The design and implementation of university educational administration system

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Abstract. The J2EE technology industry has been agreed that is a very good software architecture, and it is widely used in many large projects, this paper analyzes the presentation layer of the open source framework based on J2EE technology Siruis, business layer open source framework Spring and data persistence layer framework Hibernate related technical characteristics, and it based on Siruis + Spring + Hibernate lightweight J2EE architecture, in the development of college educational administration management system implementation.

1. Introduction

Information is an important factor to promote economic development, scientific and technological development and social progress in today's society. Today, computer technology, network technology and communication technology have been recognized as the foundation of modern information society, and their application level has become the symbol of information and modernization. Among them, the basic and important mark of social informatization is university informatization [1]. In colleges and universities, teaching affairs and teaching work occupy a very important position. It can be said that the management of them is an important part of the information construction of colleges and universities. It can be seen from this that it is necessary to realize the management of educational affairs to conform to the development of today's society [2].

My project team was invited to develop a teaching management system for a college. This college is a public - run full-time college of higher learning. According to the teaching concept and orientation goal of higher vocational colleges, it mainly trains technical application-oriented talents at the specialty level. In current higher education fast development, the social demand for high-skilled talents is also growing [3], to meet the needs of the development of society, the school enrollment expansion since a few years ago, the number of students increased dramatically, has been developed from the original development of thousands of people for ten thousand people, at the same time, the curriculum has been to the deep and wide development, the educational administration system before is artificial treatment combined with computer management, such already can't satisfy the need of modern educational administration of colleges and universities, this way can't solve the problem of large educational work, work efficiency is very low, all kinds of resource utilization is not high, especially the various statements complete time is long and error-prone, Managers often spend a lot of time, but often don't get the results they need. Although computers have been used in management, the independent use of various management software makes it impossible to share information, which leads to the formation of information islands [4]. The colleges and universities in recent years, on the other hand, have completed their own campus network construction, and for the networked management information system development laid a solid foundation, but also make use of campus network for educational
administration. In such an environment, to develop a set of educational administration management system solve the problems in current educational work, and help to improve the teaching quality, which provides decision-making support for all aspects of the user become a priority for the school development[5].

2J2EE overview

J2EE (Java 2 Platform Enterprise Edition) is a product of Java's ongoing adaptation and development, the third of three versions of Java. It is a specification for enterprise applications, or an industry standard. Each platform developed by J2EE specification developers different J2EE application servers, and all use J2EE technology to develop enterprise applications can be deployed in these different forms of J2EE application server, to simplify enterprise application development, management and deployment, greatly enhance the performance of the software. J2EE provides a multi-layered distributed application model and a set of development technical specifications. Multi-level distributed application model is refers to the application logic is divided into several levels according to their functions, each level to support the corresponding server and components, components in a distributed server component container operation (such as Servlet components running in the Servlet container, the EJB components running in the EJB container), through relevant protocol to communicate between the container, call each other between the implementation component. J2EE USES a multi-tier distributed application model [6], where application logic is divided into components by function and individual application components are distributed on different machines according to their layer. This layer is usually achieved by three or four layers:

(1) client layer components running on the client machine.
(2) Web layer components running on a J2EE server.
(3) business logic layer components running on a J2EE server.
(4) Enterprise Information System Tier (EIS Tier), the Enterprise Information System Tier software running on the EIS server.

The above layer is also commonly referred to as a three-tier application because it is distributed in three different locations: the client computer, the J2EE server, and the database in the background, or the legacy systems of the past. J2EE applications are composed of components. J2EE components is a encapsulates the functionality of the software units, it in some way in the container, the container encapsulates the J2EE, at the bottom of the API for component provides transaction processing, data access, security, persistence, etc. The J2EE specification defines the following kinds of component references:

(1) the client component of the application
(2) EJB components

Enterprise JavaBean is a core part of J2EE, defining a standard for developing component-based Enterprise multiple applications and simplifying the development of complex Enterprise applications. Its features include network service support and core development tools (SDK). The EJB's core idea is to business logic is separated from the underlying system logic, the developers need to care about the business logic, and implemented by the EJB container directory service, transaction management, durability, safety, fault tolerance, such as the underlying system logic, by agreement and method provided by the container invoking a component to each other.

