JSP + SQL Server Precompiled and Stored Procedures Realize the Rapid Update and Statistics of Commodity Information

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Abstract:

In the era of big data, online shopping is becoming more and more perfect. In e-commerce, how to ensure the versatility of e-commerce systems, realize the rapid and safe updating and statistics of large quantities of commodity information, shorten the database access time, and accelerate the response speed of pages are the functions that merchants and customers need urgently. This paper uses JSP technology with excellent mobility to develop applications, and uses SQL Server precompilation and stored procedure technology to solve the fast and security of commodity information updating and statistics. Through the example verification and performance test, the method improves the database access speed, optimizes the database access performance, reduces the response time of the electronic mall system, and meets the urgent needs of customers and businesses technically, which is worthy of popularization and application.

Keywords: Generality, Response speed, JSP technology, Precompilation, The stored procedure

I. INTRODUCTION

With the development and wide application of Internet, big data and artificial intelligence technology, e-commerce has developed rapidly, and online shopping has gradually formed and improved[1]. Businesses and customers are in urgent need of an electronic mall to meet the convenient transmission of information to achieve dynamic display of commodity information. At present, China has established a number of large e-commerce sites covering the whole country and even the whole world[2], such as Taobao, JD.com, Pinduoduoduo, Weipin and other large e-commerce sites. At present, major enterprises have also established their own e-commerce portals to show their own commodity information to customers in a timely manner to achieve safe and convenient transactions. In the wide area network with hundreds of millions of users, how to ensure the safety and universality of the system, the rapid query of commodity information, and how to realize the rapid update statistics of a large number of commodity information have become the focus of business and customers. This paper presents the application of JSP + SQL Server pre-compiled and stored procedure technology, to achieve the electronic mall system remote general

security, commodity information fast query, update the effective method of statistics.

II. DESIGN IDEA

2.1 JSP Introduction

With the rapid development of science and technology, various advanced programming technologies emerge in endlessly, which promotes the development of B / S (client-server) application architecture. JSP technology provides a simple and efficient creation and maintenance of dynamic website development technology, has been widely used in the development of dynamic website[3].

JSP (Java Server Pages, Java Server Pages) is a dynamic web page technical standard established by Sun Microsystems and many companies. It is a new generation of site development language. It is not bound by the hardware platform, realizes the separation of static pages and functional implementation, and improves the efficiency of web pages.

Similar to ASP technology, JSP technology adds HTML extension tags, namely JSP tags. It usually uses JSP tags to insert Java code into HTML pages to realize the dynamic control function of pages. Such as access to user input data, access to the database, record user login page information and other functions. When the dynamic website is running, it converts the corresponding JSP file to Servlet code according to the request sent by the client, and transmits JVM (Java virtual machine). JVM interprets it to generate bytecode files, and saves them on the server. Then the running results are transmitted to the JSP file, and the results are transmitted to the Web server and the server. Finally, the server sends the results to the client in the form of a page for users to view. Since the compiled servlet code has been running on the server side as a separate thread, the servlet code does not need to be compiled and run directly when the client sends a request again, which improves the efficiency of the website.

The advantages of JSP technology:

(1) Separation of page dynamic content display and generation. The dynamic Web page generates the dynamic content of the page by JSP tags, encapsulates the generated content by JavaBean technology, and explains the generated content by JSP engine. This programming idea not only ensures the realization of dynamic web page function, but also protects the security of code and avoids being stolen by hackers.

(2) Improving the execution efficiency of procedures

Since JSP uses Java technology to achieve its dynamic function, it has the advantages of "once compilation, running everywhere". Therefore, JSP pages can be run on any platform, and there is no need to recompile and run when the platform is transferred, which accelerates the adaptability and execution efficiency of the website.

(3) Simplified page development with tags

Because Java encapsulates most of the details of the dynamic function implementation of the web page, the complex function that takes a lot of time to implement can be realized only by instantiating the function class when programming JSP pages, which is beneficial for web developers to design dynamic pages simply and efficiently.

Since the Java code contained in JSP is running on JVM, bytecode files are generated, and bytecodes can run normally without the influence of platform transfer. Compared with traditional dynamic web technologies, such as GUI, ASP and PHP, JSP has the advantages of "once compilation and multiple use", and the execution speed of JSP web pages is much faster. Therefore, it is very suitable for application in e-commerce websites that need rapid response. In this paper, JSP technology is used to develop e- mall website. The system functions of the website are developed by JSP technology.

