



FORENSIC
REPORT
MANAGEMENT
SYSTEM

Forensic medicine ?

- ✓ Forensic medicine is the application of medical knowledge to the investigation of crime, particularly in establishing the causes of injury or death.

JMO ?

- ✓ A Judicial Medical Officer is the full-time specialist consultant who builds that link between medicine and the legal process.
- ✓ When a person is admitted to a hospital , the JMO has to examine the patient about any physical trauma and make records which will then be used to all the legal procedures undertaken if a necessity occurs

Introduction – contd.

3

► What is the process ?

1. Medico-Legal Examination Form (MLEF)
 2. Medico-Legal Report (MLR) which is a detailed expansion of the MLEF
 3. Post-Mortem Report for maintain pathological patients details
-
- ✓ So that it is necessary for the judicial Medical Officers to keep track of records about their clinical and pathological patients for this legal processes.

 - ✓ When a person is admitted to a hospital , the JMO has to examine the patient about any physical trauma and make records which will then be used to all the legal procedures undertaken if a necessity occurs

Currently details regarding patients & post-mortems maintain as a file based system.

4

So... is there a problem?

5

Currently all these records are maintained “**Manually**”

So it's ;

- Very Cumbersome
- Time Consuming
- Inefficient
- Insecure to all the participants in the process





“Accurate, Efficient and Secure solution via a Web & Mobile Based System.”

Designed & implemented to;

- ❖ Manage & overcome the issues with existing file based system.
- ❖ Analyze and evaluate the past situations.
- ❖ Maintain higher security & privacy levels (user authentication, file protection etc.)
- ❖ Maintain a fast & reliable report management process.

Deliverables

- Web based system to perform requested functionalities.
- Mobile application to handle post-mortem reports.



DEPLOYMENT PROCESS

System Modules :

- ❖ Login
- ❖ Medico-Legal Examination Form (MLEF) & Medico-Legal Report (MLR)
- ❖ Post-mortem Report Maintaining
- ❖ Analyzing features



Functional Requirements Identification

9

01

- Clinical Report Maintaining

02

- Post-mortem Report Maintaining

03

- Report & Data Analyzing



REQUIREMENTS

Clinical Report Maintaining

10



Registers the patient for investigation & check-up.



Start to fill the Medico - Legal Examination Form (MLEF) and submit it to JMO.



Complete the Medico - Legal Examination Form (MLEF) by entering the pathological details.



Compiles a Medico – Legal Report based on Magistrate's court order.

Post-mortem Report Maintaining

11



Registers dead bodies for autopsy.



Create the post-mortem report based
on autopsy.



View & Validate the postmortem reports
for further use.

Report & Data Analyzing

12



Analyze and Evaluate past reports according to Time period, Cause of death & Death caused area.



View all the reports included in the system.



View and Analyze reports that relevant to their profiles.



Overall requested system functionalities

- Report creation , view , validation , PDF creation for,
 - MLEF (Medico Legal Examination From)
 - MLR (Medico Legal Report)
 - PMR (Post Mortem Report)
 - Image Annotation
 - Image View
 - Report Analysing
- 

Non Functional Requirements

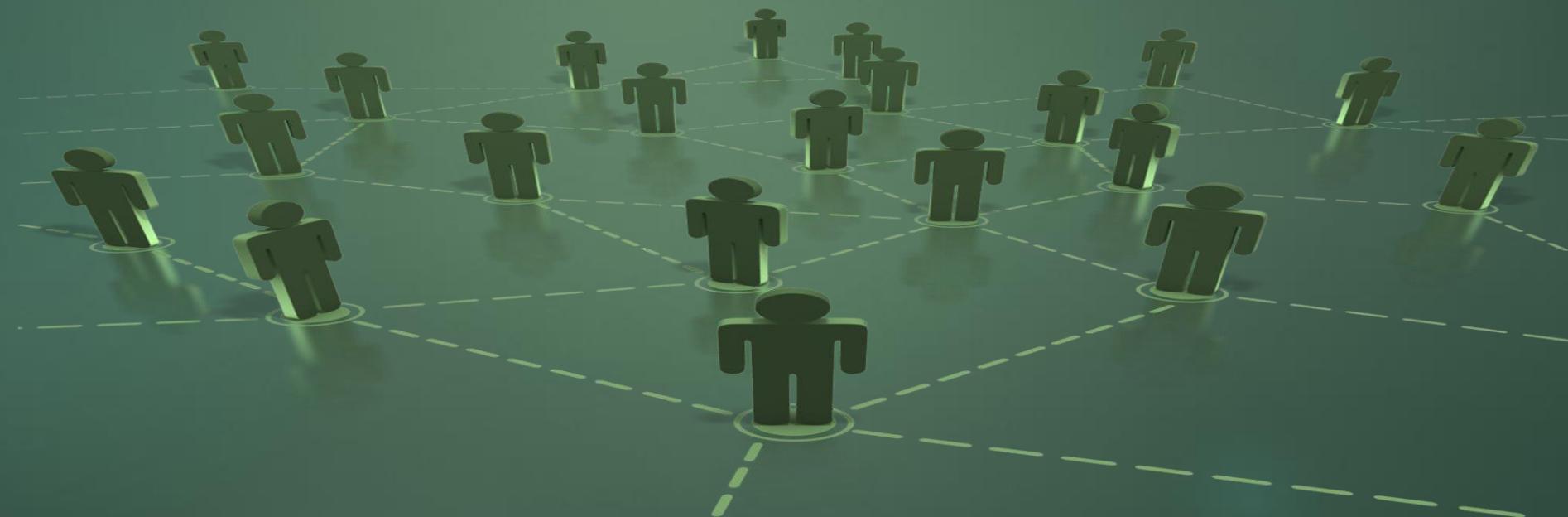
- Simple, easy, user-friendly interface
- System is reliable, Should be able to withhold even at the highest server load
- System performs with least bugs and errors during normal operation
- Supports multiple platforms(desktop, mobile) since system is web based
- High security

