E-Road Management System

Software Requirements Specification Document

Sri Lanka Institute of Information Technology

Special Honors Degree of Bachelor of Science in Information Technology

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E-Path Identifier

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Declaration

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Introduction

1.1. Purpose

This document defines the Software Requirement Specification for the E-Road Management System (ERMS).
The ERMS will provide a real time "traffic, accident and road block" attentions to the Clients through several ways.
Clients can access this system through mobile phones and desktop or laptop computers.

The purpose of this document is to give an outline of the functionality and the technology requirement of the E-Road Management System (ERMS).

It is ensures that the software requirements of this proposed system are understood by the Research and Development team. Overall Description and Specific Requirements of this document contains details description of the software component which is going to be implemented.

The second part of this document contains Research Review Document (RRD) of this system. Statement of work, project plan and project constraints represent the main chapters of that document. It will help to do works in order, identify risks and do risk management.

At the end of this document mention, specific deliverables, output components of the proposed project. Supporting information consist with appendix and other supportive materials.

This document is intended for several types of readers. Therefore document is writing according to the standard format unambiguously.

1.2. Scope

This document covers the user expectation and helps to get a better understanding about the proposed project and the research criteria, and this document expresses all the requirements, overview, main goals and tasks of the proposed E-Road Management System for the Motorist.
Further it defines the product perspectives which compare the system with other related competing products. It also provides product perspectives and details of the design process.

Requirements are categorized in to functional requirements and non-functional requirements.
Functional requirements are associated with specific functions, task or behaviors the system must support.
Non functional requirements are the constraints, on various attributes of these functions or task which have to pay more attention.

Now a day's mobile phone have become part of humans life and it having all the abilities that a computer having, most of the time it's more preferable because of its portability.
Mobile applications can now be developed to deliver any type of data or information to any sought. It is very important to develop that kind of mobile phone based traffic controlling system for motorist, because in real time it way helps the user in many ways.

The E-Road Management System broken into four different modules they are:

- E-Path Identifier
- E-Destination Management System
- E-Statistical Analyzer
- E-Mobile Tracker

E-Path Identifier, This is the module the attention is mainly focus on the reducing the traffic by indicating to the system as soon as it's possible, to meet all requirements our system provide services to Client.

- Objectives :
  - ERMS provide best path to the Motorist with the help of Google Map. By avoiding traffic, accidents and road blocks.
  - In real time ERMS will be updated through a mobile base application.
  - If any accident happens, after the authorize person update the system. The system automatically looks for nearby Hospitals, Police Stations and send emergency alerts (using auto generated SMS & mails). And direct them to the point with the help of Google Map. All this happen in a short amount of time.

- Goals :
  - The existing traffic control system in the developed countries is static and it does not have automated response to emergency vehicles .The passage of emergency vehicles are not dynamically controlled and have to be overlooked by the traffic personnel for faster passage. There is no support for providing a fast passageway for emergency vehicles.
- Benefits :
  - Optimization of traffic flow by synchronization between neighboring traffic signals.
  - Ensuring faster passage for emergency vehicles like ambulances, fire engines etc...

E-Destination Management System, this module helps to improve efficient transport services and destination management services such as tourism.

- Objectives :
  - Client can search a place (e.g. Colombo) and in on enter, the system will provide with pointing the place in Google Map and pointing all important locations in that place just like Hotels, Schools, Hospitals, Airport, Railway Station, Police Station.
  - Transport services shown to user input destination and routes. All shown to the user graphically.
  - All Hotels, Hospitals, Railways, Airports, etc… personalities are provided from an authorized web page (profile) there they can update their services and can provide services to our Client such as online reservation. After Client Search the place in Google Map and click on it Clients can view this page or profile.

- Goals :
  - The goals that are achieved through this module is providing better tourism services, Tourism industry in Sri Lanka largely focused on media based marketing and promotion during and after the tsunami, yet, some innovative marketing promotions were required for recovering the confidence of potential tourists, especially in UK, Germany, and Italy.
- Benefits :
  - Transport services plays a huge role in a growth of a Country and tourism provides is the major income in our Country. To get gain more income, ERMS provided with a web base system.

E-Mobile Tracker, portability and mobile phones usability in this modern environment force to develop and inherit all the features that carries in EPI and EDMS.