A deployable EJB component consists of three parts:

The semi-remote interface: defines user-callable methods provided in an EJB component, commonly referred to as functions or procedures that implement business logic, for Remote users to call. When the EJB component is deployed to the container, the container automatically generates the Remote interface's corresponding instance, the EJB object, which is responsible for the proxy user's invocation request.

Parliamentary Home interface: used to find, locate and clear existing EJB objects and create new EJB objects. Enterprise Beans class is a concrete implementation of business logic class, it is available for user invokes methods defined in the Remote interface. The specific function is different, EJB2.0 specification defines three types of Enterprise Beans: solid body Beans (Entity Beans). The news
flooding dynamic Beans (Message - drive Beans) Beans (Session Beans), Session Beans There are two types of statelessness and statefulness: general stateless session Beans simulate business logic; Stateful session Beans are usually simulated a user session, and temporarily hold customer information, according to the customer request to invoke other Beans to store data. Both session Beans without saving state information or data, when customer broken links or server is shut down, session Beans also disappear. Entity Beans to simulate business data, he said a data store, is a state of information or a record in a database. The entity Beans in the disconnected client or server is turned off, there is still a service to ensure the data is preserved. The message-driven Beans Session Beans behave much like session Beans, except that message-driven Beans are invoked only when a message is sent to these Beans as needed.

(3) JSP(Java Server Pages) and Servlets components

JSP is a dynamic web page technical standard. A bit like ASP, it inserts segments and JSP tags into traditional web HTML files to form JSP files. The server executes the Java code after the page is requested by the client and returns the resulting HTML page to the client's browser. A Servlet is a small Java application on the server side that extends the capabilities of a Web server, has platform-independent and protocol features, and can generate dynamic Web pages. It ACTS as the intermediary between a customer request (a Web browser or other HTTP client) and a server response (a database or application on an HTTP server). Servlets provide much of the same functionality as JSP, but are implemented in a different way, with all servlets written in Java and HTML generated. Unlike a traditional Java application that starts from the command line, servlets are loaded by a Web server that must contain a Java virtual machine that supports servlets.

2. System business process analysis

Demand analysis is an important stage, the overall design of the system is also the last stage of the software defined period it comes from the initial user the formal requirements to meet the requirements of the user of the software product of the mapping process. Its basic task is to put forward complete, accurate, clear and specific requirements for the system, that is, to answer the question "what does the system do". The requirements of the office of academic affairs information system should be a collection of information, automation and network into a comprehensive integration of advanced educational administration information system, educational administration departments to improve the efficiency of management, need an information system to provide quality and efficient business management and transaction processing. In order to meet the needs of the modern educational administration of the college, the system should meet the following requirements when it is completed:

(1) practical function: the university education management information system should be able to organize work scientifically and reasonably according to the teaching management business process and provide daily teaching management functions.

(2) advanced technology: the university educational administration management information system adopts advanced computer software and hardware technology, able to adapt to the change of era and environment development needs, to ensure that the system won't lag behind in a long time.

(3) the high stability: the university educational administration information system running speed, high efficiency, not only can help managers to improve business efficiency, but also can effectively prevent all kinds of artificial operation error, maintain the integrity of the data.

If we want to understand every detail of the business process, we must analyze the business process of the system and find out the mistakes and shortcomings in the original system development through detailed analysis. And make the correction in time, so that the system can be optimized. Business process analysis is the business on the basis of the function modules are realized, the business process with the specified symbol to represent each step, with graphics and connected into a whole, the business flow chart [19]. It is a graphical representation of the transaction process. Take teaching staff information management processing a teacher information, this business process analysis for example. Teachers are an essential part of a school, and their relevant information is stored as basic data in the educational management system. When a teacher enters college, his basic information such as name, degree, date of
birth, degree information shall be as archives, entry to subsystem faculty to preserved in the information management system, all information at work at the same time, such as: teaching, scientific research, rewards and punishment, training, and so on and so forth will be timely entry added in. Based on the information recorded, the college can assess its work. The business flow chart of the teaching staff information management subsystem is shown in figure 1.