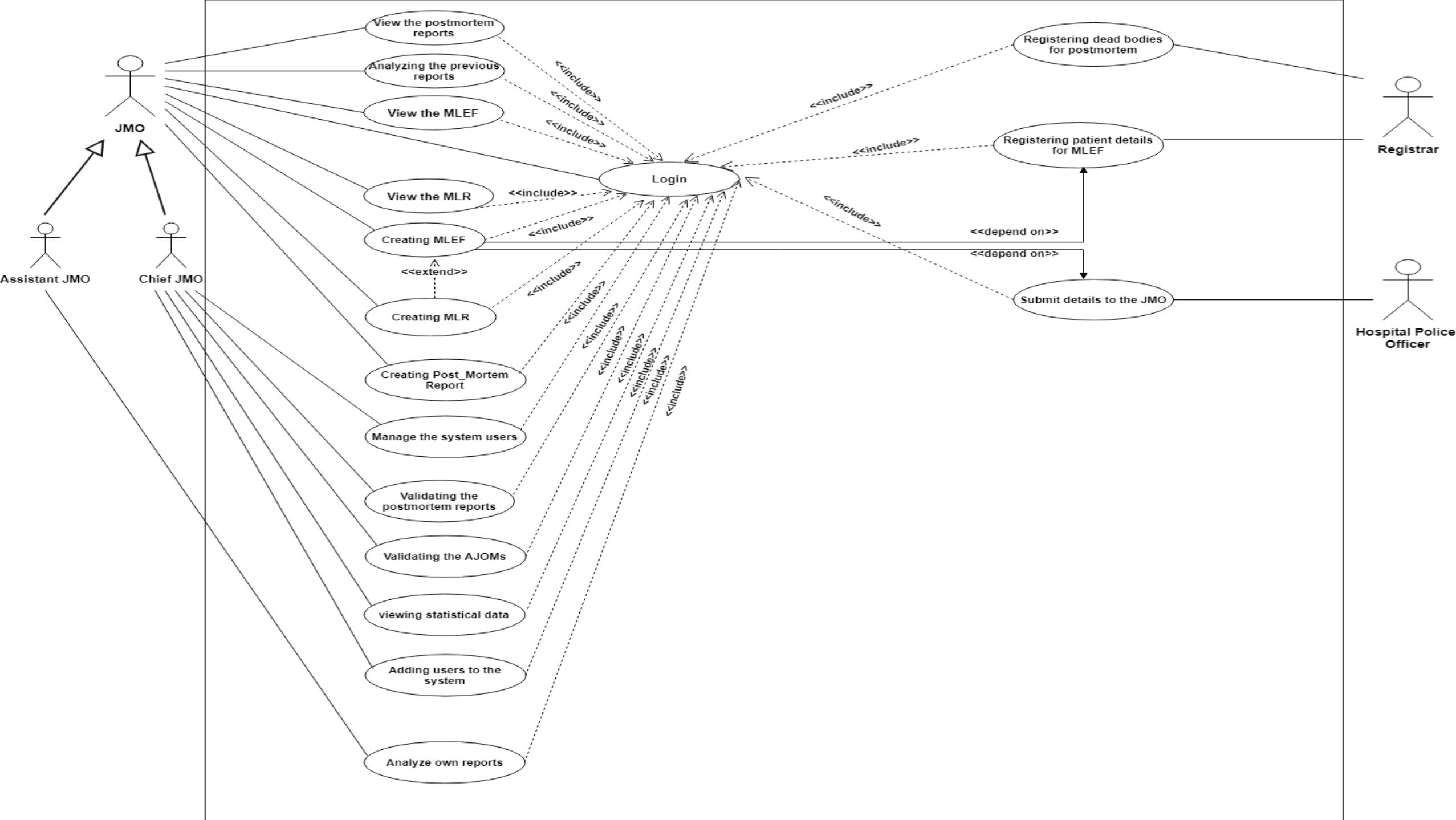


Use Case Diagram

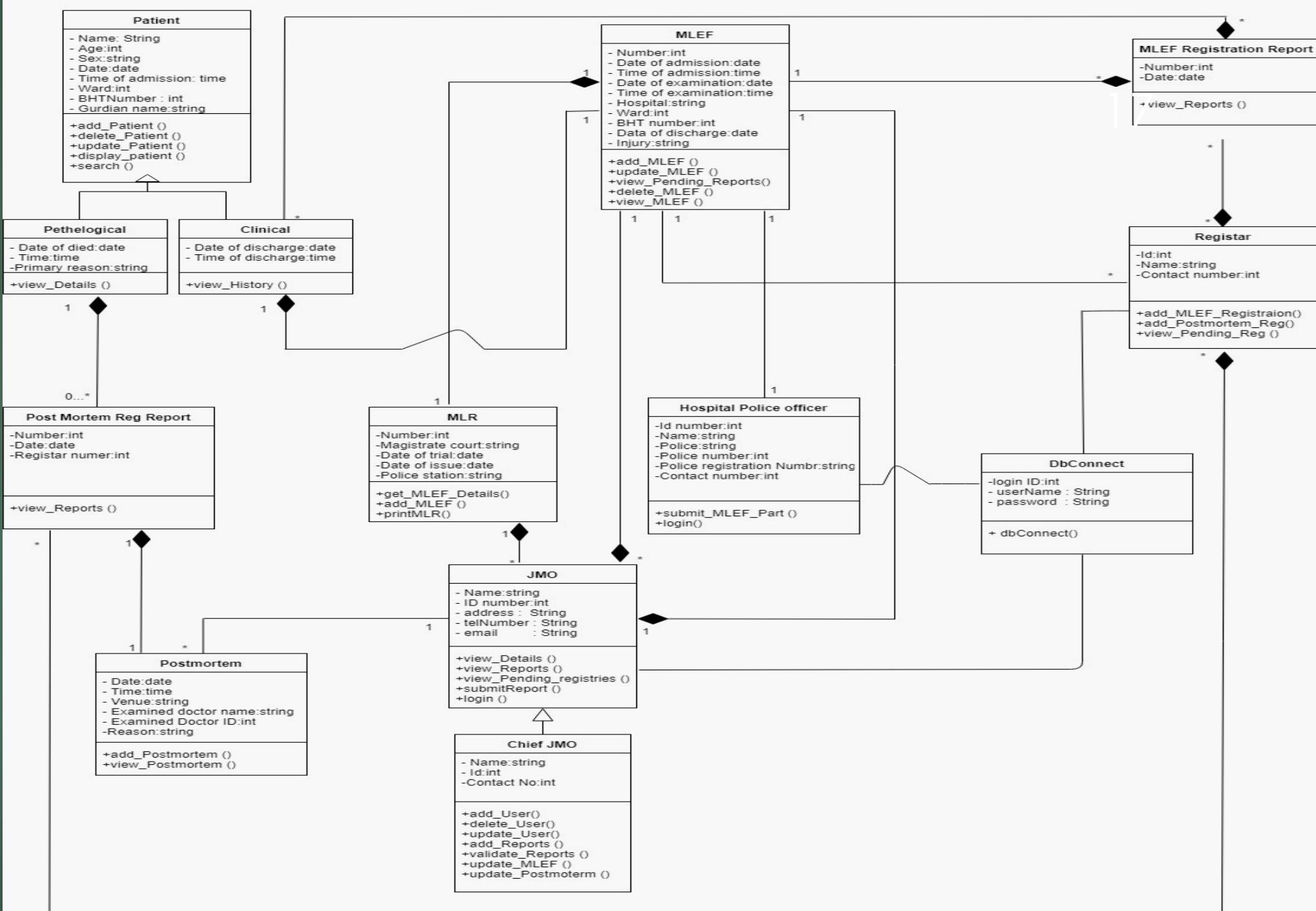
System Actors :

- ❖ Chief judicial medical officer (Chief JMO)
- ❖ Assistant judicial medical officer (Assistant JMO)
- ❖ Registrar
- ❖ Hospital Police Officer