- Objectives :
  - Using a mobile phone also Clients can get to know or identifies best path by entering the destination point.
  - If Client needs the system will provide alternative transport services pointing in Google Map such as Bus stands, Train stations and flight services. After having a look whether our Client like to reserve tickets they can reserve tickets through our system.
- Goals :
  - Improvement and development of new business models requires mobile providers to accurately understand their subscribers' usage.
- Benefits :
  - Third-generation (3G) mobile networks are opening the way for access to an ever-expanding array of

high-bandwidth applications and data services to mobile subscribers.

- Mobile operators, the need for service differentiation is urgent.

E-Statistical Analyzer, The best idea to plan the future is get to know the past. And this is the module carries out the research in past motor ways.

- Objectives :
  - Auto generated statistical graphs between population, accidents, vehicles and more.
  - Simulator, this is use to get to know how it will look like if any change happens in population, vehicles, etc. When the Client input some values in any of those the following outcome will arrives by studying the past stored data in the system.
- Goals :
  - Traffic flow is difficult to predict. It is influenced by a multitude of factors, including the behavior of individual drivers. This makes management of the traffic flow an uncertain business. It is impossible to predict the traffic volume, as drivers' destinations are unknown and their plans may change depending on the road situation.
- Benefits :
  - Manage a variety of input files for multiple scenarios.
  - Compare output results from multiple simulation runs.
  - Generate nicely formatted reports, and charts for inclusion in reports and presentation slides.

1.3.Definition, Acronyms and Abbreviations

1.3.1 Definition

- Mobile Application :
  In order to develop a mobile application, it will do mobile programming using suitable programming language.
- Traffic Controlling System:
  The **Traffic Control System** gives guidance to motorist, to prevent collisions and manage efficient traffic flow.
- Simulator:
  Simulation is the imitation of some real thing, state of affairs, or process. The act of simulating something generally entails representing certain key characteristics or behaviors of a selected physical or abstract system.

1.3.2 Acronyms and Abbreviations

Acronyms	Abbreviations
3G	Third generation of mobile phone standards and technology, superseding 2G.
API	Application Programming Interface.
DBMS	Data Base Management System.
GPRS	General Packet Radio Service.
GUI	Graphical User Interface.
LAN	Local Area Network.
SRS	Software Requirement Specification.
RRD	Research Review Document.
SMS	Short Message Services.
URL	Uniform Resource Locator.

1.4. Overview

The major objective is to implement a system that can be run automatically when an accident or road block or traffic identified in a particular road. That points Geocode comes as an input, and provide the alternative path to our Clients.

As modern societies move toward fast growing and generalized World and more governments enact laws to protect each and every individual, the management and development of roads reach the higher place with the advancement of Information Technology in this World; the road management should take advantage to upgrade their management techniques. In addition, the mobile nature of today's mobile administration requires immediate information access and total flexibility. This technology comes through as the optimal portable solution for information access, management and improved communication, while providing the strongest security measures in the market today.
Clients should be allowed to access the system anytime, anywhere and through mobile or through their personal computers. Administrator should be able to keep update the system through sending sms to the system or by accessing to the system through the internet or update through internet access able cell phones. Anyone should be able to share resources and exchange ideas through the internet.

The motivation for this research is to solve the traffic, road blocks, accident's, inform the Client about the pre-planned road blocks from the government, statistical graph generations, place descriptions and provide better transport services to the Client.
A system and method for real time vehicle guidance by Central Traffic Control Unit are presented.
The proposed E-Road Management System includes a unit equipped with Individual Mobile Units (position determining system adapted to determine their present position) and communicatively linked to the E-Road Management System computer server.
The ERMS unit broadcasts the update traffic patterns in real time, thereby enabling the Clients to dynamically calculate the desired optimal travel paths. With regards to the above problems, our team comes across with the solution called **E-Road Management System.**

