SOFTWARE ENGINEER – INTERN

PAXCOM, GURUGRAM, HARYANA

Internship report submitted in partial fulfillment of the requirement for the degree of Bachelor of Technology

in

Computer Science and Engineering

By

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UNDER THE SUPERVISION OF

Mr. PANKAJ CHAUHAN

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CERTIFICATE

This is to certify that the work which is being presented in the internship report titled **“Software Engineer – Intern - Paxcom, Gurugram, Haryana”** in partial fulfillment of the requirements for the award of the degree of B.Tech in Computer Science And Engineering and submitted to the Department of Computer Science And Engineering, Jaypee University of Information Technology, Waknaghat, is an authentic record of work carried out by **Shreya Dwivedi** during the said period; February 2022 – till date, ensuring proper care towards the rules and regulations as specified by the Non-Disclosure Agreement signed between Shreya Dwivedi and Paxcom Pvt Ltd. Gurugram, Haryana, dated 10th February, 2022.

(Student Signature)
Shreya Dwivedi, 181375.

This is to certify that the above statement made by the candidate is true to the best of my knowledge.

DECLARATION

I hereby declare that the work presented in this report entitled **“ Software Engineering Intern - Paxcom, Gurugram, Haryana ”** in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science and Engineering/Information Technology** submitted in the department of Computer Science & Engineering and Information Technology, Jaypee University of Information Technology Waknaghat is an authentic record of my own work carried out over a period from February 2022 to May 2022 under the supervision of **Mr. Pankaj Chauhan** and **Mr. Shikshank Sharma**.

The matter embodied in the report has not been submitted for the award of any other degree or diploma.

(Student Signature)
Shreya Dwivedi, 181375.

This is to certify that the above statement made by the candidate is true to the best of my knowledge.

ACKNOWLEDGEMENT

Firstly, I express my heartiest thanks and gratefulness to almighty God for his divine blessing makes it possible for us to complete the project work successfully.

I am really grateful and wish my profound indebtedness to Supervisor **Mr. Pankaj Chauhan** and **Mr. Shikshank Sharma**. Deep Knowledge & keen interest of my supervisors in their respective fields to carry out this project. Their endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all stages have made it possible to complete this project.

I would like to express my heartiest gratitude to **Mr. Pankaj Chauhan** and **Mr. Shikshank Sharma**.

I would also generously welcome each one of those individuals who have helped me straight forward or in a roundabout way in this internship. In this unique situation, I might want to thank the various staff individuals, both educating and non-instructing, which have developed their convenient help and facilitated my undertaking.

Finally, I must acknowledge with due respect the constant support and patience of my parents.

Shreya Dwivedi
(181375)

REPORT UNDERTAKING

I, Shreya Dwivedi, 181375, (B.Tech- Computer Science and Engineering) currently pursuing my internship with Paxcom Pvt. Ltd from 07th February, 2022 to July, 2022.
As per procedure I have to submit my internship report to the university, related to my work that I have done during this internship.

I have compiled my internship report, but due to COVID-19 situation and Work from Home procedure being followed, my mentor in the company is not able to sign this report and no digital signatures are allowed as part of the company's confidentiality policy.
So, I hereby declare that the internship report is fully designed/developed by me and no part of the work is borrowed or purchased from any agency. And I'll produce a certificate/document of my internship completion with the company to the Training and Placement Cell whenever COVID-19 situation gets normal.

Shreya Dwivedi
181375

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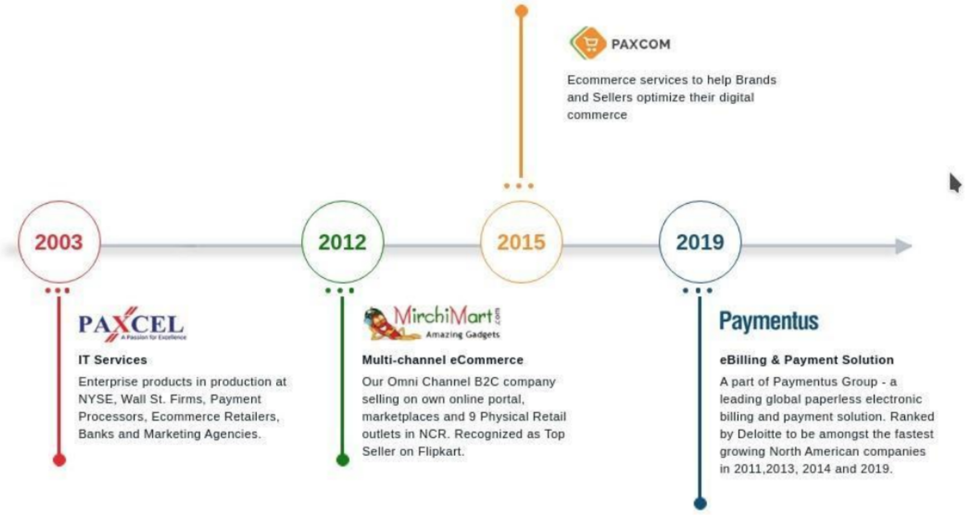
1.1 Company introduction

Paxcom:

Fig.1.1- Paxcom Logo



IT Services

Enterprise products in production at NYSE, Wall St. Firms, Payment Processors, Ecommerce Retailers, Banks and Marketing Agencies.

Multi-channel eCommerce

Our Omni Channel B2C company selling on own online portal, marketplaces and 9 Physical Retail outlets in NCR. Recognized as Top Seller on Flipkart.

Ecommerce services to help Brands and Sellers optimize their digital commerce

eBilling & Payment Solution

A part of Paymentus Group - a leading global paperless electronic billing and payment solution. Ranked by Deloitte to be amongst the fastest growing North American companies in 2011,2013, 2014 and 2019.

Fig.1.2- Company Division

Paxcom is a SAAS-based platform that offers entire ecommerce automation solutions, including the creation and management of e-stores (or marketplaces), extensive data analysis, exponential revenue development, controlled warehouses and supply chains, and customer satisfaction. Paxcom is rapidly gaining ground. Every day, paxcom work with the world's most well-known businesses to help them strengthen their digital presence and increase sales. Paxcom’s services and technologies may be customised to your needs, whether you need help troubleshooting or a comprehensive strategy. Everything paxcom does is driven by smart data analysis and analytics, allowing you to make educated decisions and fine-tune your product plans.

As of now Paxcom has offices in Washington, North Carolina, Delhi, Gurgaon and Mohali. Paxcom has a team of 400+ Ecommerce enthusiasts that are passionate about leveraging technology and our experience to make Digital Commerce easier for companies throughout the globe.

PepsiCo, Mondelez, Britannia, Lenovo, Wipro, and Abbott, among others, rely on our data, analytics, consulting, and solutions to guide and execute their ecommerce-driven retail strategy.

Paxcom is a subsidiary of Paymentus, a global leader in paperless electronic billing and payment solutions.

Paymentus :

Fig.1.3- Paymentus Logo

Paymentus is the parent company of Paxcom pvt. Ltd. Paymentus was founded in 2004 as a result of a desire to change the way bills are paid. Paymentus has grown to become the top paperless electronic billing and payment system on the market, with over 1,700 clients, including some of the major billers in North America, because of its vision, innovation, and exceptional service.

We understand that in order to maintain our solutions current and relevant, we need employees that have the know-how, motivation, and aptitude for creating a fantastic client experience. Our dedicated, innovative staff transformed a concept into a secure, SAAS-based Customer Engagement and Payment Platform, allowing direct-bill companies to create a consistent customer experience while increasing adoption of cost-effective electronic billing and payment services.

Paymentus, which has been named one of Deloitte's fastest-growing North American firms for the past four years, is dedicated to developing better, quicker, more secure, and cost-effective billing and payment solutions. We are always looking for ways to provide more value to our clients, both in terms of solutions and service.

It's what's allowed us to develop so quickly in the previous ten years. When our clients prosper, we succeed as well. They prosper when their client ties are strengthened, and as a result, their consumers are more likely to use these cost-cutting technological services.

1.2 Our Services

Channel Intelligence-You'll get on-demand access to full data with revenue, competitiveness, category, and promotion information thanks to our dynamic KPI dashboards. Our patented technology can gather and analyze publically available data across many platforms and geographies, allowing us to make better informed, qualified judgments.

Strategy and Execution-Our team of eCommerce professionals, data and business analysts, article writers, and graphic professionals can assist you with pricing policy, marketing, and ranking on top eCommerce sites.

Campaign and AMS Management- For your brand, our highly devoted staff can plan, implement, analyze, and optimize searching and advertising (CPC and CPM) campaigns. We have a lot of experience with Amazon AMS promos, Flipkart PLA advertisements, and other resources that can assist your customers with their purchasing decisions.

