The Design and Implementation of Cloud Disk System Based on OpenStack

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Abstract

The digital campus construction of Jiangsu Maritime Institute has been carried out for many years, but it is still insufficient, such as lack of digit campus map and cloud disk system. This cloud disk system is designed and implemented for improving digital campus level. Openstack is a very useful tool to construct a private cloud platform, and this system is constructed based on Openstack platform. This system provides two methods to access, Web and Android application. The Web applcation is implemented by SSM (Spring, Spring MVC, Mybatis) framework, and the web page is beautified by Flat-UI, JQuery, and AJAX. The Android application is implemented by a hybrid application.

Keywords

Cloud Disk System, SSM, Android, MySQL.

1. Introduction

With the rapid development of new information technology, the amount of information system grows exponentially, and the traditional model of data storage has not been able to meet the current requirements. Cloud storage technology has been widely applied for its low cost, high efficiency and other advantages [1]. The digital campus construction of Jiangsu Maritime Institute has started some years, but there not exists a private cloud storage platform for some reasons. When teachers and students need to share teaching materials and transmit documents, they can only use mobile storage devices, FTP, mail and so on.

This cloud disk system provides two ways of accessing, Web and Android applications. The main functions of the cloud disk system include uploading, downloading, deleting, moving, copying, renaming, sharing and so on. These functions can basically meet the requirements of the sharing of resources between teachers and students in the institute. The cloud disk is based on the private cloud platform, and constructed by OpenStack platform. The development of web application uses the Spring framework as the foundation, Spring MVC as a MVC (Module View Controller) framework, and MyBatis technology to interact with the database. Teachers and students can easily store and share teaching resources through this cloud disk system. The cloud disk system can be compatible with more than IE8 and most browsers on the market. By simple rewriting, the cloud disk system can also be applied to data sharing in small and medium-sized enterprises.

2. Requirement Analysis

2.1 Functional Requirement

The main function of the cloud disk system includes listing, uploading, downloading, deleting, moving, copying, searching, sharing, renaming, new folders. The use diagram of this system is shown in Fig. 1.

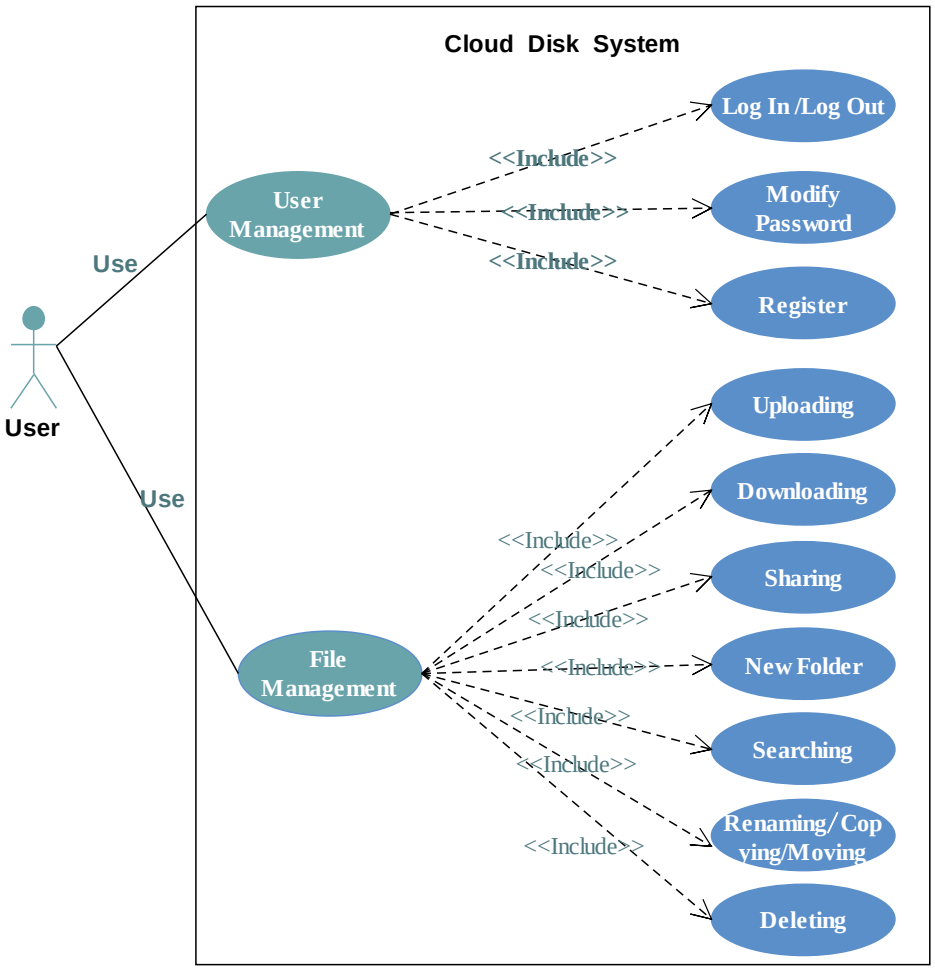

Fig. 1 Use diagram

The following is mainly for the analysis of new folder, uploading file, downloading file, and deleting files.

