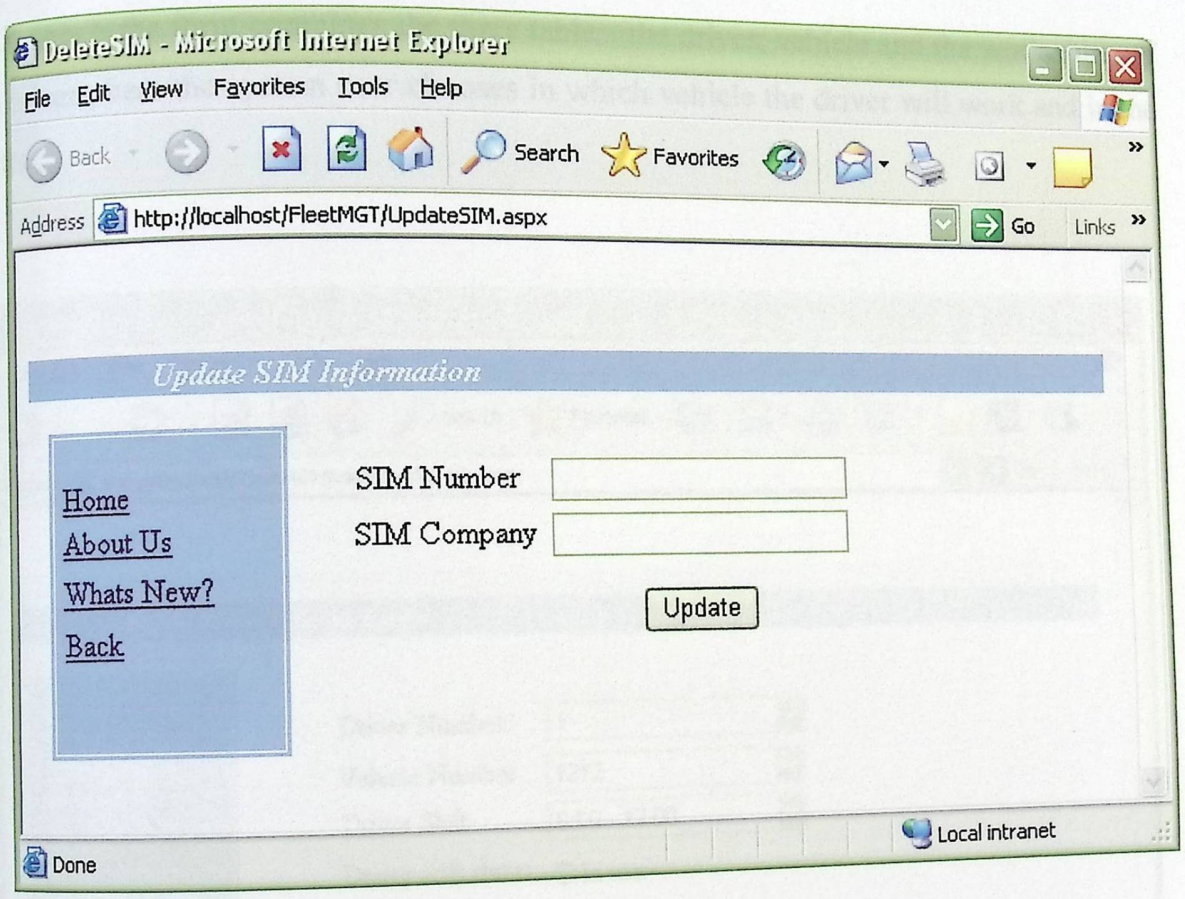


Figure 45.5 update Sim page

5.3.4.5 Add Driver Vehicle

This is the form combines the three tables: the driver, vehicle and the work shifts of the drivers, here the system user chooses in which vehicle the driver will work and in the shifts

