E-Commerce web application using Spring Framework

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***Abstract*- In recent times, it has become necessary for any business to have an online presence in order to remain relevant and competitive. Because of this necessity, many businesses, including small enterprises, now operate an e-commerce web store to increase sales and attract new customers. In addition, business owners do not have to worry about finding a place to erect their stores and customers can have unhindered access to a wide range of products at anytime and anywhere in the world. E-commerce is a multi-disciplinary area, which shouldbe developed in co-operation with existing fields such as Information Systems and Technology, Marketing, Finance and Supply Chain Management, Business Strategy and Management. It aims to create and disseminate enduring knowledge for the fast-changing e-commerce environment.**

Index Terms- Spring Framework, IOC, ORM, Hibernate, E-commerce, Security.

INTRODUCTION

The proposal of this paper is to present Spring Framework that is widely used in developing enterprise applications. Considering the current state where applications are developed using the EJB model, Spring Framework assert that ordinary java beans(POJO) can be utilize with minimal modifications. This modular framework can be used to develop the application faster and can reduce complexity. This paper will highlight the design overview of Spring Framework along with its features that have made the framework useful. The Integration of multiple frameworks for an E-commerce system has also been addressed in this paper. This paper also proposes structure for a website based on integration of Spring, Hibernate, Security and MVC Framework.

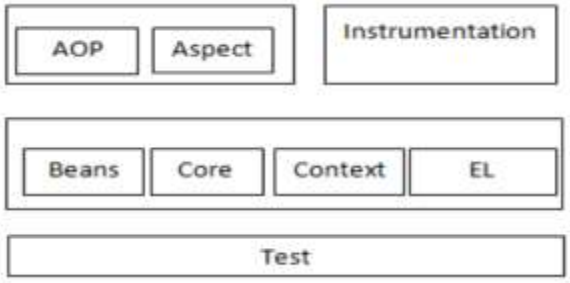
Spring framework has a layered architecture so when an E-commerce application is developed using spring framework it has clear separation of presentation layer, business layer, persistence layer. The layered architecture of spring framework allows users to select which of its components users can use.

PROPOSED METHODOLOGY

1) ARCHITECTURE OF SPRING FRAMEWORK

The architecture of spring has seven modules. The modules are as follows:

- Core Container
- Spring Context
- Spring AOP
- Spring DAO
- Spring ORM
- Spring Web
- Spring MVC



Spring is open source development framework that offers many functions to programmers. A member of EJB team called Rod Thomson, has started company with name Interface21, and started experiment on ordinary java classes (POJO) to provide enterprise services to industry applications. Finally, he succeeded in process of creating complex enterprise java application model as Spring Framework. The features of Spring Framework are the Inversion of Control, Aspect oriented programming and Spring MVC. Aspect oriented Programming: This module provides separation of business logic services from the business operation. If services are implemented as part of business method then the following problem will arise.

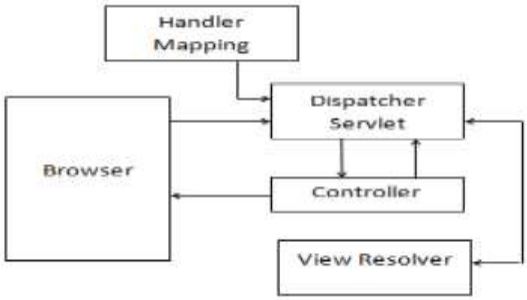
- Boiler Plate code of Service
- Business class becomes complex.
- Managing business service become complex.

FEATURES OF SPRING FRAMEWORK

The Spring Framework provides its own MVC model. The major components of Spring MVC are as follows:-

1. Dispatcher Servlet – Dispatcher Servlet uses Handler Mapping and forwards the request to concerned controller.
2. Controller - It handles the request and is created by user. They are objects that can respond to the actions a user takes like form filling or clicking a link.
3. View- It can be imagined as method of presenting the output to the users.
4. Model And View - Model means data, which is accessible in that view. Model is the data in the form of key/value pair.
5. View Resolver – View Resolver is a bean, which finds an appropriate view for the logical name set for Model And View object.
6. Handler Mapping- Whenever Dispatcher Servlet receives incoming requests it associates the request to individual controllers with the help of this component.

