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The Implement of Web Applications Based on Struts & Hibernate & Spring

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Abstract: This paper takes college reference room management system for example, proposes the rapid development method which is based on architecture technology of Struts, Spring and Hibernate (SSH), and presents the procedure of design and development during the course of Web information system. Result proves that, the SSH framework could reduce the development time of complex business systems, enhance the maintainability and scalability of the systems also.

Keywords: web applications; rapid development; Struts technology; Spring technology; Hibernate technology

1 Introduction

Currently, the web applications based on B/S model are sub-divided into five layers: user layer, presentation layer, business layer, persistence layer and database layer [1]. However, the traditional development mode has no ready tools corresponding with the layers to quickly develop a web application with clear hierarchy. In recent years, there are three mature technologies in the J2EE platform based on MVC pattern: they provide rapid development tools of different levels in web systems [2]. The Struts, Hibernate and Spring (SSH) technology framework, which integrated with Struts, Spring and Hibernate, not only improve the efficiency of system development, but also the security, stability and robustness of system.

2 SSH Framework

SSH framework is welcomed by the developer for its lightweight, open source and agile development supported, it is the Abbreviation of Struts + Spring + Hibernate [3]. SSH integrate effectively the three architectures together, the hierarchical structure is clear, and avoids high level of coupling in a single frame structure, thus it is easier to maintain and expand a system.

In the SSH framework, web layer is mainly realized with the Struts. The Struts just is a MVC framework based on JSP Model2, which could simplify the development of web layer, achieve the separation of presentation logic and data, and reduce the time of development.

Spring framework and Struts framework can be inte-

grated perfectly, and have advantage in management of transaction dependence. The foundation of architecture is the IOC container based on Bean property. Spring mainly processes the application business logic, business validation and transaction management, and manages the object dependence in business layer as well.

Hibernate is an O/R (Persistence object/relationship) mapping framework, complete with common Java objects, carried out the lightweight package of JDBC, thus can display the data of object graph to the UI layer in case of the database is disconnected, these data can be send back to the data persistence layer and update to the database.

In general, the method of integration with three framework is to take Struts framework as the foundation architecture of overall system (complete the separation of MVC), use Hibernate framework to support the persistence layer, and use Spring to support the business layer [4-5].

3 System Design Based on SSH

3.1 Design of System

With the growing of college enrollment, colleges more and more type and quantity of information need to be stored. The overall target of system development is to achieve the systematization, standardization, information and automation management of college reference room, finally, improve the efficiency of data management, and reduce the workload.

3.1.1 The Analysis of Business Process

After analyze the business process of reference room management, the system mainly complete the staff information management, book information management, lending information management, etc... Figure 1 present the general business process of system.
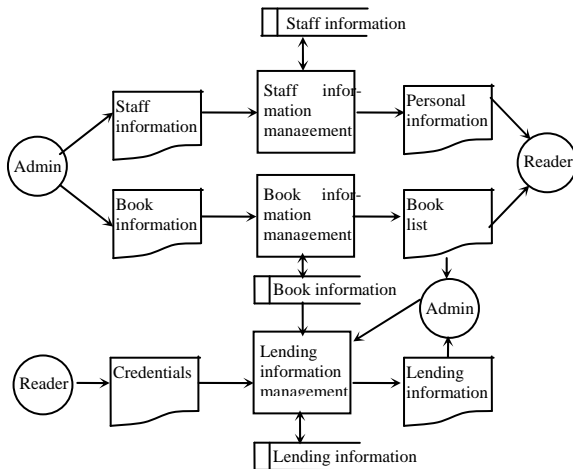

Figure 1. The business process diagram of system

3.1.2 Design of Function Modules

According to the analysis of business and data flow, the main of system are shown in Figure 2.
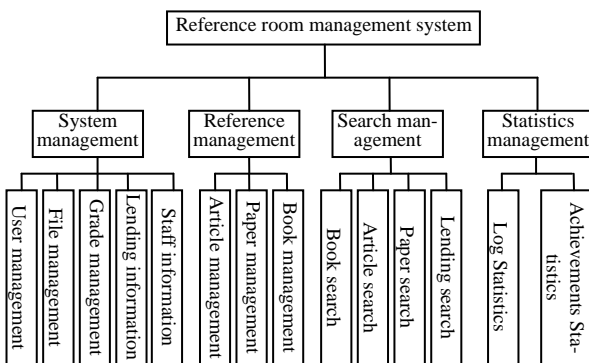

Figure 2. The function structure of system

3.1.3 Design of System Architecture

The system includes five levels, which is shown in Figure 3.

User layer: treatment the interaction of the user with the client browser, including JSP and HTML pages.

Presentation layer: the Views are some JSP pages. The data is indicated with ActionForm, the Controller combines with Action Servlet, Struts2 configuration file and Action classes.

Business Layer: achieve the business method and interfaces of the system, which are formed with some Java classes and JavaBean. The core business logic is packaged into JavaBean, as well as the interactive relationship between Hibernate.

Persistence layer: mainly implement the object/ relationship mapping, using Hibernate's own database connection pool technology.