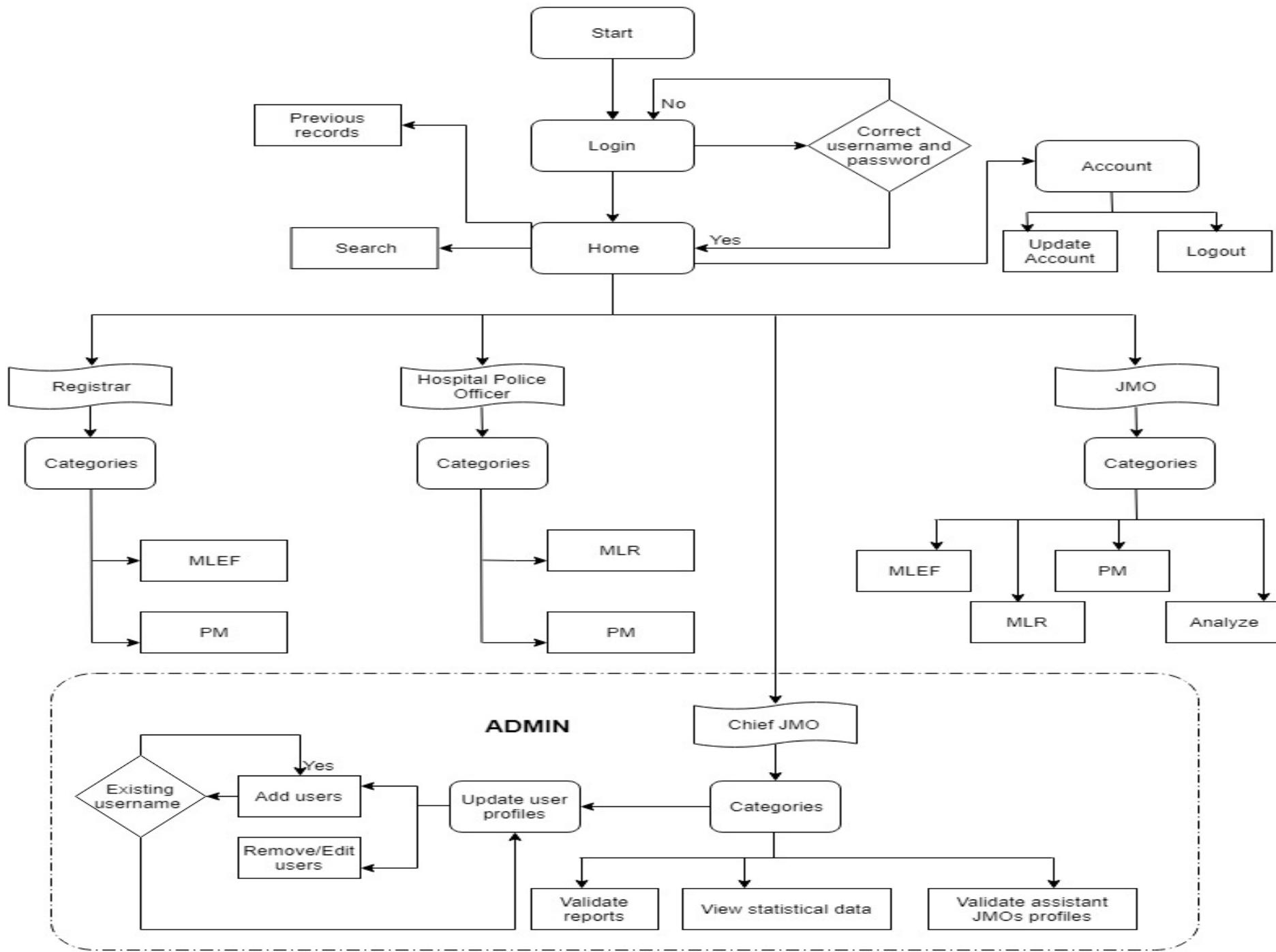




Class Diagram



UI Flow Diagram



Usability & User Experience

19

- ✓ Developed as a “**Intranet Application**”.
- ✓ Used two separate UI design pattern for the normal users' profiles & admins' profiles.

Normal users' profile

The screenshot shows a web-based application for managing forensic reports. At the top, there's a navigation bar with a logo, the text "Forensic Report Management System", and links for "Home", "View", "User name", and a dropdown menu. Below the navigation is a section titled "POST-MORTEM REPORTS" containing a table with columns: SR Number, Police Area, Officer Number, Patient Number, INQUEST Number, and Date of Examination. Three blue buttons labeled "Create MLEF", "Create PM", and "View Reports" are visible. The table data is as follows:

SR Number	Police Area	Officer Number	Patient Number	INQUEST Number	Date of Examination
005/01/2019	Ragama	HPO/065/004	P00093	IN0098	2019-09-05
SR0006	Kelaniya	HPO/089/023	P0006	IN0006	2018-12-19
SR0007	Ragama	HPO/089/023	P0006	IN0007	2018-12-19

Admins' profile

The screenshot shows the "Welcome to the admin Page of FRMS" dashboard. It features a dark background with several icons and their corresponding labels: "View Reports" (magnifying glass), "Add User" (person icon), "User Details" (person icon), "Add MLEF" (document icon), "Create MLR" (gavel icon), "Validate Reports" (checklist icon), "Add PM Report" (footprint icon), and "Analyse Reports" (chart icon). The top of the screen has a navigation bar with "FRMS Home", "Admin Home", "Hello", "Logout", and the time "7:58:36".

- ✓ Consider about Availability and Accessibility
 - No dead links
 - No loading errors
 - Responsiveness

- ✓ Providing Search filter functions to perform fast access to the required data.

Registrars' Details					
<input type="text" value="Search for Names.."/> <input type="button" value=""/>					
Name	User Name	email	Contact Number	Registrar ID Number	Account Type
Ajith Rajarathne	AjithR	ajithrajarathne@gmail.com	0754125587	Reg/002/007	Registrar
Dilshan Gunarathne	DilshanG	dilshang@gmail.com	0774126698	Reg/005/345	Registrar
Divya Rajarathnam	DivyaR	divyarajarathnam@gmail.com	0774123698	Reg/006/107	Registrar
Ayoma Wijerathne	AyomaA	ayoma@gmail.com	0755321469	Reg/016/099	Registrar



Registrars' Details					
<input type="text" value="Ayoma Wijerathne"/> <input type="button" value=""/>					
Ayoma Wijerathne	AyomaA	ayoma@gmail.com	0755321469	Reg/016/099	Registrar

- ✓ Strategically used 2 colors schemes for present System users details & Reports details.