Omni Channel Solutions-We simplify warehouse operations and order fulfillment from beginning to end. To help you keep track of inventory over platforms, like eCommerce, local retailers, and distributors, our solution effortlessly interacts with major logistics services and marketplaces like Flipkart and Amazon.

Marketplace Seller Solutions- We've here to help you improve order fulfillment, inventory tracking, and account reconciliation. Our superior digital capabilities can assist you in reconciling purchases and returns and identifying additional costs instantly — this is necessary for payment monitoring, consolidation, and dispute resolution.

1.3 Products

Paymentus provides a variety of payment-related goods and services, including eBilling, invoice production, and easy payment gateway services.

The current team on which this internship is working is working on the paymentus dashboarding product. The following products are more of a visualization, analytics, and data querying code that allows the end user, be it a large business with a large number of clients and a high volume and velocity of transactions, or a single end common user, to basically access, analyze, and address financial questions from their account, or in some special test cases, also offer to answer certain business logics.

- **Agent Dashboard Systems:**

This product gives our clients specialized customer assistance via a dedicated dashboard that includes payment data, history visualization, and other features. It also has functionality for IVR and Assisted IVR payments, as well as customer service.

- **Customer Portal:**

This is a feature that serves as a payment option for clients by offering features such as wallets or a direct payment site for registered users.

- **ROTP (Remote One Time Payment):**

This feature is essentially a payment gateway that allows guest users to make payments from a variety of sources and types. Works on the same principles as a payment gateway.

1.4 Description of Industry

- **Fintech (Financial technology):**

FinTech is a combination of the words finance and technology, and it is essentially the amalgamation of the two sectors in which technology is utilized to develop and better novel domains in the financial world.

Everything is a subdomain of financial innovation aided by technology, from the ability for consumers or users to view and make financial transactions online, to applications that allow them to make financial transactions in seconds to anyone around the world, to means that enable financial institutions to make rapid financial transactions in large volume and velocity. FinTech's closest analogues in our daily lives include applications like Paytm, GPay, and others, as well as investing apps like Grow and Zerodha.

One of the most significant opportunities provided by the advent of fintech in the current marketspace is in terms of assisting the common man with financial literacy and financial accessibility; it has given people more and more control over their financial decisions and investments; and it has opened up investment opportunities that were previously out of reach of the common man.

The ability for smaller businesses to compete in the same arena as established banks and financial institutions has fueled FinTech's rise.

Thanks to FinTech, it's no longer about who's the biggest, but rather who's the fastest and most sensitive to changing customer expectations. Furthermore, fintech organizations' solutions are no longer "universal." Instead, it offers specialized (typically niche) services to meet specific financial demands. It might also be supplied at a far lower cost than typical financial services.

- **Electronic Billing:**

The practice of sending and paying bills electronically is known as electronic billing, or eBilling. Customers can get bills through email, online portal, or machine-readable data format, making distribution and payment more efficient. Accounts receivable manages the eBilling process by receiving findings from accounting software or an ERP system and delivering them to clients. Aspects of this paperless process, such as follow-up when invoice payment dates are delayed, are becoming increasingly automated to increase speed and accuracy.

With the localization of technology and an increase in the number of people using the internet and other forms of technology, more and more individuals are paying their bills online, resulting in hundreds of transactions every second and millions of invoices to be sent, canceled, and kept.

In a variety of obvious ways, this industry transforms standard billing systems. It removes inefficiencies in processes, saves time and money, ensures more accurate and speedier invoice delivery to clients, and allows for rapid payments. A well-implemented electronic billing system is a strategic asset, not merely a cost-cutting measure.

Chapter-2 INTERNSHIP SEQUENCE

2.1 Onboarding

Like in any other company, onboarding at Paxcom includes various phases. After getting interviewed and receiving the offer letter, internship started on 7th February 2022, i.e the first day of work. On the very first day, an introductory session with the HR team takes place during which company's details and vision is told to the one's on boarding, HR welcomes them to the company. After that a meeting with the IT takes place which helps in setting up the office equipment like Laptops etc. IT guidelines needed to be followed by the employees are also told.

After that, the intern's manager contacts the interns and welcomes them to the company. At early stages the intern is taught how to work and other technology stacks required by the team to carry out tasks.

Internship period was/is divided into various parts or phases, inclusive but not limited to Java Basics, Java Core with JDBC, Web Development basics, Spring Framework with spring MVC, Hibernate and JPA, MERN stack development.

Following part covers the tech stack learnt with the work done during this internship till date.

2.2 JAVA Basics

Java is a widely used computer language that was first released in 1995. Oracle owns Java, which is used on over 3 billion devices. Java is a platform as well as a programming language. Java is a high-level programming language that is also robust, object-oriented, and secure.

Java was created in 1995 by Sun Microsystems (which is now a division of Oracle). The founder of Java, James Gosling, is recognised as the "Father of Java." It was known as Oak before Java. Because Oak was already a recognised business, James Gosling and his colleagues decided to alter the name to Java.

Platform: A platform is any hardware or software environment in which a programme operates. Java is referred to as a platform since it has a runtime environment (JRE) and API.

It is employed for the following purposes:

- Apps for mobile devices (specially Android apps)
- Applications for the desktop
- Applications for the web
- Web servers and application servers are two types of servers.
- Games
- Connection to a database

Why Should You Use Java?

- Java may be used on a variety of systems (Windows, Mac, Linux, Raspberry Pi, etc.)
- It is one of the most widely used programming languages on the planet. It is simple to learn and use.
- It's free and open-source.
- It is safe, quick, and strong.
- It has a considerable following in the neighborhood (tens of millions of developers)
- Java is an object-oriented programming language that offers programmes a logical structure and allows code to be reused, saving development costs.
- Java is similar to C++ and C#, making it simple for programmers to transfer from one to the other.

Java Collections:

In Java, a collection is a framework that offers an architecture for storing and manipulating a collection of objects.

Java Collections are capable of doing any data operations such as searching, sorting, insertion, modification, and deletion.

A single unit of objects in Java is referred to as a collection. Many interfaces (Set, List, Queue, Deque) and classes are available in the Java Collection framework (ArrayList, Vector, LinkedList, PriorityQueue, HashSet, LinkedHashSet, TreeSet).

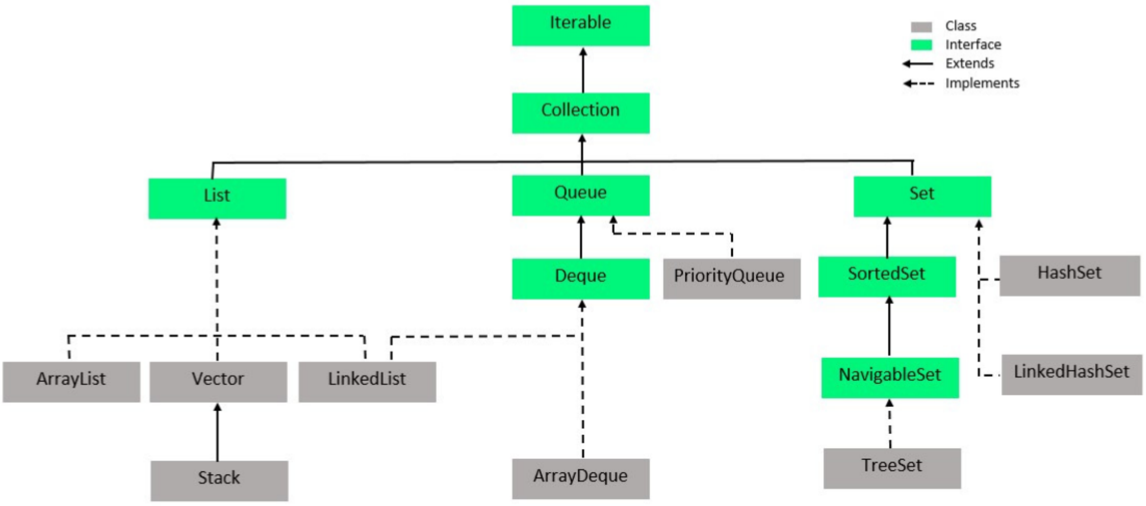


Fig.2.1- Hierarchy of Java Collections

Java Generics:

Generics refers to the parameterized types. The objective is to make type (Character, Integer, String, etc., along with user-defined types) method parameters, as well as interfaces and classes. Generics may be used to design classes that function with a variety of data types. A generic entity is one that works on a parameterized type, for example classes , interfaces, or functions.