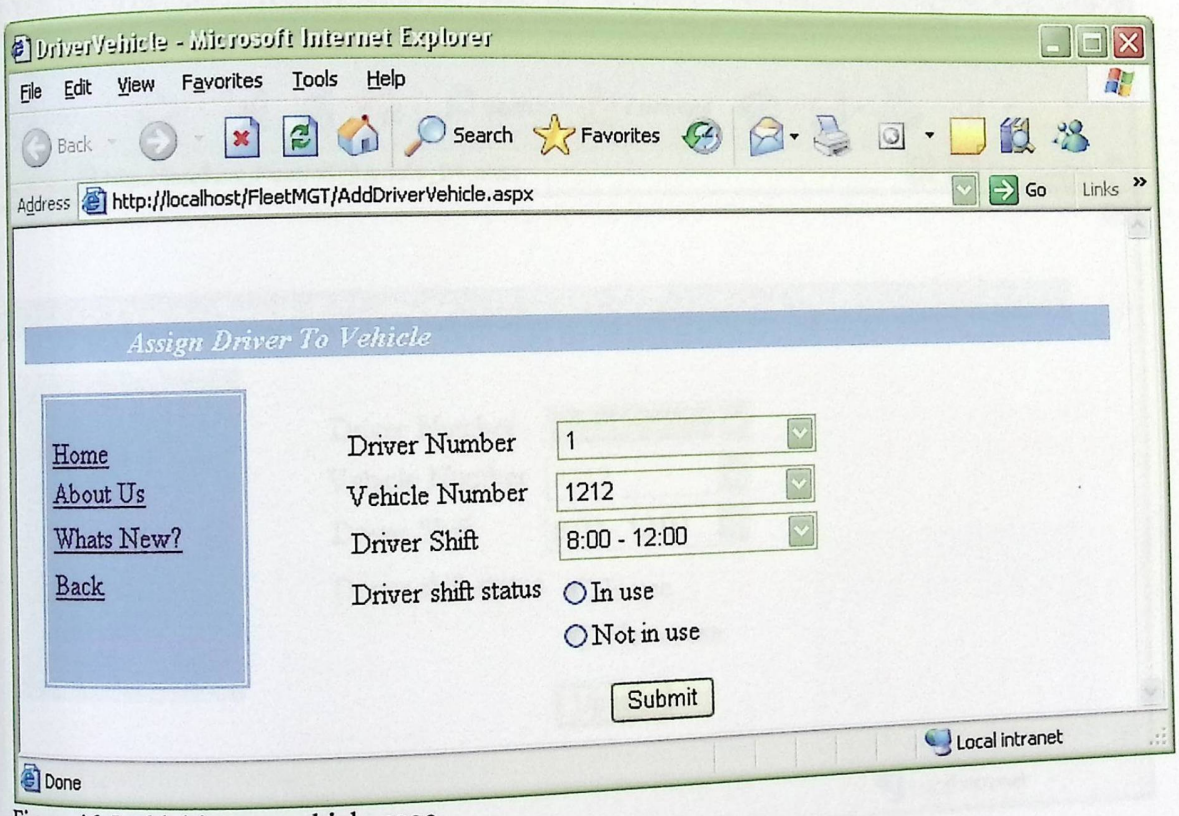


Figure 46.5 add driver to vehicle page

5.3.4.6 Update Driver to vehicle

This form is for making changes on what we made before in the form "add driver to vehicle", sometimes there is a need to change to various attributes such as the driver change of shifts thus to modifying his information.