2. Overall Descriptions

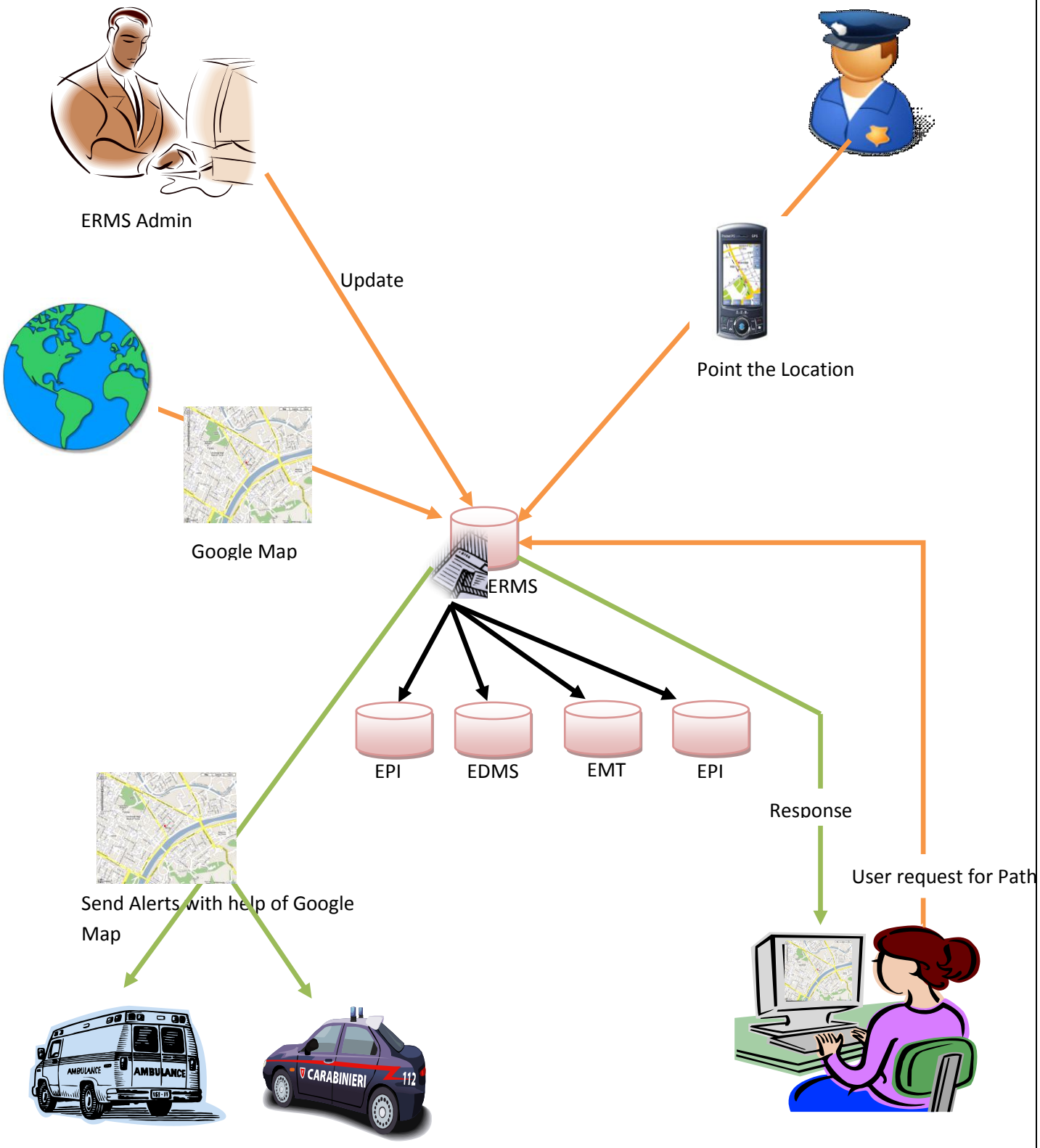


Figure -1-

2.1. Product perspective

Most of the software that are available today related to this topic does not do both of this functions that is monitoring the traffic and providing the alternative path. Traffic Monitoring and providing the alternative path is aimed on EPI system that goes through a lot of trouble in allocating the alternative path according to the user requirement with the help of Google Map. Traffic Monitoring and Bandwidth Allocation should be user-friendly and reliable software for the above purpose.

2.1.1. System Interfaces

EPI is a .net developed product and it has been developed to work with any operating system. The plan is to have a machine assigned as a web server and for that machine, Windows-7 Operating system will be used as the developers are familiar with it.

The web site will be supported by any web browser. Therefore there the users of the website are also free of from any Operating system.

2.1.2. User Interfaces

Creating the user interfaces using the Visual Studio 2010 software needs complete knowledge about the software and use of C#. In section 3.1 sample contents of the EPI's pages is available. It is a must to inform, that an ERMS web site is open for any user and therefore the web pages may slightly be altered in the end product.

2.1.3. Hardware Interfaces

There are no special hardware interfaces that EPI will need as its main input devices are mouse and the keyboard. The main output device will be the computer monitor. However in a special circumstance such as indicate or update system may require an mobile phone that run on EPI application.

2.1.4. Software Interfaces

Visual Studio 2010 software will interact with a relational database- MSSQL. In order to do so it needs a web server. This product is planned to use MSSQL web server. As the back end coding of the web site is done using C#.