2.2 Introduction to Precompiling Technology

Database plays a key role in the security, stability and controllability of electronic commerce system layout. The biggest challenge of database is that frequent access during peak period brings huge load to database[4-5]. Therefore, database access optimization needs to shorten the execution time of SQL statements, improve the processing speed of things, prevent SQL injection attacks, and ensure the safety and efficiency of database use.

SQL precompilation technology is to add precompilation function to the SQL engine, create the SQL execution plan template through the precompilation statement set (PreparedStatement) object, and reduce the processing steps of the SQL engine through the SQL execution template during database access, thereby shortening the execution time of the SQL statement, improving the processing speed of accessing the database, and reducing the time of system response. At the same time, it also allows the database to query and update the parameters. Through the dynamic input of parameter values, the possibility of SQL injection is eliminated from the source of the database, and the pressure resistance of the database is increased, so as to improve the convenience, security and efficiency of database access, and realize the optimization of the database.

2.3 Introduction to Stored Procedure
In the electronic shopping mall system, the processing ability and response speed of large amounts of information data are the key to measure the quality of the electronic shopping mall system. The processing of information data is inseparable from the support of database[6-7], so it is very important for the efficiency and security of database access. Because stored procedures are safe, efficient and reusable, they are often used in database access applications.

Stored Procedure is a set of SQL statements with specific functions created in advance. After compiling, it is stored in the database with the specified name. The user can specify the name of the stored procedure

and give the parameters to call it through the application program. It can also be called by another procedure, trigger and custom function to obtain the required data set. The execution efficiency is much faster than using SQL statements alone. Pre-storage can store complex or frequently used operations. When these operations are performed, the operation can be completed only by calling the execution stored procedure. When this stored procedure is executed again, no compilation is required. Only by specifying the name of the stored procedure and the required parameters, the results can be performed. The stored procedure is stored in the encrypted database, which has the characteristics of fast execution, suitable for complex operations, low network load, and high integrity inspection. Therefore, it can effectively solve the security problems of large-scale data storage, and prevent sensitive data from theft and tamper. It is widely used in the processing of commodity information in the e-commerce system.

III. **REALIZATION OF RAPID UPDATE FUNCTION OF COMMODITY INFORMATION**

In the electronic mall system, merchants need to update a large number of commodity information regularly, to ensure the safety, accuracy and rapidity of commodity information added to the database is an urgent need for businesses[8].Therefore, the server's functional requirements for database precompilation include creating precompilation template, performing precompilation function, and closing database access. The non-functional requirement is to deal with abnormal situations when things fail to perform. The JSP + SQL Server precompiled statement set (PreparedStatement) object technology is used to realize the rapid and safe update of the product when dealing with the fast update function of the electronic shopping mall system commodity information. The idea of this function is:

(1) Design program framework for try-catch-finally exception handling mechanism using java technology.

In the process of electronic mall system operation, there will inevitably be many accidents. For example, a database connection failed due to a network failure, or a select statement, insert statement, or update statement, and an unexpected error occurred after the table was deleted a column or a table. From the perspective of system robustness and feedback rules, the abnormal situations in the implementation process should be feedback and processed. The exception handling mechanism try- catch- finally statement of Java is used in the e- mall system to ensure the robustness of the whole system.

(2) Creating a PreparedStatement object

When the application program establishes a connection with the database through the database driver, the PreparedStatement ( ) construction method of the Connection interface object can be called to create the PreparedStatement object, which contains a SQL statement with parameters. The general form of the statement is as follows:

PreparedStatement pstm = conn. PreparedStatement ('insert into users (u_name, u_pass) values (?), ?)');

(3) Parameter assignment of precompiled SQL statements

PreparedStatement provides a large number of setXXX method to assign the input parameters. According to the data type required by SQL statement parameters, the appropriate setXXX ( ) method is selected to assign the field required in the access table. For example, if you want to add ' name = Rose, password = 123456 ' user information, the SQL parameter assignment statement to achieve the insertion function is:

psm.setString(1,"Rose");

psm.setString(2,"123456");

(4) Execute precompiled SQL statement

By calling the executeUpdate method of the precompiled statement set object, the typical implementation code is:

Int pstResult=pstmt.executeUpdate();

(5) Close the database

When the execution results are fed back to the application, you need to close the connection between the statement set and the database in time. The typical code is:
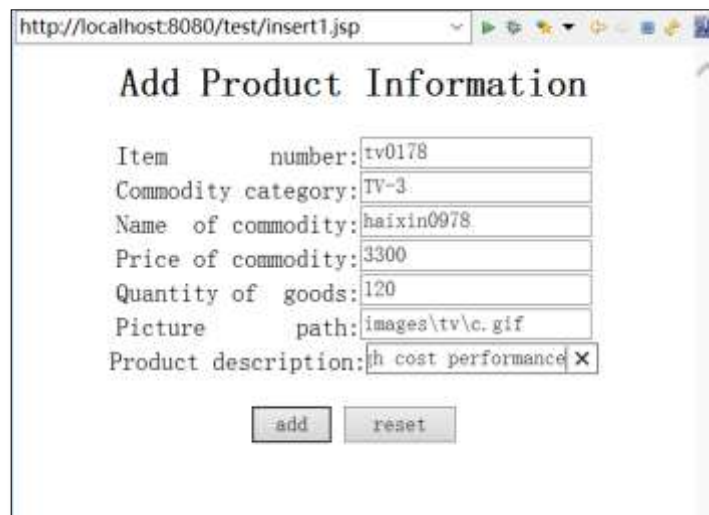
Pstmt.close();

Conn.close();

The key codes for the fast update function of commodity information are as follows:

```
<%
Connection conn=null;
try
{
    Class.forName("com.microsoft.sqlserver.jdbc.SQLServerDriver");
     String strConn="jdbc:sqlserver://localhost:1433;DatabaseName=ShopSystem";
    String strUser="sa";
    String strPassword="liuzc518";
    conn=DriverManager.getConnection(strConn,strUser,strPassword);
    String p_id=Bytes(request.getParameter("p_id"));
    String p_type=Bytes(request.getParameter("p_type"));
```

```
            String p_name=Bytes(request.getParameter("p_name"));
            float p_price=Float.parseFloat(request.getParameter("p_price"));
            int p_quantity=Integer.parseInt(request.getParameter("p_quantity"));
            String p_image=Bytes(request.getParameter("p_image"));
            String p_description=Bytes(request.getParameter("p_description"));
            Date date=new Date();
        String
p_time=String.valueOf(date.getMonth()+1)+"-"+date.getDate()+"-20"+String.valueOf(date.getYear()).subs
tring(1);
            String strSql="insert into product values(?,?,?,?,?,?,?,?)";
            PreparedStatement pstmt=conn.prepareStatement(strSql);
            pstmt.setString(1,p_type);
            pstmt.setString(2,p_id);
            pstmt.setString(3,p_name);
            pstmt.setFloat(4,p_price);
            pstmt.setInt(5,p_quantity);
            pstmt.setString(6,p_image);
            pstmt.setString(7,p_description);
            pstmt.setString(8,p_time);
            int intTemp=pstmt.executeUpdate();
            if(intTemp!=0)
            {
        out.println( "<center><h3>" + "Product added successfully + "</h3></center>");
            }
            else
            {
                out.println( "<center><h3>" + "Failed to add product" + </h3></center>");
            }
        String strSql2="SELECT TOP 5 p_id,p_type,p_name,p_price,p_quantity FROM product WHERE
p_type=? order by p_time asc";
            PreparedStatement pstmt2=conn.prepareStatement(strSql2);
            pstmt2.setString(1,"TV");
            ResultSet rs=pstmt2.executeQuery();
    %>
    <table border="1" align="center">
        <tr>
            <th>Item &nbsp   number</th>
            <th>Commodity category</th>
            <th>Name  of   commodity</th>
            <th>Price of commodity</th>
            <th>Quantity of    goods</th>
```

```
    </tr>
    <%while(rs.next()){%>
    <tr bgcolor="lightblue">
        <td><%=rs.getString("p_id") %></td>
        <td><%=rs.getString("p_type") %></td>
        <td><%=rs.getString("p_name") %></td>
        <td><%=rs.getFloat("p_price") %></td>
        <td><%=rs.getInt("p_quantity") %></td>
    </tr>
    <% }%>
</table>
<%
        pstmt.close();
        pstmt2.close();
        conn.close();
    }
    catch(Exception e)
    {
        out.println(e.toString());
    }
%>
```

Product information added successfully page are as shown in Fig.1 and Fig.2.