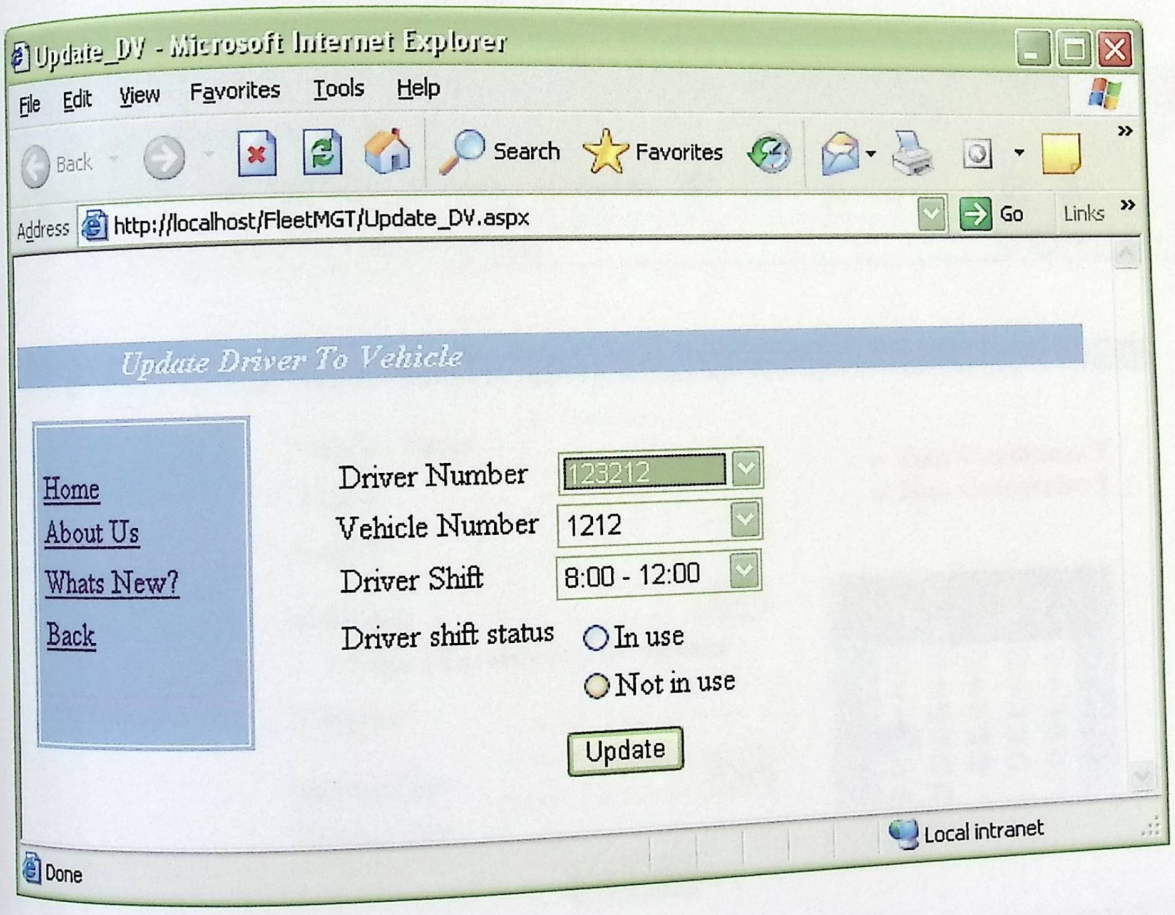


Figure 47.5 update driver vehicle page

5.3.4.7 Add Point

This form is for adding the coordinate points to the database and to view the results on the map directly after clicking on the "Add & View Botton", to save the points is for the more advanced steps and is discussed below.

