PROJECT REPORT

DESIGN
AND DEVELOPMENT
OF
WEB APPLICATION –
ONLINE RENTAL PORTAL

Using JSP, Servlets & SQL

ACKNOWLEDGEMENT

It is my pleasure to be indebted to various people, who directly or indirectly contributed in the development of this work and who influenced my thinking, behavior and acts during the course of study.

I express my sincere gratitude to all for providing me an opportunity to undergo this industrial training as the part of my engineering degree.

I am thankful to Ms. Nandita Singla and Ms. Jaspinder Kaur, my project mentors at C-DAC, for their continuous support, cooperation, and motivation provided to us during the entire course of training.

I also extend my sincere appreciation to her for providing her valuable suggestions and precious time in accomplishing my goal of creating this project.

I would like to thank the almighty and my parents for their moral support and friends with whom we shared our day-to day experience and received lots of suggestions that improve our quality of work.

Last but not least, I would also love to extend my gratitude to the University for giving me the opportunity to explore my potential at C-DAC.

Simran Koul
Roshni Dhand

I. ***PREFACE***

We are all aware of the modern e-commerce portals, and how life would become dysfunctional without them. These modern e-commerce portals (like Amazon, Flipkart, Snapdeal and many others) are primary examples of the shift technology has brought in the e-commerce marketplace.

My vision to create this project is under the perspective of creating a relevant real-time renting system for the ease of renting for the customers as well as the vendors. Online Rental Portal is an e-commerce driven system that has been desired to simplify the functioning of the process of renting in real-time.

This project is a means to implement the logic, functioning, and methodology of various aspects of Java as a language, and the frameworks which Java constitutes of. Though Java is one of the old programming languages, but it definitely is irreplaceable. And, Java has from time to time proved its worth for a Web Application Developer.

This report aims at helping the reader analyze and comprehend the entire process of building the online rental portal.

II. ***CONTENTS***

ABOUT C-DAC

The **Centre for Development of Advanced Computing** (**C-DAC**) is an Autonomous Scientific Society of the Ministry of Electronics and Information Technology (MeitY), of the Government of India.

About the Industrial Training in JAVA

The last 6 months at C-DAC were nothing short of an exponential curve of learning, inspite of the lockdown from the month of March itself. The continuous online classes via Zoom not only established the necessity of technology, but also empowered the vision of education through the perseverant mentor at C-DAC.

This industrial training has given all the students a vision as a student, but learnings of a professional. The 6-months long industrial training may have seemed short due to the lockdown, but it has not decreased the efficiency of students.

The target of the Industrial training was to enable ourselves not only greater knowledge for the programming language, but also gives an opportunity to implement through the real-time projects that are built.

PROJECT UNDERTAKEN

1.1 Objective

The aim of this project was to implement the logics and functionality of the Java programming language and its frameworks through a real-time system. As the name of the project suggests, this project focuses on making renting easy for both customers and vendors. Choosing E-commerce as a topic wasn't very difficult, for we all understand how significantly has e-commerce improved and marked its importance in the field of technology.

Talk about Amazon, or Flipkart, they are the hub of E-commerce in the technology right now. And, thus, the goal of the project was to build something similar with a different tech stack, including but not limited to Java.

1.2 Need to Choose the project

A project is not necessarily limited to a programming language, when built from scratch. It involves system design, database design, data flow diagrams, and eventually it all sums up to fit in the puzzle. Thus, to choose the project, the real-time application was considered. And, there is no industry as diverse as E-commerce presently.

Elaborating on why this project was chosen:

1) Why E-commerce?

   E-commerce is currently the best rising industry in technology. Considering Amazon, every day so many users buy, cancel, make a request, add to cart and do tons of operations. To see how it all links up at a system level is what I wanted to find and analyze. As mentioned earlier, starting a project from scratch requires fundamental knowledge of everything that is required to make the project big.

2) Why Java?

   Do you know that Netflix runs on Java? Though Java is considerably one of the old

programming languages, but it is fundamentally strong and includes various features to build a fancy web application.

1.3 Industry Application

As mentioned before, E-commerce is thriving at an exceptional rate at present. Apart from the fact that people have become more aware about doing all the essential and few non-essential services by the means of internet, it has given more wings to the ideas generated by entrepreneurs, tech savvy enthusiasts, or the businessmen.

Let us take an example of OLX, it also stands for the same significance as this project does. The main difference that shall come between what this project has created and the existing relevant application is the tech stack. OLX is mainly about Javascript, and Node.js, while this project explores JAVA and the frameworks primarily, supported by the Front-end languages (HTML/CSS)

INTRODUCTION TO ASSIGNED JOB

Effectively, the job assigned in this entire process of creating this project was not limited to one, but included several segments according to the required criteria. Nevertheless, the crux of the project was to develop and design a web application on 'ONLINE RENTAL PORTAL' using the following tech stack primarily: Java, JSP, Servlets and MySQL.
In detail, the different tasks that were performed in order to collectively produce the project as a finely made web application were:

1) Requirement Analysis

   To understand what the project demands is the most important criteria, and to know how to implement comes second. The first job was to create a workflow of the required job, according to the modules required in the project. The requirements are not limited to but include the modules (eg: users, customers etc) , functionality of the modules and the list of requirements may vary from project to project.

2) System Design

   When we talk about system design in technical terms, it includes two parts: Front End and Back end. Deciding on which tools and languages to use on Front-end according to the requirement analysis phase is what this phase of job assigned includes. Similarly, it goes for the back end.

   For any small or big feature in a project, it is important to know the requirements. So, the crux is to know your requirements very well, before you come to designing/coding your logic.