2.1.5. Communication Interfaces

As the web site is developed is in a machine acts as the server machine, users of the web sites needs an internet connection to use the web site. Therefore a modem to connect to the internet and an interface for the modem is needed. As the database grows there will be a need for a Database server as well, in that case a high speed network connection between the application server and the web server must be created.
So at such a point some more communication interfaces may needed and the least expensive fastest available connection will be used according to that time.

2.1.6. Memory Constraints

- The recommended minimum requirements are as follows;

  For a single computer

  RAM - 256 MB

  Storage - 40 MB

2.1.7. Operations

- Validating User

  Identifying whether the user is an existing user of the system or a new user. If the user is an existing user, the records will be stored under his profile in the database. If the user is a new user he or she will be instructed to get membership through the user login.
- Getting lat and lag

  The system receives the point that is send by the assistant through EPI enable mobile phone to the ERMS. After receiving the polygon the system automatically update the ERMS.
- Analyzing Road Block Type

  The recorded and stored message will be analysis to get to know the type of the road block.
- Provide Best Path

  The conclusion gained from the ERMS by update the system. When a Client for a best path by avoiding the accident points he or she will get best path with the help of the Google Map.
- Provide Alert

  If the patient is in a critical state according to the conclusion made, an alert will be sent to the doctor to take an immediate action.

2.1.8. Site adaptation requirements

The system minimum requires an internet modem or a router as hardware components. These components should be connected to the personal computer before the access to the ERMS website.
And 3G mobile phone to access ERMS mobile service EMT.

2.2. Product Functions

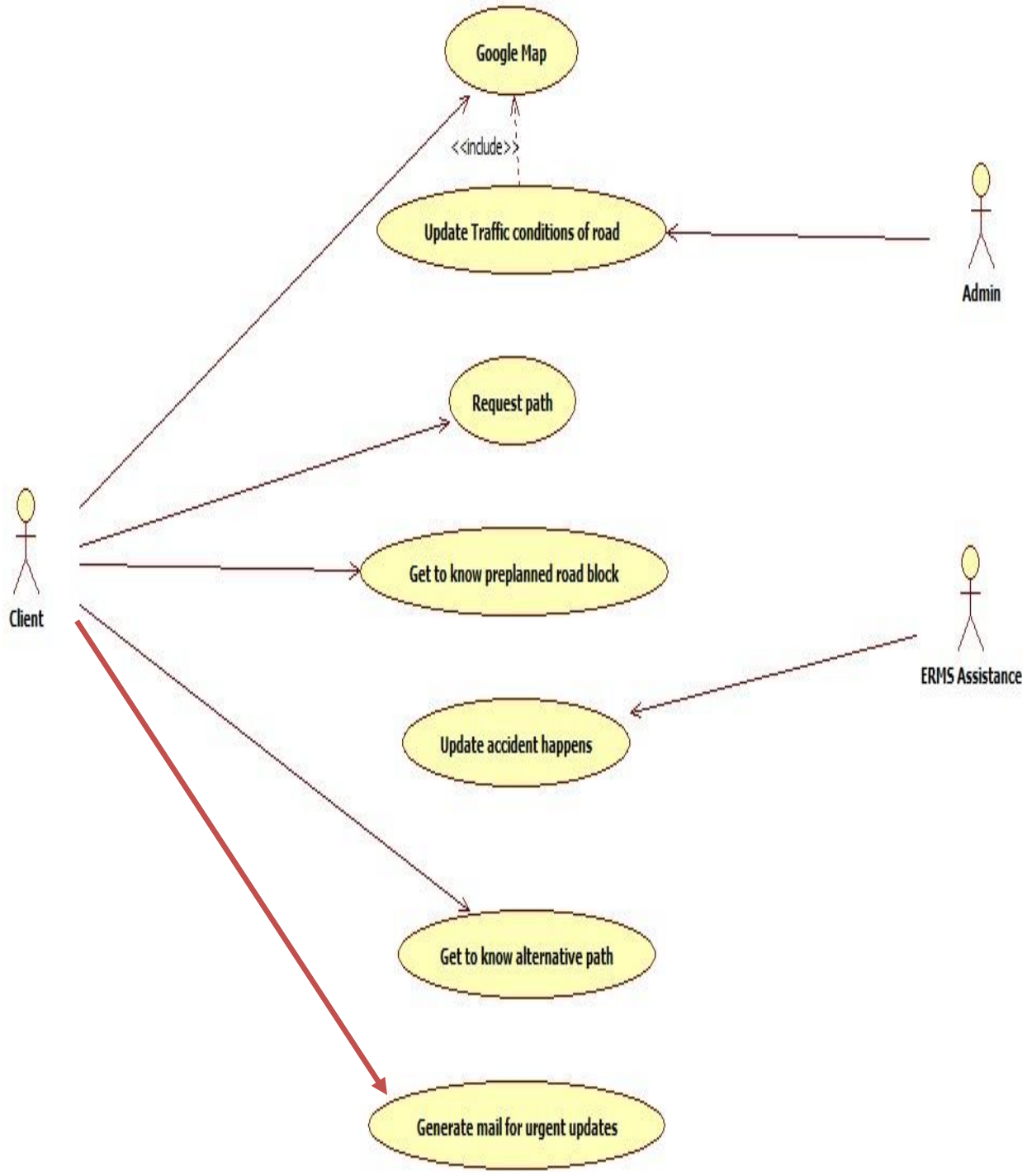
This products basic outcome is a website and a mobile application. However there is a large scope of details to be learned in the practical approach, which must be emphasized.