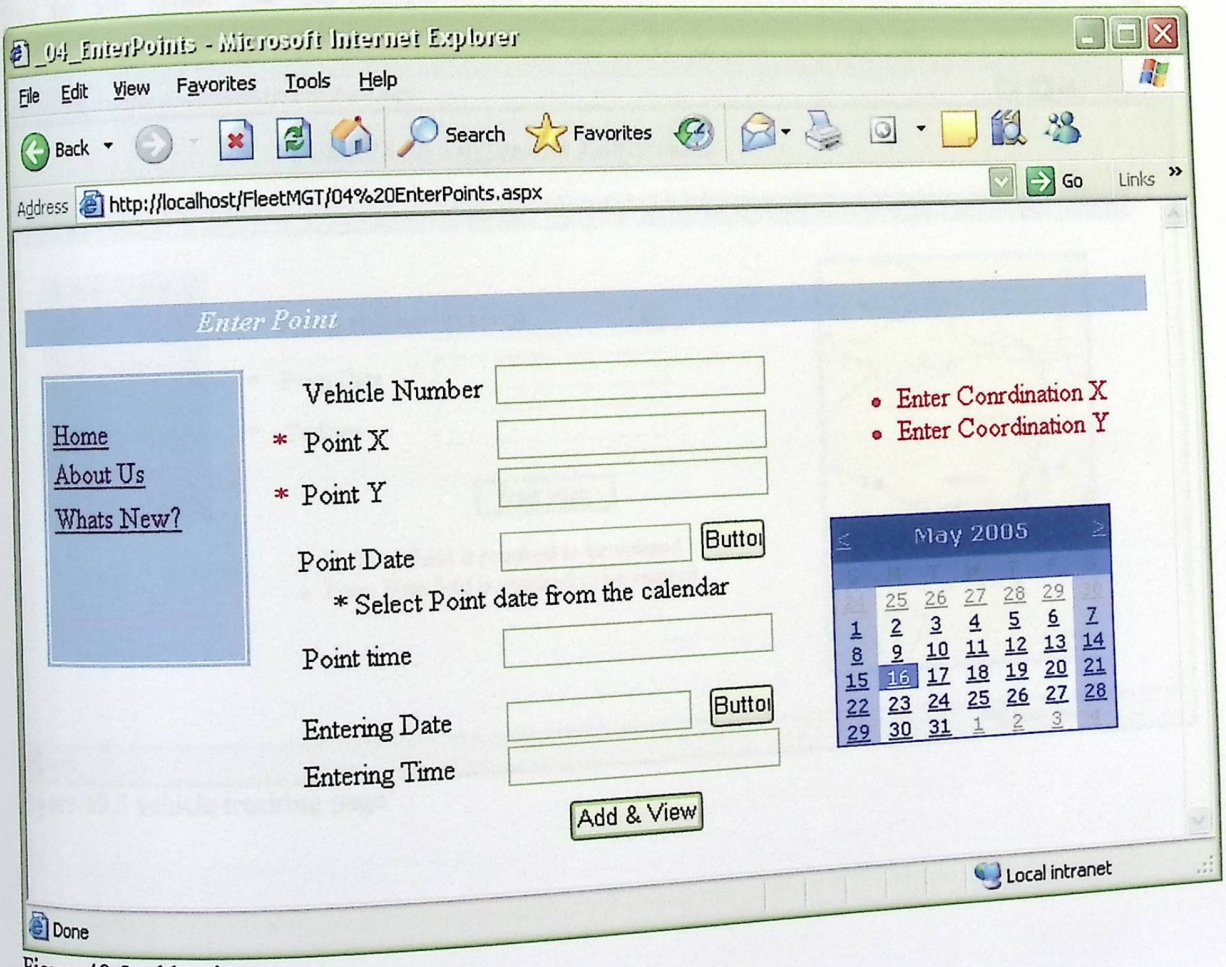


Figure 48.5 add point page

5.3.4.8 Vehicle Tracking:

This form appears after adding the information from the "Enter point" form to the database; this is a history of the vehicles' different locations, time and dates.

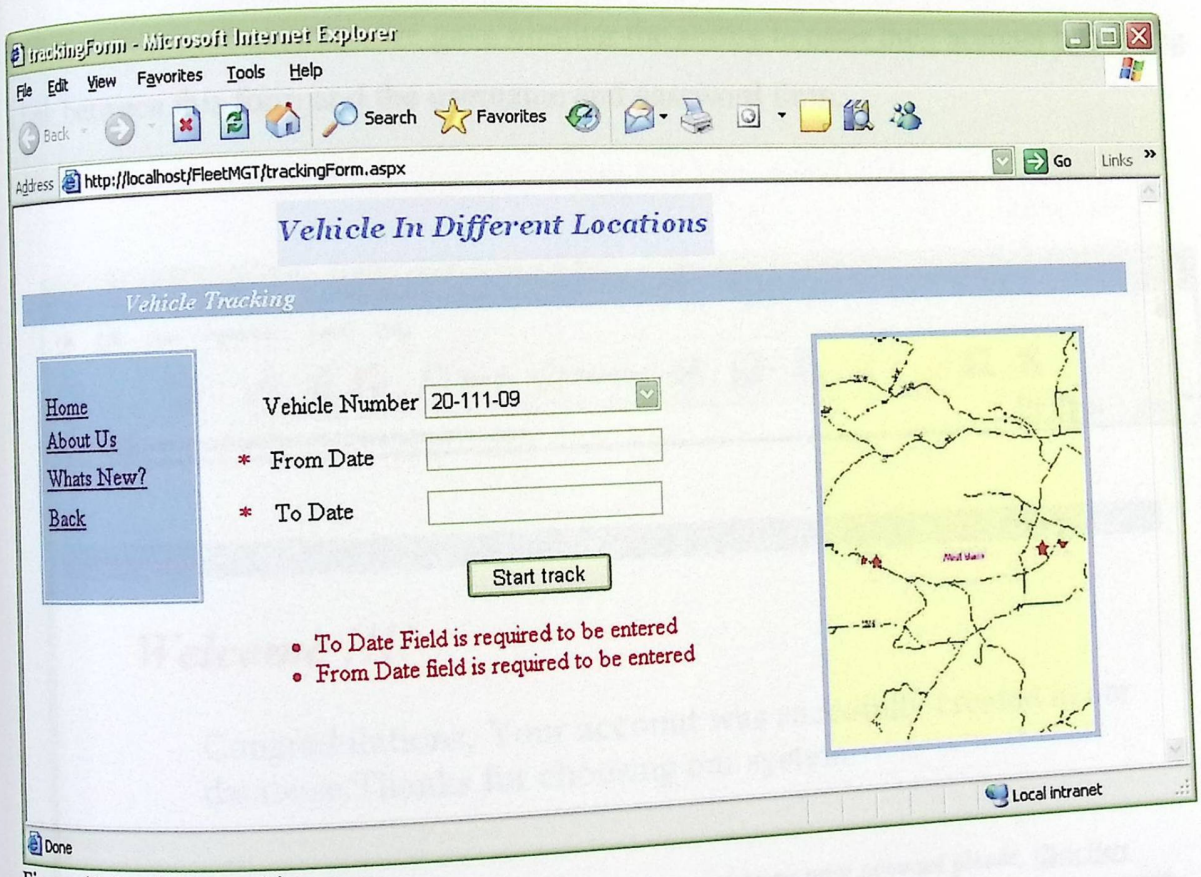


Figure 49.5 vehicle tracking page

5.3.5 *Output screens Design*

5.3.5.1 New user success

This form appears when the user finishes from making a new account and it greets the user for the new account, we gave him/her the ability to enter their account by making a link between this form and the username and password form.

