Assisting Sri Lankan Licensed Surveyors By Software To Manage Court Commission Surveys

Court Commission Management System

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Abstract* – The Court Commission Management System (CCMS) is proposed as a solution to manage the heap of work which has to be faced by Licensed Surveyors & Court Officials in Sri Lanka. This report describes the design and implementation details of automating this work overhead of Surveyors. This system mainly support with functionalities like recording court commissions, updating them with daily events and generating reports regarding commissions. CCMS is designed according to the Model-View-Controller Architecture (MVC) Pattern & Client-Server Architecture Style. It is designed as a web application using Symfony Framework which is best suited for MVC pattern. Doctrine Library is used as the Object Relational Mapper to integrate with MySQL database and triggers. As the final output, CCMS acts as a tool or an assistant to manage court commissions' daily tasks and reports. Therefore this can be viewed as a great work reliever for hundreds of Licensed Surveyors all over the country.

1. INTRODUCTION

1.1. Background of the application domain or problem

Land related dispute resolution in Sri Lanka follows a common procedure involving a Court Commission and Licensed Surveyors. A Court Commission is informed by the relevant Court applicable to the region of the land so that the surveyors are given with the task to prepare a plan for the disputed land. This is informed through postal system in the country.[1]

In this process the licensed surveyor examines the details of the disputed land and prepares the plan by surveying, which is a task consuming both time and effort. So it needs to be managed for every event happening in the Court Commission until the required plans and documentation are prepared.

Due to this tedious process, many licensed surveyors experience considerable confusions and stress which leads delays in delivering the survey plans for troubled lands. Therefore this project is about assisting the management of court commissions for licensed surveyors with functionalities such as recording and maintaining commission on daily basis and generating report on them while maintaining a complete log of all events.

1.2. Motivation for the selected system development

Not only the surveyors and clerks but also the people also have to face for several court days because the surveyors sometimes cannot complete the surveys on time due to number of commissions per a surveyor is high. Therefore, having identified these circumstances, a sophisticated system to manage court commissions is obviously needed.

By developing such a huge system for this type of situation, one can learn many technologies and methodologies about software engineering and project management. Therefore all these things can be viewed as the motivation for the selected system development.

1.3. Importance and main purpose of the system

CCMS is targeted for two type of users. They are Licensed Surveyors and Court Clerks. Main purpose of the system is to act as an efficient assistant for managing court commission work.

1.4. Overview

This document provides a well-defined introduction of the Court Commission Management System with its requirements, elaboration, development, testing and deployment.

2. LITERATURE REVIEW

The CCMS is a web application based on MVC architecture pattern. Model is the he lowest level of the pattern which is responsible for maintaining data. View is responsible for displaying all or a portion of the data to the user. Controller is the software code that controls the interactions between the Model and View.

Client-Server architecture style is used for CCMS. Browsers like Firefox, Google Chrome and Internet Explorer (after version 7) can be viewed as clients and they are used by both types of users. Server is where the functionality and database schema & data are stored.

Symfony Framework [2] is used to develop the system using NetBeans IDE [3]. It can be viewed as the leading PHP framework to create websites and web applications. Built on top of the A set of decoupled and reusable components. Symfony conforms to the MVC pattern completely [4].

MySQL is used as the technology to implement the relational database of the system. The audit system of CCMS is completely based on MySQL TRIGGERS which are automatically triggered when a predefined event occurs in the system. [5] MySQL Injection is assisted by the doctrine symfony itself by using prepared statements with the help of setParameter(variableName, variableValue) function.

Doctrine Library is used as the Object-Relational Mapper by integrating in Symfony Framework. [6] It allows the developer to consider the database relations as objects. The whole database schema is created and maintained using Doctrine Annotations and symfony commands. [7]

For security, Biba model [8] in which the lower level objects and users cannot alter the information of higher level objects and users, is used. In the system, Licensed Surveyors are high level users whereas Court Clerks are low level users. Password Hashing is used as a non-cryptographic technique where the real password is never saved in the database. It was done by SHA1() – Secure Hash Algorithm 1. [9]

Parsley Validation Library is used for client side validation of user text fields and inputs. Singleton design pattern is used when storing the current user and his/her required details. For that, session object is used to store the current session. [10]

3. SYSTEM MODELS

3.1. System Requirements

Functional Requirements of the system are creating detailed accounts for users, user settings functionality, creating court commissions, editing them, making a report and a complete audit of the system to view what the user has done.

Non-functional requirements of the system are usability, reliability, performance, and supportability and security.

Figure 3.1.1 and Figure 3.1.2 show the use cases involved with each user. Figure 3.1.1 depicts the use cases involved with the licensed surveyor whereas Figure 3.1.2 for the court clerk. In common, both users have account activity use cases such as registration, account editing and deletion. But for a licensed surveyor, use cases such as creating, editing and deletion of commissions, uploading files to events and report creation is involved. Special use case for a court clerk would be a search for a numbered commission in the system.

3.2. System Design

Figure 3.2.1 shows the class diagram or the logical view of the system. Main models are the User, Commission, Party and FinalReport. Surveyor and Clerk is inherited from User and PartitionFinalReport is inherited from the FinalReport class. Block class is used to manage blocks of land in relevant court commission land. Party is a person but since it is not a user of the system, it is kept separately.

Figure 3.2.2 shows a main activity in the CCMS which is court commission creation. There all the details regarding a commission is recorded. The notice letters that are to be mailed for land parties are automatically generated from the system because all the names and addresses of parties are added to the system while entering commission details. Then those letters can be printed or downloaded to users' personal computer.

Figure 3.2.3 shows the database design of the system. The database schema is normalized into 3rd normal form.

4. SYSTEM IMPLEMENTATION

4.1. Implementation Procedure

The CCMS is a web application based on MVC architecture pattern and Client-Server architecture style. Browsers like Firefox, Google Chrome and Internet Explorer (after version 7) can be used to access the application from anywhere.