Color Scheme

For Users →

↓ *For Reports*

MLEF Reports Details

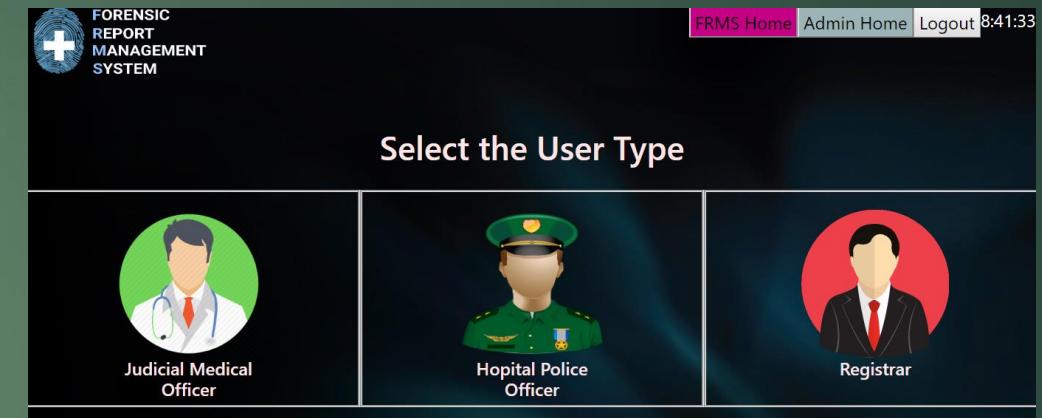
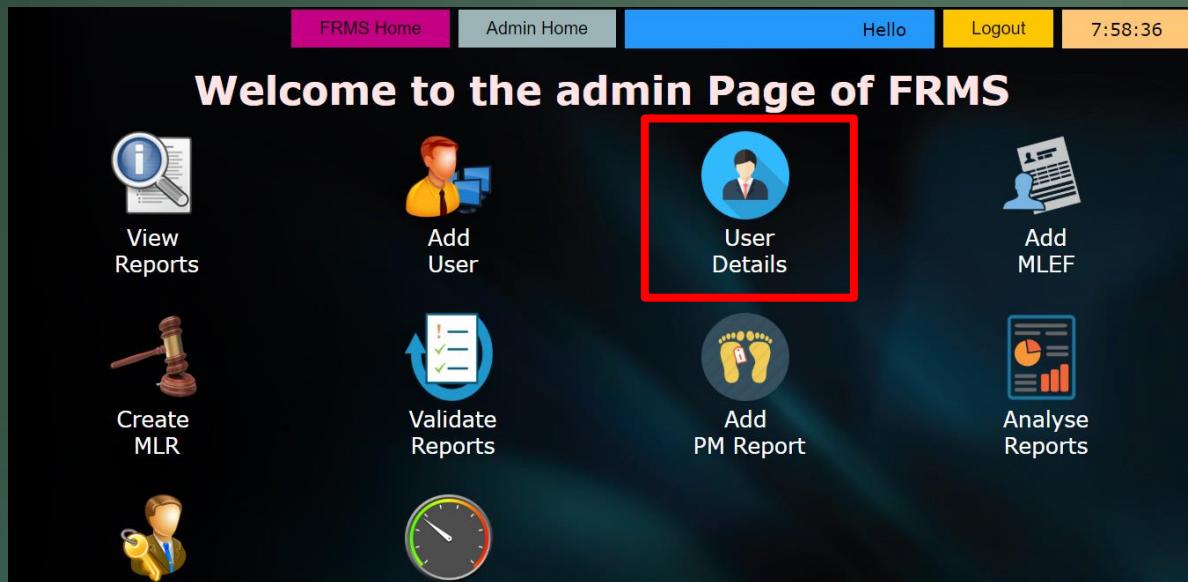
Search for MLEF Number

MLEF Number	Date of Issue	Examinee Name	Examinee NIC	JMO ID	Examination date	Examination Time	Body Harm Type
18	2018-11-29	A.B. Senevi	600201620V	942123059v	2018-11-29	10:00:00	
10	2018-11-17	Anil	345675678v	942123059v	2018-11-28	12:42:00	
17	2018-11-16	Kapila	33424	942123059v	2018-11-14	23:24:00	
11	2018-11-16	Ajith Perera	894560569v	942123059v	2018-11-14	03:45:00	
14	2018-11-15	Name1	345643067v	942123059v	2018-11-02	03:24:00	

REGISTRAR DETAILS	
Field Name	Details
Name	Ajith Rajarathne
User Name	AjithR
Registration Number	Reg/002/007
Contact Number	0754125587
email	ajithrajarathne@gmail.co
Account Type	Registrar

Update **Delete**

- ✓ Used simple UI flow for the system.



This screenshot displays the 'JMO DETAILS' page. It contains a table with the following data:

Field Name	Details
Name	Ruvi Karunanayake
User Name	RuviK
Registration Number	SLMC/1986/001
NIC Number	710256896v
email	ruvik@gmail.com
Contact Number	0776236985
Address	11/4, Station street, Kohu
Account Type	Assistant JMO

At the bottom, there are two buttons: 'Update' (blue) and 'Delete' (red).

This screenshot shows the 'JMOs' Details' page. It includes a search bar at the top right labeled 'Search by Names...' with a magnifying glass icon. Below the search bar is a table with the following data:

Name	User Name	Registration Number	ID Number	e-mail	Contact Number	Address	Account Type
Rohan Alwis	RohanA	SLMC/1989/099	689020678v	rohanalwis@gmail.com	0112709719	87/A, Station Road, Maradana	Cheif JMO
Ruvi Karunanayake	RuviK	SLMC/1986/001	710256896v	ruvik@gmail.com	0776236985	11/4, Station street, Kohuwala	Assistant JMO

- ✓ Providing PDF generates functions for to get a PDF version of required reports.

The screenshot shows the FRMS Home page with a navigation bar at the top containing 'FRMS Home', 'Admin Home', and 'Logout' with the time '8:50:30'. On the left, there's a logo for 'FORENSIC REPORT MANAGEMENT SYSTEM' featuring a fingerprint and a cross. The main content area is titled 'Post-Mortem Reports Details' and includes a search bar with the date '005/01/2019' and a magnifying glass icon. Below is a table with columns: SR Number, Date of Issue, Examinee Name, Examinee NIC, District, Examination date, Examination Place, and Relevant Cause. Two rows of data are visible:

SR Number	Date of Issue	Examinee Name	Examinee NIC	District	Examination date	Examination Place	Relevant Cause
005/01/2019	2019-09-05	Dr. Default	Default	Colombo	2019/01/05	Colombo	null
003/01/2019	2019-01-04	Dr. Ruvi Karunananayake	710256896v	Kalutara	Test	Test	Test

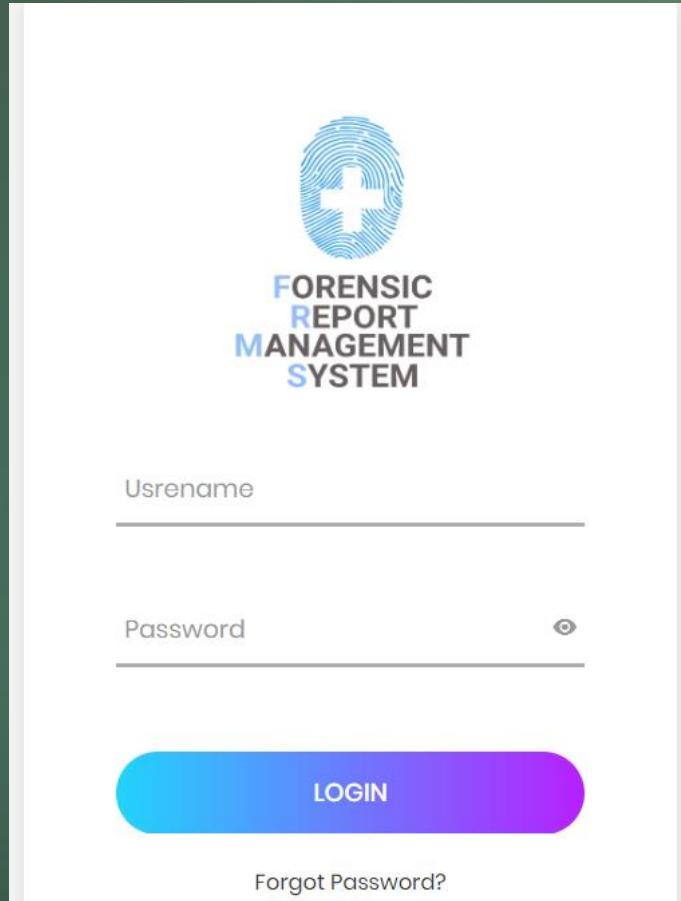


A modal window is displayed with a 'Download PDF' button at the top right. Below is a table with columns 'Field Name' and 'Value'. Five rows of data are shown:

Field Name	Value
SR	005/01/2019
Police	Ragama
Police_ID	HPO/065/004
Patient_ID	P00093
INQUEST	IN0098

Testing Process

□ Invalid Login Credential Detecting

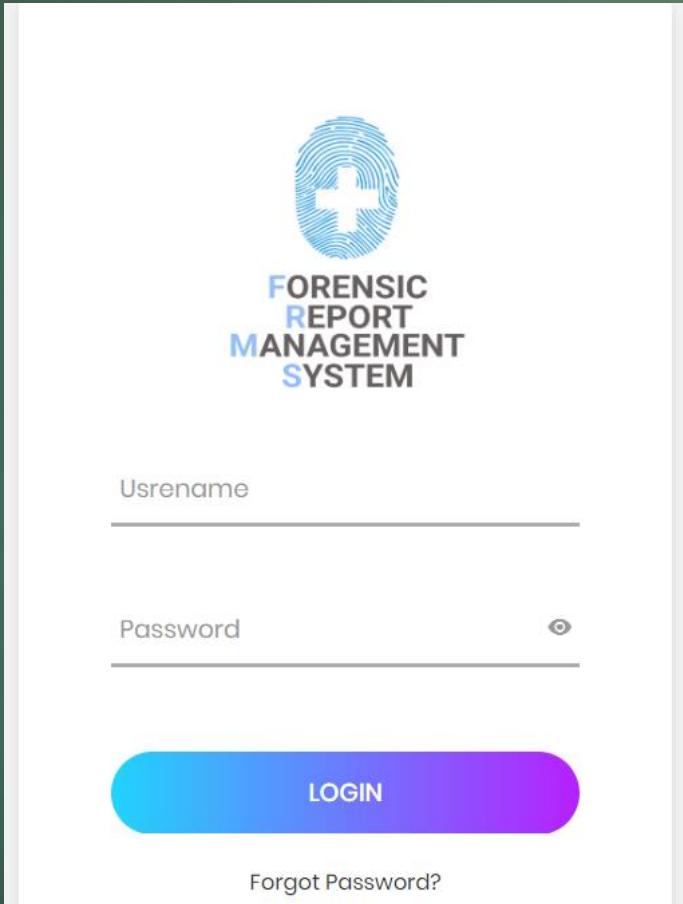


- ❖ When Invalid username or /and password entered given message displays



Testing Process – contd.

- Validating AJMOs before displaying the pages.



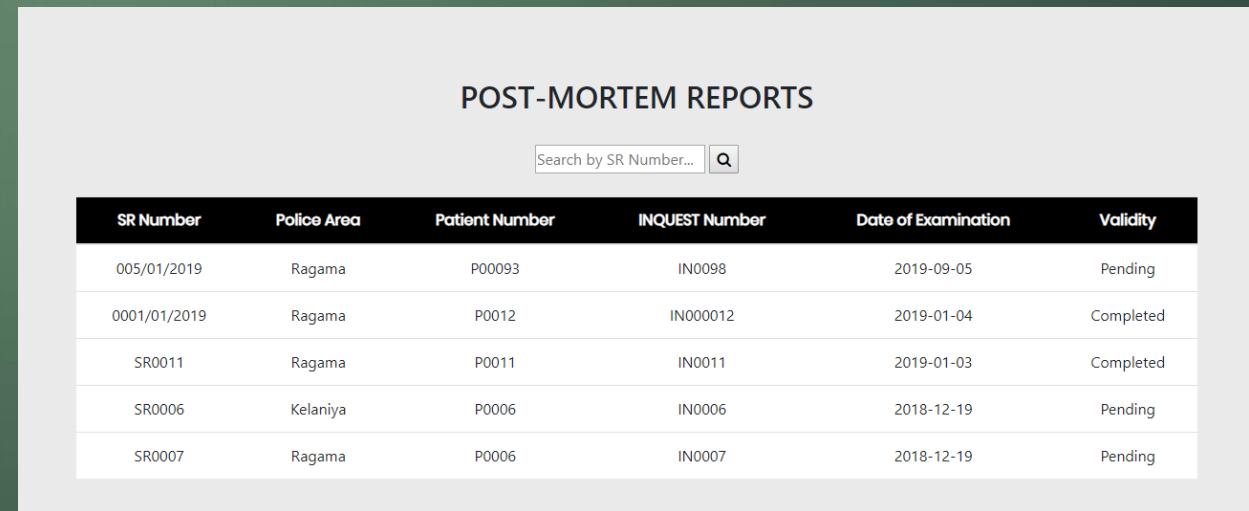
FORENSIC
REPORT
MANAGEMENT
SYSTEM

Username

Password

LOGIN

Forgot Password?



SR Number	Police Area	Patient Number	INQUEST Number	Date of Examination	Validity
005/01/2019	Ragama	P00093	IN0098	2019-09-05	Pending
0001/01/2019	Ragama	P0012	IN000012	2019-01-04	Completed
SR0011	Ragama	P0011	IN0011	2019-01-03	Completed
SR0006	Kelaniya	P0006	IN0006	2018-12-19	Pending
SR0007	Ragama	P0006	IN0007	2018-12-19	Pending

Testing Process – contd.

□ Validating forms and detecting blank fields.

POST-MORTEM REPORT

SR No:

02/01/2019

Police:

Police Station Name...

Investigating Officer:

HPO/065/004

Patient Registration Number:

Patient ID...

Title:

Mr.

- ❖ When blank field values entered error warning alert displays

- Directing to the case when clicked on the relevant record.

POST-MORTEM REPORTS

SR Number	Police Area	INQUEST Number	Date of Examination	Validity
0001/01/2019	Ragama	P0012	IN000012	2019-01-04 Completed

MLEF REPORTS

MLEF Number	Date of Issue	JMO Number	Ward	Examination Date
18	2018-11-29	942123059v	16	2018-11-29
10	2018-11-17	942123059v	12	2018-11-28

SR No. = 0001/01/2019

POST-MORTEM REPORT

SR No:	0001/01/2019
Police:	Ragama
Investigating Officer:	HPO/089/023
Patient Details:	P0012

Previous Next

- Doesn't provide access to update the some data fields for maintain the security of the system .

JMO DETAILS

Field Name	Details
Name	Ruvi Karunananayake
User Name	RuviK
Registration Number	SLMC/1986/001
NIC Number	710256896v
email	ruvik@gmail.com
Contact Number	0776236985
Address	11/4, Station street, Kohu
Account Type	Assistant JMO

Can't update

Update **Delete**

- Only disable the user account & maintain the user details when performing the delete function for maintain the integrity of the system.

JMO DETAILS

Field Name	Details
Name	Ruvi Karunananayake
User Name	RuviK
Registration Number	SLMC/1986/001
NIC Number	710256896v
email	ruvik@gmail.com
Contact Number	0776236985
Address	11/4, Station street, Kohu
Account Type	Assistant JMO

Disable the user account.