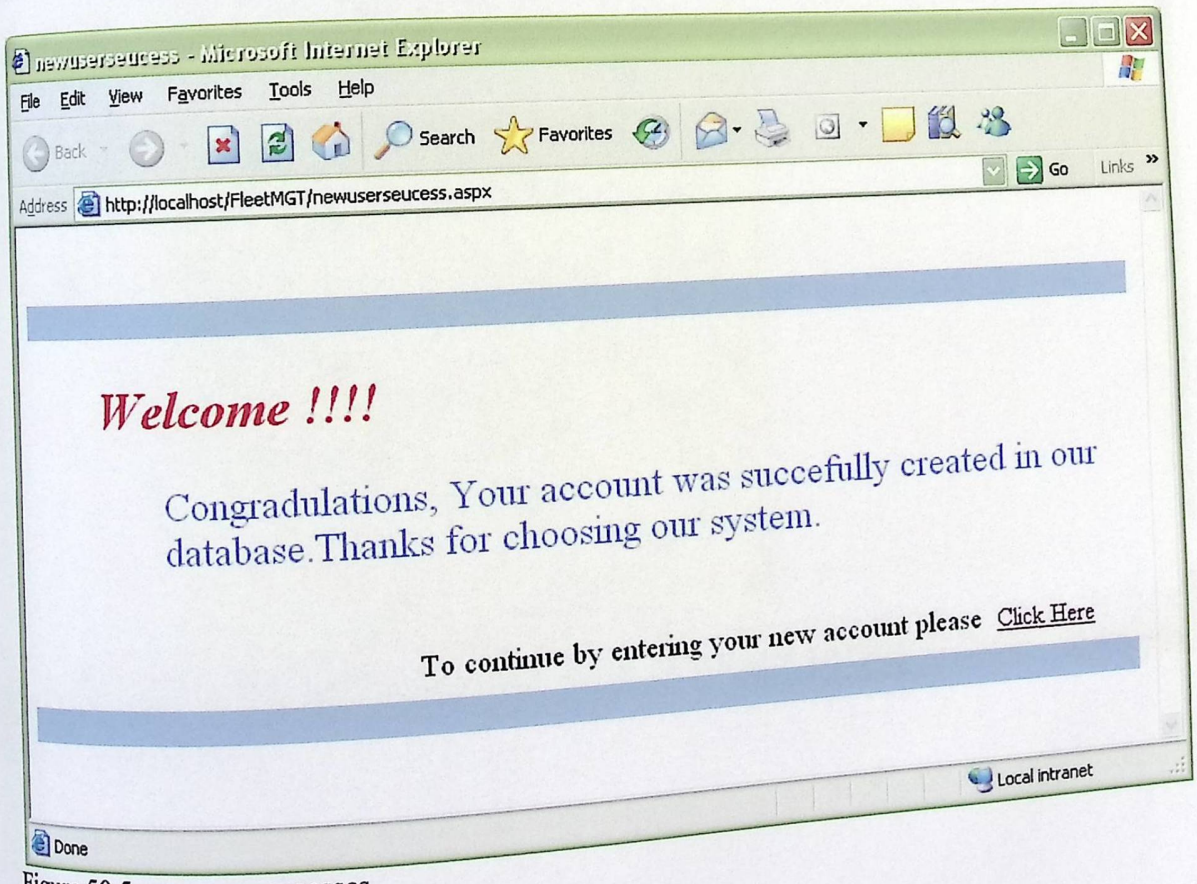


Figure 50.5 new user successes

5.3.5.2 History (Tracking)

This form appears after the user finishes from the "Tracking" form which allows the user to choose the vehicle number and then to specify from which date to which date he needs to see the location of the vehicle on the map.

