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SUPRIYA .A.B
BNMIT, Professor, BNMIT, Bangalore, India, supriyabidarhalli@gmail.com

Mr. Omprakash Sringeri
OmS Patent Services Private Limited, Bangalore, India, omprakash@omspatntservices.com

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SUPRIYA.A.B[1], KAVITHA.C[2] & SADANAND RUDRAIAH[3]

[1&2]BNMIT, Professor, BNMIT, Bangalore, India
Mr. Omprakash Sringeri OmS Patent Services Private Limited, Bangalore, India
Email: supriyabidarhalli@gmail.com, omprakash@omspatntservices.com

Abstract— Client Relationship Management (CRM) system is used to manage the services provided by a company to its customers. CRM is a multi-disciplinary concept. Its successful implementation involves many aspects. CRM systems have been developed for various fields such as sales management, product management etc., but has not evidently been adopted for providing patent services, where a person or a company can submit his or their work, search for existing patents using key words, etc. Current companies providing patent services, have their own interfaces, which have few limitations. As a result, CRM system for patent servicing is developed where a separate database is maintained for each client, enabling to check previous works, review service being rendered, anytime and anywhere. And at the service provider end, CRM system helps organize work making it clutter free.

Keywords—*CRM, patent, patent services.*

I. INTRODUCTION

Customer relationship management (CRM) is a widely-implemented strategy for managing a company's interactions with customers, clients and sales prospects. It involves using technology to organize, automate, and synchronize business processes.

There are many CRM systems that have been developed for various areas such as marketing, sales, banking [1] [2], tourism [3], insurance [4] etc. There are also many generic CRM systems that can be configured to suit the requirements of the customer [5].

However, the requirements of patent services are entirely different from others. The available generic CRM systems cannot be made use for patent servicing. Due to this, existing patent servicing companies have their own different interfaces and the transaction is carried out mainly through emails. The drawback of this method is that the client will not be able to view the services are rendered to him and also it might not be a secure communication. Hence a CRM for patent services being deployed as a Web application is proposed.

II. BACKGROUND

Generally, applications that are Web based have the architecture as in Fig. 1. Many CRM applications also have the same architecture. The architecture is called the layered architecture containing - client layer, presentation layer, business layer and data layer. Each of these is explained below.

Client Layer: This layer contains the Web browser in the client machines that access the Web application that is deployed on the server i.e. a Web server. The user interface i.e. the presentation layer is accessed through the Web browser using HTTPS protocol.

Presentation Layer: This layer contains the user interface of the application. Any available technology such as JavaServer Pages, JavaServer Faces etc may be used to develop the user interface of the application. This layer is a part of the application and hence is at the server side.

Business Layer: This layer is at the server end where the application is deployed. This is where the business logic is implemented. It contains pure Java classes that help implementing the business logic, Servlets that accept the HTTPS requests from the client layer and sends back responses. It also contains the Data Access Objects that are used to access the database. The data layer is accessed from this layer through Java Database Connectivity (JDBC).

Data Layer: This layer stores the application's business data and supporting data. A separate database is maintained for each and every customer to store the data specific to them. This enables the clients to view the work currently being rendered or the previously rendered services.

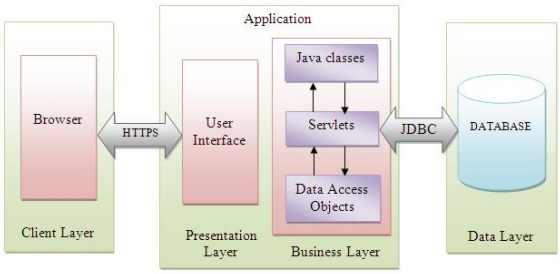

Fig. 1: Web based CRM Application Architecture

The usual scenario is that, an event in JSP file, which constitutes the user interface, hits a servlet. Servlet accepts the request and then calls the data access objects. Servlets may also make use of pure java classes to implement any business logic. The data access objects first get a connection and then access the said database through a set port. Upon setting up of connection, database is accessed and necessary actions are carried out and connection is closed. The control is then passed over to the servlet that called the data access object. On success, appropriate web page is displayed using request dispatcher. More technical details can be found in following sections below.