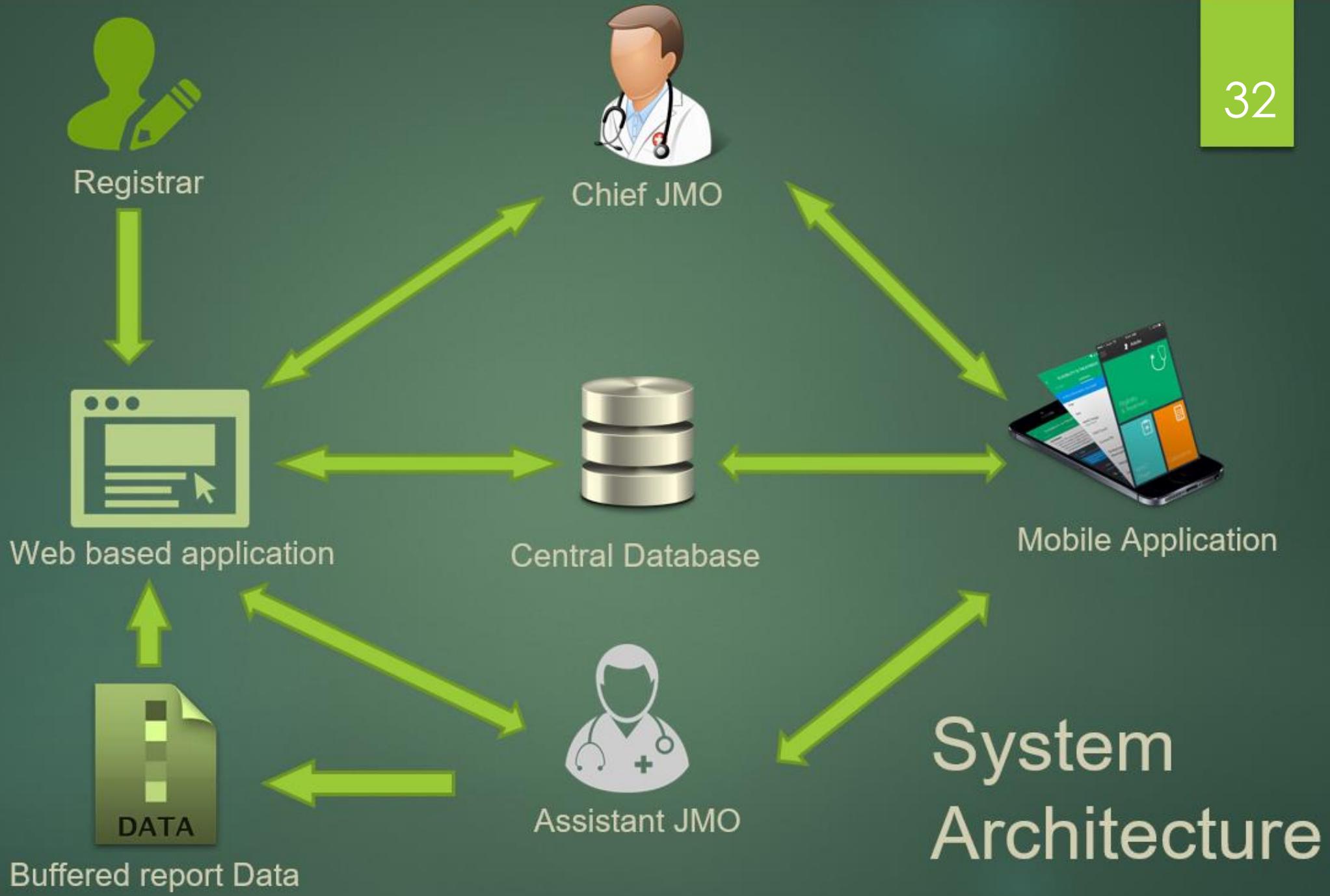
name	username	Doctor_ID	NIC	email	password	contactNumber	Address	accountType	Validity
Ruvi Karunananayake	RuviK	SLMC/1986/001	710256896v	ruvik@gmail.com	769f1de2ae9635f	0776236985	11/4, Station street, Kohuwala	Assistant JMO	Disable

Applied Test Cases

30

Test case ID	Description
TCoo1	Validating JMOs when logging in to the system
TCoo2	Validating Hospital police officers when logging in to the system
TCoo3	Validating Registrar when logging in to the system
TCoo4	Validating users before displaying the pages
TCoo5	Inserting MLEF with invalid data formats & with missing data fields
TCoo6	Inserting to the database the information that users have entered.
TCoo7	Updating the register (MLEF as well as postmortem) with newly inserted cases.
TCoo8	Directing to the case when clicked on the relevant record of the register

TC010	Retrieving the MLR by filling automatically relevant fields included in the MLEF.
TC011	Validating JMOs before using the android application .
TC012	Allowing JMOs to fill latter part of the postmortem report after performing the postmortem .
TC013	Allowing CJMO to validate AJMOs reports .
TC014	Allowing CJMO to add & remove new users .
TC015	Allowing to view and analyzed according to the provided search query.



MVC architecture is used as planned to design & implement the system

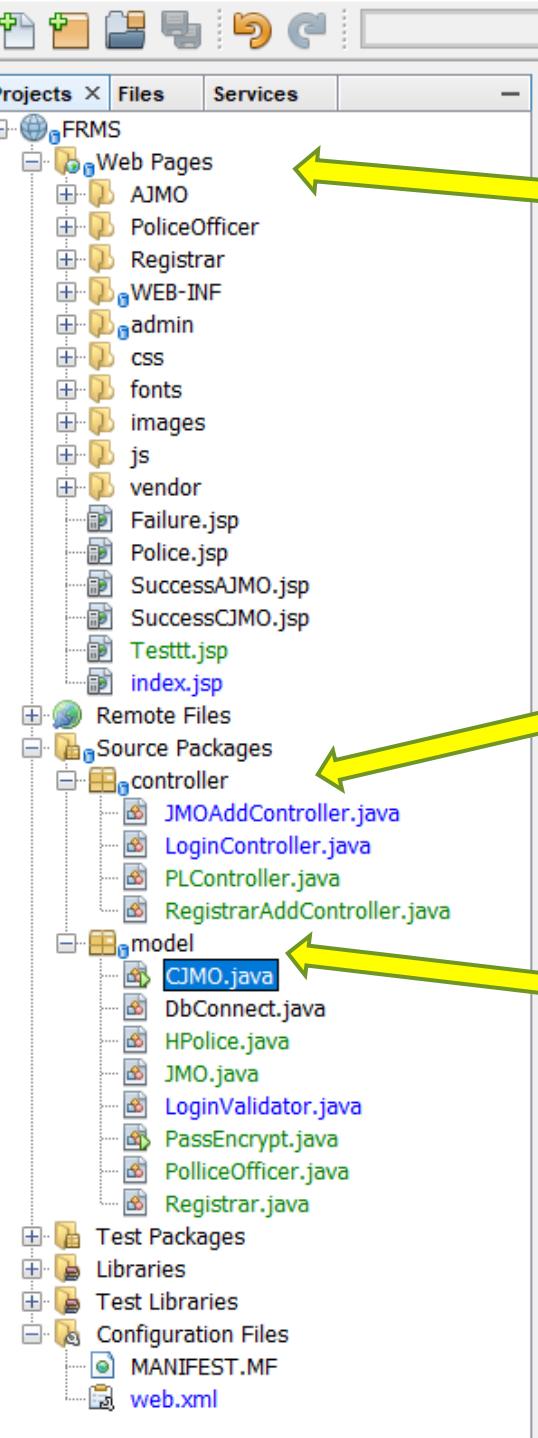
View (JSP/HTML pages)