3) Coding

This is the logical part, and involves building a flow of the project by logic. This involved different aspects of the programming language. Using the tools decided while designing the system, it is about bringing it to action in the easiest, but the most systematic way.

a) Front End

Front End involves the user design and user experience. Front-end is extremely important for the first impression that you were to put on your customer. How the person reacts to what he or she sees results eventually into the lead generation of the business, which is the primary goal from the perspective of the owner of a company.

b) Back End

This involves connecting what your users enter and storing it in the database for future purpose. A simple example, is the authentication. When the user registers for the first time, their details are fed to a database. When the user logs into their account later, their credentials are then matched with the ones in database. If they don't match, the user is not authorized to enter to their account. Now, if there was not database, there would be no possibility of storing data. This was also a crucial responsibility.

Summing up, the combination of all the steps mentioned above resulted into this web application. Thus, it is important to mention here any web application requires more attention on gathering the requirements than it does on the coding part. It is only the clarity in requirement analysis phase, which helps you understand everything clearly.

FEASIBILITY STUDY

There are multiple reasons why this project is feasible, and why it can be expanded in the near future, if be the need. Let us ponder over the reasons in detail.

1) E-commerce

   As many time as the Online Rental Portal will be mentioned, its significance in the marketplace will also be mentioned. The fact that we have a lot of examples of what worked for different applications (like Amazon, Flipkart) can set a higher standard of what we can implement in our own. The prototypes don't have to match, but the project can be built on similar lines. This industry does make it feasible for a new project/idea pertaining the same to survive in the marketplace, for long enough and longer, if the idea is loved by the stakeholders.

2) Cost

   The feasibility of a project is utterly dependent upon how much money we are putting in, and the throughput we eventually get from the project. Let us say that this is the only project that my company is wanting to own, so as an entrepreneur, I will be keen to make it work in my first attempt. For the same, the best developer will be hired (compromising on the cost may be a big factor here!). And, marketing people will also be required to make a reach for the project. A product manager may also be needed. It has become very easy to find good employees via social media platforms (LinkedIn), or the freelancers' hub (Upwork). So, cost that it takes to build the project can definitely be manipulated, which makes the project more feasible, giving the flexibility.

3) Value

The value this project brings to the audience, and how this project caters its needs is the throughput. And, this must be evaluated to get a sense of feasibility of the project. Obviously, this project is needed because of the problem that it solves – the concept of renting would become easy by giving them a common platform to work upon.

4) Tech Stack

The tech stack used in the project is very flexible. And, of course, it can be changed with requirements and needs of the stakeholders, customers or the organization. And, this flexibility is the biggest reason why this project is feasible.

REQUIREMENT ANALYSIS

Requirement Analysis is surely the most important part of the entire process in making a project from scratch. Requirement gathering and analysis gives you a clear insight on how you want to proceed ahead with the project.

There are two types of requirements that we need to infer to before moving ahead in building the project. These two types are:

1) Business Requirements

   This is about the customers, the vendors, the stakeholders – basically about the people involved in the scenario. In layman terms, it is supposed to define what your system is doing.

   In this project, the requirements are defined from the perspective of customers and vendors. The relationship between the customer and vendor is managed by the intermediator influence which the owner or administrator acts as.

2) Software Requirements

   Any Operating System should do.

   a) IDE

      IDE (Integrated Development Environment) is used to write the code not limited to Java, but includes HTML/CSS (in JSP pages).

      NetBeans 8.0.2 was used in this project.

   b) MySQL Workbench

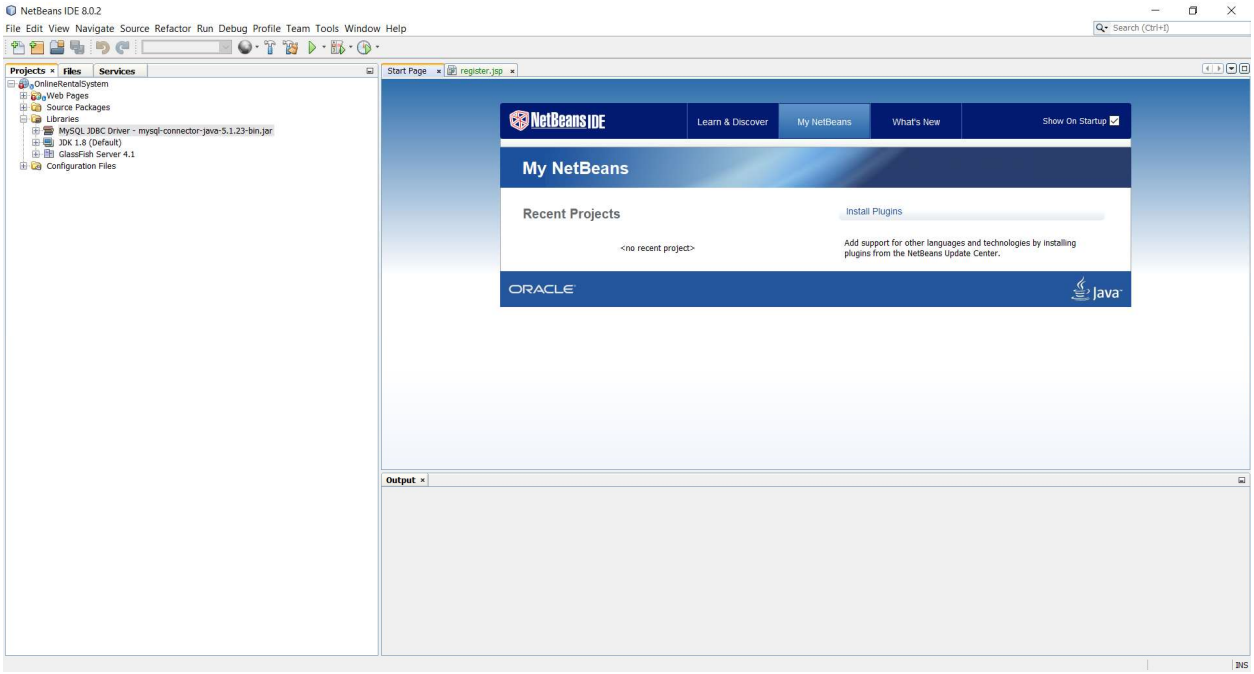
      This will store the data of customers, vendors and admins, which will then be used which doing different operations.