III. PATENT SERVICES REQUIREMENTS

Patent services are the services rendered by patent servicing companies. All these services require various data inputs from the customer. Hence, CRM for patent services should take the required data from the client based on the service requested. There are various services that are rendered by patent servicing companies such as

- Patentability Search - In patentability search it is determined if the idea proposed by the client is patentable or not. This requires the service providing person to search various patent and non-patent documents. And initially, this requires the Disclosure Document from the client, to analyze his/her idea.
- Invalidity Search - In invalidity search, it is determined if a previously acquired patent is valid or not. The specifications needed for this are the patent number, the priority date of the patent, the specific claims that are sought to be invalidated, any known related art and any other related information that would help the service provider.
- Patent Specification Drafting - Once it is determined that the idea is patentable, the novel idea has to be documented as per the patent document specification. This is called patent specification drafting. This requires the disclosure document from the client and also prior art document if any.
- Evidence of Use/Infringement Search - Determining if a patent is being infringed is called evidence of use or infringement search. For this service to be rendered, patent number, target product and/or target company have to be specified.
- Freedom to Operate – This determines if there are any potential patent barriers for a technology or product to be commercialized. This requires a document with the features of the product or the technology to be specified.
- Mining – Systematic scanning and analysis of patent documents is called mining. This requires a list of patents document to be specified.
- Portfolio – This includes systematic scanning and analysis of patents that are owned by a single person or company. A list of assignee specific patent numbers has to be specified.
- IPO - Drafted patentable document has to be filed at Indian Patent Office by filling various required forms as per the requirement of the inventor/assignee. It has to be specified if it is New India Patent Application filing, National phase, Foreign Filing License or any other.
- Response to Office Actions – Patent might not be granted after first attempt of examination. In that case an intimation letter will be sent. Changes have to be made to the drafted document and then examination has to be taken again for a patent to be granted. This requires the patent application number, application title and first examination report date to be specified.

IV. FEATURES OF PATENT SERVICES CRM

One of the main features of patent service CRM is the user friendly and efficient user interface for both client and service provider for integrated interactions. Along with this, security is also given importance and hence, HTTPS protocol is used. This provides security as it uses Transport Layer Security (TLS) and Secure Sockets Layer (SSL) cryptographic protocols to provide communication security over Internet.

The actors defined for the CRM system are- Admin, Manager, Team-lead, Team-member and client. Role is assigned to each and every user as admin, manager, team-lead, team-member or client so that access privileges can be provided based on the role. Admin can create users and accounts and can modify them. On creation of users and accounts, an email will be sent along with username and password. The passwords will be encrypted and stored in the database. SHA1 encryption is used to accomplish this.

Figure 2 is a screen shot where admin can create an account by entering all the required details.

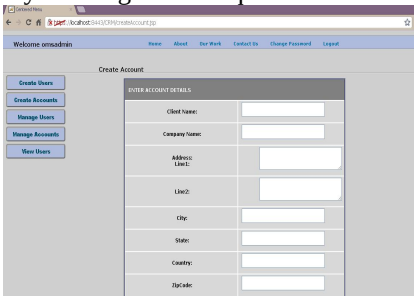

Figure 2: Screen shot of account creation form

A manager can create case, create team with team members and a team-lead. Manager can view all the cases that have been created and also assign case to a team. Figure 3 is a screen shot of the drop down menu with all the case types.

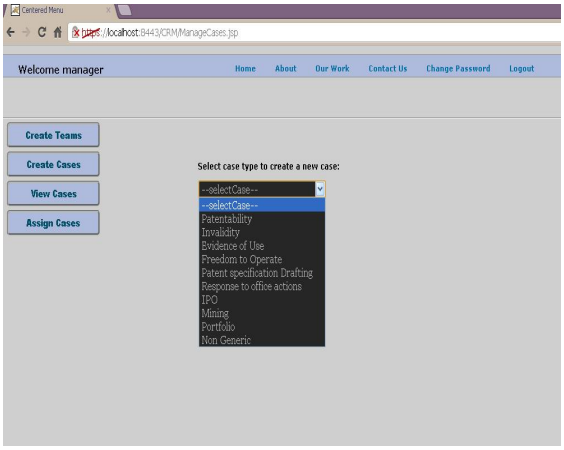

Figure 3: Screen shot of create case drop down

A separate form is displayed for each type of case listed in the dropdown menu. For example, to create a patentability search case, a form where necessary details have to be filled is displayed as shown in figure 4.