Symfony Framework is used to develop the system using NetBeans IDE and it conforms to the MVC pattern completely. MySQL is used to implement the relational database of the system. The audit system of CCMS is completely based on MySQL TRIGGERS which are automatically triggered when a predefined event occurs in the system. The database relations are created using doctrine annotations and symfony commands. Doctrine Library is used as the Object-Relational Mapper. It allows the developer to consider the database relations as objects.

For security, Biba model is used. In the system, Licensed Surveyors are high level users whereas Court Clerks are low level users. Password Hashing is used as a non-cryptographic technique where the real password is never saved in the database. A hash value derived from Secure Hash Algorithm 1 – SHA1 is saved and when a user tries to login, the system will check if the given username/email exist in the database and if it exists, then the system will compare the hash value of the given password with the stored hash value. If they are equal, then only the user will be granted access. MySQL Injection is assisted by the doctrine symfony itself by using prepared statements with the help of setParameter(variableName, variableValue) function.

Parsley Validation Library is used for client side validation of user text fields and inputs. Singleton design pattern is used when storing the current user and his/her required details. For that, session object is used to store the current session. Bootstrap libraries are used for user interface creation and to gain the responsiveness. JavaScript coding is done to have client side functionalities like adding multiple contact numbers, licenses, plaintiffs and defendants.

Following pseudo codes explains the user login scenario and file upload scenario.

User Login

```
If (user login request is POST) {
    If (given username exists in the system) {
            storedHashValue ← getPassword(username)
            givenHashValue ← sha1(given password)
            if (storedHashValue == givenHashValue) {
                    allow access
            } else {
                    message "Password is incorrect"
            }
    } else {
            message "Username is invalid"
    }
} else {
    message "System error"
}
```

Generally, the user enters the username and password to log into the system. Then the system will check the username availability in it. If it is not available, the system will notify the user about it. If the given username is available, then it will check for the stored hashed password value of the account. That value is compared with the new hash value obtained by hashing it by SHA1. If those two values match each other, then access is granted and denied otherwise.

File Upload

```
If (filetype is in allowedTypes[] ) {
    If (filesize <= allowed size) {
            Store file in database
} else {
    Message "File is large"
}
} else {
    Message "invalid file type."
}
```

When a file is to be uploaded, the system will check its type and checks if its' type is allowed in the system. CCMS allows pdf, jpeg, png, bmp and rar types. If the uploading file is a valid type then it’s size will be checked. If it is too large the user will be notified. But the system has the ability to store a file of 10MB for each upload.

4.2. Main Interfaces

Figure 4.2.1 shows the login interface and homepage. Figure 4.2.2 shows the signup form for user details. By clicking ‘Add New Contact’ button, user can add many contacts he wants. Figure 4.2.3 shows the signup form for LS details. It appears after entering User details. By clicking ‘Add New Court’ and ‘Add New License’ buttons, LS can add many courts and licenses he wants. Figure 4.2.4 shows the signup form for CC details. It also appears after entering User details. Acknowledgement Page for successful user registration is shown by Figure 4.2.5.

Figure 4.2.6 shows the Account Homepage for a Licensed Surveyor. Currently working commissions are in the given table. LS can edit or delete them. Figure 4.2.7 shows the Editing a court commission. LS can add a new event to the Commission. Or when he finished surveying one block of the land, he can enter a new block. Required files (maps, text files) can also be uploaded. Interface for creating a new court commission is shown by Figure 4.2.8. Any number of Plaintiffs and Defendants can be added as needed per each court commission.

Figure 4.2.9 shows the Account Homepage for a Court Clerk. Court commissions handled by court clerk’s working court is displayed in the lower table. Search bar is used to find a numbered court commission from the table. Figure 4.2.10 shows the entered court case numbered commission emphasized below in red if it is present in the system. Figure 4.2.11 shows the System audit for CCMS administration. Figure 4.2.12 shows the User logs, Clerk logs, Surveyor logs, Commission Logs which are viewed according to the users.

5. SYSTEM ANALYSIS & TESTING

This web application is designed by Symfony framework. So that the application inherits great functional performance mixed with developers coding behaviour. Database is accessed and manipulated in a secure manner using transaction. SQL Injection is prevented using prepared statements in doctrine. Therefore the consistency of the database is assured. Application is running on a server so that it is crucial for the server to keep up its activity. If the server is down, the system will go down. Therefore a suitable RAID architecture must be proposed and used.

6. CONCLUSION AND FUTURE WORK

This report describes the design and implementation details of automating this work overhead of Surveyors. This system mainly support with functionalities like recording court commissions, updating them with daily events and generating reports regarding commissions. The CCMS is designed according to the Model-View-Controller Architecture Pattern & Client-Server Architecture Style. It is designed as a web application using Symfony Framework which is best suited for MVC pattern. Doctrine Library is used as the Object Relational Mapper to integrate with MySQL database and triggers.

The managing of a court commission can be slightly altered to give a user friendly feature which contains more editing features in a single page. Viewing of a court commission can be enhanced to a separate page too. The report generation is at the basic form in this system. It can be developed to give a full detailed report too.

This system insist that the users will add correct data types and values as data inputs. But there can be many instances where users enter wrong information. So that, the Robust Nature of the application (behaving while coping with errors) should be increased.

If the system can be upgraded to above specifics, CCMS can be deployed in to the Sri Lankan Community so that many users can get the most of it and manage their work. Surveyors Institute of Sri Lanka (SISL) and Survey Department of Sri Lanka (SDSL) can be notified about this system, so that they also will be interested in sponsoring these types of applications.