Reason for popularity of Generics

Every class or subclass of Object, and an Object reference can refer to any object. There isn't any safety in such features. Generics include this type of safeguard.

The term "generics" refers to types that have parameters. The notion is that type (Integer,Character, String, etc., as well as user-defined types) may be sent as a parameter to methods, classes, and interfaces. It is possible to design classes that function with various data types by using Generics. A generic entity is anything that works with a parameterized type, such as a class, interface, or function.

Advantages of Generics

Every class or subclass of Object, and an Object reference can refer to any object. There isn't any safety in such features. Such a security feature is added to generics. In other cases, we'll look at that kind of safety feature.

Core Java with JDBC

Java Database Communication, or JDBC, is a standard Java API allowing database-independent connectivity between the Java programming language and a variety of databases.
Each of the actions listed below that are often connected with database usage have APIs in the JDBC library.

- Making a database connection.
- Creating SQL or MySQL statements is a common task.
- In the database, running SQL or MySQL queries.
- Viewing and editing the records that result.

JDBC is a standard that defines a comprehensive set of interfaces for accessing an underlying database from a mobile device. Java may be used to create a variety of executables, including

- Applications written in Java
- Applets in Java
- Servlets in Java
- ServerPages in Java (JSPs)
- JavaBeans for Business (EJBs).

All of these executables can utilize a JDBC driver to connect to a database and utilize the information contained there.

JDBC is similar to ODBC in that it allows Java programmes to incorporate database-independent code.

2.3 MAVEN

Maven is a tool that accounts for project management and comprehension and also provides developers with a lifecycle framework that is default build. Since Maven employs a uniform architecture directory and a lifecycle that is default build, the team developing the project can automate it’s build infrastructure within a short period of time.

In the case of different development teams, Maven can quickly set up the method to operate according to standards. Maven makes the lives of developers easy in terms of report establishing, checking, building, and automation testing because most of the project configurations are basic and are also reusable.

Maven provides developers ways to manage the following :

- Builds
- Documentation
- Reporting
- Dependencies
- SCMs
- Releases
- Distribution
- Mailing list

To summarize, Maven makes project development easier and more consistent. It smoothly manages duties including compilation, distribution, documentation, team communication, and more. Maven improves reusability by automating the majority of the build process.

2.4 Spring Framework

Spring is a framework with a lot of features. It's also referred to as a framework of frameworks since it supports a variety of frameworks, including Struts, Hibernate, Tapestry, EJB, JSF, and others. Through a larger sense, the framework may be regarded as a structure in which we discover solutions to diverse technological difficulties.
IOC, AOP, DAO, Context, ORM, WEB MVC, and other modules make up the Spring framework.

Advantages Of Learning Spring
Spring is the most widely used corporate Java application development framework. Spring Framework is used by millions of developers across the world to produce high-performing,

easily tested, and reusable code.

The Spring Framework is an open source platform of Java that is free of cost. It was originally written by Rod Johnson and was distributed under the Apache 2.0 license in June 2003.

When it comes to size and transparency, spring is little and transparent. Spring framework's basic version is about 2MB in size.

The fundamental capabilities of the Spring Framework may be used to build any Java programme, however additions are there for constructing web apps on top of the Java EE platform. By the use of a POJO programming model, this framework is dedicated to create J2EE software easier to use and promote good programming habits.

Spring is a profound Java application development framework in the corporate field. This Framework is used by a number of developers across the globe to generate high-performance, reusable and easy tested code.

The Spring Framework is a free of cost, open source platform of Java. It was originally written by Rod Johnson and was distributed under the Apache 2.0 license in June 2003.

In matters of transparency and size, spring is little and transparent. Spring framework's basic version is about 2MB in size.

The basic capabilities of Spring Framework may be used to build many Java programmes, however there exist additions for constructing web apps on top of the Java EE platform. By the use of a POJO programming model, this framework is dedicated to create J2EE software easier to use and promote good programming habits.

Dependency Injection (DI)

The Dependency Injection (DI) flavor of Inversion of Control is the technique with which Spring is most closely associated. The idea of inversion of control (IoC) is a broad one that may be stated in a variety of ways. Inversion of Control is manifested in a variety of ways, one of which being Dependency Injection.

When building a complicated Java programme, application classes should be as independent as feasible from other Java classes so that they may be reused and tested separately from other classes during unit testing. Dependency Injection aids in the bonding of these classes while maintaining their independence.

What precisely is dependency injection? Let's take a closer look at these two terms independently. The dependent element is translated into a relationship between two classes in this case. Class A, for example, is reliant on class B. Let's have a look at the second section, injection. This simply indicates that the IoC will inject class B into class A.

Dependency injection can take place during construction by giving arguments to the function Object() { [native code] } or afterward by utilizing setter methods. Because Dependency Injection is at the core of Spring Framework, we'll go through it in detail in a separate chapter with examples.

Aspect Oriented Programming (AOP):
Aspect-Oriented Programming (AOP) is a kind of programming that focuses on the (AOP) The Aspect Oriented Programming (AOP) framework is one of Spring's most important components. Cross-cutting concerns are functions that lay over many locations in an app. These cross-cutting concerns are conceptually different from the program's business logic. Logging, declarative transactions, security, caching, and other frequent good examples of aspects are just a few.

The primary modularity unit in Object Oriented Programming is the class, while the primary modularity unit in AOP is the aspect. DI is used for decoupling the application objects from each other, whereas the AOP is used for decoupling the objects from the cross-cutting concerns.

2.5 Spring – MVC :

The Spring MVC is a framework of Java used for developing web apps, wherein the design pattern of Model-View-Controller is applied. All of the essential functionalities of the core spring framework are supported, including both Control Inversion and Dependency Injection.

Along with assistance from DispatcherServlet, it provides an instinctive method for utilizing MVC in this framework. The DispatcherServlet takes requests and routes them to their respective resources, like controllers, views and models.

Spring Web Model-View-Controller:

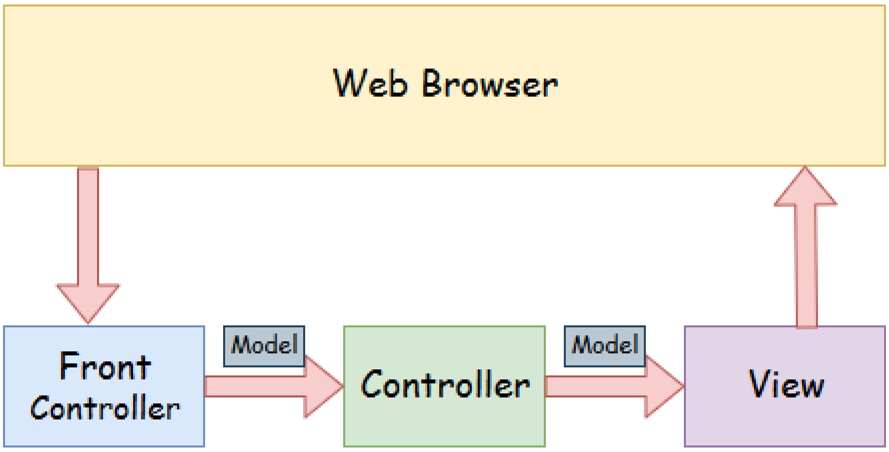


Fig.2.2- Spring Web Model-View-Controller

Model: A model is a collection of the application's data. A data set might consist of a single object or a group of objects.

Controller: A controller is where an application's business logic is stored. The @Controller annotation is used to designate the class as the controller in this case.

View: A view is a representation of the given data in a certain format. JSP+JSTL is commonly used to construct a view page. Other view technologies, including Apache Velocity, Thymeleaf, and FreeMarker, are also supported by spring.

Front Controller: The DispatcherServlet class serves as the front controller in Spring Web MVC. It is in charge of controlling the Spring MVC application's flow.