c) Servers

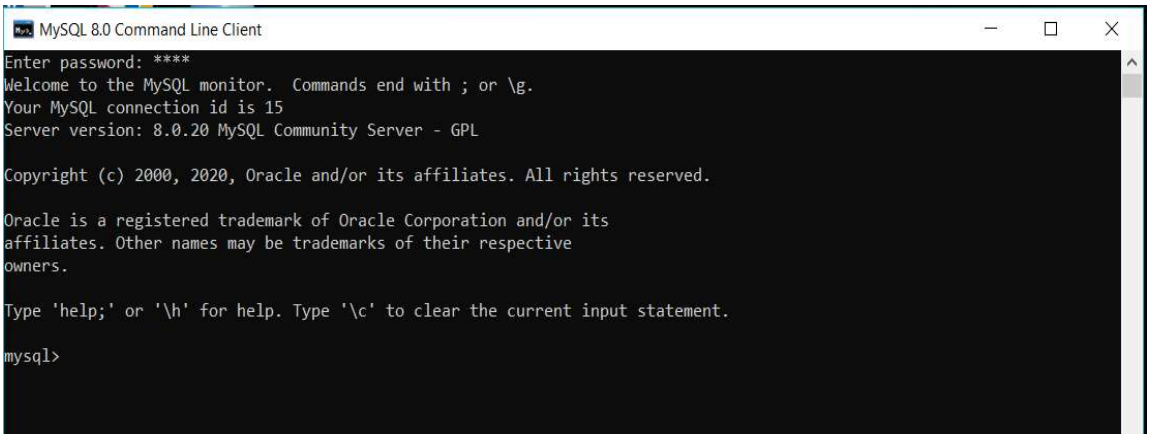
Servers are used to host your web pages.
Glassfish or Apache Tomcat server. It comes pre-installed in the NetBeans IDE making it fairly easy for the developer.

Set-Up

1) NetBeans



2) MySQL


MySQL 8.0 Command Line Client
Enter password: ****
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 15
Server version: 8.0.20 MySQL Community Server - GPL
Copyright (c) 2000, 2020, Oracle and/or its affiliates. All rights reserved.
Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
mysql>

3) Server


Output
OnlineRentalSystem (run)
Java DB Database Process
GlassFish Server 4.1
#!## LogManagerService.postConstruct : rootFolder=C:\Program Files\glassfish-4.1\glassfish
#!## LogManagerService.postConstruct : templateDir=C:\Program Files\glassfish-4.1\glassfish\lib\templates
#!## LogManagerService.postConstruct : src=C:\Program Files\glassfish-4.1\glassfish\lib\templates\logging.properties
#!## LogManagerService.postConstruct : dest=C:\Users\Simran\AppData\Roaming\NetBeans\8.0.2\config\GF_4.1\domain1\config\logging.properties
Info: Running GlassFish Version: GlassFish Server Open Source Edition 4.1 (build 13)
Info: Server log file is using Formatter class: com.sun.enterprise.server.logging.ODLLogFormatter
Info: Realm [admin-realm] of classtype [com.sun.enterprise.security.auth.realm.file.FileRealm] successfully created.
Info: Realm [file] of classtype [com.sun.enterprise.security.auth.realm.file.FileRealm] successfully created.
Info: Realm [certificate] of classtype [com.sun.enterprise.security.auth.realm.certificate.CertificateRealm] successfully created.
Info: Authorization Service has successfully initialized.
Info: Registered org.glassfish.ha.store.adapter.cache.ShoalBackingStoreProxy for persistence-type = replicated in BackingStoreFactoryRegistry

MODULAR DESCRIPTION OF THE JOB

The job assigned aims at creating the relationship between the customer and vendor at ease with the intermediate intervention of the administrator or the system, which belongs to the organization or the company the project involves with. The different modules of the project aim at collating together to form a bigger domain of the functionalities which together form the Online Rental portal, in this case to be precise.

Let us talk in depth about what the different modules bring together for the job of creating a system that makes renting (or any process, for that matter) easier.

1) Easy and Elegant UI/UX

   For both the customers, and the vendors, the easy and yet elegant looking UI helps in the feasibility of the working of the portal primarily. But, given that, it also lasts an impression, which further helps in the marketing of the product, in second phase of the project build-up (in general scenarios)

   This is an important aspect from the user's point of view, be it customer or vendor.

2) Fast Query processing

The better tech stack leads to one big advantage, and that's how fast your web application works. The MVC architecture of JAVA has divided the entire web application into M (Model), V (View) and C(Controller), which results in keeping the front-end code and the back-end code segregated for the understanding on the level of Software Developers.
But, apart from that, how fast the user is retrieved with the results also depends on what part of the MVC is used in the modules together.

DETAILED ANALYSIS OF INDIVIDUAL MODULE

One project is the combination of different modules together, which define their own set of functionality, and methods to propagate within the same, or different modules co-existing together in the project.

The entire project, Online Rental Portal, is divided into different modules for the ease of understanding of the functionality that the project aims to bring.