7. REFERENCES

[1] Survey Department of Sri Lanka (since 1971.04.05). *Court Commission Surveys Circulars* [Online]. Available:

http://www.survey.gov.lk/surveyweb/Home%20English/Circulars.php]

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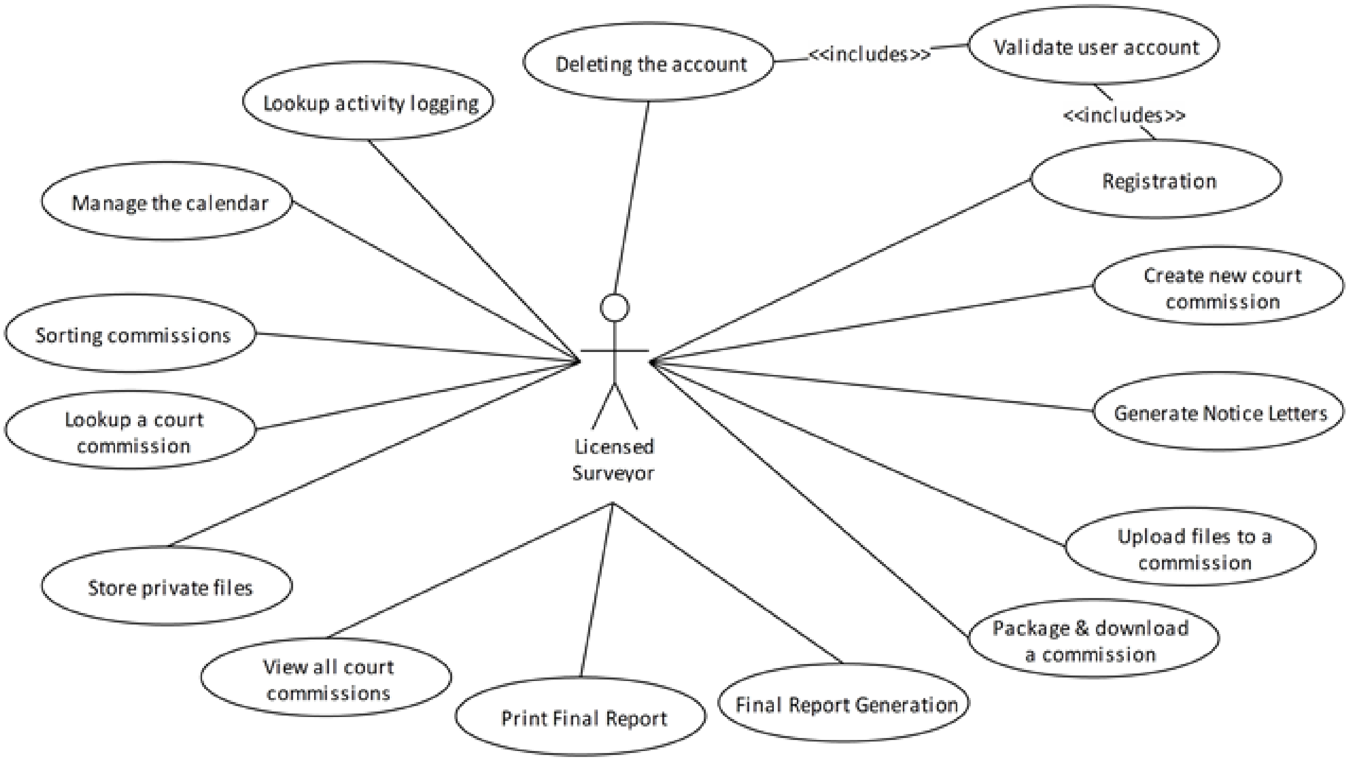
[8] Kenneth J. Biba (1975). *Biba Model* [Online]. Available: https://en.wikipedia.org/wiki/Biba_Model

[9] D. Eastlake, 3rd Motorola, P. Jones, Cisco Systems (2001 September). *US Secure Hash Algorithm 1 (SHA1)* [Online]. Available: https://www.ipa.go.jp/security/rfc/RFC3174EN.html

[10] Guillaume Potier. *Parsley - the ultimate JavaScript form validation library* [Online]. Available: http://parsleyjs.org/