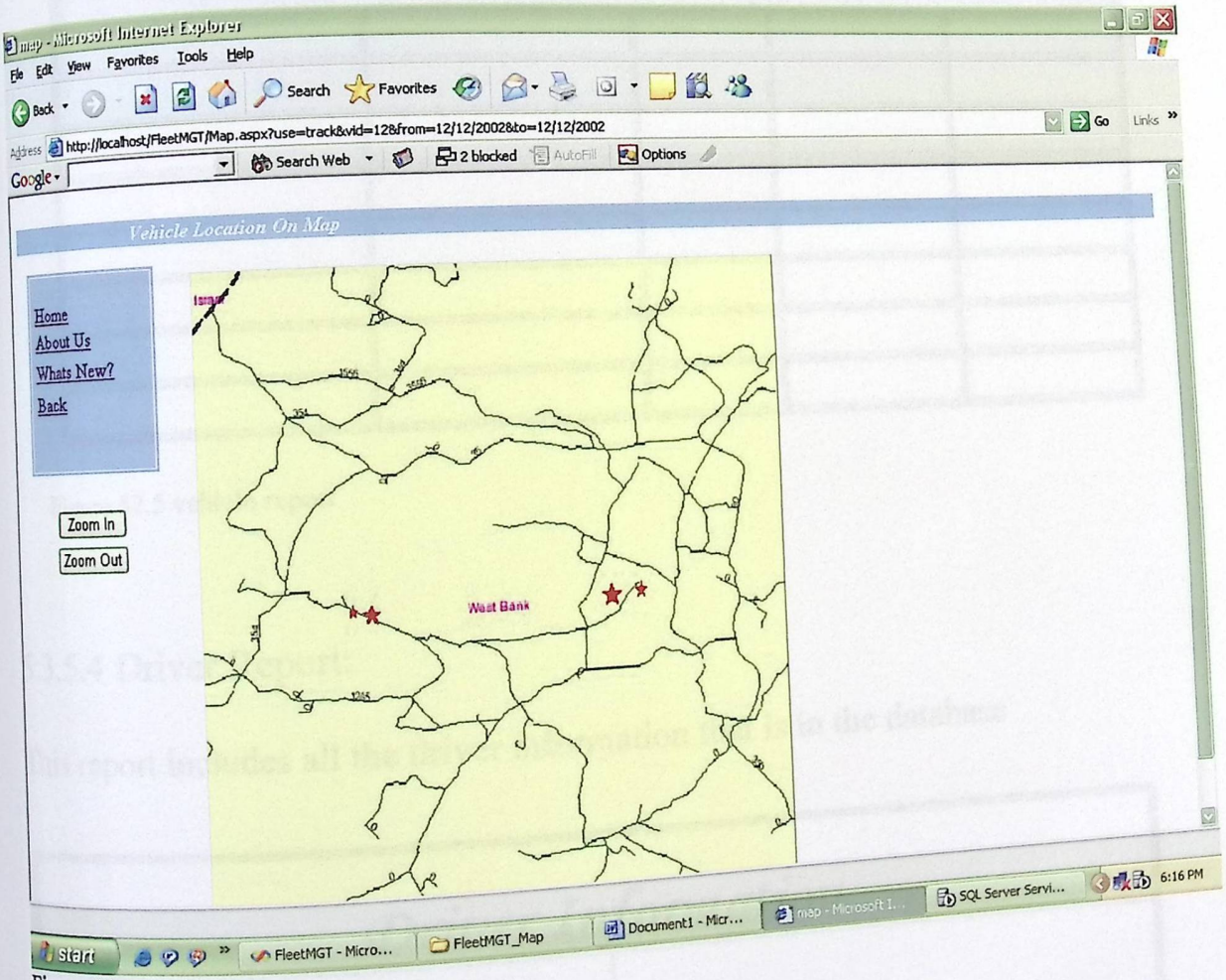
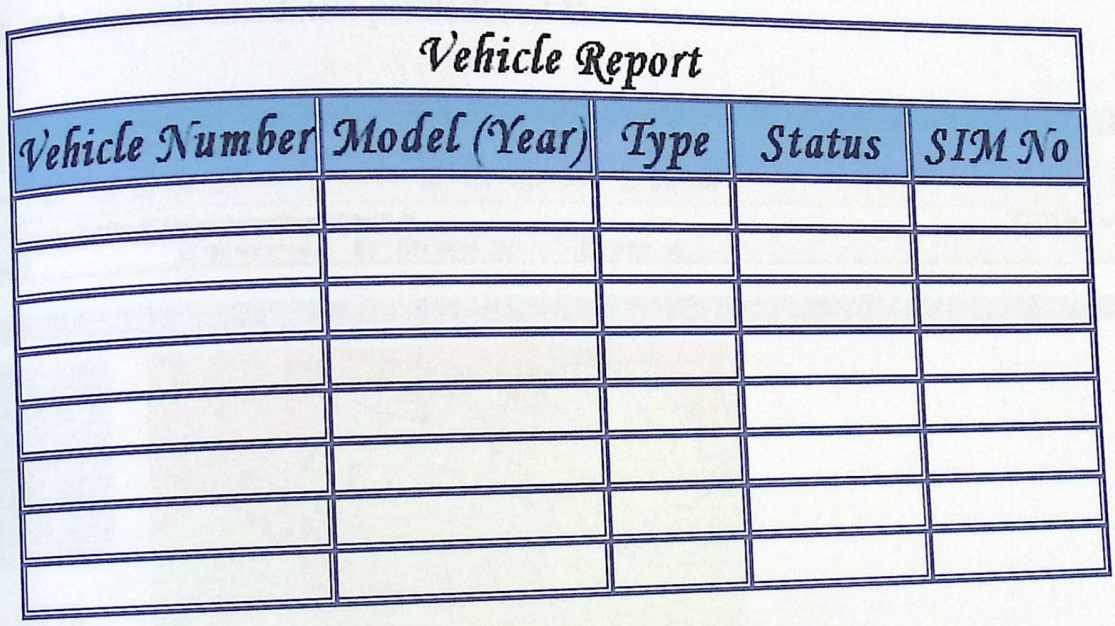