1) Administrator

   In simple words, the administrator knows it all. Whether it is about the customer, or the vendor, it knows all about their orders, history, current orders, account details (not the payment details, of course!)
   The admin is bound to interfere between the client (which in our case, is the customer) , and the service(which in our case, is the vendor) in the extreme circumstances.
   Otherwise, the admin only overlooks between the two such as to simplify the relationship and creating balance between the two other modules.
   The functionality includes, but is not limited to:

   - View profiles

- Delete the profiles

2) Customer

   Talking about any customer, the basic functionality involves is CRUD (Create, Read, Update and Delete). There's a complete list of functions that a customer is accustomed to perform, independent of everything else. The functions include, but are not limited to:

   - Register as a customer
   - Login as a customer
   - Adding Items to the cart
   - Removing items from the cart
   - Updating the cart
   - Viewing the cart/page/profile

3) Vendor

   Like the customer, vendor is also authorized for the basic CRUD operations which include Create, Read, Update, Delete.

   Vendor looks out to promote and sell their products/services on the main page of the web application. The functionality of the vendor includes, but is not limited to:

   - Register as a vendor
   - Log in as a vendor
   - View profile
   - Add products/services
   - Accept orders from the customers

Thus, the combination of the 3 modules, and various other basic functionality would make up this entire project. The relevance of the relationship between customer and vendor grows stronger with this organization through best delivery services by the intermediate, admin.

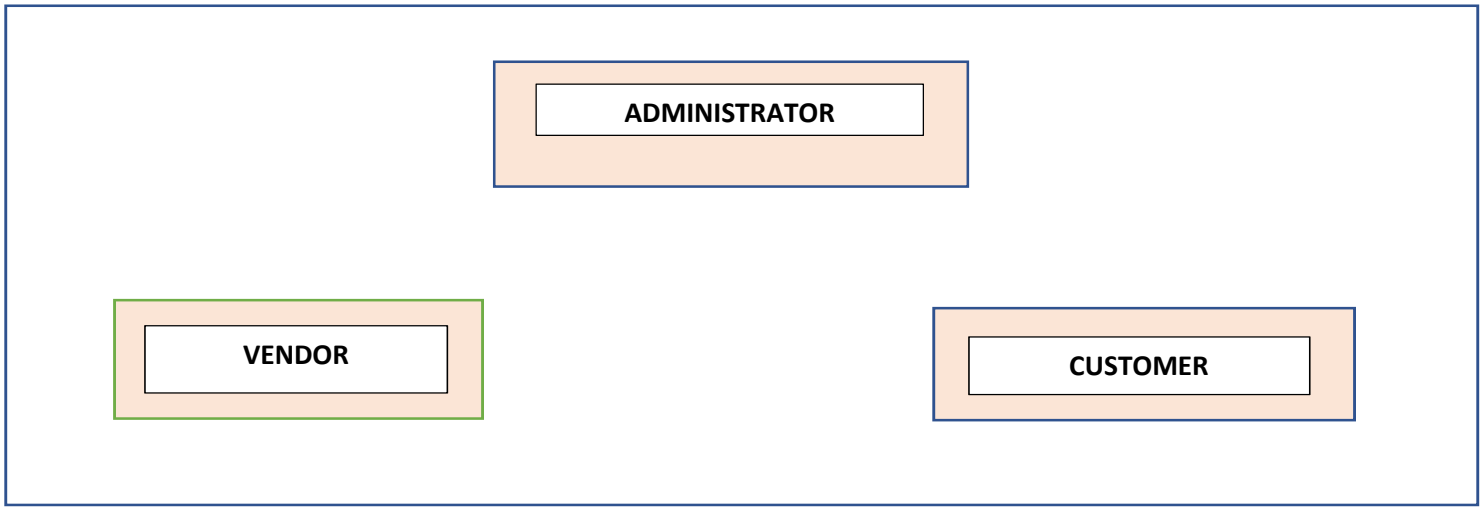


Fig 1. The pictorial representation of the three modules in the project – Admin, Vendor and Customer

DESIGN

The design of the project has been bifurcated into two parts as the System Design, and the Database design. System design includes the servlets, and the JSP whereas the Database Design includes creating tables.

1) System Design

System design involved coding for the flow of the data from one servlet to the other. The motive was to make the interface not only attractive, but also user friendly.

2) Database Design

The Database design was crucial part of the process as the database has the important data which is needed for the operations to happen between the consumer and the vendor.

The Database Design is shown in detailed layout below:

1) Customer

```
mysql> desc customer;
+------------+---------------+------+-----+---------+----------------+
| Field      | Type          | Null | Key | Default | Extra          |
+------------+---------------+------+-----+---------+----------------+
| customerId | int           | NO   | PRI | NULL    | auto_increment |
| firstName  | varchar(40)   | YES  |     | NULL    |                |
| lastName   | varchar(40)   | YES  |     | NULL    |                |
| address    | varchar(200)  | YES  |     | NULL    |                |
| mobileNum  | decimal(10,0) | YES  |     | NULL    |                |
| email      | varchar(100)  | YES  |     | NULL    |                |
| password   | varchar(32)   | YES  |     | NULL    |                |
+------------+---------------+------+-----+---------+----------------+
```

2) Vendor

```
mysql> desc vendor;
+-----------+---------------+------+-----+---------+-------+
| Field     | Type          | Null | Key | Default | Extra |
+-----------+---------------+------+-----+---------+-------+
| vendorId  | int           | NO   |     | NULL    |       |
| firstName | varchar(40)   | YES  |     | NULL    |       |
| lastName  | varchar(40)   | YES  |     | NULL    |       |
| address   | varchar(200)  | YES  |     | NULL    |       |
| mobileNum | decimal(10,0) | YES  |     | NULL    |       |
| email     | varchar(100)  | NO   | PRI | NULL    |       |
| password  | varchar(32)   | YES  |     | NULL    |       |
+-----------+---------------+------+-----+---------+-------+
```