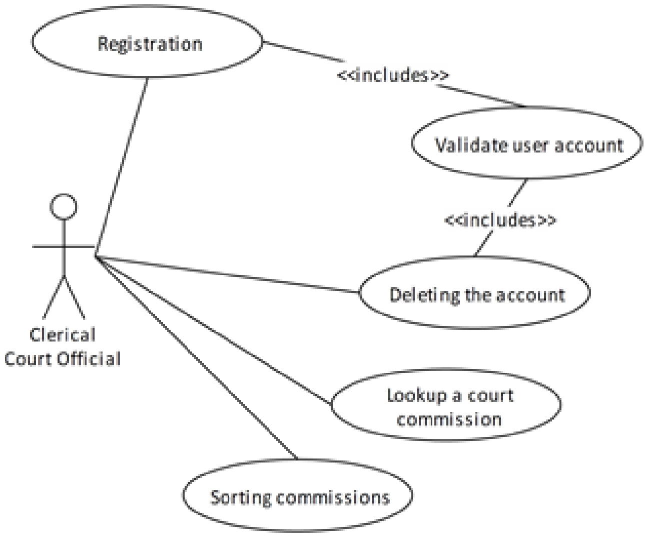
8. FIGURES

Figure 3.1.1 – Use Case Diagram for Licensed Surveyor



Use case diagram for Licensed Surveyor

Figure 3.1.2 – Use Case Diagram for Court Clerk



Use case diagram for Clerical Court Official

Figure 3.2.1 – Class Diagram

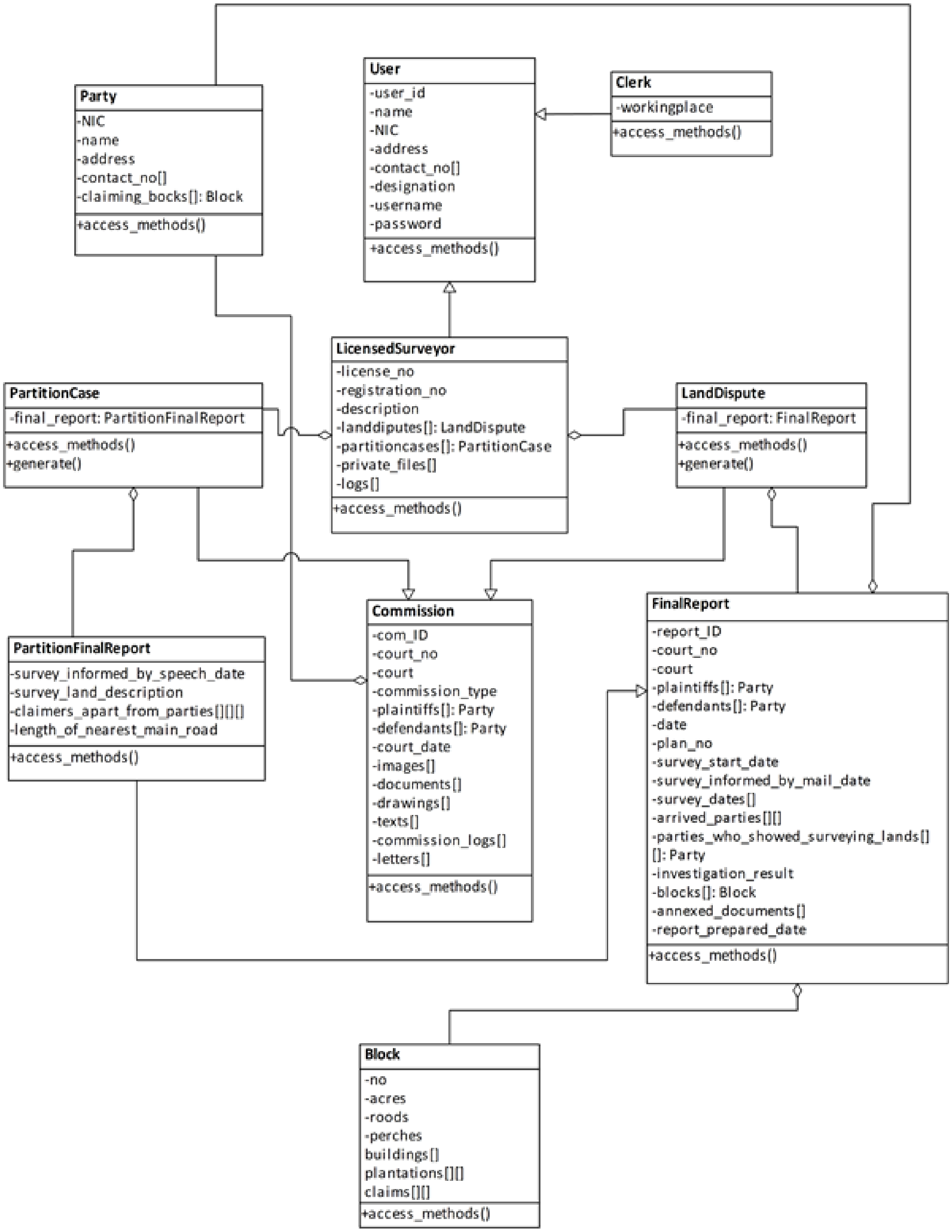


Figure 3.2.2 – Activity Diagram for Creating a New Court Commission

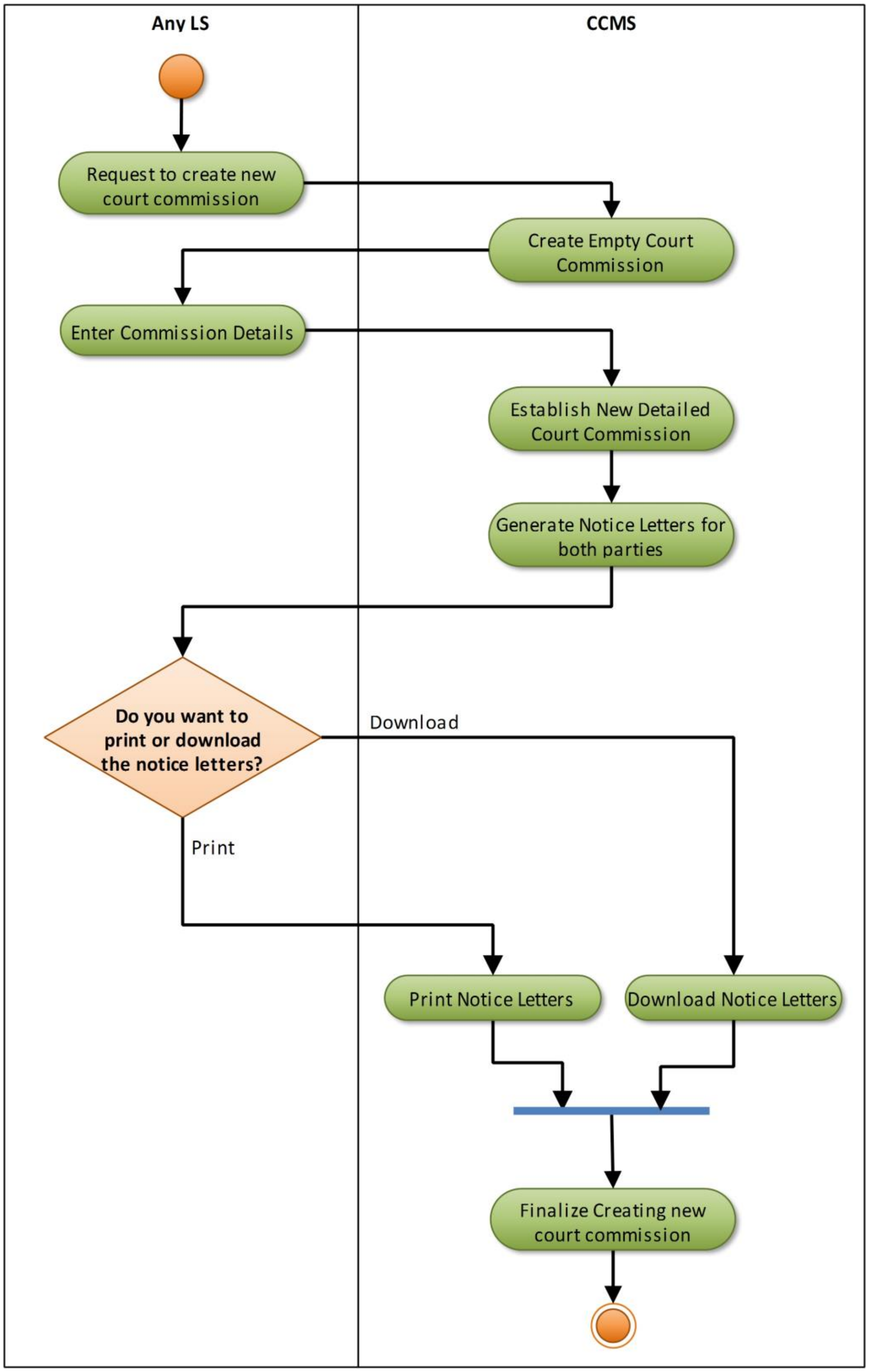

Any LS
CCMS
Request to create new court commission
Create Empty Court Commission
Enter Commission Details
Establish New Detailed Court Commission
Generate Notice Letters for both parties
Do you want to print or download the notice letters?
Download
Print
Print Notice Letters
Download Notice Letters
Finalize Creating new court commission