1. New folder

After users log in the cloud disk system, users can create a folder according to their needs. Users can also create subfolders of the folder to facilitate the differentiation of the stored files.

2. Uploading file

Uploading files is an important function of the cloud disk system. Users can upload files in multiple categories and multiple formats. It supports images, documents, videos and so on.

3. Download files

Users can select a file or some files, and click the button of download. At this time, files are downloaded to the local disk. The path to the file download is not optional at the time of download. It is determined by the download path set by the browser.

4. Deleting Files

Deleting files is to remove some file. The deleted files are not completely disappeared from the user's private cloud disk. The deleted files are uniformly placed in the recycle bin. If users feel regret after deleting some files, these files can be recovered in the recycle bin. If the content in the recycle bin is really wasted capacity, then the recycle bin can be emptied, and the deleted files will disappear completely from the private cloud space.

2.2 Performance Requirement

The performance requirements of this system should achieve a certain amount of pressure test range. The response time of the click button cannot exceed 2 seconds. In order to prevent the user from invalidating the error, the multiple clicks on the same button are only corresponding once. Now the cloud disk system is used in the campus, so the system needs to support at least 1200 people to perform normal operations online.

2.3 Performance Requirement

Users of this cloud disk system have an absolutely private storage space, and no one can access the storage space of other users as long as there is no user authorization. Even an administrator only has server management rights and cannot access any user's private space.

3. System Design

3.1 Functional Design

User management and file management are two main functions. User management includes registration, login, logout, modify password, personal information management. Storage management includes upload, download, sharing, delete, copy, move, rename, etc. The module structure of this system is shown in Fig. 2.

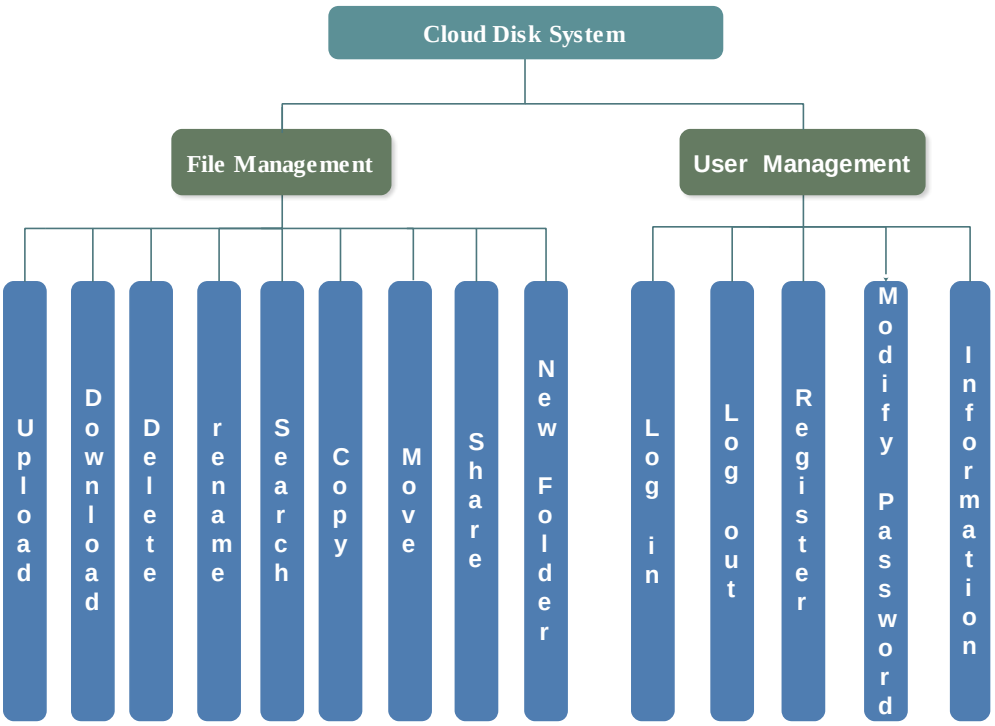

Fig. 2 Functional diagram

3.2 Development Architecture

The development of this system is based on Java EE platform, and the cloud is installed on Centos operating system. The development tool is Eclipse, and MySQL database is used to store information. The Bootstrap and Flat UI is used for page design. The overall technical architecture is shown in Fig. 3.