![Diagram](image)

**Figure 1. Teaching staff information management subsystem business process**

We have analyzed the business process of the system above, and data flow analysis is necessary to implement it. To appear in the process of business data or information to make an analysis, handling, and storage operations such as, analysis data as independent objects, only from process to examine it in the business process flows, without processing of be particular about institutions, such as carrying the body of the element. Similar to the business process representation method, it is also represented by graph, called data flow diagram. For each school, the educational administration methods are roughly similar: initially, the institute of higher vocational college talent training plan, the guiding thought of it requires each department for the opening of a new professional class make six semester teaching plan, and report to the office within the given time, the office of review, after entry to the academic affairs as the foundation data management subsystem. After the completion of the recruitment of students work, each department according to each student do offer you professional, determine the number of New Year class assignments to each department office of the department, arrange the new semester each class's and grade's teachers, and timely report to teach, the information office of the entry, use for arranging courses arranging management system, schedule inform participating teachers and department, across from freshman; Students must register with the student registration office in time when they come to school every semester. At the end of the semester, the academic affairs office will arrange examinations and examination rooms and send them to the departments and inform the teachers and students involved. After the students have finished the examination, the teacher will review the examination papers, and then record the results online. Meanwhile, the paper results will be reported to the department and the academic affairs office for archiving and record. Students can check their grades online. The academic affairs office will arrange the student make-up examination by the student achievement form and other matters; The student status office may handle the student status according to the student status management system.

3. Functions implemented by the system

3.1. administrator user module
The administrator module contains the sub-modules of the whole management system, with the functions of query, modification, addition and deletion of each sub-module. There are mainly the following aspects:

(1) user management: management of administrator, teacher and student information. (2) schedule management: manage course information and semester teaching plan. (3) department management: manage the information of secondary colleges and departments. (4) professional management: manage all professional information. (5) teacher management: manage all teacher information. (6) student
management: manage all student information. (7) examination management: manage all the arrangements and results of the final examination.

3.2. teacher user module
(1) course management: including course addition, deletion, modification, etc. (2) examination management: including final examination result entry, query and examination arrangement query, etc. (3) teacher management: including personal information such as searching and changing my password. (4) student management: including inquiry of students’ study
Student enrollment information, attendance information input, etc.

3.3. student user module
(1) schedule query: query the course content, teaching teachers, teaching locations, etc. by term. (2) performance query: query of exam results of different semesters. (3) information management: management of personal information, including modification of personal information and password, etc.

3.4. system level overview
First, login the system, user input username and password, after verification through role assignment can enter the system; Users can query, add, modify, or delete information as required. For example, administrators and teachers can add information according to permissions, students can view information, and all users can change their passwords.

4. System data privacy protection encryption
This article through to the symmetrical secret key and asymmetric contrast and secret key system requirements analysis identified on the basis of AES encryption mode choice, in describing the AES encryption principle introduced before AES encryption used knowledge of number theory, namely the finite field addition and multiplication algorithm. Through the next round of AES encryption of byte replace operation, line shift operation, columns, confusion and rounds of secret key addition operation phases one by one, mainly around the security of the AES ascension to improve.

In the AES encryption algorithm, use the S box instead of the chaos principle, the concrete operation is to use the operation of mixed column operation to realize the chaos. In the current improvement of AES encryption, most of the improvement in principle of diffusion.