Figure 3.2.3 – Database Design using Entity Relationship Diagram

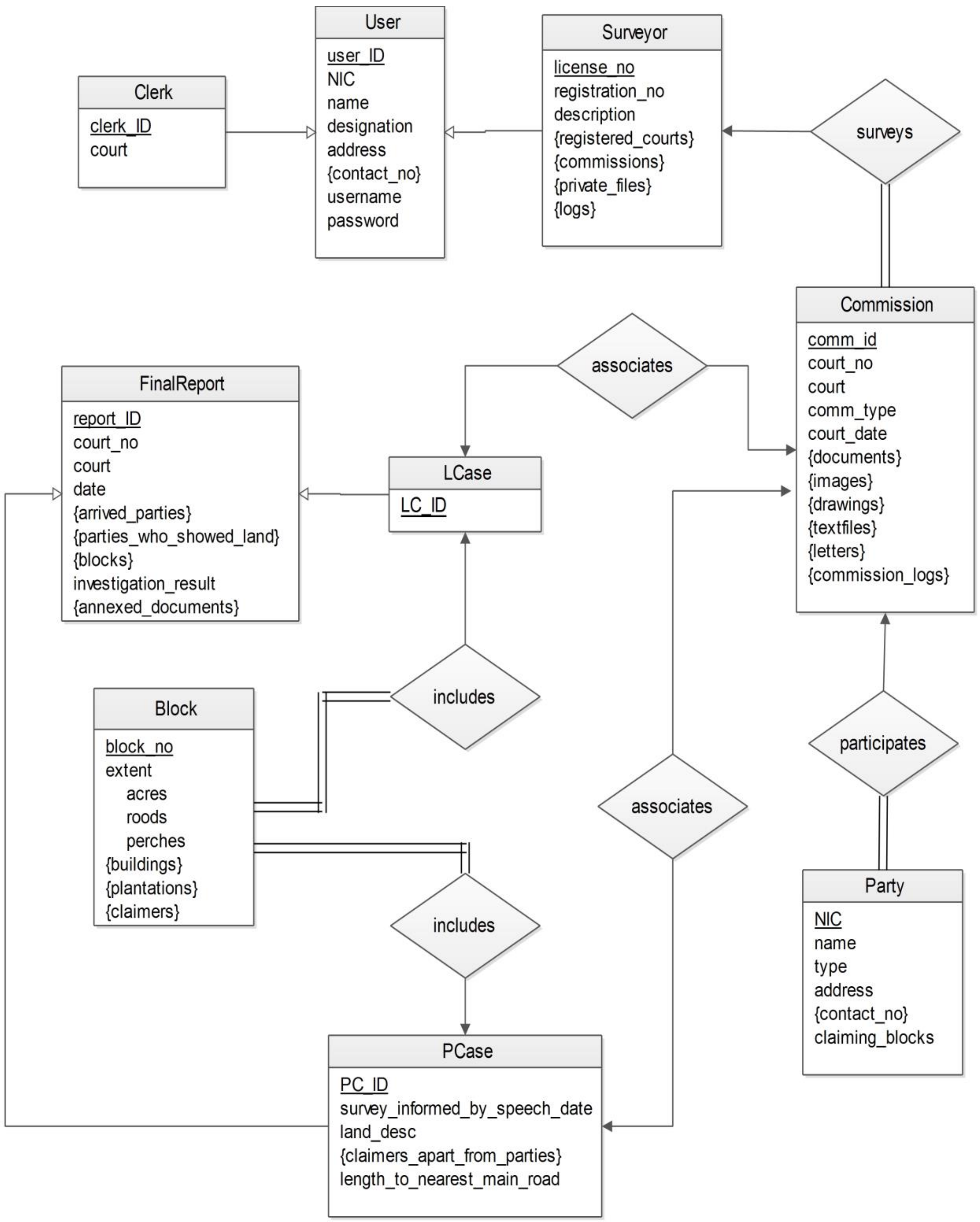
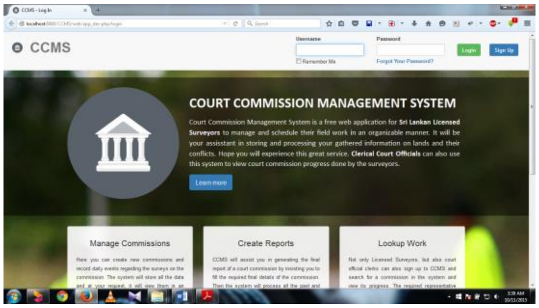


Figure 4.2.1 – Login interface and Homepage



COURT COMMISSION MANAGEMENT SYSTEM

Court Commission Management System is a free web application for **Sri Lankan Licensed Surveyors** to manage and schedule their field work in an organizable manner. It will be your assisstant in storing and processing your gathered information on lands and their conflicts. Hope you will experience this great service. **Clerical Court Officials** can also use this system to view court commission progress done by the surveyors.

