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Key Technologies of Network Forum System Based on SSH2 and its Implementation

Guiying Han and Xizuo Li

School of Information and Communication, Dalian Nationalities University, Dalian, 16600, China

Abstract: Network forum is an information service system on the Internet. A practical network forum system was developed. Several key technologies of network forum system based on the SSH2 (Struts2+hibernate3+spring3.x) were discussed, that included rights management, paging management, database connection pools, etc. The system loads the data access layer by means of the reflection mechanism of the Spring framework and manages the user's rights by means of the AOP (Aspect Oriented Programming) thinking. It uses the AJAX (Asynchronous JavaScript and XML) and JQuery technology to provide users with a more accessible experience. The system can be used as a practical network platform for university students to learn and communication.

Key words: Network forum, struts2, spring3.x, hibernate3, AJAX, MySQL

INTRODUCTION

With the rapid development of Internet technology, network Forum has become essential for network communication. It is an information service system on the Internet and provides a public whiteboard, allowing users to publish information or to provide their own views. Therefore, it has a very important significance to develop a practical online forum for university students to learn and communicate.

Taking into account maintainability and scalability of the forum system, SSH2 is used as the system architecture (Deng *et al.*, 2001; Chen, 2008; Li *et al.*, 2010) and adopt the MySQL 5.5 as the back-end database and then, design and implement a network forum system and finally achieved a good result in the practical application. This study will discuss the methods and key technologies of the design and implementation of network forum.

SYSTEM ARCHITECTURE

The system uses a three-tier architecture and is based on the Struts 2, Spring 2.5 and Hibernate 3. In fact, the Struts 2 is the further encapsulation of the Servlet. On the one hand, it is responsible for handling requests for the Web pages and on the other hand, it makes the backend data to be called in the presentation layer by means of the simple struts tag. The Spring 2.5 is responsible for the effective organization of the functional classes. Once the developers entrust the Spring

framework with the functional classes, the Spring will dynamically instantiate and load the function classes according to the actual situations and orderly conduct the business logic. The Hibernate 3 is responsible for providing a simple interface to configure the database and accesses the database. Meanwhile, it provides a caching function, greatly improving the concurrent processing capability of the website.

For more efficient use of hardware resources, multiple physical servers are used to install VMware or Oracle VirtualBox and set up a virtual machine in order to make them working together. By means of cluster technology, the computing resources of the physical machines can be rationally allocated and used in the maximum. Also, this technology can be used to effectively control the physical machine computing resources and efficiently use the resources. In this system, the Nginx is used as a load balancing server and automatically detects each Web server's load and balances the distribution of each server to respond the requests. When a Web server fails, Nginx can automatically detect it and transfer the business to other available Web server.

OVERALL DESIGN

The forum is based on the SSH2 architecture. It uses Java technology and uses MySQL 5.5 as backend database, also uses Apache Tomcat5.0 as the Web server. The software structure of the system is shown in Fig. 1. Because the use of the system is for the university

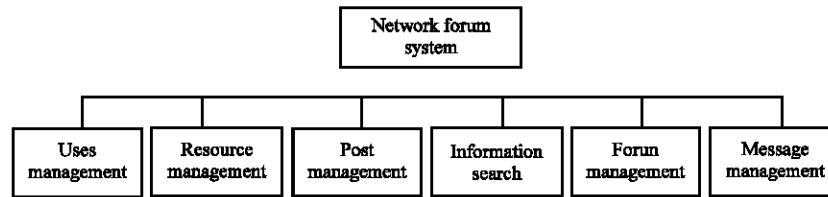


Fig. 1: Software structure of the network forum system

students, the contents of the forum is focused on learning. According to the requests of the functions for the forum, the system is divided into several functional modules, that include user management, resource management, post management, information search, forum management, message-in-website, etc. Among them, the user management is used to manage the users that log on to the forum and provides the functions of user registration, authentication, rights management, personal data modification and password retrieve. The resource management refers to uploading and downloading a variety of learning resources for students and online browsing functionality. The post management is used to manage the posts for the entire forum and provides the functions of publishing posts, viewing posts, replying posts, editing posts, deleting posts, etc. The search information module provides users with a convenient searching functions, the contents includes the user information, learning resources, posts, boards, bulletin information, the messages in the websites, etc. The forum management provides the functions of the management and maintenance of the entire forum, including addition, maintenance and deletion of the boards. It also provides the management and maintenance for the announcement information, as well as the adverse statement processing for the forum. The last module is the message management, it is mainly used to send and receive short messages among website users.