Flow of Spring Web MVC:

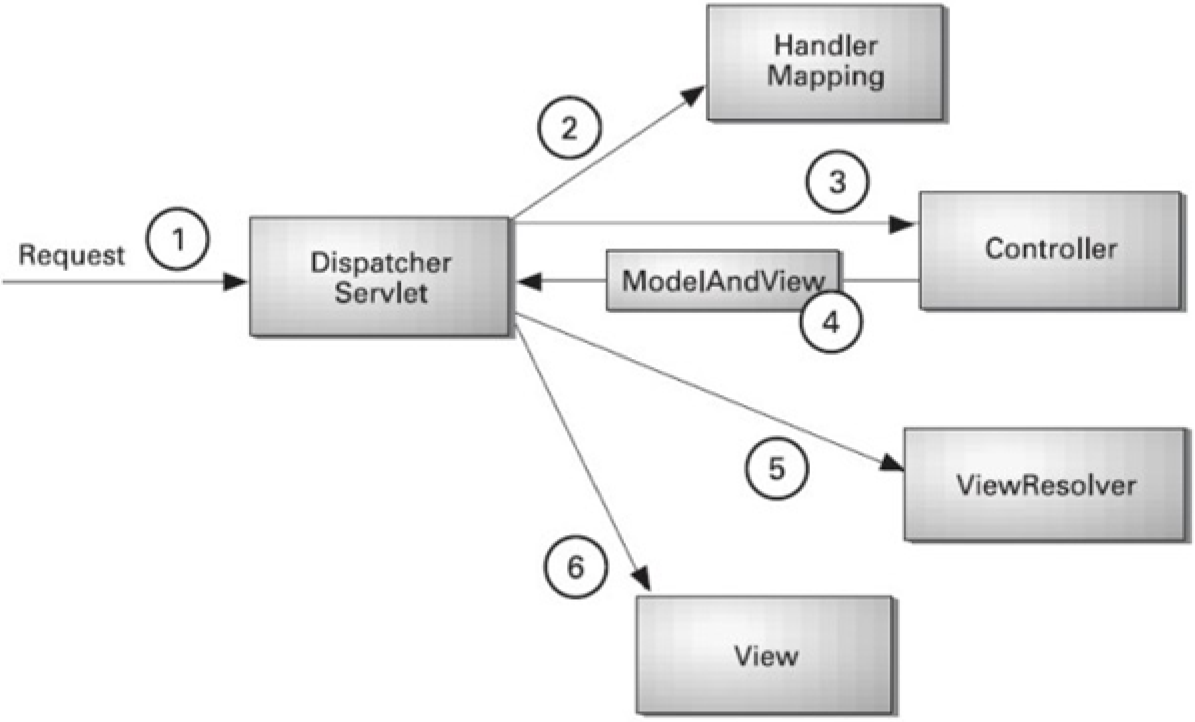


Fig.2.3- Flow of Spring Web MVC

As shown in the diagram, the DispatcherServlet, which serves as the front controller, intercepts all incoming requests.

- The DispatcherServlet reads the XML file for a handler mapping entry and sends the request to the controller.
- The controller returns a ModelAndView object.
- The DispatcherServlet looks in the XML file for a view resolver item and then calls the given view component.

2.6 Web Development

The term "web development" refers to the process of designing, developing, and managing websites. Web design, web publishing, web development, and database administration are all included. It is the building of an internet-based application, such as a website.

The term "web development" is made up of two words: "web" and "development."
Web: web pages, and anything else that functions through the internet are referred to as the web.
Development: is the process of creating an application from the ground up.

There are two methods to categorize web development:
Frontend Development
Backend Development

Frontend development: It is that part of a website with which the user has direct interaction. It is also called the client side of the application.

Backend Development: It is also known as a website’s server side. The users are not able to look or interact with this part of the website. This part doesn't have direct interaction with the user and is used for organizing and data storage.

Frontend Technologies:
HyperText Markup Language (HTML): HTML stands for HyperText Markup Language. It's a markup language that's used to design the front end of web pages. Because it is used to create the framework of a website, it works as a skeleton.
CSS: stands for Cascading Style Sheets, which is a simple language meant to make the process of creating web pages presentable easier. Our website is styled with it.
JavaScript: JavaScript is a programming language that allows our website to have dynamic behavior.

Backend Technologies:

- **PHP :** Php is a server-side programming language that was created with web development in mind.
- **Java :** Java is one of the most extensively used and popular programming languages. It has a lot of scalability.
- **Python :** Python is a programming language that allows you to work fast and efficiently with systems.
- **Node.js:** Node.js is a cross-platform open source runtime environment for executing

JavaScript code outside of a browser.

Frameworks for the back end: Back end frameworks include Express, Django, Rails, Laravel, Spring, and more.

Web Development using JAVA

JSP:

JSP(Java Server Pages) is a programming language of the server-side using which, developers can create platform independent and dynamic Web apps. JSP's can access the entire APIs of Java, including JDBC, which allows connections to business related databases.

Why should you learn JSP?

JavaServer Pages are frequently used in the same manner that applications written using the Common Gateway Interface are (CGI). However, as compared to CGI, JSP has some benefits.

Because JSP allows Dynamic Elements to be included in HTML Pages rather than having separate CGI files, performance is considerably improved.
Unlike CGI/Perl, which needs the server to load an interpreter and the target script each time the page is accessed, JSPs are always built before they are handled by the server.
JSPs, like Servlets, are constructed on top of the Java Servlets API, thus they have access to all of the strong Enterprise Java APIs, such as JDBC, JNDI, EJB, JAXP, and so on.
The approach offered by Java servlet template engines allows JSP pages to be used in conjunction with servlets that handle business logic.

Servlets:

Excluding the performance limits of the Common Gateway Interface programmes, Servlets provide a component-based, platform-independent solution for creating Web Apps. They can access the entire APIs of Java, including JDBC, which allows connections to business related databases.

Need for learning Servlets

You can make use of Servlets to get user’s input through forms of web pages, display records from database/source, and build web pages dynamically.
Java Servlets are regularly used for the exact same motives as apps constructed in CGI(Common Gateway Interface). However, Servlets have some benefits over CGI.

- Performance has improved noticeably.
- Servlets run in a Web server's address space. It isn't required to set up a distinct procedure for each customer request.
- Because servlets are built in Java, they are platform agnostic.
- The Java security manager on the server imposes a set of constraints to safeguard the server's resources. As a result, servlets are trusted.
- The whole functionality of the Java class libraries are accessible by servlets. It uses the sockets and RMI techniques you've already seen to connect with applets, databases, and other software.

2.7 Hibernate

Hibernate is a high-performance Object/Relational persistence and query service that is free to download and licensed under the GNU Lesser General Public License (LGPL). Hibernate not only handles the mapping of Java classes to database tables (as well as Java data types to SQL data types), but it also allows you to query and retrieve data. This article will show you how to use Hibernate to create database-driven web apps in a step-by-step manner.

Hibernate is a Java framework that includes an abstraction layer and takes care of the implementations within. Writing a query for CRUD activities, establishing a connection with databases, and other chores are included in the implementations.

A framework is a piece of software that abstracts numerous technologies such as JDBC and servlets.

Hibernate creates persistence logic, which saves and processes data so that it may be used for a longer period of time. It's a lightweight ORM tool that's also open-source, giving it an advantage over competing frameworks.

What Is An ORM Tool, Exactly?

It's a strategy for mapping the objects in a database. Data generation, modification, and access are all made easier using an ORM tool. It interacts with databases via the Java API internally.

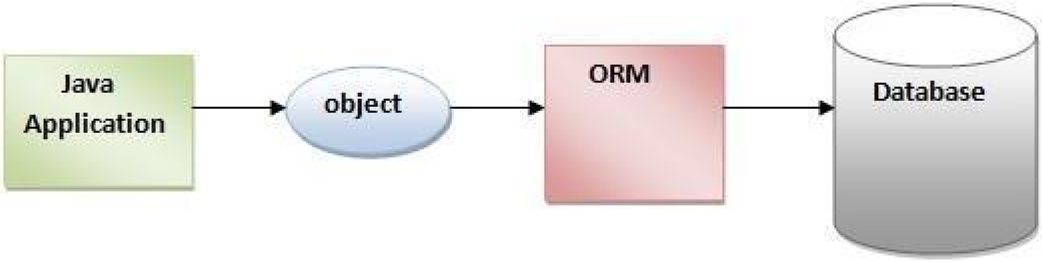


Fig.2.4- ORM Tool

A relational database is represented in a tabular style using rows and columns, but Java is an object-oriented computer language that is represented as a graph of objects. So, when it comes to saving an object in a database, there is a clear mismatch, and we have Object Relational Mapping to manage this mismatch (ORM). As a result, ORM is a framework for mapping an object to a relational database.

Hibernate overcomes the drawbacks of previous technologies such as JDBC. Let's look at how it outperforms JDBC in terms of job optimization.

- Hibernate eliminates the database requirement that JDBC has.
- Working with JDBC, changing databases costs a lot of money; hibernate solves this problem with ease.
- When working with JDBC, which is readily handled by hibernate, code portability is not an option.
- The object-level connection is strengthened via Hibernate.
- It gets rid of the exception-handling portion, which is required when dealing with JDBC.
- The object level connection is overcome by Hibernate.
- By addressing the boiler plate problem, it minimizes the amount of code while increasing readability.