For the standard of diffusion ability, in the academic circle, the diffusion branch number is the index, and the diffusion branch number is described as follows:

When setting $F$ is encrypted byte vector linear transformation is expressed as $(F_{2^n})^n \rightarrow (F_{2^n})^n$, the number of non zero bytes in a way that is weight said: $W(\alpha)$ is zero bytes, and the number of branch when calculating linear transformation method is as follows:

$$B(f) = \min_{\alpha \neq 0} \left( W(\alpha) + W(f(\alpha)) \right), \text{ over here, } \alpha = (\alpha_1, \alpha_2, \ldots, \alpha_n) \in (F_{2^n})^n.$$ 

The transformation function used by the AES algorithm is $(F_{2^n})^4 / x^4 + 1$, and the reversible polynomial $c(x)$ used in the transformation satisfies $c_i \neq 0 \mid 0 \leq i \leq 3$, so the value of $W(\alpha)$ can only be taken from the set $\{1,2,3,4\}$. $\alpha = [\alpha_0, \alpha_1, \alpha_2, \alpha_3]^T \in (F_{2^n})^4$, $f(\alpha) = [b_0, b_1, b_2, b_3]^T$, so $W(f(\alpha)) = 4$, $W(\alpha) + W(f(\alpha)) = 5$; $W(\alpha) = i \mid 2 \leq i \leq 4$, $\alpha \neq 0 \ f(\alpha) \neq 0$, so $W(f(\alpha)) \geq 1$, $W(\alpha) + W(f(\alpha)) \geq i + 1$. The upper bound of the branch number satisfies $B(f) \leq n + 1 = 5$, so the branch interval of $(F_{2^n})^4 / x^4 + 1$ is $[3,5]$. When using AES, a simple reversible polynomial, $B(f) = 5$ is used to satisfy the maximum requirement of the diffusion layer.

requirements for diffusion performance.

When the AES algorithm is in the operation of column confusion, the concept of the maximum distance of the circulant matrix is used, which is as follows:

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The \((n,l,d)\) matrix generated by a linear code \(G\) satisfies \(d = n - l + 1\), \((n\) is code length, is code dimension). Matrix \(C\) in a limited domain for a maximum points on the \(GF(2^k)\) code is 4 (6), the linear code generator matrix in \(G = [I | C]\) piece on the right, in this linear code generator matrix \(I\) is a third-order unit matrix, without considering the left part, in order to card the encryption operation on the linear transformation matrix of the charge, and no to reduce the distance between the code word, that is building a maximum distance separable code matrix is sufficient and necessary condition of optimal diffusion layer.

In this paper, the \(8 \times 8\) size of the hadamard matrix is used to increase the original number of branches from 5 to 9, and its maximum linear separable code is \((16,8,9)\). The following is the definition of the matrix:

In the \(n\) element: \(\alpha_0, \alpha_1, \cdots, \alpha_n\), the structure of each element in the hadamard matrix is \(A_{i,j} = \alpha_{i \oplus j}\), in the finite field, it satisfies the condition \(A^2 = k \cdot I_n\), \(k\) is commonly used, when \(k = 1\), the matrix \(A\) is the matrix.

In the suitable coefficient when the choice, use the following way: randomly selected 8 hexadecimal system first, according to the definition of hadamard matrix to the structure of the related, not zero when the input bytes can out of that part of the algorithm.

5. Conclusion
The design of the educational administration system include: student management, teacher management, curriculum management, performance management, and other content, in the process of educational administration management system design and development, has experienced the demand analysis, concept design, logic design and physical design process, finally completed the construction of the database. The development of the educational management system can provide students and teachers with web-based teaching and information management services, which is conducive to the implementation of school teaching plans. Based on essentially the development of the educational administration management system in 2008, the operation method is to use the query and operation function of the computer, make the school teaching management through the Internet, realize office anytime and anywhere, educational administration personnel according to their own rights and responsibilities, to complete the corresponding educational administration work. To build and perfect the scientific and reasonable educational administration management system management system is an important part of teaching management in colleges and universities, is the only way to improve their comprehensive competitiveness of colleges and universities, this to improve college scientific decision-making, ensure the efficient operation of university teaching management is of great significance.

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