

## *Design of a Cloud Computing Based Employment Platform for College Students*

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**Abstract:** Currently, the employment situation is becoming increasingly severe, which involves the stability and development of the national economy. Therefore, universities should strengthen the information exchange between talent demand and talent supply, improve the level of employment guidance services, fully play its employment guidance function, and establish an exchange platform between students, enterprises, and employers in our school. At present, the construction of employment service platforms in universities is still incomplete, with some shortcomings that cannot meet the diverse needs of society for graduates. In order to meet the employment needs of college graduates, this article combines the Internet and human resources to build a cloud computing employment service database and a university employment service information exchange platform. In traditional employment service platforms, due to the lack of corresponding information technology equipment and software provided by schools, students are unable to timely obtain relevant employment information and enterprise recruitment situation, seriously affecting the quality of students' employment. Therefore, this paper have developed a college student employment platform based on Hadoop cloud computing platform, which realizes the collection, processing and storage of graduate employment information and enterprise recruitment information data, and carries out client communication through the Strust2 framework. After testing the employment platform for college students, we found that the system has excellent response speed. After using the system, the student signing rate and employment rate are as high as 99% and 100%, which fully proves that the employment system can provide excellent services for enterprises and students, thereby effectively improving employment rates. At the same time, it has also been verified that the algorithm proposed in this study is feasible and can effectively reduce human resource costs.

## 1. Introduction

### 1.1 Evaluation Background and Significance

Today, as the national economic development enters the new normal, employment is one aspect that needs to be adjusted more vigorously. The level of employment is an important factor affecting the quality of employment for college students. To solve this problem, it is first necessary to establish a sound, practical and feasible information platform that can provide information services for students and enterprises. With the development of modern technology, it has become an inevitable trend to use network technology and computers to manage the employment work of universities and conduct relevant decision-making analysis. This means that digital campuses would become the development direction of universities. However, there are already a large number of student information management systems, academic information management systems, dormitory management systems, etc., which are independent and do not achieve data sharing. Therefore, in order to solve the problems existing in the existing platform, when people build a new employment information service platform, people also hope that people can combine the original system with cloud computing technology to have higher integration and sharing of students' employment information resources, integrate the functions of business systems of various departments on different platforms, and add new service functions, so as to build an efficient, real-time, and easy-to-use employment information platform to provide graduates with the required services [1-2].

### 1.2 Cloud Computing Technology in the National Evaluation Status

At present, cloud computing has made significant progress in basic products, operating system technology, and other aspects. Sokiyna M Y verified the importance of cloud computing services in managing and analyzing big data in commercial organizations, discussed the concept of cloud computing and its capabilities in commercial organizations, and explained the concept of big data and its unique characteristics and sources. Finally, the relationship between cloud computing and big data (extraction, storage, and analysis) was elaborated [3]. Borse Y proposed a comprehensive monitoring algorithm for data security posture of private cloud computing platform software based on scene entropy for current data security monitoring methods with large monitoring errors, poor real-time performance, serious omission of abnormal data, and high energy consumption. Based on data redundancy removal and data security mechanisms, data security posture monitoring indicators are selected, and the calculated scene entropy difference of each indicator is used as the monitoring target [4]. Due to the lack of experimental teaching in MOOC, it has caused great difficulties for both teachers and students, and weakened the effectiveness of the curriculum, and some experimental courses cannot be taught through MOOC. Therefore, Guan S proposed cloud computing-based virtualization technology to fundamentally solve the problems of excessive student numbers and lack of experimental resources. In addition, the large-scale data processing capabilities in the cloud computing environment also make it possible for teacher-student interaction on the MOOC platform [5]. The research results of these scholars serve as the theoretical basis for designing employment platforms for college students, but further exploration is needed in practical significance.

Therefore, this paper proposes a college student employment platform designed based on Hadoop cloud computing platform, so as to realize the collection, processing and storage of graduates' job search information and enterprise recruitment information data, and provide reference for similar education service sharing platform construction.