Hibernate overcomes all of JDBC's flaws to give optimum and efficient solutions for each activity. Let's look at some of the actions, technologies, and databases that we may use with the hibernate framework in Java.

Because it is an open-source framework, anyone can use it for free. The source code for hibernation may be available on the internet, allowing for changes.

The benefit of having a lightweight framework can be seen in the significantly reduced installation package. When no container is used for execution, efficiency improves. Even while hibernation can function with numerous technologies at the same time, that doesn't imply it couldn't work on its own. We may also operate with hibernation without using any other technology.

Hibernate is unique in that it doesn't need to implement hibernate API interfaces or extend from hibernate API classes since hibernate application development classes are loosely connected.

Functionalities Supported By Hibernate:

- Hibernate is database agnostic thanks to the Hibernate Query Language.
- It facilitates DDL operations that are performed automatically.
- Auto Primary Key Generation is supported by Hibernate.
- Cache memory is supported.
- Hibernate does not need exception handling.
- Hibernate is an ORM tool, which is the most significant feature.

The Benefits Of Hibernate In Java

- Lightweight and open-source — Its accessibility and efficiency are aided by its low weight and open-source nature.
- Enhanced performance — Using cache memory improves performance.
- Database Independence — Its database independence allows it to function with a variety of databases.
- Automatic table creation saves us from having to manually create tables using auto DDL operations.
- It handles the mapping of Java classes to databases using XML files without the need to write any code.

- Using basic APIs, we may store and get data straight from the database.
- It does not necessitate the use of an application server.
- Smart fetching techniques reduce database access.
- It allows for basic data querying.

2.8 JPA - Java Persistence API

JPA (Java Persistence API) is a Java specification. It's used to keep data from a Java object and a relational database in sync. JPA serves as a connector between object-oriented domain models and relational database management systems.

JPA is merely a standard, thus it doesn't accomplish anything on its own. It needs to be put into action. As a result, ORM technologies such as Hibernate, TopLink, and iBatis support JPA data persistence requirements.

Database operations are performed by every corporate programme by storing and retrieving large volumes of data. Despite all of the storage management solutions available, application developers frequently struggle to perform database activities effectively.

To communicate with the database, Java developers often require a lot of code or a proprietary framework, however with JPA, the effort of dealing with the database is substantially reduced. It connects object models (Java programmes) with relational models (database program).

What exactly is JPA?

The Java Persistence API is a set of classes and methods for persistently storing large volumes of data in an Oracle database.

When should you use JPA?

A programmer uses the 'JPA Provider' framework, which permits easy interaction with database instances, to alleviate the load of developing scripts for relational object management. JPA takes over the needed framework in this case.

Chapter-3 PROJECT WORK

3.1 Project Introduction

Payments dashboard is a MERN stack project which is a part of Green Dot project being developed under Paymentus. Payments Dashboard is a web dashboard which will be used by the user to find the transaction details using the filters embedded into the dashboard. Based upon the filter, the API will fetch the transaction records from the database and display them in the table under the filter form. Each transaction will have a “Details” button, which upon clicking will show up the transaction details in another webpage.

3.2 Javascript Essentials

Arrow Functions and Function Declarations:

The component is the foundation of every React application. Components in React are defined using JavaScript functions and classes.

React components, unlike JavaScript functions, return JSX elements, which are utilized to organize our application's interface. Camel case is used for JavaScript functions, whereas pascal casing is used for React function components (in which all words are capitalized). In React, function components may be written using both function declarations and arrow functions.

The main advantage of arrow functions is their conciseness. We may utilize many shorthands to create our functions in order to eliminate unneeded boilerplate, and we can even do it on a single line.

Template Literals:

Working with strings in JavaScript has a sloppy past, especially when you wish to concatenate or join numerous strings. To join strings before the advent of ES6, you had to use the + operator to join each section of the string together.
With ES6, we now have a new type of string called a template literal, which consists of two backticks '' instead of single or double quotes.

The flexibility to utilize any JavaScript expression (that is, anything in JavaScript that resolves to a value) within the $ syntax is what makes template literals so powerful.

Short Conditionals: &&, ||, Ternary Operator:
Given that React is merely JavaScript, selectively displaying (or hiding) JSX components is as simple as using basic if and switch expressions. We may reduce redundancy and make our code more succinct by using several fundamental JavaScript operators.
Using the ternary operator, we can change the if expression into the following. The ternary operator is similar to an if-statement in that it is shorter, acts as an expression rather than a statement, and can be used within JSX.

Three Array Methods: .map(), .filter(), .reduce():
Using curly brackets to insert primitive values into JSX components is simple.
Any valid expressions can be inserted, including variables with primitive values (strings, integers, booleans, and so on) and object attributes with primitive values. What if we have an array and want to loop through it to display each array element within a single JSX element?
The.map() function may be used for this. It allows us to alter each element in our array according to the inner function's instructions.
It's worth noting that when combined with an arrow function, it's very succinct.
As the name implies,.filter() allows us to remove certain members from our array. For example, we might use.filter to delete all names of programmers that began with the letter "J." ().
It's vital to remember that.map() and.filter() are merely various forms of the.reduce() array function, which may convert array values into almost any data type, including non-array values.

Object Tricks: Property Shorthand, Destructuring, Spread Operator:
Objects, like arrays, are a data structure that you must be familiar with when using React. Unlike arrays, objects exist for the purpose of organizing key-value storage, therefore you'll

need to be extremely familiar with accessing and modifying object attributes.

You name the property and its related value when you add properties to an object as you construct it. If the property name and the value are the same, all you have to do is list the property name.

The dot notation is the most common technique to obtain properties from an object. Object destructuring, on the other hand, is a more practical method. It allows us to extract attributes from a given object into independent variables with the same name.

It seems as though you're writing an item backwards, which is part of what makes the process natural. It's a lot more convenient than having to type the object name numerous times each time you want to get a value out of it.

Promises + Async/Await :

Asynchronous code — code that takes an indeterminate amount of time to run – is found in almost every React application. Especially if you're utilizing browser capabilities like the Fetch API or the third-party package axios to access or alter data from an external API.

Promises are used to resolve asynchronous code so that it may be read from top to bottom like conventional synchronous code.

Callbacks have typically been used to resolve asynchronous code in Promises. The.then() callback is used to handle promises that have been successfully resolved, whereas the.catch() callback is used to resolve promises that have returned an error.

Instead of constantly needing to utilize callbacks to resolve our data from a promise, we can use the async/await syntax, which has been tidied up to seem like synchronous code.

Only functions can utilize the async and await keywords (normal JavaScript functions, not React function components).

ES Modules + Import / Export syntax:

We were able to easily exchange code across our own JavaScript files and third-party libraries utilizing ES modules thanks to ES6.

We can also use assets like photos and svgs, as well as CSS files, as dynamic values in our code when we use tools like Webpack.

The purpose of ES modules is to be able to break up our JavaScript code into multiple files so that it may be reused across our programme.

Variables and functions can be imported and exported in JavaScript programming. Importing and exporting may be done in two ways: named imports/exports and default imports/exports.

3.3 ReactJS

ReactJS is a JavaScript toolkit that is used to create reusable UI components. This library is fast, versatile and declarative. It is an open-source, component-based front-end library that is responsible for just the view layer of the application. It was created by a software developer at Facebook, Jordan Walke. Walke came up with this idea of building a library for creating UI based on user interface components.. ReactJS was originally created and managed by Facebook, and it was then integrated into major products after some time like Instagram and Whatsapp. It was built by Facebook in the year 2011 for its section of news feed in particular and was first released to the common masses in May of the year 2013.

The MVC (model view controller) design is being used by a large number of websites. React is the view part of the MVC architecture, which stands for view, while the architecture is provided by Flux/Redux.

A ReactJS application contains various components, each of which is dedicated for producing a reusable unit of the HTML code. All the React apps are created around various components. Each of these components are stacked with one another to create sophisticated applications. The components are simple units/building blocks stacked with each other to create applications. To fill the data in HTML Document Object Model, ReactJS makes use of a virtual DOM-based method. The virtual Document Object Model is fast because it simply alters the individual DOM elements rather than refreshing the whole DOM every single time.

We build React components which correlate to multiple parts to create a React application. These components are then organized within higher-level components, determining the structure of the application. For example, we have a form with multiple elements– input fields, buttons and labels. Now, we can write each form element as a separate React component, that would then be combined together into a component of a higher-level, which the form component itself. These form components will define the structure as well as the items contained inside the form.