3) Admin

```
mysql> desc admin;
+----------+--------------+------+-----+---------+-------+
| Field    | Type         | Null | Key | Default | Extra |
+----------+--------------+------+-----+---------+-------+
| email    | varchar(100) | YES  |     | NULL    |       |
| password | varchar(100) | YES  |     | NULL    |       |
+----------+--------------+------+-----+---------+-------+
```

4) Product

```
mysql> desc Product;
+--------------------+--------------+------+-----+---------+----------------+
| Field              | Type         | Null | Key | Default | Extra          |
+--------------------+--------------+------+-----+---------+----------------+
| id                 | int          | NO   | PRI | NULL    | auto_increment |
| productName        | varchar(100) | YES  |     | NULL    |                |
| productType        | varchar(100) | YES  |     | NULL    |                |
| quantity           | int          | YES  |     | NULL    |                |
| price              | decimal(10,0) | YES  |     | NULL    |                |
| priceCondition     | varchar(40)  | YES  |     | NULL    |                |
| productDescription | varchar(2000) | YES  |     | NULL    |                |
| image              | longblob     | YES  |     | NULL    |                |
| vemail             | varchar(100) | YES  | MUL | NULL    |                |
+--------------------+--------------+------+-----+---------+----------------+
```

5) tempCart

```
mysql> desc tempCart;
+------------+---------------+------+-----+---------+-------+
| Field      | Type          | Null | Key | Default | Extra |
+------------+---------------+------+-----+---------+-------+
| proId      | int           | YES  |     | NULL    |       |
| qty        | int           | YES  |     | NULL    |       |
| proPrice   | decimal(10,2) | YES  |     | NULL    |       |
| priceDur   | int           | YES  |     | NULL    |       |
| vendorId   | int           | YES  |     | NULL    |       |
| customerId | int           | YES  | MUL | NULL    |       |
+------------+---------------+------+-----+---------+-------+
```

6) Orders

```
mysql> desc orders;
+-----------+---------------+------+-----+---------+----------------+
| Field     | Type          | Null | Key | Default | Extra          |
+-----------+---------------+------+-----+---------+----------------+
| orderId   | int           | NO   | PRI | NULL    | auto_increment |
| custEmail | varchar(100)  | YES  |     | NULL    |                |
| bill      | decimal(10,2) | YES  |     | NULL    |                |
+-----------+---------------+------+-----+---------+----------------+
```

CODING

There are two languages that are primarily being used in designing the web application as mentioned above. These two languages are:

1) JAVA

   A programming language is nothing, but a language to translate your instructions to your machine. Java is being used to connect the data flow of the application from one servlet to another servlet using MVC Architecture.

2) SQL

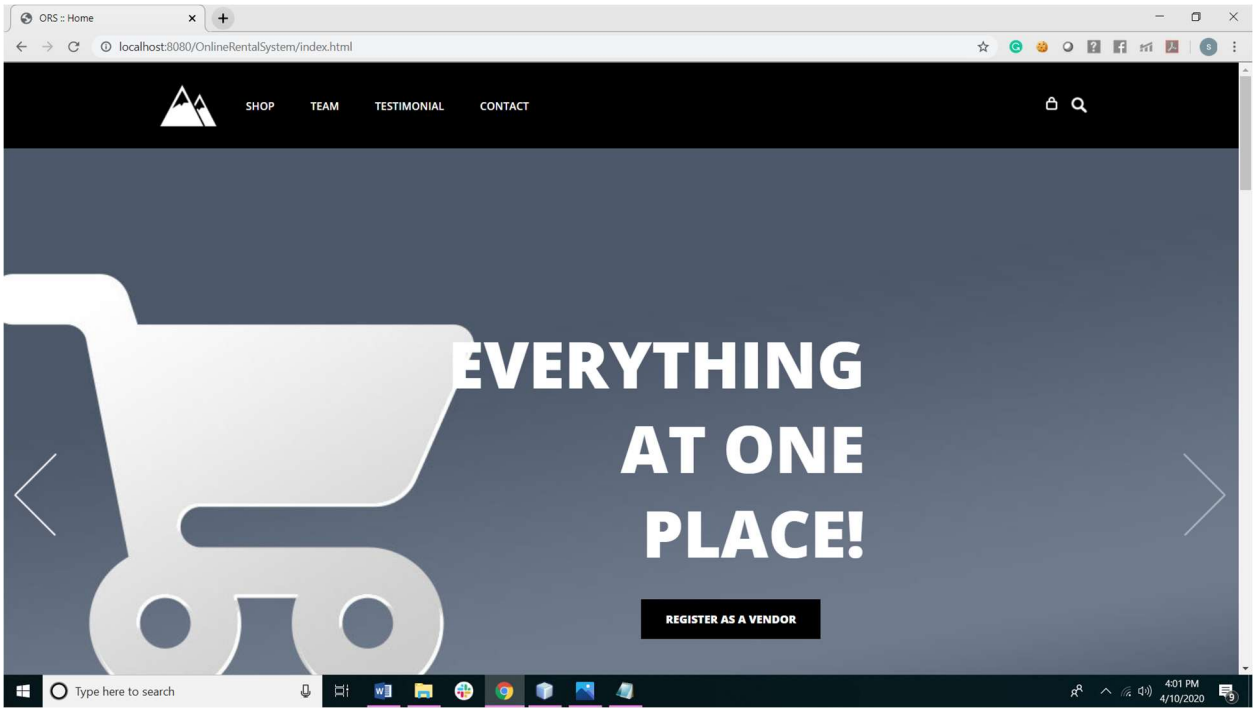
SQL, stands for Structured Query Language, is used to make your application “talk” to the data that already exists, if any. This is important as all the data of the customers, and vendors is used here.