Basically the developers must learn the ERMS software and have to develop:

- Providing proper Authentications
- Providing proper Authorizations.
- Providing mobile access facility.
- Providing E-mail facility.
- Facilitating advertising.
- Facilitate Commenting.
- Managing per planned road blocks -Therefore a relational Database creation.
- Creating a search engine for best path which supports free text, efficient search.
- Designing and tuning the database to support the searches to best path.
- Creating supportive help documents.
- A facility to ask for help from system admin.
- Proper user management policy.

The development team also has to:

- Make the EPI user friendly and attractive.
- Manage information at the beginning for a period of time until the EPI get established.
- Do an EPI promotion.


Google Map
<<include>>
Update Traffic conditions of road
Admin
Request path
Client
Get to know preplanned road block
ERMS Assistance
Update accident happens
Get to know alternative path
Generate mail for urgent updates

2.3. User Characteristics

Anyone who is familiar with internet surfing can use EPI. Still if some users are new to websites they also can learn how to use EPI easily by the supplied help documents or the helping facilities.

However to create and edit a page in EPI user got get registered with ERMS and have to have a considerable computer literacy.

2.4. Constraints

To develop EPI developers needs Visual Studio 2010 software and MSSQL DBMS. It is must to have a web server like IIS etc... It is also essential to have the application server to have an internet connection.

For the users of EPI must have a connection to the internet and have to use a web browser.

2.5. Assumptions and Dependencies

When the proper user management policy is developed the EPI's reliability will be maintained. Furthermore EPI has to depend on users to feed more and more information to EPI database and users to maintain EPI, which means an assumption is made that users are familiar and supportive to collaborative web site development concept.