Although there are numerous JavaScript frameworks available today (such as Angular and Node), React was the first to enter the market and quickly garnered popularity. The earlier frameworks used the DOM to follow a standard data flow topology (Document Object Model). When a web page is loaded, the browser creates a document object (DOM). It dynamically adds or removes data on the back end, and when any changes are made, a new DOM is built for the same page each time. The application's performance suffers as a result of the repetitive construction of DOM, which wastes memory and slows it down.

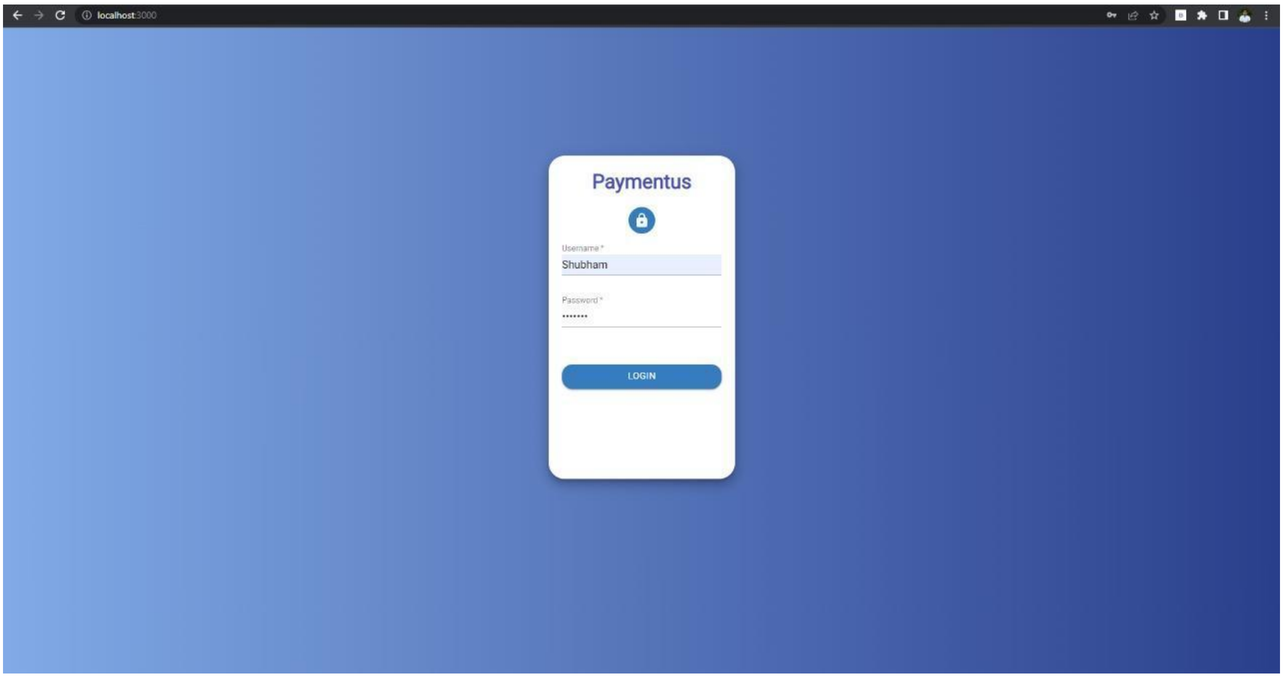
3.4 Step by Step Working of the Project

- Users will input credentials and based upon the validation, users will be either redirected to the dashboard, if credentials are valid, or shown an “Invalid Credentials” message.
- If authenticated, the user will input the filter as per requirement and click on the “Search” button.
- Based upon the filters inputs by the users, API will fetch the data from the database and display the data in the table below the filter form.
- On the form, users will be able to select “No. of Records” per table.
- Users will be able to see the transaction details upon clicking the “Details” button, transaction details will show in different pages.

Additional Features:

- If an unauthenticated user tries to access the restricted URLs, they will be shown an appropriate message.
- If the user is inactive for 10 minutes, the user will see a pop up asking if the user wants to logout or stay logged in. And if user doesn’t choose, they will be logged out after 5 minutes

Login Functionality :



Username * Shubham

Password * •••••••

Fig.3.1- Login Page

Login functionality is being achieved using API from a Node.js server, upon entering the credentials, credentials will be validated, if they are valid, a token and a refresh token will be returned otherwise an error message will be returned which will be shown to the users. If credentials are valid, they will be authenticated and redirected to the dashboard.

Dashboard :

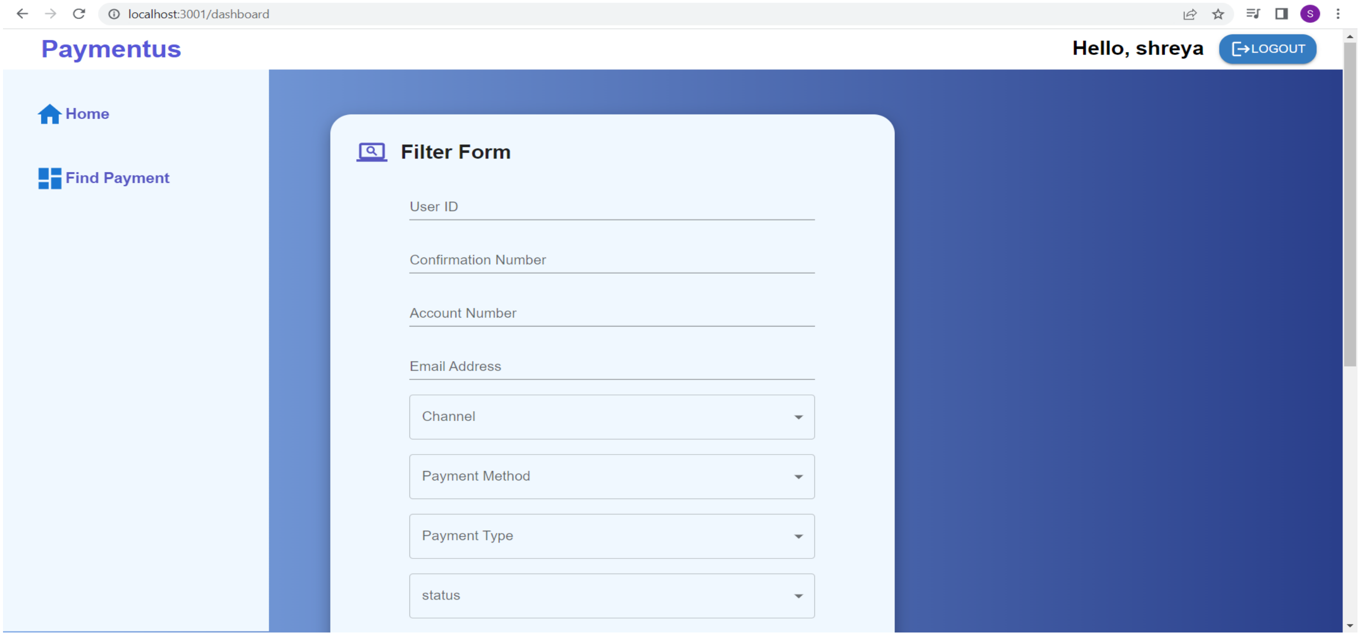


Fig.3.2- Dashboard

After the user successfully logs in, they will be redirected to the dashboard where on the left they’ll see a sidebar with navigation routes. On the topbar, there’s a logout button. In the middle there’s a Filter form which provides the main functionality of filtering and fetching the data.

Filter Form Functionality :