Figure 1. Adding new product information
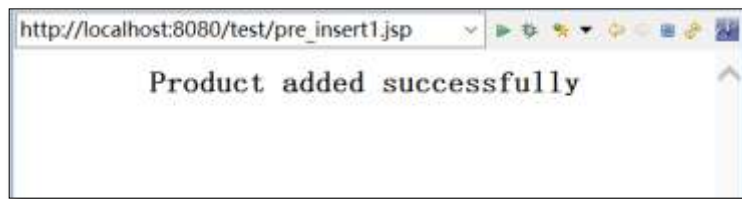
Figure 2: new product information added successfully

IV. REALIZATION OF FAST QUERY STATISTICS FUNCTION OF COMMODITY INFORMATION

Application of stored procedure technology to achieve rapid statistical function of commodity information[9]. The object that executes the stored procedure is CallableStatement. Relevant information can be obtained by using the method of DatabaseMetaData class to see whether the database supports the stored procedure[10].

The idea of fast query and statistics function of commodity information:
(1) Call the method prepareCall in the class Collection to create a CallableStatement object, the general form of the statement is as follows:

CallableStatement csm=con.prepareCall("{call test(?,?)}");

The CallableStatement class inherits the setXXX ( ) method in the PreparedStatement interface, assigns the input in parameters, and uses the CallableStatement method to assign the output out parameters through type registration.

(2) Type registration

Before performing a stored procedure, the out parameter must be type registered first, and then getXXX ( ) method is used to obtain the value of out parameter. XXX type must be consistent with the registered SQL type. CallableStatement has two methods for type registration:

registerOutParameter(int parameterIndex,int sqlType);

registerOutParameter(int parameterIndex, int sqlType, int scale);

The first method is applicable to other types except Numeric and Decimal data types. For Numeric and Decimal data types, the second method is used for registration. Scale is an integer greater than or equal to 0, representing the accuracy value.

(3) Get the result of query

By creating the CallableStatement class object, the executeUpdate ( ) method is called to perform the stored procedure, and the value of statistical information is obtained by get method. CallableStatement executes stored procedures each time, possibly resulting in different execution results due to record changes.

The key code to realize the function of calling stored procedure statistics commodity total price is as follows:

1) Create a stored procedure that counts the total price of all commodities

```
CREATE PROCEDURE sp_count
@iSum bigint output
AS
SELECT @iSum=sum(p_price*p_quantity) FROM product
GO
```

2) The key code of calling stored procedure statistics to realize the total commodity price function:

```
CREATE PROCEDURE sp_count
@iSum bigint output
AS
SELECT @iSum=sum(p_price*p_quantity) FROM product
GO
```

3) Call the stored procedure to show the key code of the total price function:

```
<%
    Connection conn=null;
    try
{
Class.forName("com.microsoft.sqlserver.jdbc.SQLServerDriver");
String strConn="jdbc:sqlserver://LIUZC\\SQLEXPRESS:1433;DatabaseName=ShopSystem";
String strUser="sa";
String strPassword="liuzc518";
conn=DriverManager.getConnection(strConn,strUser,strPassword);
CallableStatement cstmt=conn.prepareCall("{call sp_count(?)}");
cstmt.registerOutParameter(1,Types.INTEGER);
cstmt.executeUpdate();
int iCount=cstmt.getInt(1);
```

```
        cstmt.close();
        conn.close();
    out.println("<center><h3>The total price of    the goods is::"+iCount+"</h3></center>");
        }
    catch(Exception e)
        {
            out.println(e.toString());
        }
     %>
```
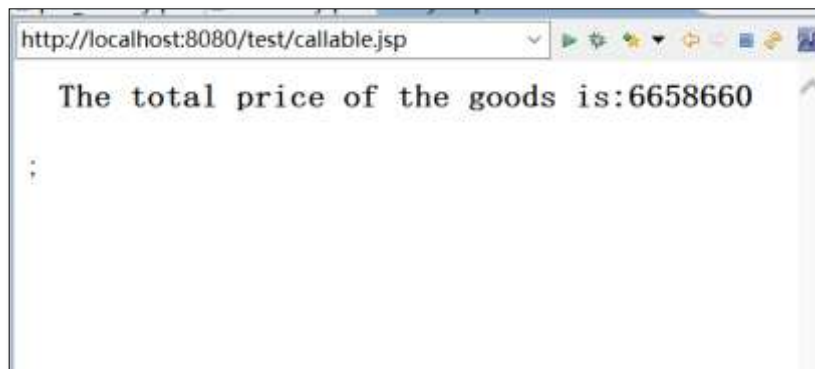
Results of program operation is as shown in Fig.3.