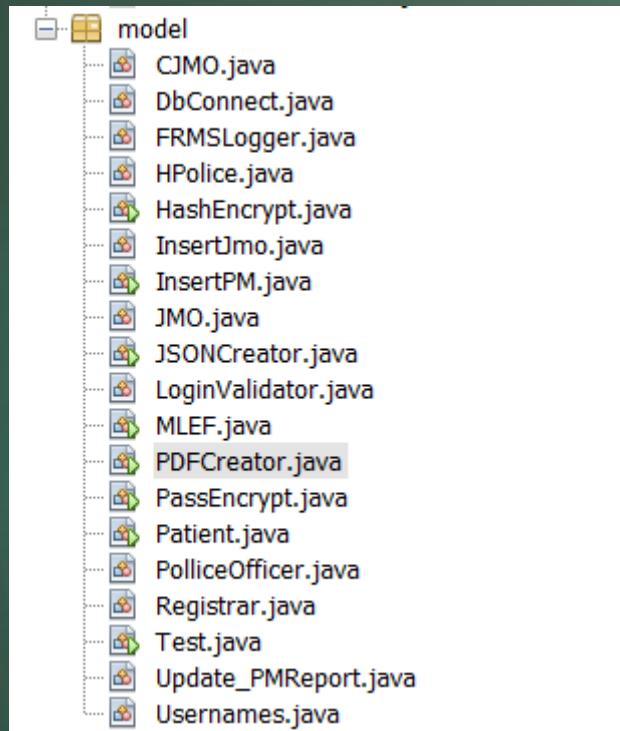
Controller (Java Servlets)



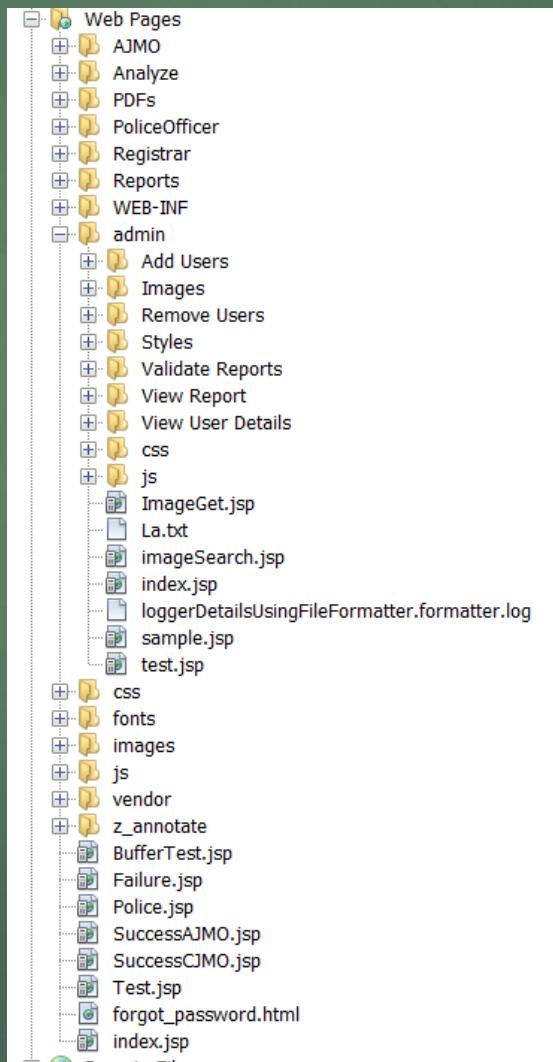
Model (Java SE)



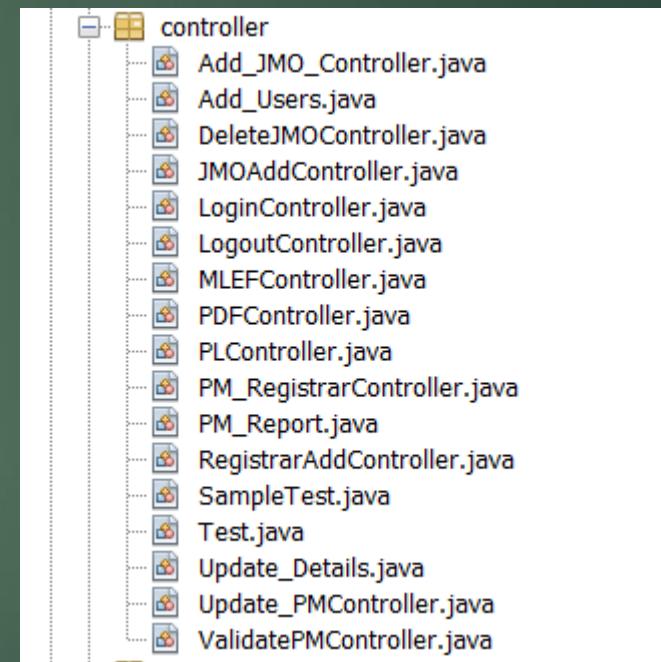
Model Components



View Components



Controller Components



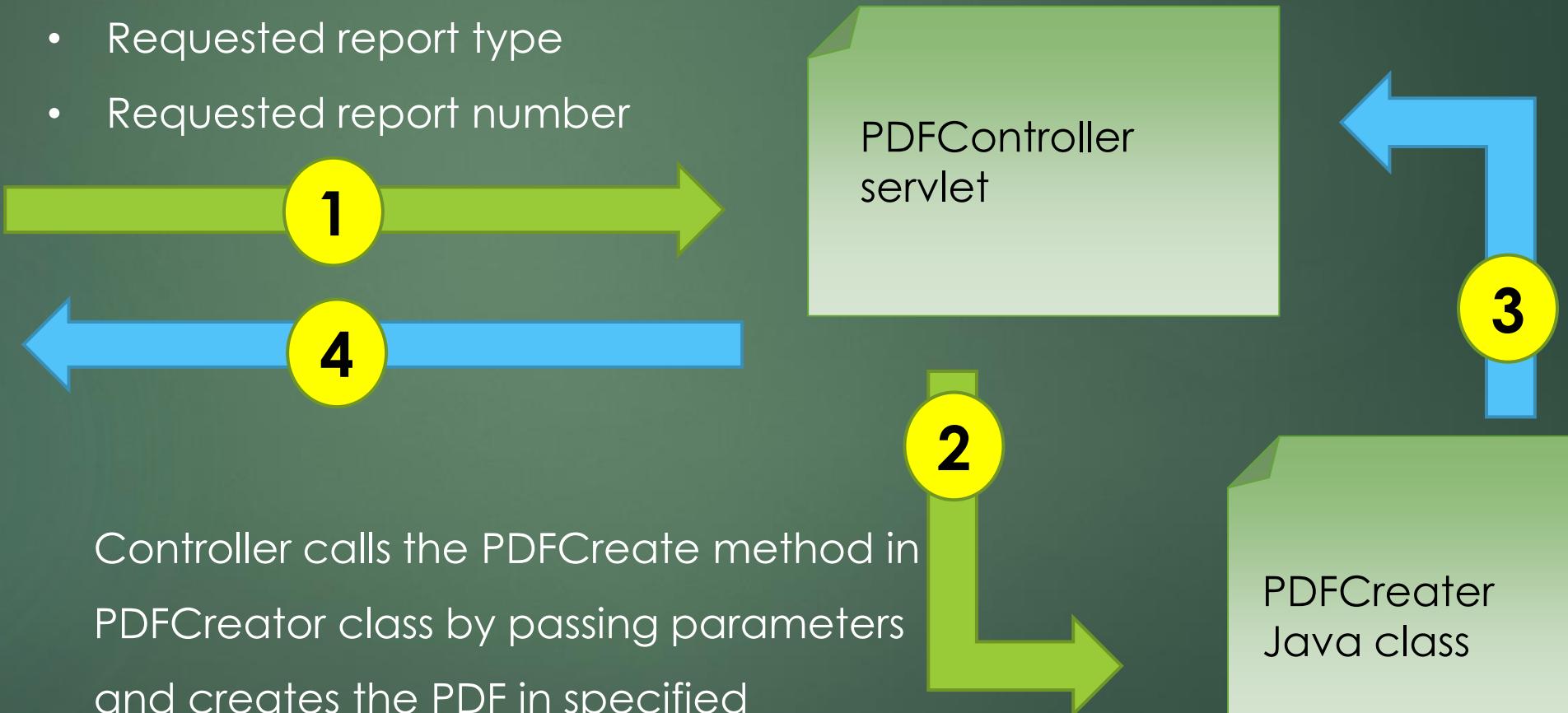
System component Interaction for PDF generation