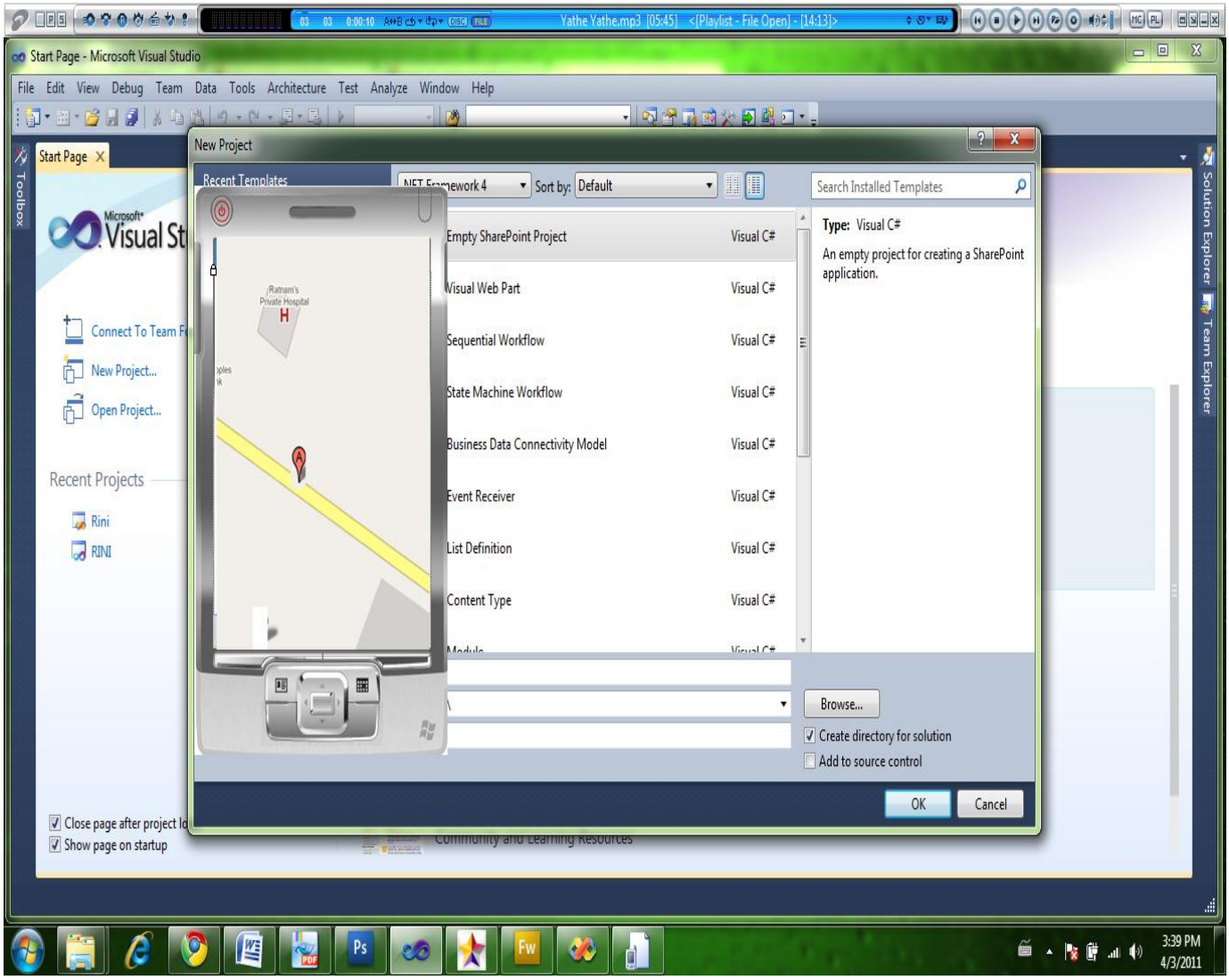
2.6. Apportioning of Requirements

The basic functionalities described in section 2.2 will be developed. However slight change in the skin of EPI and the user management policy may be altered in order to provide more user friendliness, security and reliability of data.