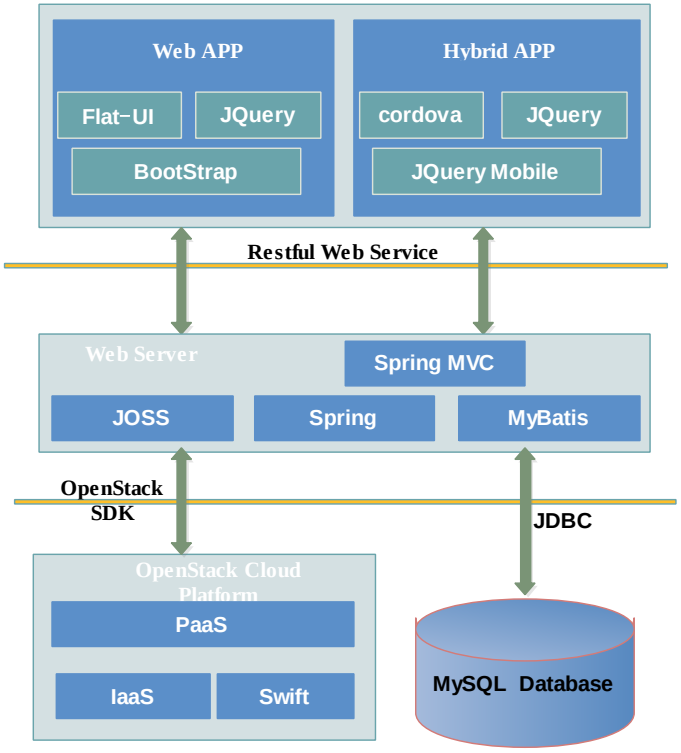

Fig. 3 Architecture diagram

B/S (Browser/Server) model is used for Web APP. Bootstrap is a front-end framework for cloud storage applications based on HTML, CSS and JavaScript, which is more flexible than traditional front-end frameworks, making Web APP development faster [2]. JQuery is a lightweight JavaScript library with good compatibility [3]. In order to make the cloud disk system adapt to the different mobile platform, the hybrid APP is developed [4]. It is based on the Cordova framework, and hybrid APP is implemented. It can support a variety of operating system, such as IOS, Android, and Window Phone. The hybrid APP development uses HTML5 and JQuery mobile framework. JQuery Mobile is the front-end development framework for creating mobile web applications [5].

The runtime environment configuration of the cloud disk system configures is based on XML files, including the Spring MVC framework and the Mybatis entity mapping [6]. The Spring principle of the cloud disk system is shown in Fig. 4.

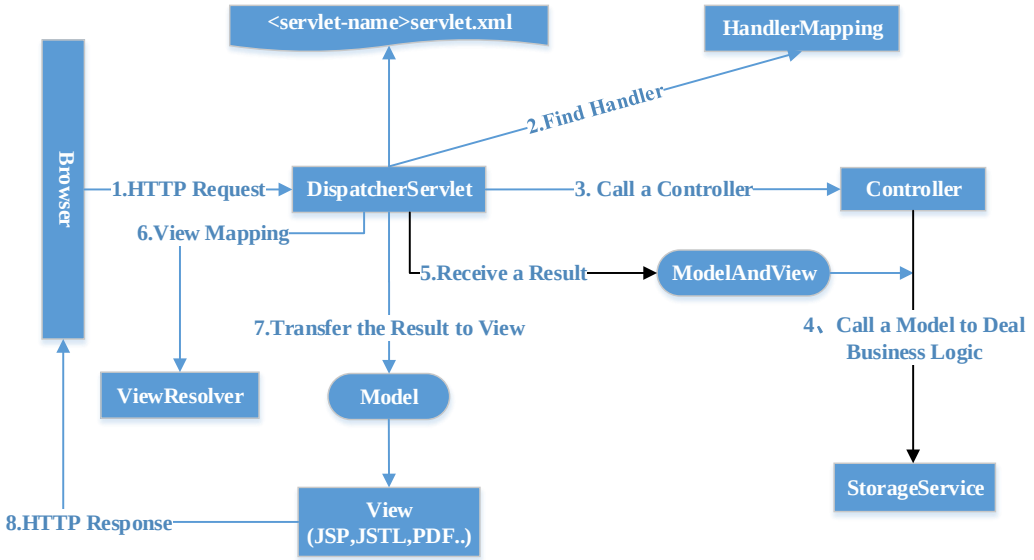

Fig. 4 MVC Framework

PaaS (Platform-as-a-Service) offers a runtime environment for this cloud system and it provides elastic compute. IaaS (Infrastructure-as-a-service) provides virtualized computing resources. In this model, this platform is developed and launched without the complexity of building and maintaining the infrastructure typically associated [7-8]. MySQL is a relational database and used for storing user data [9]. OpenStack Swift is used for storing unstructured data such as video, image, and document [10].