KEY TECHNOLOGIES AND ITS IMPLEMENTATION

In the following, several key technologies of the practical network forum system based on SSH2 are presented. The system is divided into the DAO layer (it is also called data access layer, responsible for interacting with the database), the service layer (it is responsible for the underlying business logic processing) and the action layer (it is also called behavior layer, responsible for the interaction with the presentation layer and the organization of the top-level business logic).

Among them, the DAO layer and the service layer are also divided into the interface layer and the implementation layer.

Since the system has several modules, but their implementation processes are similar, therefore the post management module is taken as the expounded sample in the following.

Query function and its implementation: Taking into account the scalability of the system, a variety of interfaces are provided for the query modules in the development process in order to meet the queries of different conditions, such as the post ID query, the first classification query, the first and secondary classifications query, etc.

In the following code, according to the user ID and first classification, the query is implemented. The core code to achieve the DAO layer interface is as follows:

```

Return (List<Request>) getHibernateTemplate(). executeFind(
new HibernateCallback() {
    public Object doInHibernate (Session s) throws
        HibernateException, SQLException { Query query = s.createQuery("from
Requestion r where r.user.id = "+param+" and r.categoryId = 3 order by
r.commitDate desc");
        List list = query.list();
        return list;
    }
});
    
```

This programming method uses the typical access to the database from the Spring+Hibernate. When the Hibernate framework is entrusted to the Spring, the Spring will further encapsulate the Hibernate. As shown in the above code, there is no the relevant code to open and close the database. The reason is that after the Spring encapsulates the Hibernate framework, a HibernateTemplate class is created. This class does not require the developer to manually instantiate, but in the process of the program running, the Spring automatically instantiates the class according to the actual need and returns to the object of the HibernateTemplate that is marked with @Resource annotation. Such automatic assembly process can be seen everywhere in

the Spring applications. Doing so, the development time is saved. Once the interface is defined, regardless of how the subsequent implementations change, the Spring will help developers to instantiate an accurate class.

Rights management: The rights management of the system is implemented by the Spring framework. As the Spring framework provides some annotation functions, it enables developers to set the cutting points in the programs and add the business logic on the cutting point. Once the program is running, it can perform the added business logic before or after the cutting point, according to the developer's setting. This way, it is very simple to conduct rights management. It needs simply to check the user's operating authority before the program runs to the corresponding operations and determines whether it has the authority to operate and makes the appropriate treatments (Cheng *et al.*, 2012). The following code takes the registration as an example and elaborates the process of setting the cutting points and executing the permissions check by using the Spring annotation. By executing the program, whether the user is logged in can be checked before inserting data into a database, if not login, then return to the login page:

```
@Before("execution(public * com.itbbs.service. *.add*(..))")
//this statement limits the method of isLogin() in the following code and it
can be executed before the rules of "public * com.itbbs.service. *.add*(..)"is
satisfied.
public int isLogin() throws Throwable {
    String url = "../login/login.jsp";
    loginCheck(url);
    return 0;
}
private void loginCheck(String loginURL) throws Throwable {
    HttpServletRequest request = ServletActionContext.getRequest();
    HttpServletResponse response = ServletActionContext.getResponse();
    User u = (User) request.getSession().getAttribute("user");
    if (u == null) {
        String url = request.getContextPath() + request.getServletPath();
        String old = (String) request.getSession().getAttribute("oldURL");
        if (old != null) {
            request.getSession().removeAttribute("oldURL");
        }
        request.getSession().setAttribute("oldURL", url);
        System.out.println("old url is "+ request.getSession().
getAttribute("oldURL"));
        response.sendRedirect(loginURL);
    }
    else {
        System.out.println("user is " + u.getUserName());
    }
}
```

In this system, all the name of the method that involves in the adding data are unified with the "add" at the beginning and all the function classes that involves in the underlying business logic are unified with the package "com.itbbs.service". It stores the interfaces of

the functional classes and the package "com.itbbs.service.impl" stores the implementations of the above interfaces.

The implementation of the principle is to entrust all the function classes to the Spring framework and then, to set the cutting point by means of the annotations. The Spring framework will check whether to reach the cutting point when executing the function class. Once the program runs up against the cutting point, it performs the operation according to the setting and then, executes the code behind the cutting point through the reflection mechanism.

This way, it is possible to concentrate on writing a PermissionCheck class that is used to set the cutting point and add rights management. So the development process for developers is greatly simplified.