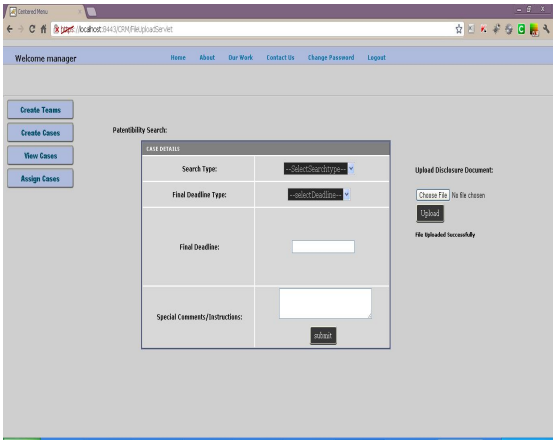

Figure 4: Screen shot of form for patentability search

Case details can be viewed by all the users except admin. Team-lead and team-members can view the cases that have been assigned to their team. Each case that has been created has status, initially the status will be "created", once the manager assigns it to a team, the status changes to "assigned". Later, the team member can send the case to team-lead for approval and then the status will be changed to "To be Approved". If the team-lead approves the case after reviewing, the status changes to "approved" else to "rejected". Once the case has been approved, team-member can upload the final work-product for the client to view and the status will change to "submitted". The client can then view the uploaded work-product, if satisfied, the client accepts it and the status changes to "accepted" else to re-submitted".

Figure 5 is a screen shot showing the table that contains the details of all the cases that hs been created.

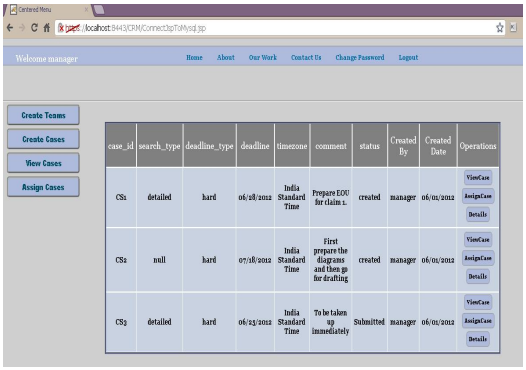

Figure 5: Screen shot of details of cases created

V. IMPLEMENTATION

The entire application is developed using Java technologies and MySQL. User Interface is developed using JavaServer Pages (JSP). JSP technology is used to simplify the development of dynamic Web pages. In a JSP page, static content is developed using regular HTML tags whereas the code for dynamic component is enclosed within JSP tags. The server side implementation of the application is achieved using Servlets. Servlet technology provides a simple, vendor independent mechanism for extending the functionality of a web server. A servlet is a simple Java class, which is dynamically loaded on a Web server and thus enhances the functionality of the Web server.

The data from JSPs are sent to corresponding servlets using the action attribute of form tag in HTML upon occurrence of certain events such as form submission. At the servlet end these are read using name of the required field, as shown.

String val = request.getAttribute("username");

Once this statement is executed, the value entered inside the text box by name username is copied to the String named val.

JDBC is Java based technology for managing the database. Database connection will be established between the database and text editor by making use of the InitialContext class in Java as shown:

```
Context initCtx = new InitialContext();
Context envCtx =
(Context)initCtx.lookup("java:comp /env");
DataSource ds = (DataSource)envCtx.lookup
("jdbc /crm");
conn = ds.getConnection();
```

InitialContext class is the starting context for performing naming operations. On execution of these

above specified lines of code, connection to the database is returned.

Data Access Objects also call the getConnection method to retrieve a connection to database and perform required functions such as data base retrieval, insertion update etc. This is accomplished using prepared statements as shown.

PreparedStatement pst = conn. Prepare Statement ("insert into case_record (case_id, search_type, deadline_type, deadline_date, timezone, comments, status, created_by, created_date) values(?, ?, ?, ?, ?, ?, ?, ?, ?)");

Prepared statement contains the query that has to be made to the database and "?" are put in where ever values have to be specified. Once all the required values for the query to execute correctly are specified,

pst.execute();

has to be included for the query to get executed. Once accessing the database is done the connection has to be closed as shown.

conn.close();

All the files that are uploaded pertaining to the cases are stored in the database as Binary Large Objects (BLOBs). They are retrieved and used while the case is in progress.

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