The MVC model of Spring Framework can be shown as below:-



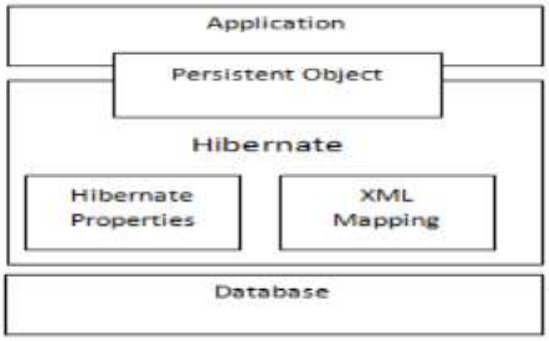
Spring in XML stands for Extensible Markup Language. XML is widely used in frameworks for configuring information. The information can be processed by parsers. Xml files can be modified and the change can be seen throughout the application. Xml files need not to be complied so time needed in deployment to servers can be saved.

There are three types of xml files:

- web.xml file
- applicationContext.xml file
- DispatcherServlet.xml file

web.xml: Whenever a request is made by a user then web.xml file forwards the request to Dispatcher Servlet, which is being specified in the web.xml file. The web.xml file specifies the xml version number and name of Dispatcher Servlet.

E-Commerce System Using Spring and other frameworks. This modular framework can be used with many other frameworks for making of an E-commerce application such as hibernate. This framework divides web system into three layers: Model, View and Controller. Model consists of JavaBeans, EJB; View consists of JSP files; Controller is carried out by Actions.



Structure of Hibernate

Hibernate framework: This framework minimize the complications and difficulty of writing the SQL statements. It charts Java classes to database tables efficiently. It is mainly associated with databases. Integration of Spring and Hibernate, Spring and Hibernate frameworks can be integrated together to develop an E-commerce applications The Spring framework can take care about business logic. The Hibernate framework can help in persisting data and retrieving the data to and from database respectively. The architecture based on integration of above frameworks can be shown as below:-

PROPOSED SYSTEM

Spring framework, which is modular, and having a multitier architecture can be used with multiple other frameworks such as Hibernate. Although spring has its own MVC, which can be used in developing the entire application. The proposed system can be considered here with the help of a website such as that of a Shopping Cart where user requests items and buys items. It generally has three layer i.e. presentation layer, business layer and database layer.

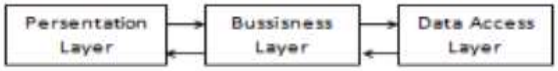
A. Presentation layer: The Presentation Tier is generally responsible for displaying the output on screen in a look and feel appearance. User Interface is the user sees when they open a web page in the

browser. It is what is presented to the user on the client side within their web browser. It is responsible for handling requests and forwarding the response back to client. It provides with the views that can be provided to the users such as JSP, HTML documents. The presentation layer can be done using spring MVC.

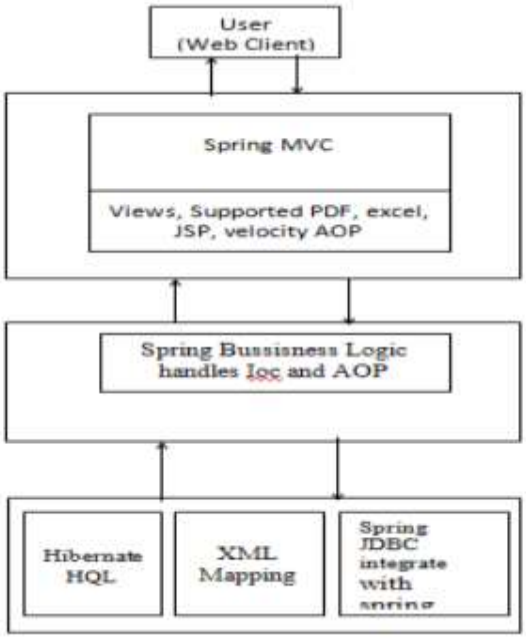
B. Business layer: The business layer is also called as functional Process Logic, Business Rules and all the logic related to functionality can be kept in Business layer. In this layer, we can typically define POJO, beans, interfaces, classes, functions, procedures, properties file. The business layer can be handled using spring framework because it has various features such as scheduling, dependency injection, internationalization, distributed transactions.

C. Data Access layer: The data access layer or persistence layer can used for connectivity with any database. It can handle several operations called by user including creation of databases.

The general architecture for the three tier can be as follows:



The proposed architecture for the website consisting of the three layers is as follows:



The above architecture can be explained as follows in terms of model, view and controller.

A) Responsibilities of Model

• Reads data sent by a controller.
• Apply business logic for the given data.
• If required store/read data from database.
• Returns the result of business operation back to controller.

B) Responsibilities of View

• Read the data produced by a model.
• Apply presentation required for data.
• Render the response to browser.