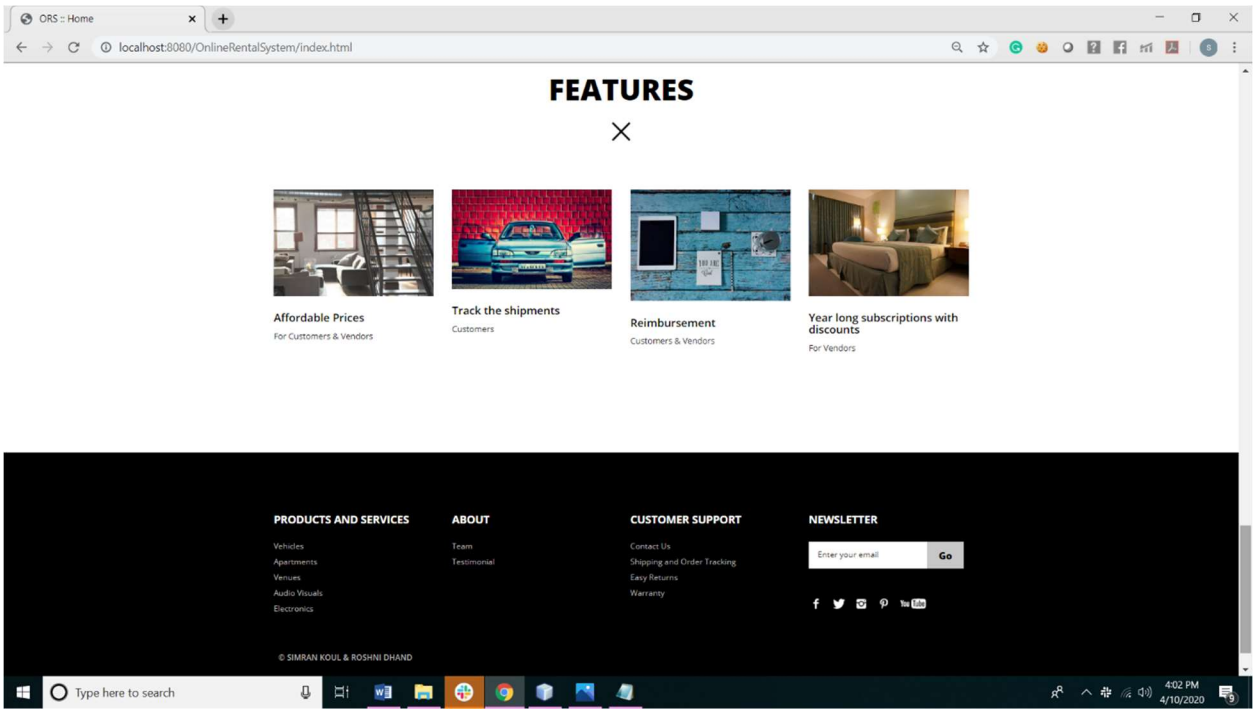
The combination of the two languages mentioned above fulfill the requirement of the working of this web application.