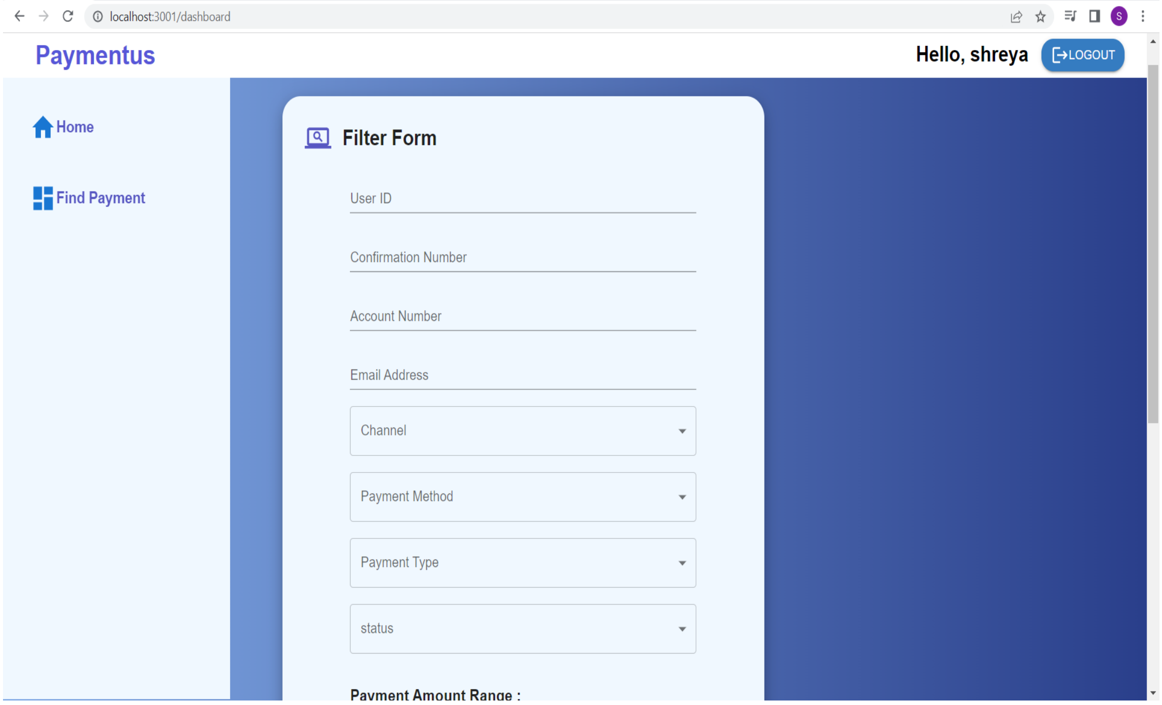
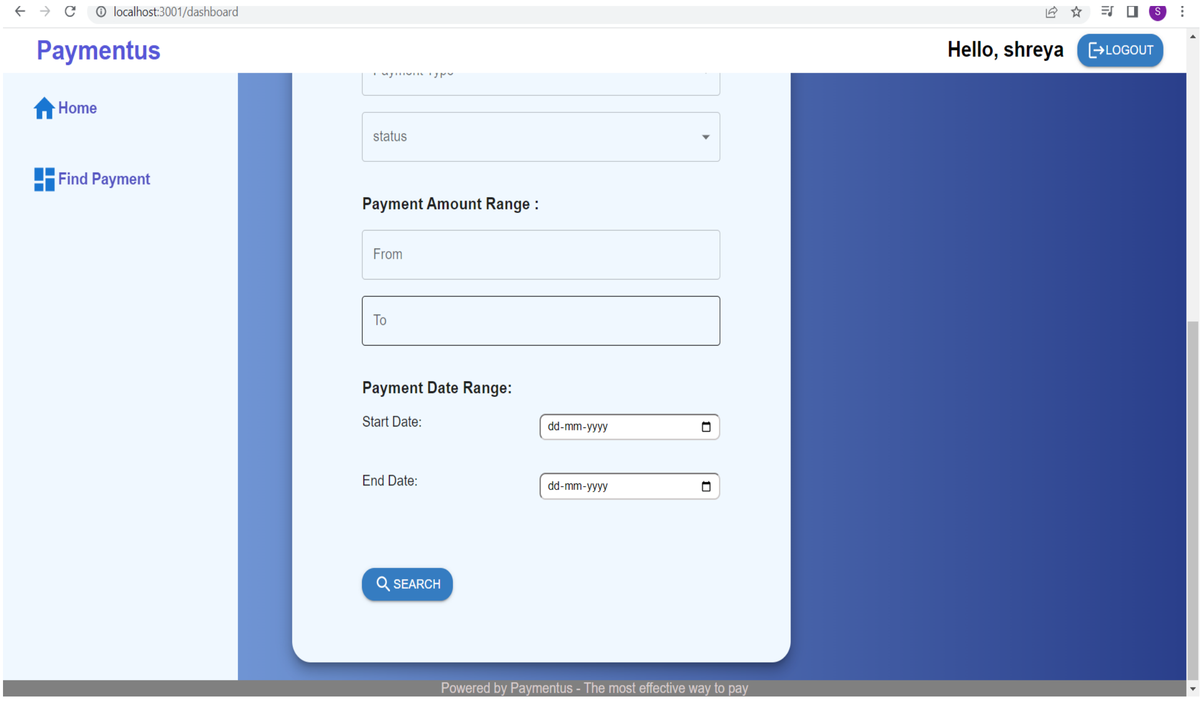


Fig.3.3.1- Filter Form



status

Payment Amount Range :

From

To

Payment Date Range:

Start Date: dd-mm-yyyy

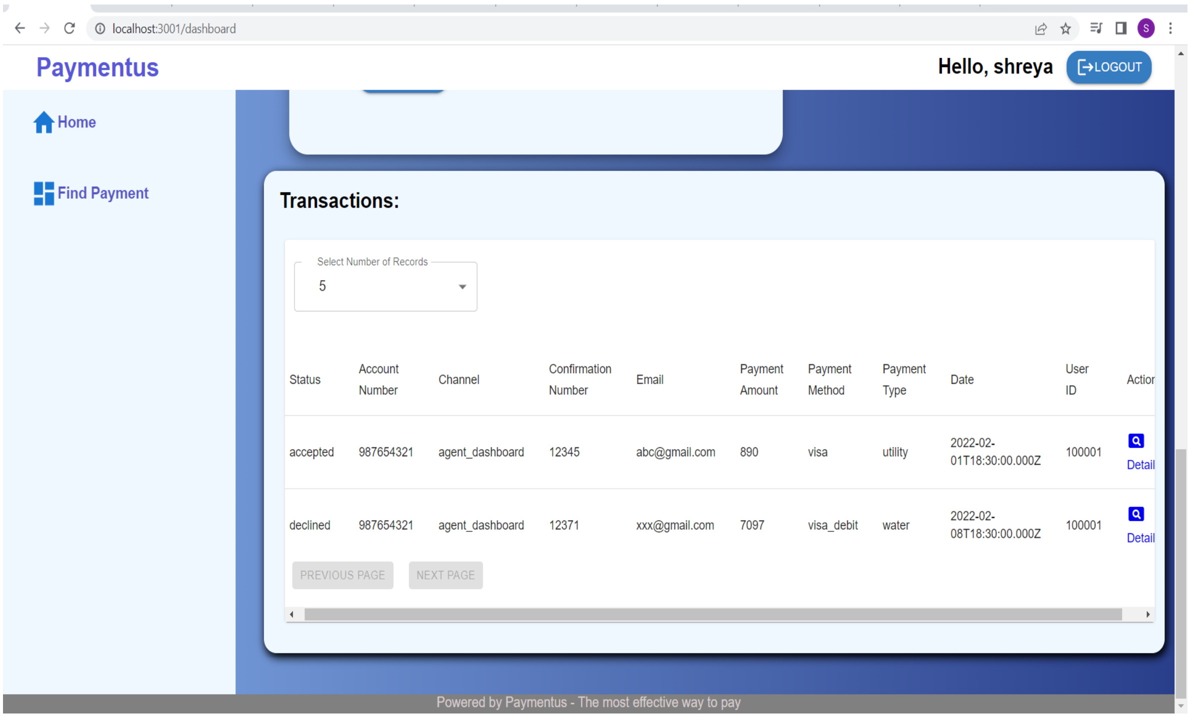
End Date: dd-mm-yyyy

Powered by Paymentus - The most effective way to pay

Fig.3.3.2- Filter Form(2)

The above form provides the main functionality of hitting the API with fields and returns the records based upon the filter.