## 2. Introduction to Cloud Computing and Related Technologies

### 2.1 Overview of Cloud Computing

#### 2.1.1 Definition and Characteristics of Cloud Computing

Cloud computing is a relatively emerging technology, and the so-called “cloud” refers to multiple computing processors that can serve as CPUs or servers [6-7]. That is to enable multiple devices with computing capabilities to process technical data uniformly, and use relevant technical means to summarize and sort the data calculated by each device, and finally obtain the calculation results. Essentially, cloud computing is the use of the massive computing power of cloud computing centers to complete tasks with high computational complexity, thereby saving users’ time and costs.

#### 2.1.2 Classification of Cloud Computing

According to the type of cloud computing deployment, it can be divided into 3 types: public cloud, private cloud, and hybrid cloud. Based on the type of services that can be provided, cloud computing can be divided into three main categories: PaaS, SaaS, and IaaS [8-9]. Platform as a Service (PaaS): The function of this layer is to provide users with an application development and deployment platform as a service, especially providing users with a programming environment for distributed parallel computing and distributed storage. Software services, also known as SaaS (Software as a Service), are built on the employment cloud platform as the foundation of the software service layer. It provides an entry point for upper level software applications, mainly focusing on diversified business application services for governments and enterprises, supplemented by popular application services for public users. Infrastructure as a Service can provide computing, storage and network infrastructure services according to the needs of users, including servers, storage and network devices [10-11].

### 2.2 Big data Platform Architecture Hadoop

Hadoop provides a good technical means for big data processing and cloud computing. There are many excellent technologies in the Hadoop technical system, which can help people quickly realize the development and application of the college students’ employment platform system [12-13]. Hadoop, as a distributed software framework for processing massive amounts of data, has the characteristics of high reliability, efficiency, scalability, affordability, and high fault tolerance. The technology used in the college student employment platform system includes spring, struts, and hibernate, which can be integrated to design an employment system. Spring is the business logic layer of the college student employment platform system; struts is the page display control layer of the college student employment platform system; hibernate provides support for database persistence operations of the college student employment platform system, mainly for persistence layer design [14-15]. The architecture is shown in Figure 1:

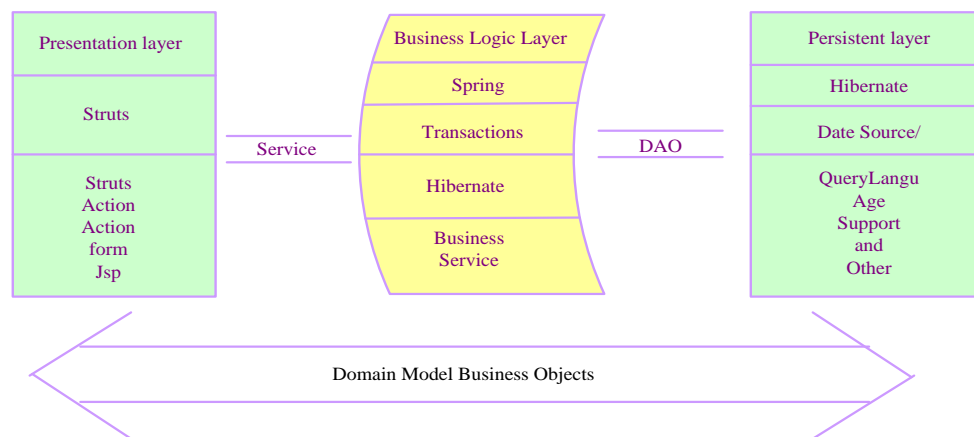


Figure 1. Struts+Spring+Hibernate architecture

### 2.3 Demand Evaluation for Building a Cloud Computing Platform for College Student Employment

Requirement analysis is a necessary step for the construction of any system, and can be seen as a planning map. The more in-depth and comprehensive the requirement analysis, the more perfect and standardized the construction of university employment platforms.

#### ① Analysis of functional requirement of college employment platform

The college student employment platform system built with cloud computing as the core consists of the following four subsystems, namely the user management system, graduates' job search and employment subsystem, employers' recruitment management subsystem, school employment management subsystem, etc.