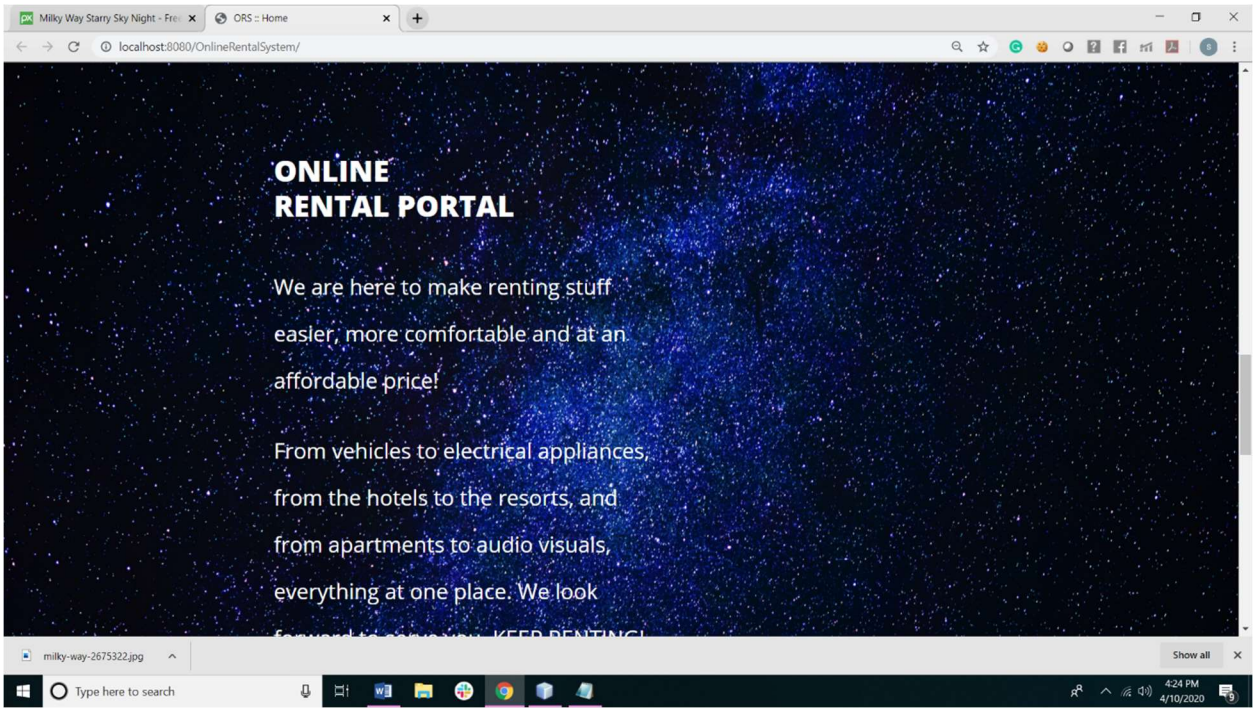
SNAPSHOTS

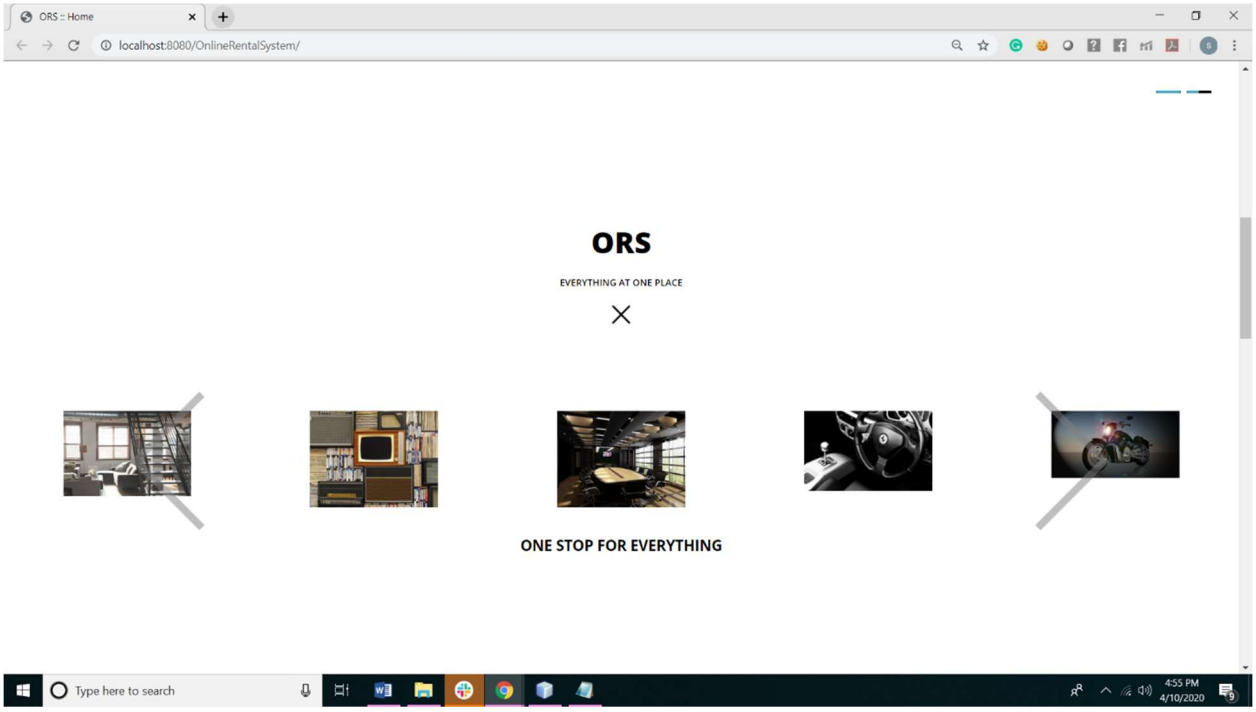
Following are the snapshots of the codes that have been used to create this web application – Online Rental Portal. Few of the snapshots are added according to the functionality they are providing to the web application.

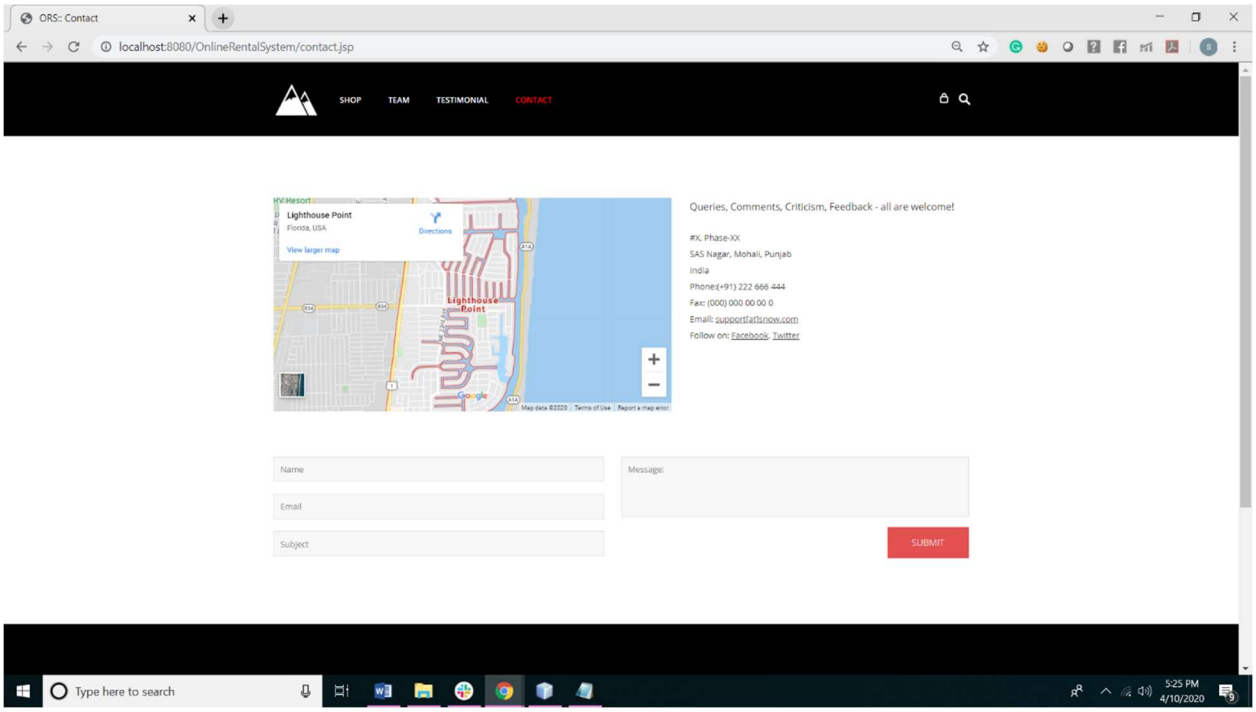
WHAT THE WEB APP LOOKS LIKE?