Manage Commissions

Here you can create new commissions and record daily events regarding the surveys on the commission. The system will store all the data and at your request, it will view them in an

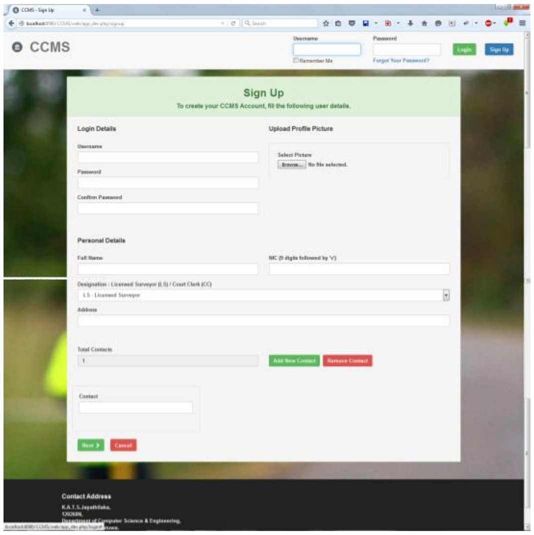
Create Reports

CCMS will assist you in generating the final report of a court commission by insisting you to fill the required final details of the commission. Then the system will process all the past and

Lookup Work

Not only Licensed Surveyors, but also court official clerks can also sign up to CCMS and search for a commission in the system and view its progress. The required representative

Figure 4.2.2 – Signup form for user details



Sign Up

To create your CCMS Account, fill the following user details.

No file selected.

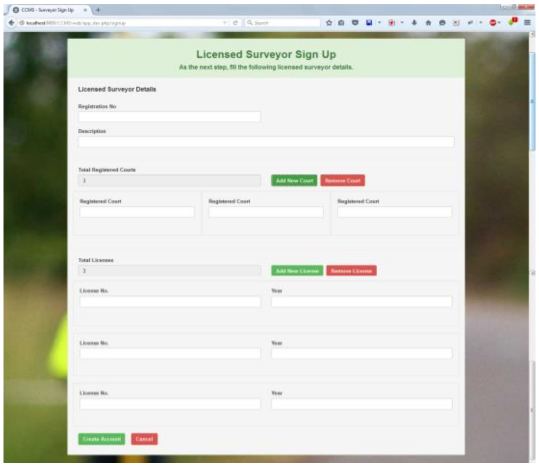
Designation: LS - Licensed Surveyor

Total Contacts: 1

Contact Address

K.A.T.S.Jayathilaka,
120260N,
Department of Computer Science & Engineering,

Figure 4.2.3 – Signup form for LS details



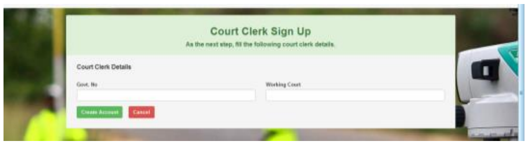
Licensed Surveyor Sign Up

As the next step, fill the following licensed surveyor details.

Total Registered Courts: 3

Total Licenses: 3

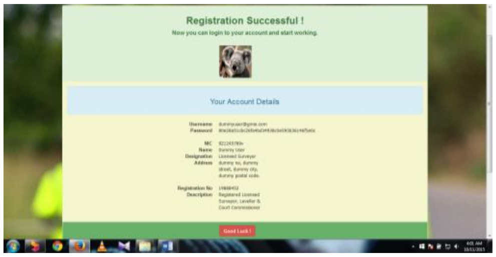
Figure 4.2.4 – Signup form for CC details



Court Clerk Sign Up

As the next step, fill the following court clerk details.

Figure 4.2.5 – Acknowledgement Page



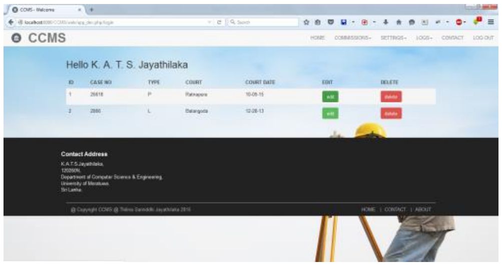
Registration Successful !

Now you can login to your account and start working.

Your Account Details

Username	dummyuser@gmail.com
Password	[illegible]
NIC	[illegible]
Name	Dummy User
Designation	Licensed Surveyor
Address	dummy no, dummy street, dummy city, dummy postal code.
Registration No	[illegible]
Description	Registered Licensed Surveyor, Leveller & Court Commissioner

Figure 4.2.5 – Account Homepage for a Licensed Surveyor



Hello K. A. T. S. Jayathilaka

ID	CASE NO	TYPE	COURT	COURT DATE	EDIT	DELETE
1	26618	P	Ratnapura	10-09-15	edit	delete
2	2880	L	Balangoda	12-28-13	edit	delete

Contact Address

K.A.T.S.Jayathilaka,
120260N,
Department of Computer Science & Engineering,
University of Moratuwa,
Sri Lanka.

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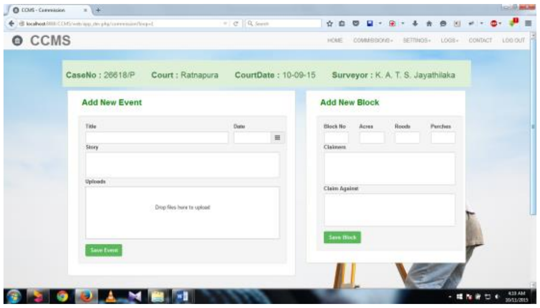
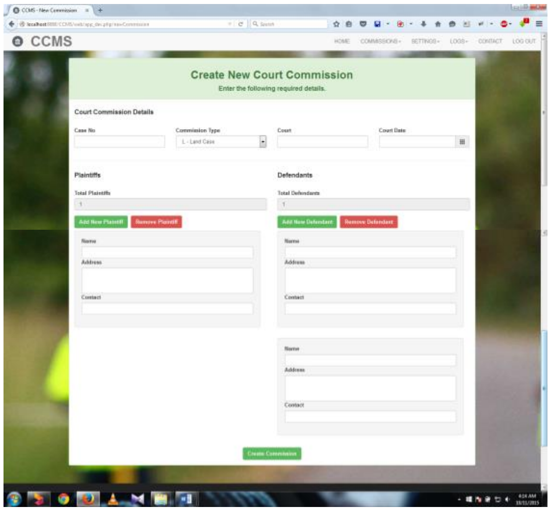
Figure 4.2.6 – Editing a court commission



CaseNo : 26618/P **Court :** Ratnapura **CourtDate :** 10-09-15 **Surveyor :** K. A. T. S. Jayathilaka

Figure 4.2.7 – Interface for creating a new court commission



Create New Court Commission
Enter the following required details.