#### ② Analysis of non functional requirement of college employment platform

The first is system integrity, which refers to the functions that must be possessed by the business and the system itself for operation. These functions are mainly applied to user management, data management, system updates, and software release. The second is the adaptability of the system to changes. Changing the software environment means that an operating system has scalability. Its business or operating environment is constantly changing, and the software needs to be constantly updated to meet human needs. This type of system has strong scalability when adapting to changes in the environment. The maintainability of a system refers to improving the difficulty of the software, which means updating the system throughout the entire process from software startup to software shutdown, in order to correct errors or adapt to new requirements. System maintenance includes revising product design and product definition.

## 3. Design of Employment Platforms for Universities and Colleges

### 3.1 Overall Framework Design

The university employment platform implemented on the Hadoop platform can solve a series of problems such as storing and processing a large amount of data, while ensuring the system's efficiency, stability, security, and scalability. The university employment platform includes four modules: data collection, data processing, data storage, and client communication through the Strust2 framework, namely the interaction between the server and the Android system [16-17]. The system framework is shown in Figure 2:

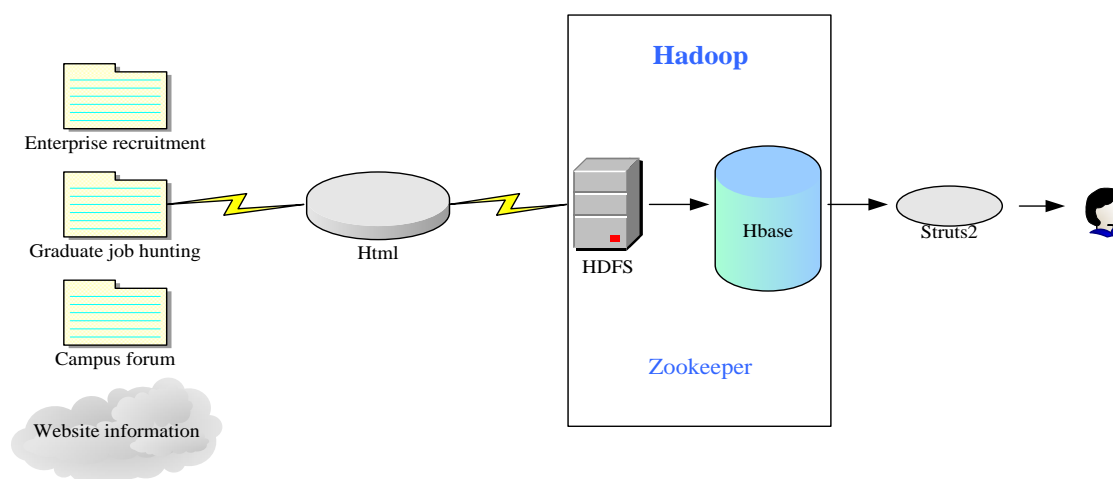


Figure 2. System framework based on Hadoop platform

### 3.2 Role Function Implementation

#### 1) Data collection module

In order to obtain information about graduate job hunting, corporate recruitment, campus forums, and other related websites, it is necessary to use web crawler tools for data collection. This script or program automatically collects and extracts web information based on pre-set network rules. The system uses Heritrix as an open source web crawler tool, which can capture web information without searching. At the same time, the image resources captured by Heritrix can also be used as the data source of information extraction, and software developers can view the captured results through the Web console.

#### 2) Data parsing and storage module

By using HtmlParser software to process text information in college student employment platforms, seed network addresses can be mapped to different XML extraction templates, thereby extracting various effective data from web page structures. Since these structured contents need to be stored in memory, they must be stored in a large database. On the Hadoop platform, HBase can store information such as campus forums, graduate job applications, and corporate recruitment parsed by HtmlParser. MapReduce is used as the parallel computing mode, while HBase storage mode is built based on the HDFS distributed system.

#### 3) Communication between the server and Android client

When Android needs to obtain data from the server, the Java server technology and Struts2 framework it adopts can be used to obtain network data. In this process, in order to ensure the normal operation of the application, it is necessary to optimize its server-side architecture to improve the performance of the entire system and better serve people's lives. Struts2 is a classic MVC framework that achieves the functionality of MVC by separating the input, processing, and output processes of an application from three aspects: model, controller, and view.