ORS :: Home
localhost:8080/OnlineRentalSystem/index.html
SHOP
TEAM
TESTIMONIAL
CONTACT
EVERYTHING AT ONE PLACE!
REGISTER AS A VENDOR
Type here to search
4:01 PM
4/10/2020


ORS :: Home
localhost:8080/OnlineRentalSystem/index.html
FEATURES
Affordable Prices
For Customers & Vendors
Track the shipments
Customers
Reimbursement
Customers & Vendors
Year long subscriptions with discounts
For Vendors
PRODUCTS AND SERVICES
Vehicles
Apartments
Venues
Audio Visuals
Electronics
ABOUT
Team
Testimonial
CUSTOMER SUPPORT
Contact Us
Shipping and Order Tracking
Easy Returns
Warranty
NEWSLETTER
Enter your email
Go
© SIMRAN KOUL & ROSHNI DHAND
Type here to search
4:02 PM
4/10/2020


Milky Way Starry Sky Night - Fre
ORS :: Home
localhost:8080/OnlineRentalSystem/
ONLINE
RENTAL PORTAL
We are here to make renting stuff easier, more comfortable and at an affordable price!
From vehicles to electrical appliances, from the hotels to the resorts, and from apartments to audio visuals, everything at one place. We look
milky-way-2675322.jpg
Show all
Type here to search
4:24 PM
4/10/2020


ORS :: Home
localhost:8080/OnlineRentalSystem/
ORS
EVERYTHING AT ONE PLACE
ONE STOP FOR EVERYTHING
Type here to search
4:55 PM
4/10/2020


ORS:: Contact
localhost:8080/OnlineRentalSystem/contact.jsp
SHOP
TEAM
TESTIMONIAL
CONTACT
Lighthouse Point
Florida, USA
Directions
View larger map
Queries, Comments, Criticism, Feedback - all are welcome!
#X, Phase-XX
SAS Nagar, Mohali, Punjab
India
Phone:(+91) 222 666 444
Fax: (000) 000 00 00 0
Email: support[at]snow.com
Follow on: Facebook, Twitter
Name
Email
Subject
Message
SUBMIT
Type here to search
5:25 PM
4/10/2020

CONCLUSION

The process of creating a project from scratch, and learning a new technology in depth has definitely made me a smarter professional. The skills I have gained through this project are of immense importance to me, be it the technical skills or non-technical skills. The 6-month long industrial training may have been more difficult because of the lockdown, but the work did not stop.

On the contrary, learning Java has been a roller-coaster. But, eventually, it is now part of my skillset. The importance of project management, SDLC and requirement analysis (to be more precise) has never been more clear to me than now. Building project from scratch definitely gives you more confidence for the skill than ever before.

FUTURE SCOPE

Nothing is “perfect’ in the world of software development. There are always alternate ways to do the same thing, or even better ways to do the same thing. Thus, a software or a web application requires consistent efforts even after the web application or the software is deployed. In fact, one the application is deployed, then the real journey of the web application begins. Because, then it is handed in to the people for whom this project is made for.

In future, there are many advancements that can be thought of with respect to Online Rental Portal. First, let us consider the tech stack. As mentioned above, there are always different and more efficient ways to do the same thing. With respect to this project, we can consider using different Java frameworks in order to make the project perhaps more relevant to the Java being used ubiquitously. Spring Boot, and Hibernate are one of the best and most famous frameworks of Java. In fact, if you would read the job description of a JAVA developer, none of them will miss out on these two frameworks.

Now, the main question arises is that why should we use Spring or Hibernate? That’s because Spring and Hibernate becomes easier for the developer to work upon. By using any one of the two, the developer can easily swim through coding, as the infrastructure code need not to be worried by the developer, and he or she can put their entire focus on the business implementation. This is the biggest advantage of Spring or Hibernate to be used as a future advancement for this same project.

Though there seem to be endless debates about “best language for web application”, there is no right or wrong answer. Because, it completely depends upon the user’s requirements, and the functionality. The decision to choose a particular language is highly influenced by frameworks and their functionalities, technical details of the project, the scope of work, scale of the project (small, medium, large – how is the project impacting the society, and to what extent?) All these questions need to be answered to.

As the technology is shifting to different platforms almost many times in a few months, thus it has become imperative to think about “what if we need to shift?” If this is going to be the need, it would be good to move with the changing times, and this project would sure be implemented or converted in PHP with Node.js (as they seem to hit the sweet spot for the users using them).

Nevertheless, as mentioned, it is important to keep in mind that every project’s tech stack may or may not be the viable option at some point of time. And, thus, it is for the best interest to keep your choice of interests open for further development of your web application.

BIBLIOGRAPHY