Figure 51.5 tracking page

5.3.5.3 Vehicle Report:

This report includes all the vehicles information that is in the database



Vehicle Report

Vehicle Number	Model (Year)	Type	Status	SIM No

Figure 52.5 vehicle report

5.3.5.4 Driver Report:

This report includes all the driver information that is in the database

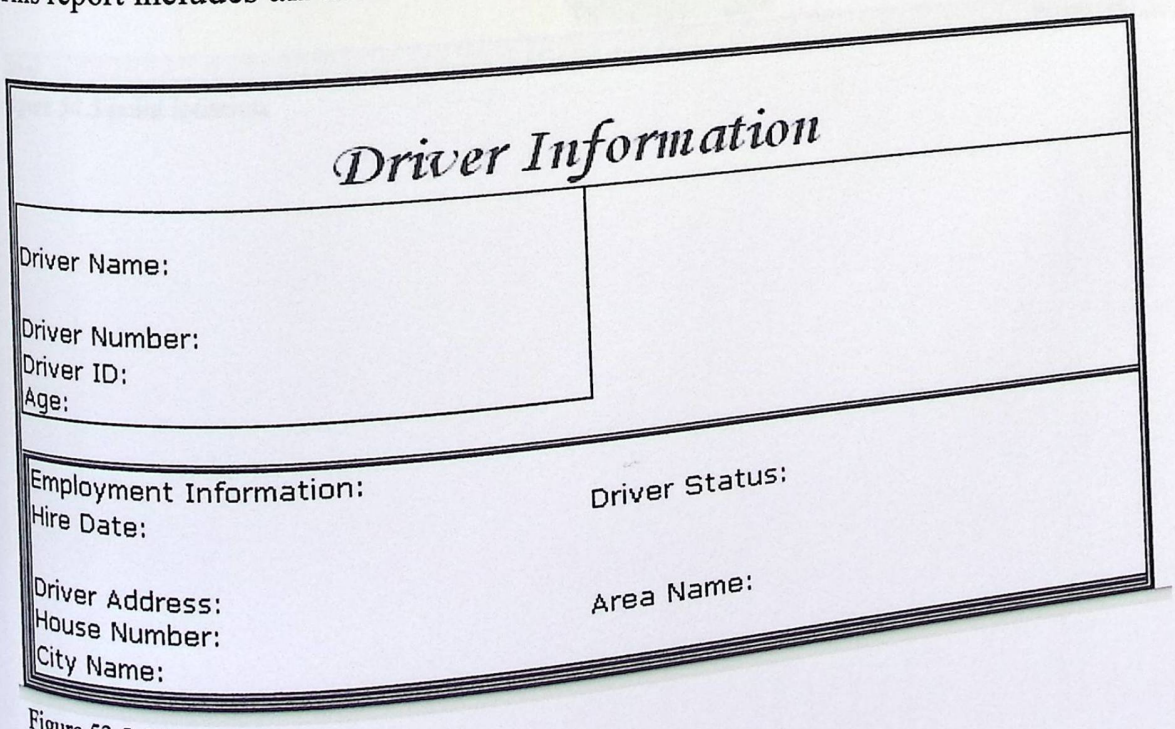


Figure 53.5 driver report

5.3.5.5 Point Location

This form comes after the user finish from entering points to the database, and the result of the entered coordinate points X and Y.