### 3.3 Search Intelligent Recommendation Algorithm

Employment information recommendation of college employment platform mainly uses big data recommendation algorithm to generate data through collaborative filtering algorithm. The similarity calculation is mainly based on user preferences, and the user-based collaborative filtering recommendation algorithm is used for search recommendation [18-19]. The main use of search intelligent recommendation is to calculate the similarity between users using cosine similarity

algorithm, and then recommend search matching data for users based on the level of similarity [20]. The similarity algorithm for searching between students and enterprises on university employment platforms is as follows:

$N(a)$  is the keyword set of student’s personal job search information  $a$ , and  $N(b)$  is the keyword set of enterprise  $b$ ’s recruitment information. The similarity formula between students and enterprises is:

$$M_{ab} = \frac{|N(a) \cap N(b)|}{\sqrt{|N(a)| * |N(b)|}} \quad (1)$$

Assuming that people want to recommend the search keywords  $i$  and  $j$  to college students  $G$ , and  $F=3$  similar enterprises are selected, which are  $I$  enterprise,  $J$  enterprise, and  $K$  enterprise, and then  $p(G, i)$  and  $p(G, j)$  respectively are calculated:

$$p(G, i) = M_{GI} + M_{GK} \quad (2)$$

$$p(G, j) = M_{GJ} + M_{GK} \quad (3)$$

Finally, based on the calculation results, it is possible to determine the suitable enterprise for college student  $G$ .

#### 4. Performance Testing of University Employment Platforms

The effective testing of university employment platforms is the key to verifying whether they can deliver high-quality services. The first step in testing is to design the testing objectives of the university employment platform, which include:

- (1) Overall requirement: All university employment platforms can be connected normally and there would be no unexpected errors during normal operation.
- (2) Functional requirement is to meet all the needs of users and has some expansion functions.
- (3) Performance requirements are to satisfy sufficient user access, and to quickly respond to user requests, and the response time must be within the user’s acceptable range.

##### 4.1 Performance Testing

Taking Nanchang University as an example, this paper briefly expounds the application of the employment platform for college students. The performance indicators of the system mainly include response speed, maximum concurrent capacity, and maximum number of online users.

Table 1. System response speed detection to users

Test case number	Performance Test 01			
Test the project	System response speed to the user			
Number of people	Login (s)	Information statistics (s)	Information entry (s)	Information query (s)
100	0.325	0.980	0.536	0.650
350	0.573	1.352	0.874	0.973
700	1.021	2.145	1.002	1.875
1050	1.332	2.584	1.475	2.764

From Table 1, it can be seen that as the number of users increases, the system’s response speed

would slow down, but there is no significant change. Overall, the response speed of the university employment platform constructed in this article is relatively fast. Under the maximum concurrent and online user load, the response speed would slow down, but the impact is not significant.

The university employment platform attaches great importance to its security, and the consequences of the attack system are unpredictable, so the security test effort work cannot be ignored. Therefore, this article analyzes the test results of introducing bugs at different stages, and conducts a proportion analysis of the system requirements analysis stage, coding stage, testing stage, and release stage.