Transaction Table Functionality :



Transactions:

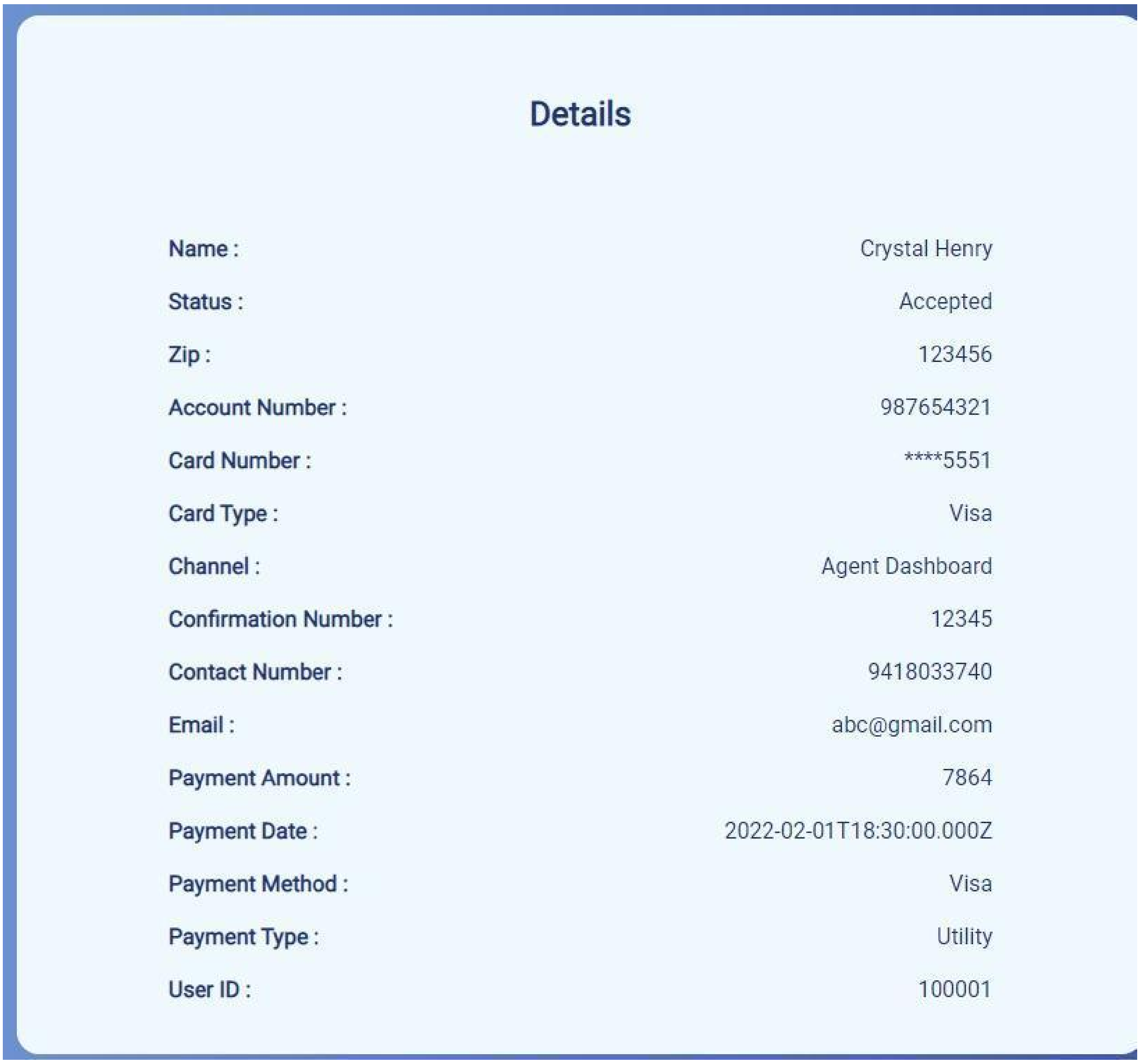
Select Number of Records: 5

Status	Account Number	Channel	Confirmation Number	Email	Payment Amount	Payment Method	Payment Type	Date	User ID	Actior
accepted	987654321	agent_dashboard	12345	abc@gmail.com	890	visa	utility	2022-02-01T18:30:00.000Z	100001	Detail
declined	987654321	agent_dashboard	12371	xxx@gmail.com	7097	visa_debit	water	2022-02-08T18:30:00.000Z	100001	Detail

Fig.3.4- Transaction Table

Transaction table filled with records fetched from the API after filling the filter form. By default 5 records will be shown in the first page, users can see more by clicking the next button. Users will also have the option to choose how many records they want to see per page. Users can also check a particular transaction's details, by clicking on the "Details" button in the Actions columns.

Transaction Details Functionality:



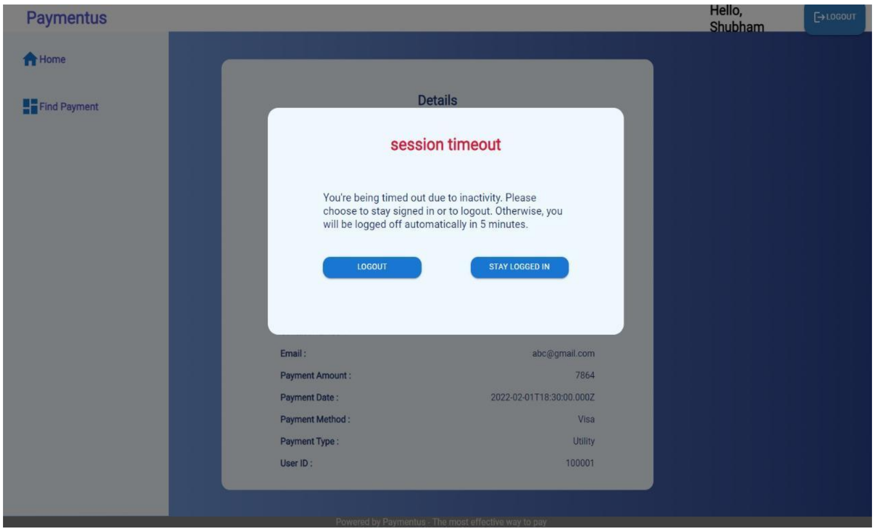
Details

Name :	Crystal Henry
Status :	Accepted
Zip :	123456
Account Number :	987654321
Card Number :	****5551
Card Type :	Visa
Channel :	Agent Dashboard
Confirmation Number :	12345
Contact Number :	9418033740
Email :	abc@gmail.com
Payment Amount :	7864
Payment Date :	2022-02-01T18:30:00.000Z
Payment Method :	Visa
Payment Type :	Utility
User ID :	100001

Fig.3.5- Transaction Details

Transaction details page will display the transaction detail of a particular transaction if a user clicks on the details button for a particular transaction.

Other Functionalities :



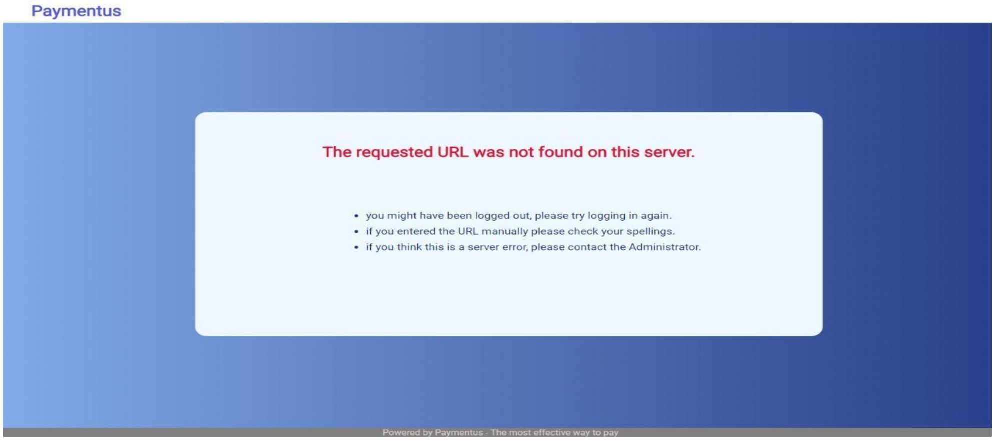
session timeout

You're being timed out due to inactivity. Please choose to stay signed in or to logout. Otherwise, you will be logged off automatically in 5 minutes.

Email :	abc@gmail.com
Payment Amount :	7864
Payment Date :	2022-02-01T18:30:00.000Z
Payment Method :	Visa
Payment Type :	Utility
User ID :	100001

Fig.3.6- Session Timeout

After 10 minutes of inactivity, user will be shown above pop up modal, user will be asked if they want to stay logged in or logout. If user doesn't pick, 5 minutes later they will be logged out.



The requested URL was not found on this server.

- you might have been logged out, please try logging in again.
- if you entered the URL manually please check your spellings.
- if you think this is a server error, please contact the Administrator.

Fig.3.7- Unauthorized Access to URL

If a user tries to access dashboard or a page which requires them to be logged in without logging in, they will see the above error page.

Chapter-4 CONCLUSION

This internship was a wealth of information; not only did I gain knowledge in Full Stack Development, but I also learned about how a project is developed, how a team works, how each employee's work is tracked, how work is distributed among different team members, what are the various stages of development, what are the technical problems that one encounters during the development of a project, and what all is required before the development begins. During the internship I’m getting the opportunity to worth with the finest software engineers in the industry.
Technology wise, I’m learning Java Full stack development and MERN stack development.

REFERENCES

- https://paxcom.ai/
- https://www.paymentus.com/
- https://www.udemy.com/
- https://spring.io/
- https://reactjs.org/
- https://www.w3schools.com/REACT/DEFAULT.ASP
- https://www.baeldung.com/spring-tutorial
- https://www.baeldung.com/learn-jpa-hibernate