Paging with high-performance: Generally, there are two kinds of the paging methods. The one is to query all the data and stores the result sets in the memory and then separates the results into the pages and finally extracts the pages from the front end by means of the AJAX (for instance, the gridview control of the ASP.net is implemented by using this method) (Li, 2007; Crane *et al.*, 2007). The benefits of doing so is to reduce the number of queries and enables users to quickly extract the information, but it will consume a lot of memory and the extracted data do not have real-time. The another is called section query. The user just finds out the section that he wants to access. The benefits of doing so is that the data has a real-time and always contains the most recent data. Also, the consumption of memory is less but the access to database becomes frequent.

In the Hibernate framework, there is a query class, it contains the setFirstResult method and the setMaxResult method that can be used to limit the query. But, despite the limit queries, there will be a risk of "full table scan", which would seriously affect query efficiency, so the "order by" query condition is added to avoid the risk of "full table scan ". The key code is as follows:

```
public List<Requestion> listByParentType(final Pager p,final int parentId)
{
return (List<Requestion>) getHibernate Template(). executeFind(
new HibernateCallback() {
public Object doInHibernate(Session s) throws
HibernateException, SQLException {
Query query = s.createQuery( "from Requestion r where
r.categoryId=3 and r.parentTypeId="+ parentId + " order by r.commitDate
desc");
query.setFirstResult(p.getFirstResult());
query.setMaxResults(p.getPageSize());
List list= query.list();
return list;
}
});
}
```

Database connection pool: The database connection is extremely important and limited resource, but repeatedly establishing and releasing connections cause a lot of overhead and performance degradation. Database connection pool technology can be used to effectively eliminate this bottleneck and greatly improve the performance of database access. In this system, there may be a large number of processes to simultaneously access the database and in each process to access the database, it must establish a connection with the database, access data, be disconnected, then the performance of the system is seriously impacted and even lead to database errors, i.e. database memory overflow.

Establishing a database connection pool is an effective means to solve this problem. Once establishing a database connection pool, the operations in the process of accessing the database becomes to operate the database connection pools. A certain number of connections can be set in the database connection pool. When the connection with the database is needed, it just gets a connection from the "buffer zone" and puts it back after the process is finished. Its basic principle is to establish a number of database connection objects and put them into a specific memory (called the pool). Each time the system receives a connection request, it just sends a connection object to the requester. So it avoids to repeatedly create and close the connection and these connected objects can be recycled to use. The specific process is as follows:

- If you want to use the database connection pool, it needs to create a connection pool object and also needs to define the maximum number of connections
- For the requests to access the database, it can directly obtain a connection from the connection pool. But if there is no connections available in the connection pool, the process needs to wait
- When the operation is complete, the connection needs to return to the connection pool
- When the database is shut down, all the connections are released
- When you exit the system, the connection pool object is released

CONCLUSION

The network forum is an information service system on the Internet. A practical network platform based on

SSH2 is implemented, that can be used to learn and communication for university students. This study discusses the key technologies of the network forum and its practical application and the effect of the SSH2, as well as the advantages in practical applications and also explores the reflex mechanism in the Spring. Practice shows that the network forum system based on SSH2 is running well and also easy to extend and maintain.

In the system, besides using SSH2 framework, AOP thinking is also used to conduct the management of user rights and adopt AJAX and JQuery technology to enhance the user experience and reduce network traffic.

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REFERENCES

- Chen, M., 2008. Design and realization of college students forum based on ASP. NET. *J. Chongqing Inst. Technol.*, 22: 162-165.
- Cheng, Z.J., W.M. Wang and M. Gao, 2012. Design and Implementation of Management and Query Center of Log Auditing System Based on SSH2. In: *Affective Computing and Intelligent Interaction*, Luo, J. (Ed.). Springer, USA., pp: 262-265.
- Crane, D., J. Sonneveld, B. Bibeault, T. Goddard, C. Gray and R. Venkataraman, 2007. *Ajax in Practice*. Manning Publications, USA.
- Deng, C.Y., Z.G. Zhou, W.Y. Li and G.Z. Xuan, 2001. Three typical algorithms to implement the web message board or forum using PHP. *Comput. Eng. Sci.*, 23: 4-6.
- Li, G., 2007. *AJAX Collection Based on J2EE*. Publishing House of Electronics Industry, Beijing, China.
- Li, S.F., K.H. Hu, F.L. Zhang, K. Lu, S.T. Chen and Y.L. Bo, 2010. Implementation of SSH2 framework-based management system for university scientific research network. *Comput. Appl. Software*, 27: 195-196.