3. Specific Requirements

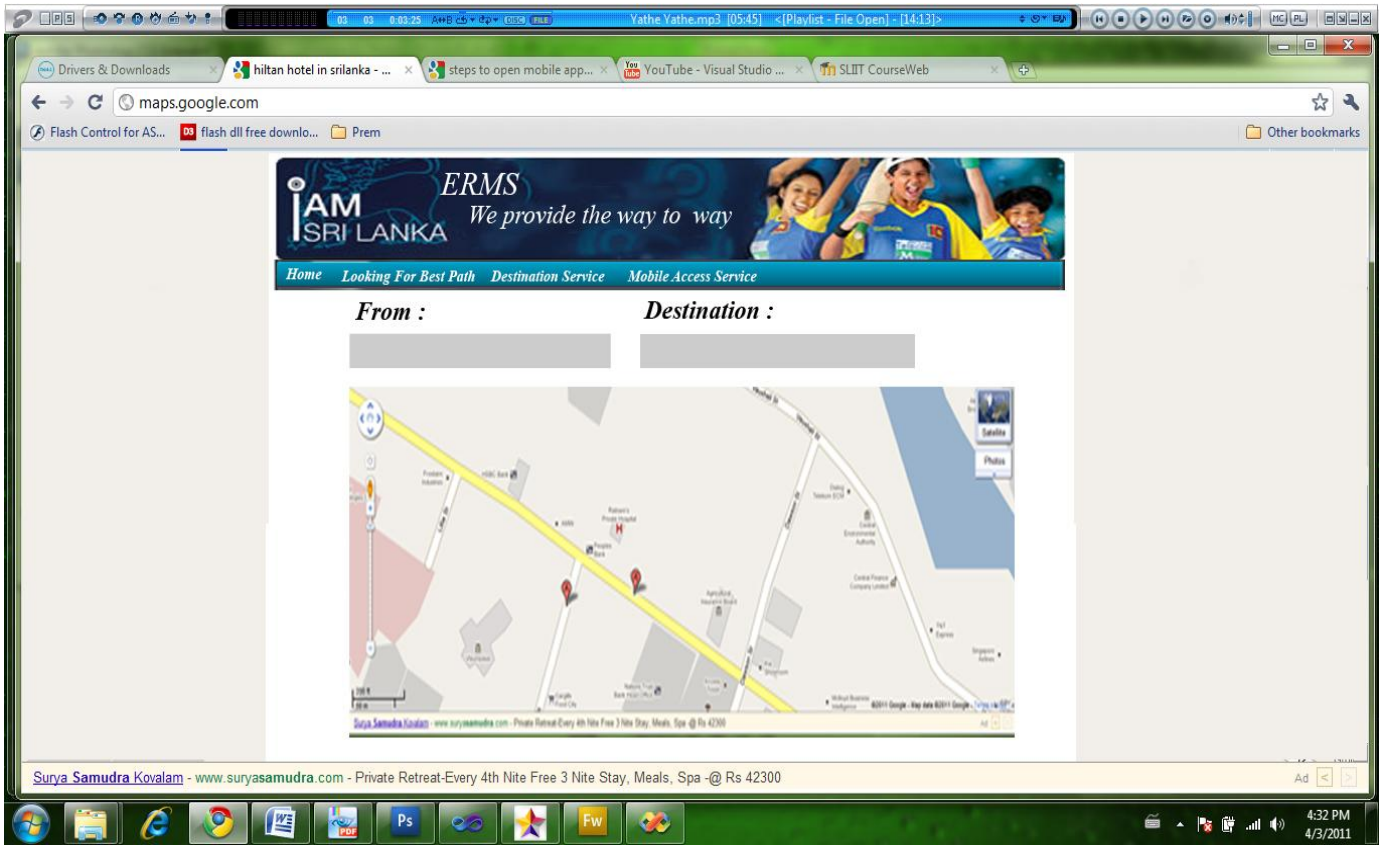
3.1. External Interface Requirements

3.1.1. User Interfaces



This is the first interface that Admin face while he or she try to update the system through the mobile application through this Admin can update the system EPI.

In the next step admin receive this interface; there the Geocode text area will be automatically appearing. Then in the “Alert Message Type” text area Admin have to enter whether it is a traffic or road block or an accident.
After receiving the message system will update the ERMS Database.



When Client needs a best path, this is the interface ERMS Client get.
In the given text area they have to enter “From” and “Destination”.

3.1.2. Hardware Interfaces

In this system developers use many hardware interfaces to full fill the system needs. One thing is 3G Mobile phones. Mobile phones used to update the system from the EPI Admin movement in traffic area. This hardware carries a mobile software application that is developing by the EPI module under ERMS. The idea behind this is when we access the Google Map using the 3G mobile phones the Google map will appear with the current location where the user is.
Then the developers of the EPI planned to use this as the one going to indicate the road block location. The mobile application gets the Geocode (lat and lag) and send to the system.
By not using any other expensive devices this will be a good cost effective system, very fast and effective.