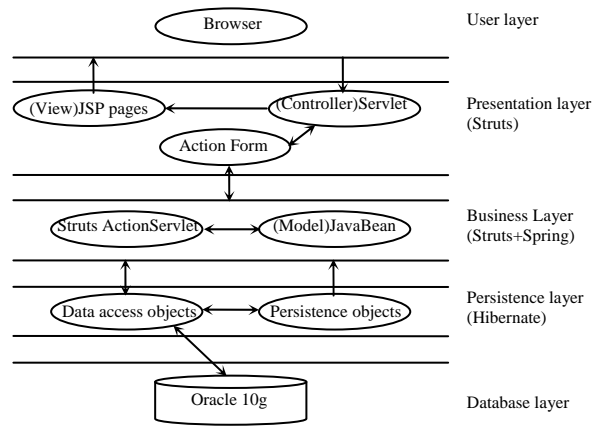Database layer: use the Oracle to manage the application data.

Figure 3. The system architecture

3.2 Implement of System

In system development process, take MyEclipse 6.5 as development tool, the database system choose Oracle 10g. Complete the SSH integration of three framework with configuration file. When deploy the web server, use Linux operating system, and the Tomcat6.0 as service software.

Firstly, achieve the basic Java object according to the UML models of system, and then complete the basic DAO interface, use DAO classes of Hibernate framework to implement the mapping and access between Java classes and the database. Finally, complete the business logic with Spring.

3.2.1 Presentation Layer

Presentation layer is responsible for processing the re-

quest and data transfer between the client and the business layer. The layer achieved by Struts framework, mainly include the JSP pages, ActionForm, Action, Action Servlet and Struts2config. Xml.

The settings of "Statistics condition check" action in Struts2config. Xml file is as follows:

```
< action path ="/ StatVoiceAction"
        input ="/news/ StatRule. jsp"
        type ="org.spring framework.web.struts.
DelegatingActionProxy"
        name ="NewsActionForm"
        parameter ="methode"
        scope ="request"
         validate ="true"
    < / action >
    …
<!-- Log Statistics function -->
<include
   file="com/linkage/trtbs/action/querystat/queryStat.xml
" />
<!—Chart display of Log Statistics-->
<include
file="com/linkage/trtbs/action/querystat/chart/log_chart.x
ml">
</include>
    (Other code slightly)
```

3.2.2 Business Layer

At first, create the management classes for each function module to manage and maintain its business logic, and then modify the of Spring, register the bean class corresponding to the manage   class, to meet their transaction control with AOP mode. The example configurations file of transaction management as follows:

```
< ! - -Configure sessionFactory - - >
    <bean id="sessionFactory"
    class="*.LocalSessionFactoryBean">
    <property name="configLocation"></property>
    </bean>
    …
< ! - Configure Java classes of statistics management- - >
    <bean id="StatisticManager"
    class="*. StatisticManagerImpl" singleton="false">
```

```
    < property name ="StatisticDAO">
            < ref local ="StatisticDAO"> < / ref >
        < / property >
    </bean>
    …
<!-Configure the methods of transaction management -->
    <aop: config>
    <aop: pointcut id="StatisticMethod"
    expression="execution(*.Statistic*"/>
    <aop: advisoradvice-ref="txAdvice"
    pointcut- ref="StatisticMethod"/>
    </aop: config>
    (Other code slightly)
```

Spring configure the SessionFactory and HibernateTemplate with the configuration file, in order to achieve dependency injection of Hibernate resources. In configuration file, the search for resources such as JDBC DataSource and Hibernate SessionFactory is defined as different Bean, the application objects could access the resources only through reference by the corresponding Bean [5].

3.2.3 Persistence Layer

Firstly, create the persistent classes and mapping through an XML format mapping described file to achieve the objects map as database tables, the relationships map as the relationship between tables. The suffix of the document is entitled "hbm.xml". It is necessary to create configuration profile as "Hibernate.cfg.xml". The code following is part of configuration file of the system.

```
    <session-factory>
<!—ORACLE access setting-->
<property
name="connection.username">developer</property>
<property name="dialect">
    org.hibernate.dialect.Oracle9Dialect</property>
<property name="connection.driver_class">
            oracle.jdbc.driver.OracleDriver</property>
<property
name="connection.url">jdbc:oracle:thin:@*.*.*.*:1234:
TRTBS </property>
<property
name="connection.password">pan*2345</property>
```

```
<property name="show_sql">true</property>
<!-- Parameter management module -->
   <mapping re-
source="com/linkage/trtbs/vo/parammanage/TdAreaCod
e.hbm.xml" />
      …
      </session-factory>
      (Other code slightly)
```

4 Conclusions

In the J2EE platform, a appropriate design pattern and framework technologies could improve development efficiency, and ensure software quality. The practice shows that, SSH framework could reduce system development time, improve system maintainability and scalability, and enable the system to better meet the change of business needs. However, because of the complete separation of each layer in SSH framework, and the flexible implement, the Action mapping in Struts is very complex, thus the work is heavy, such as completing

the mapping between the objects and the relationship through the Hibernate configuration file [6]. If there are more intelligent configuration tool, the SSH framework technology will have a better future of applications.

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