Court Commission Details

Case No	Commission Type	Court	Court Date
	L - Land Case		

Plaintiffs

Total Plaintiffs: 1

Name
Address
Contact

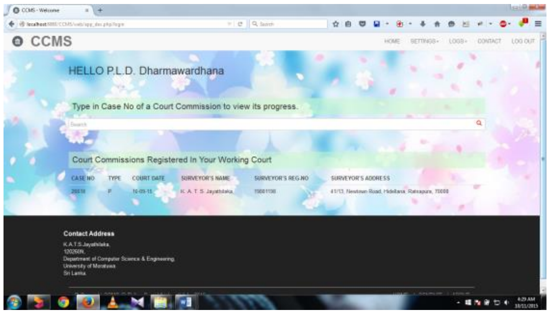
Defendants

Total Defendants: 1

Name
Address
Contact

Name
Address
Contact

Figure 4.2.8 – Account Homepage for a Court Clerk



HELLO P.L.D. Dharmawardhana

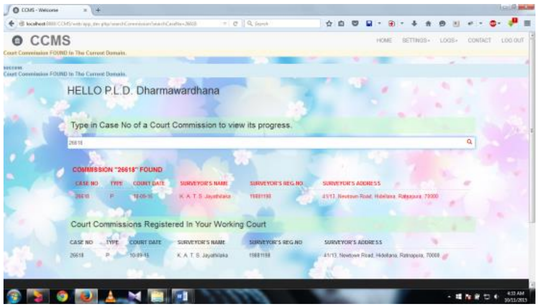
Type in Case No of a Court Commission to view its progress.

Court Commissions Registered In Your Working Court

CASE NO	TYPE	COURT DATE	SURVEYOR'S NAME	SURVEYOR'S REG.NO	SURVEYOR'S ADDRESS
26618	P	10-09-15	K. A. T. S. Jayathilaka	1988 1198	41/13, Newtown Road, Hidellana, Ratnapura, 70000

Contact Address
K.A.T.S.Jayathilaka,
120260N,
Department of Computer Science & Engineering,
University of Moratuwa
Sri Lanka.

Figure 4.2.9 – Search result for a numbered court commission



Court Commission FOUND In The Current Domain.

success
Court Commission FOUND In The Current Domain.

HELLO P.L.D. Dharmawardhana

Type in Case No of a Court Commission to view its progress.

26618

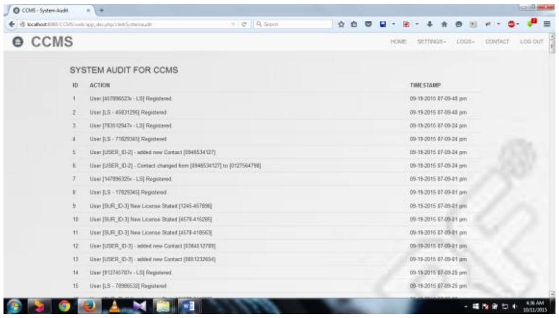
COMMISSION "26618" FOUND

CASE NO	TYPE	COURT DATE	SURVEYOR'S NAME	SURVEYOR'S REG.NO	SURVEYOR'S ADDRESS
26618	P	10-09-15	K. A. T. S. Jayathilaka	19881198	41/13, Newtown Road, Hidellana, Ratnapura, 70000

Court Commissions Registered In Your Working Court

CASE NO	TYPE	COURT DATE	SURVEYOR'S NAME	SURVEYOR'S REG.NO	SURVEYOR'S ADDRESS
26618	P	10-09-15	K. A. T. S. Jayathilaka	1988 1198	41/13, Newtown Road, Hidellana, Ratnapura, 70000

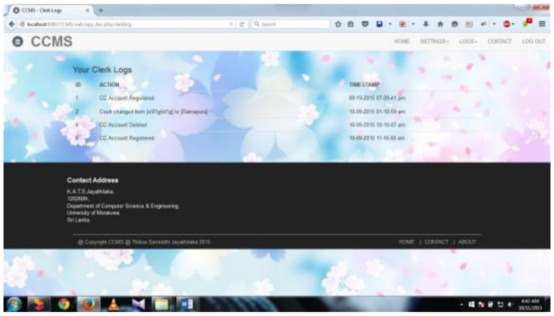
Figure 4.2.10 – System audit



SYSTEM AUDIT FOR CCMS

ID	ACTION	TIMESTAMP
1	User [457896523v - LS] Registered	09-19-2015 07-09-48 pm
2	User [LS - 45831296] Registered	09-19-2015 07-09-48 pm
3	User [783512947v - LS] Registered	09-19-2015 07-09-24 pm
4	User [LS - 71829345] Registered	09-19-2015 07-09-24 pm
5	User [USER_ID-2] - added new Contact [0948534127]	09-19-2015 07-09-24 pm
6	User [USER_ID-2] - Contact changed from [0948534127] to [0127564798]	09-19-2015 07-09-24 pm
7	User [147896325v - LS] Registered	09-19-2015 07-09-01 pm
8	User [LS - 17829345] Registered	09-19-2015 07-09-01 pm
9	User [SUR_ID-3] New License Stated [1245-457896]	09-19-2015 07-09-01 pm
10	User [SUR_ID-3] New License Stated [4578-415285]	09-19-2015 07-09-01 pm
11	User [SUR_ID-3] New License Stated [4578-418563]	09-19-2015 07-09-01 pm
12	User [USER_ID-3] - added new Contact [0784512789]	09-19-2015 07-09-01 pm
13	User [USER_ID-3] - added new Contact [0851232654]	09-19-2015 07-09-01 pm
14	User [913745787v - LS] Registered	09-19-2015 07-09-25 pm
15	User [LS - 78986532] Registered	09-19-2015 07-09-25 pm