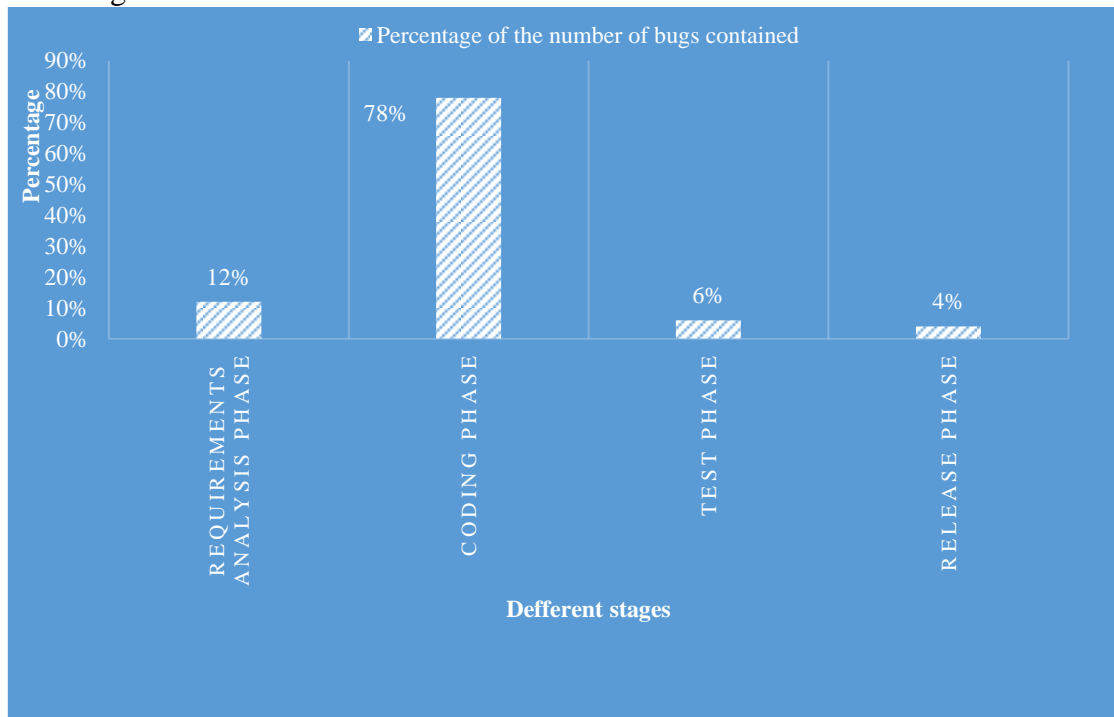


Figure 3. Result analysis of the test bug introduction phase

Figure 3 shows the results of bug testing introduced at different stages. The proportion of bugs in the coding stage is 78%; the proportion of bugs in the requirements analysis stage is 12%; the proportion of bugs in the testing stage is 6%; the proportion of bugs in the release stage is 4%. It can be seen that bugs occur the most frequently in the coding section, so it is necessary to strengthen unit testing of the system and achieve automation of unit testing.

#### 4.2 Functional Testing

At present, Nanchang University has about 34000 college students and about 8000 graduates every year. After being used by students of Nanchang University, the college students' employment system designed in this paper has been tested periodically, and the test results of six cycles are shown in Figure 4. Figure 4 fully reflects the student employment rate and signing rate. From this, it can be seen that after adopting the college student employment system, the signing rate and employment rate of students reached 99% and 100% respectively. Therefore, it has been verified that the college student employment system designed in this article can provide good services for enterprises and students, and improve employment rates.



Figure 4. Student employment situation

### 4.3 Test Summary

The testing of the university employment platform has shown that the system has good openness, strong scalability, structured use, hierarchical architecture, and high hardware platform compatibility. The modular software system platform is conducive to future upgrade and expansion implementation, meeting the increasing number of users, and thus building a complete, unified, technologically advanced, effective, stable, safe and reliable university employment platform. The preliminary operation results indicate that the employment platform for college students constructed in this article has performed well in improving student employment and signing rates. Moreover, in the employment management work of enterprise units, it is easy to operate and convenient for data processing, and has high reliability, more complete functions and stronger applicability.

### 5. Conclusions

This project mainly aims to develop a Hadoop cloud computing platform-based employment platform for college students, which is aimed at the current situation of scattered ways to obtain employment information for college students, inconvenient collection and low reliability, messy information, and low reliability. This system is mainly composed of four parts: a data collection module, a data analysis module, a data storage module, and an interaction module between the server and the Android system. The purpose is to comprehensively analyze the complex and ever-changing employment information of universities, organize it, and ultimately display it on the user’s mobile phone client. This article completes the work of resource sharing platform and application simulation system, and provides functional testing, performance testing plan, and testing summary for the application of university employment platform, in order to provide reference significance for the construction of similar educational service sharing platforms.

### Funding

If any, should be placed before the references section without numbering.



## Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

## Conflict of Interest

The author states that this article has no conflict of interest.

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