C) Responsibilities of Controller

• Accept the request send by a client.
• Find suitable model for a request.
• Calls appropriate model component.
• Get the result from model.
• Call suitable view to display the result.

Benefits of Spring MVC are as follows-

1) Spring MVC uses interface approach, which avoids concrete inheritance between action and form objects.

2) Using Spring IOC testing of objects without server is possible.

Although Spring MVC has its own added advantages, it also comes with some limitations such-

1) Spring MVC requires extensive XML configuration files, which can become tedious.

2) Spring MVC does not support AJAX-Asynchronous JavaScript, which is a newer trend in developing web application

3) The Spring framework acts as a good contender for the middle tier because of its Aspect Oriented Programming and Inversion of Control.

The main approach of developing application using Spring Framework is as follows:

1) The Spring framework provides its own MVC. Developers sometime feel more comfortable with some other framework.

2) The Spring framework has the main functionality as Inversion of Control and Aspect Oriented Programming, which can be effectively used to handle the business objects.

3) The Spring framework can also be easily integrated with other ORM tool such as Hibernate, iBATIS. The ORM tool is a tool that performs

mapping from Object to relational tables. Hibernate is one such ORM tool. The spring framework follows DAO module, which can be helpful to connect any ORM tool. The Hibernate ORM tool can be easily integrated with spring with the help of XML mapping. The spring framework when used with Hibernate for data access for Web presentation can help in developing web application in an efficient manner.

DISCUSSION

The spring framework has MVC model.

1. The Spring MVC supports more number of views and spring MVC supports Velocity, PDF, excel in addition to JSP and Tiles.
2. Spring MVC is well organized
3. Spring MVC web tier are easier to test because the testing can be performed without server.

Integration of Spring & Hibernate for Enterprise Applications:-

1. With the help of spring, MVC all tiers can be used. The spring framework has its own JDBC module for data access but it can be compared with Hibernate based on how connection is done between database and application. JDBC vs Hibernate
2. If developer go with JDBC connection he has to write code to map object into relational tables, Hibernate map object into relational tables using the xml files so developers needs to write the code to map java classes to database tables.
3. Scalability of Hibernate is very good for high performance applications as compared to JDBC.

ARCHITECTURAL BENEFITS OF SPRING

There are multiple architectural benefits of spring framework. They can be described as following:-

1. Spring Framework can be efficiently integrate with other frameworks such as hibernate.
2. Spring provides easy access to database by using hibernate framework and avoiding the handling of error mechanism.
3. Applications developed using spring framework depends on few APIs.
4. Due to its Inversion of Control, feature the amount of time needed for testing the code is less.
5. Because Spring is a layered architecture users can select which of its components can be used.
6. The Spring Web MVC framework is flexible, robust and well designed for rapidly developing web applications.
7. Spring Framework can work effectively with J2EE for developing applications in an effective manner.

IMPROVEMENT AS PER REVIEWER COMMENTS

Analyze and understand all the provided review comments thoroughly. Now make the required amendments in your paper. If you are not confident about any review comment, then do not forget to get clarity about that comment. In addition, in some cases there could be chances where your paper receives number of critical remarks.

CONCLUSION

Being a modular framework spring is a powerful framework for developing enterprise applications. It can also be easily integrated with hibernate, security and frameworks for developing complete enterprise applications thereby reducing the coupling and clear separation of layers. Web servers such as Tomcat can also be used during integration of spring with other frameworks. Considering the present scenario wherein there is Security that can be implemented for web tier spring framework can be used effectively for all the three tiers to build an efficient enterprise application. The spring framework can be easily be integrated with any ORM tool such as Hibernate, iBATIS.

FUTURE WORK

The main objective of this thesis work was to develop an e-commerce Java web application for a small retail store where the store owner manages products, customers, and orders, while the customers make orders and pay for products. The application was developed with the above-mentioned features. One of the biggest challenges faced during the development of this software project was how to implement ORM for the application. Another challenge faced was how to integrate PayPal Express Checkout NVP API operations for the project. PayPal has a poor API

integration documentation, especially API integration for the Java programming language. This actually affected the flow of the application development process as much time was used to learn and understand the payment API integration for Java. With these challenges and others not mentioned here, a lot of new experience has been gained during the development process of this application. Although all the requirements set out for the e-commerce web application have been met, there are still areas to improve on. A mobile version can be developed for the application so that users can have a better access to the application. Also, other online payment methods like credit/debit card and bank payment methods can be implemented for the application.

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