35

When user clicks the button,
System control transfers to controller with

- Requested report type
- Requested report number

Web page with
create PDF
button

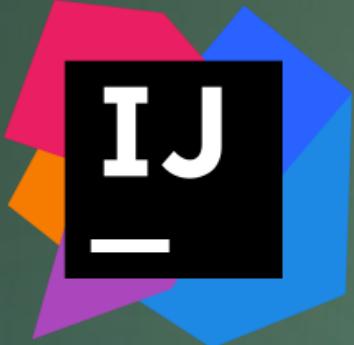


Controller calls the PDFCreate method in
PDFCreator class by passing parameters
and creates the PDF in specified
location.

Technologies used cont....

36

IDEs used for the development



Enterprise
edition



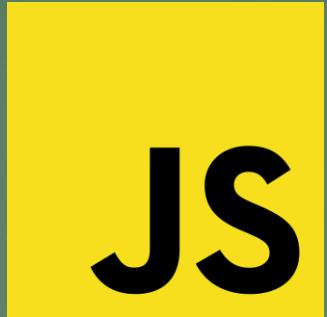
NetBeans
Java EE
edition



XAMPP

Technologies used cont....

Front end technologies & languages for web application



Bootstrap

Front end technologies & languages for mobile application



ANDROID



Back end technologies for web application

- Java cookies (To validate users and page authentication).
- Java logger class (To maintain login details.)
- Java vector (To maintain form submission details)
- FileStream Classes for file read & write functionalities.
- SHA-512 encryption



Technologies used cont....

Supportive Services and languages for the web application

- For report analysing functionality



- For PDF creation functionality (ITEXT)



ITEXT API

- djaodjin-annotate-master to annotate images.
(Java Script Based)

Technologies used cont....

Supportive Services and languages for the web application

- For image view functionality



Technologies used cont....

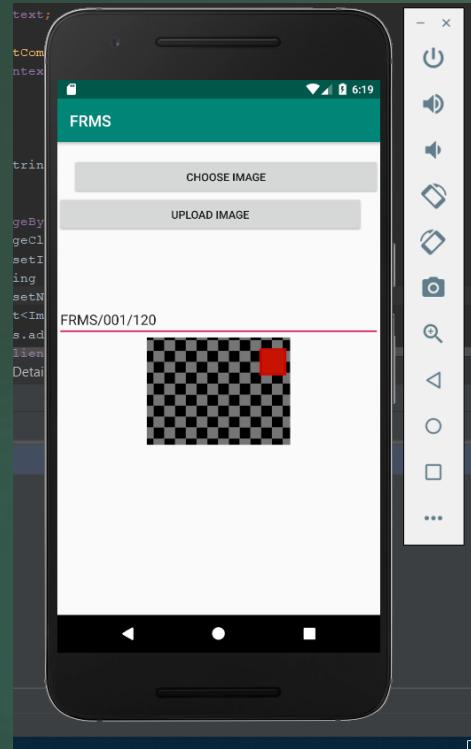
Backend services and languages for the mobile application

- For image view functionality



Technologies used cont....

42



Mobile application

Sends image upload details (ID, Image byte[])

Response



Insertion query process

Response



The reason to use web service :-

Android supports inbuilt SQLite version and couldn't use JDBC connection to send data to MYSQL database.

- SHA-512 encryption scheme is used to encrypt the user's passwords

43

name	username	Doctor_ID	NIC	email	password
Rohan Alwis	RohanA	SLMC/1989/099	689020678v	rohanalwis@gmail.com	1b1cdd74648363b040364848c4fc105b9270768115cb7b6aca...

```
public class HashEncrypt {  
    /**/  
    *  
    */  
    static byte[] hash = null;  
    public static String encryptedHash = null;  
  
    public static String bytesToHexHashEncode(String userString) {  
        try {  
            MessageDigest digest = MessageDigest.getInstance("SHA-512");  
            hash = digest.digest(userString.getBytes(StandardCharsets.UTF_8));  
        } catch (NoSuchAlgorithmException ex) {  
            Logger.getLogger(HashEncrypt.class.getName()).log(Level.SEVERE, null, ex);  
        }  
  
        StringBuffer hexString = new StringBuffer();  
        for (int i = 0; i < hash.length; i++) {  
            String hex = Integer.toHexString(0xff & hash[i]);  
            if (hex.length() == 1) {  
                hexString.append('0');  
            }  
            hexString.append(hex);  
        }  
        encryptedHash = hexString.toString();  
    }  
}
```



Technological details in summary.

- Programming adhering to Java naming conventions.
- Using OOP methodology (Abstraction, Inheritance, Polymorphism etc..)
- Knowledge about Java EE technology.
- Knowledge about database services. (MySQL, AWS RDS)
- Security mechanisms.
 - Password hashing. (SHA-512)
 - Login validation.
 - Web page access authentication (Using cookies)
- System accountability handling (By logging the user activity)
- Managing & displaying user specific specific data according to the user.
- Error handling mechanisms (Exception handing, debugging etc..)

Technological details in summary cont.

- How to enable and run service on a given IP and a port
- Accessing a defined service on a host using relevant parameters (port, URLs etc..)
- Android programming.
 - Capabilities of android (SQLite Vs MySQL)
- How to upload image to a database as a blob.
- Java File handling.
- Data Structures to maintain system details (Using Vector for MLEF detail handling)
- Using Google services to analyse data.
- Creating PDFs using java.
- SQL & database related queries & database connection methodologies.
- Java Programming (Using SE & EE version).

- ✓ Using MVC architecture for the effective maintenance of the project.
- ✓ All the html pages are implemented to verify with WW3C standards.
- ✓ Oracle standard naming convention is used with Java when declaring
 - Class names
 - Variable names
 - Method names.
- ✓ Applying planned test cases.

```
public class JMO {  
  
    private String name;  
    private String username;  
    private String password;  
    private String email;  
    private String contactNumber;  
    private String accountType;  
  
    public String getName() {...3 lines }  
  
    public void setName(String name) {...3 lines }
```

END