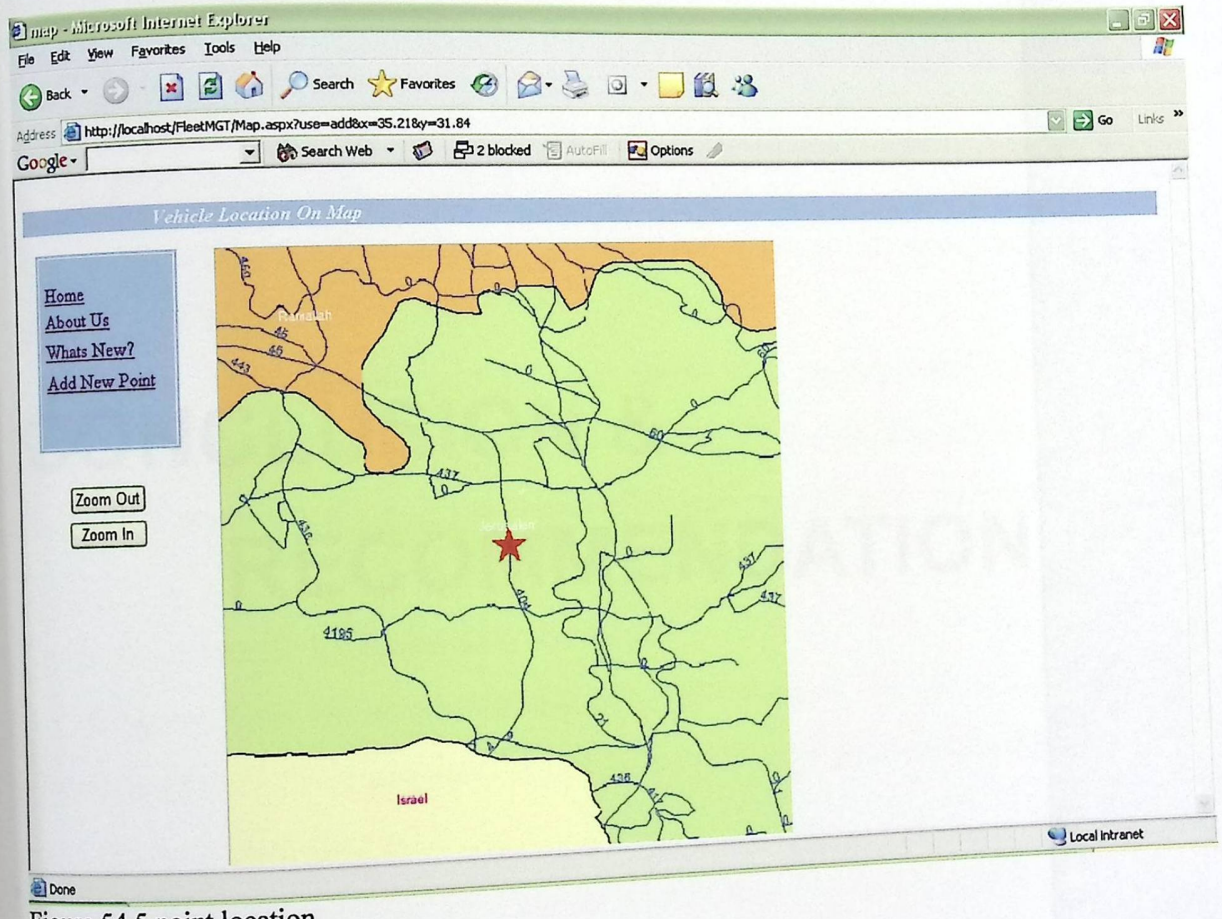


Figure 54.5 point location

CONCLUSION & RECOMMENDATION

CONCLUSION & RECOMMENDATION

Conclusion

The Fleet Management Project satisfies the needs of the customers which need to control the location of their vehicles on the map, and to track their vehicles at a certain period of time viewing the vehicles history. In our project the main work is concentrated on the administrator, the administrator account has all of the permissions needed e.g. adding and updating the database. In our project we don't need to delete any operation since all information entered is needed to satisfy the current and future project needs.

On the other hand the normal user has limited permissions; this user does not have the ability to update any information in the database, but is allowed viewing of some results or reports including viewing vehicle location.

Our project was divided into five chapters:

Chapter One is an introduction to the project, its objectives and an overview of GSE, the company that supported the project with needed maps to meet the project objectives.

Chapter Two includes the functional and non-functional requirements.

Chapter three contains analyzing the system features, modules I/O design and screens, DB design, and test plans.

Chapter four discussed the implementation of the project including the DB, I/O and all objects and modules.

The last chapter discussed the testing and quality control and quality assurance of the whole work carried out by the team to ensure all components function correctly as required and as described in the "functional and non-functional requirements".

Recommendations

Our recommendation as a team and after careful study of this project, we feel that a further development to this project would be finding the best path for the vehicle.

Another suggestion for further development would to automatically track vehicles locations on-line and in real kinematics time.

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