Figure 4.2.11 – User logs, Clerk logs, Surveyor logs, Commission Logs



Your Clerk Logs

ID	ACTION	TIMESTAMP
1	CC Account Registered	09-19-2015 07-09-41 pm
2	Court changed from [s5f1g5d1g] to [Ratnapura]	10-09-2015 01-10-59 am
4	CC Account Deleted	10-09-2015 10-10-07 am
6	CC Account Registered	10-09-2015 11-10-50 am

Contact Address
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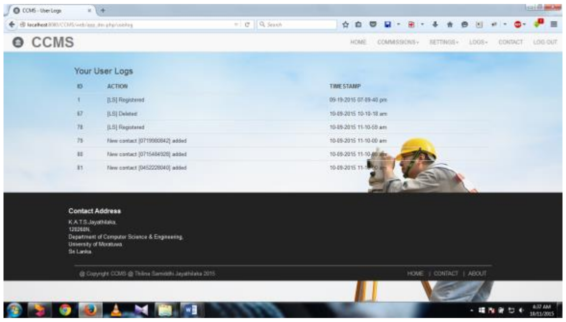

Your User Logs

ID	ACTION	TIMESTAMP
1	[LS] Registered	09-19-2015 07-09-40 pm
67	[LS] Deleted	10-09-2015 10-10-18 am
78	[LS] Registered	10-09-2015 11-10-59 am
79	New contact [0719980842] added	10-09-2015 11-10-00 am
80	New contact [0715484928] added	10-09-2015 11-10-00 am
81	New contact [0452228040] added	10-09-2015 11-

Contact Address
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120260N,
Department of Computer Science & Engineering,
University of Moratuwa
Sri Lanka.

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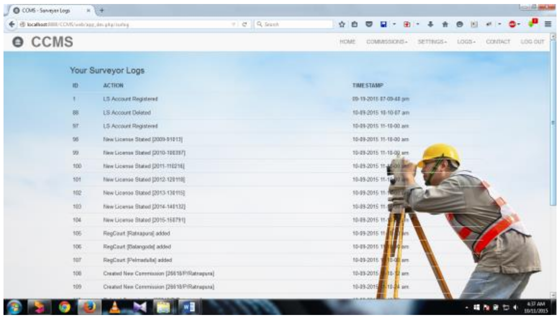
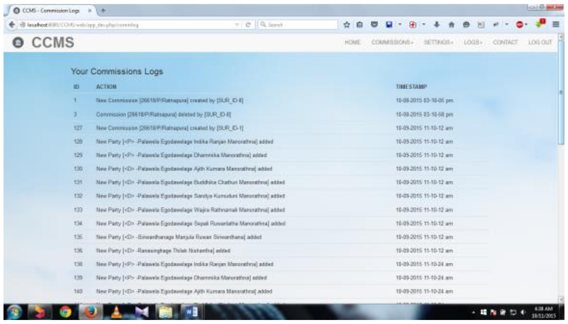


Your Surveyor Logs

ID	ACTION	TIMESTAMP
1	LS Account Registered	09-19-2015 07-09-48 pm
88	LS Account Deleted	10-09-2015 10-10-07 am
97	LS Account Registered	10-09-2015 11-10-00 am
98	New License Stated [2009-91013]	10-09-2015 11-10-00 am
99	New License Stated [2010-100387]	10-09-2015 11-10-00 am
100	New License Stated [2011-110216]	10-09-2015 11-
101	New License Stated [2012-120118]	10-09-2015 11-
102	New License Stated [2013-130115]	10-09-2015 11-
103	New License Stated [2014-140132]	10-09-2015 11-
104	New License Stated [2015-150791]	10-09-2015 11-
105	RegCourt [Ratnapura] added	10-09-2015
106	RegCourt [Balangoda] added	10-09-2015
107	RegCourt [Pelmadulla] added	10-09-2015
108	Created New Commission [26618/P/Ratnapura]	10-09-2015
109	Created New Commission [26618/P/Ratnapura]	10-09-2015



Your Commissions Logs

ID	ACTION	TIMESTAMP
1	New Commission [26618/P/Ratnapura] created by [SUR_ID-8]	10-08-2015 03-10-05 pm
3	Commission [26618/P/Ratnapura] deleted by [SUR_ID-8]	10-08-2015 03-10-58 pm
127	New Commission [26618/P/Ratnapura] created by [SUR_ID-1]	10-09-2015 11-10-12 am
128	New Party [<P> -Palawela Egodawelage Indika Ranjan Manorathna] added	10-09-2015 11-10-12 am
129	New Party [<P> -Palawela Egodawelage Dhammika Manorathna] added	10-09-2015 11-10-12 am
130	New Party [<D> -Palawela Egodawelage Ajith Kumara Manorathna] added	10-09-2015 11-10-12 am
131	New Party [<D> -Palawela Egodawelage Buddhika Chathuri Manorathna] added	10-09-2015 11-10-12 am
132	New Party [<D> -Palawela Egodawelage Sandya Kumuduni Manorathna] added	10-09-2015 11-10-12 am
133	New Party [<D> -Palawela Egodawelage Wajira Rathnamali Manorathna] added	10-09-2015 11-10-12 am
134	New Party [<D> -Palawela Egodawelage Sepali Ruwanlatha Manorathna] added	10-09-2015 11-10-12 am
135	New Party [<D> -Siriwardhanage Manjula Ruwan Siriwardhana] added	10-09-2015 11-10-12 am
136	New Party [<D> -Ranasinghage Thilak Nishantha] added	10-09-2015 11-10-12 am
138	New Party [<P> -Palawela Egodawelage Indika Ranjan Manorathna] added	10-09-2015 11-10-24 am
139	New Party [<P> -Palawela Egodawelage Dhammika Manorathna] added	10-09-2015 11-10-24 am
140	New Party [<D> -Palawela Egodawelage Ajith Kumara Manorathna] added	10-09-2015 11-10-24 am