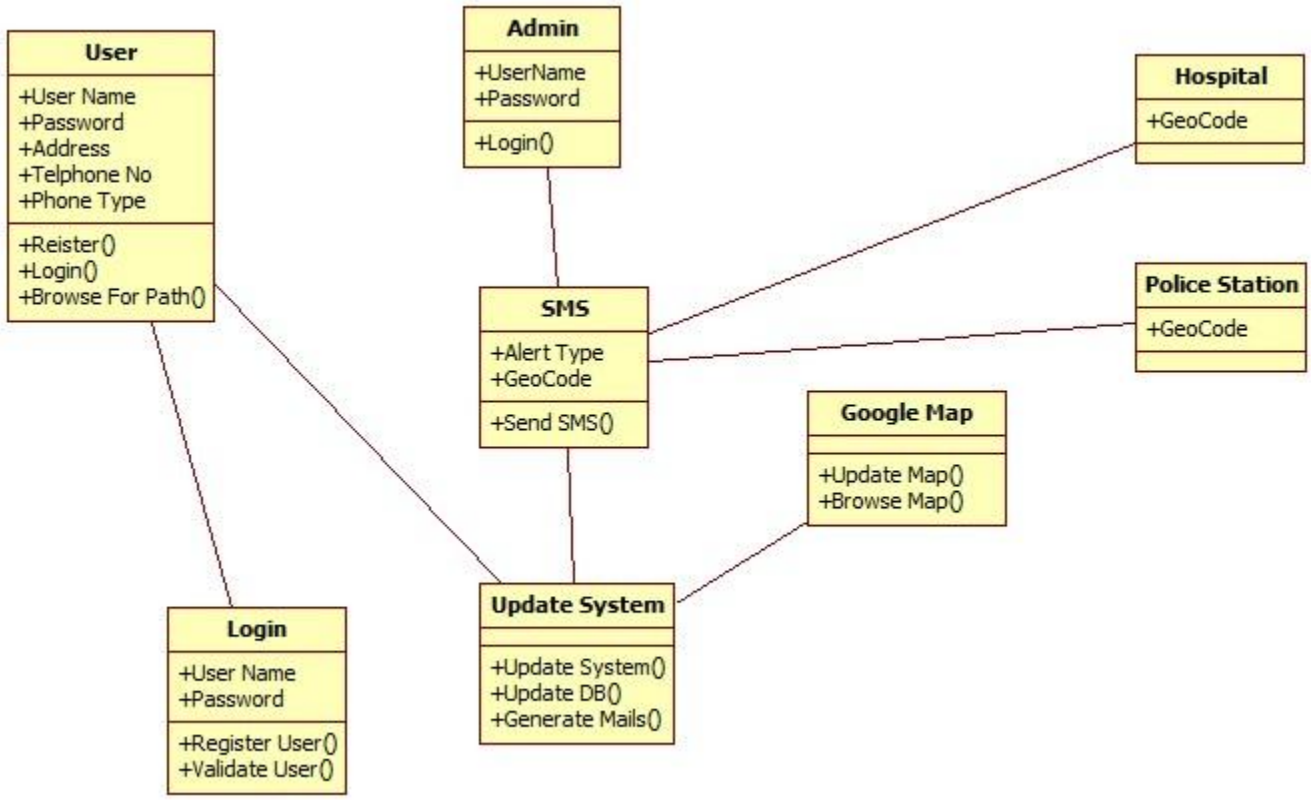
3.1.3. Software Interfaces

As developers say our main system is running under server and administration machine. In server developers must to use .Net frame work 4.0 or later, SQL server 2008 or later, Fusion Charts for charting purpose and Flash player.
In administration machine wants .Net frame work 4.0 or later and Flash player.
If any user use web edition from any reason he want to install flash player in their computer.

3.1.4. Communication Interfaces

In communication developers want to use modem, switches or router for networking and surf the internet.
Use GSM network to send and receive SMS. Use point to point links to connect each and every junction with the server.

3.2. Class / Objects



The EPI module's primary task is to capture the Admin input from the mobile phone and that's help the system to prepare an alternative paths.

- Receive SMS - This module will be responsible for track the input SMS, analysis it, get what type of block is it and to update the ERMS DB from EPI module.

- SEND Alert SMS and Mails – If the system got a message saying an accident, soon after system search for hospitals and Police station of that location and send emergency alerts.

- Alternative Path Request - If user request for best path in the system with the help of the Google Map system responds to the user.

3.3. Performance Requirements

Requirement for best performance of the system are a CPU with an 1800MHz speed and 512MB RAM. Because the system will mainly focuses on performing functions by it.
Also Admin should communicate with the system as soon as possible and also need to verify the current mood state of the roads to provide best path to user to this Admin need 3G mobile phone that is enabled with EPI mobile application.
If the Admin state that need immediate attention in a particular location then the Alert must be send to the Hospitals and Police stations very fast.

3.4. Design Constraints

The system use SMS recognition tools to identify the location using Geocode. After getting the Geocode system update in the Google Map that is hosted in the ERMS. So all these function depends on SMS recognition analyzing tool. Therefore, it could be some kind of limitation.

3.5. Software System Attributes

3.5.1. Reliability

The Reliability is an important factor for this application.
This system is de-played as a traffic controlling application which monitors traffic status. The ability of the system or a septic component to measure that traffic status in a given period of time under required functions with suitable conditions is an important issue of the system.

In detail, the consistency of the system, or to give alternative path or to send alert messages the same way each time it used. The system contains hardware and software. Therefore hardware reliability and software reliability should also be considered. The Reliability of the product should be high and quantitatively it can be specified as Mean Time to Failure (MTTF) of greater than 10000 working hours.

3.5.2. Availability

The specific system outage (system down time) is not required for the application and system availability is totally dependent on the reliability of the system.

3.5.3. Security

Access In to MSSQL database may be restricted. Even other colleagues cannot access without having authorization of the specific physician. The user (physician) will be assigning for a unique password for login to the system. Means applications are fully password protected. MSSQL server such security to prevent security violations.

3.5.4. Maintainability

The system is designed as a product of research done along with a new feature and new ideas to prevent traffic. So new functions can be added further more. It could be vary according to requirements without changing the source code of the system.

3.6. Other Requirements

4. Supporting Information

4.1. Appendices