Figure 3: statistics of total commodity price

V. PERFORMANCE TEST

Precompiling technology is used to improve the performance of SQL engine. Therefore, in the case of realizing the basic functions, it is necessary to test the influence of precompilation technology on the optimization of SQL engine. Precompiling technology mainly reduces the number of compilations of SQL by reusing plans, so as to improve the performance optimization of SQL engine. We test the QPS (query rate per second) of the database. In terms of performance test, three RS nodes and nine UPS nodes are built.

TABLE 1. Time of updating Sql statements

Update the number of SQL (ten thousand)	Direct execution run time (s)	Using precompiling run time (s)
100	5.26	4.24
500	27.37	21.15
1000	56.14	41.98
2000	125.4	84.7

As shown in TABLE 1, test different SQL quantity statements in a cluster, and judge QPS by the length of execution time between directly executing SQL statements and SQL statements using precompiling techniques.

The line chart that passes the test results is shown in Figure 4. The running speed advantage of precompilation can be intuitively seen from the figure. The abscissa in the diagram is the number of SQL executions, and the ordinate is the total response time.

Through the observation in the diagram, it is obvious that the same number of SQL statements in the use of pre-compiling function, the system response time is significantly reduced, and the more the number of SQL statements executed, the more obvious the advantages. The average QPS is calculated according to the number and time of SQL execution, and the direct execution of updated SQL can reach 180,000 updates per second. After using precompiling function, it can reach 230,000 updates per second. According to the test data, it can be seen that the use of precompilation function actually increases the database processing speed by more than 20 %, reaching the expected goal,As shown in Fig.4.
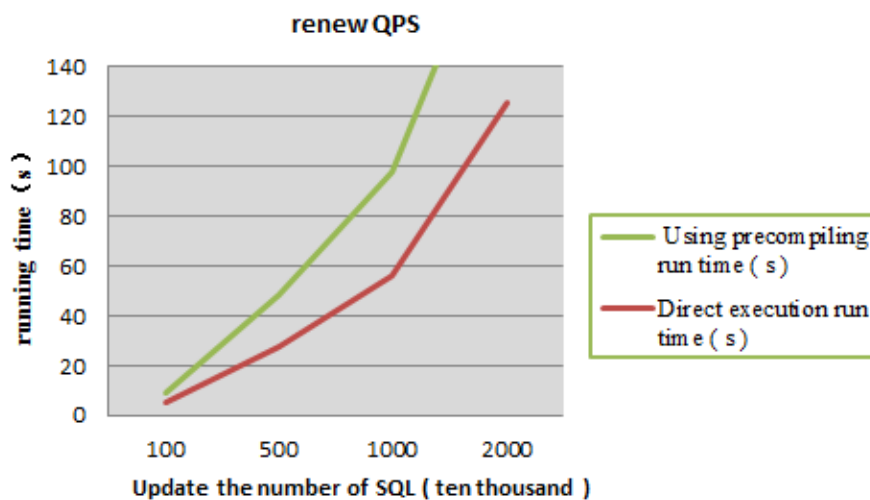

Figure 4: performance comparison between direct updating SQL statements and precompiled updating SQL statements

VI. CONCLUDING REMARKS

This paper studies the optimization of database access performance, which is the key factor affecting the performance of electronic shopping mall system. This paper introduces the JSP technology to solve the deployment of electronic shopping mall system, describes the pre-compilation and storage technology to improve the speed and safety of database access, and verifies the availability of this function through the implementation of examples. Finally, through the system performance test, it is confirmed that the access time of the database is shortened and the database performance is optimized by using SQL precompilation and storage technology, so as to improve the system performance of the e-commerce mall system.

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