4. Implementation

When users log in, the Web APP or hybrid APP sends a request including the account information to connect the server. When the connection is successful, a keystone account information is retrieved which is used to get data from OpenStack Swift server. Operations such as uploading, downloading, and new folder can be performed.

4.1 File List

After users log in this system, a file list is shown. There are two kinds of files displayed, one is a folder, and the other is a file. If it is a file, the name, size and the date of modification are displayed. If it is a folder, the name is displayed. The flowchart of this function is shown in Fig. 5.

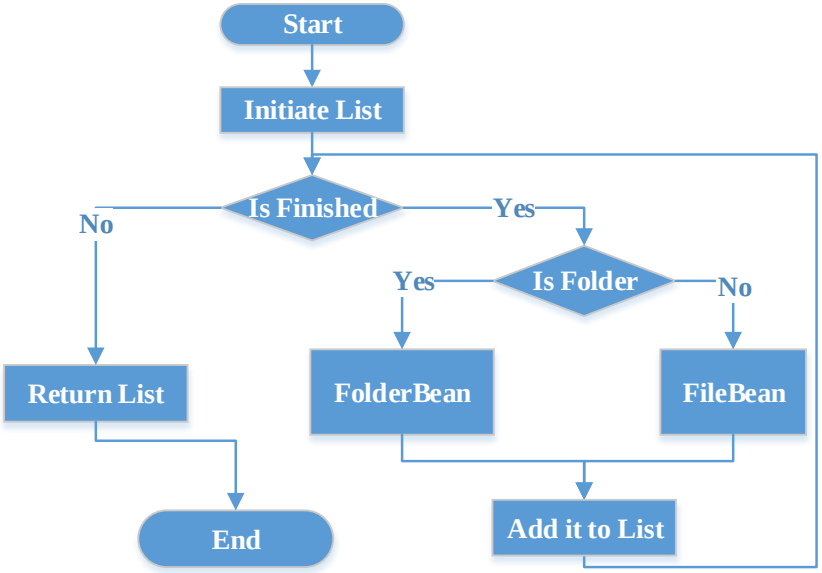

Fig. 5 The flowchart of list file

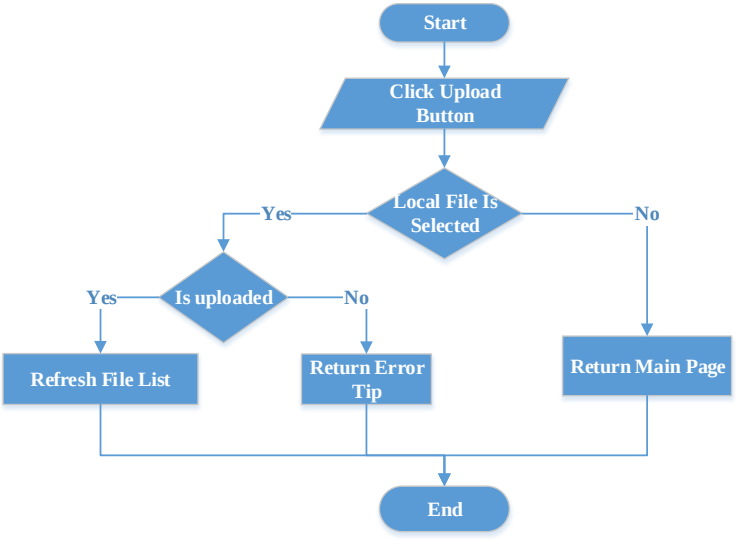

Fig. 6 The flowchart of upload file

4.2 File Upload

The file upload function can be implemented in any directory. If a file is not uploaded in a fixed folder, but the file is uploaded in the state of the navigation bar, the uploaded file will be stored in the root directory. When the user clicks the upload button, a box will pop up for the user to select the uploaded file. Fig. 6 shows the flowchart for implementing the upload function.

4.3 File Download

The download function flow chart is shown in Fig. 7.

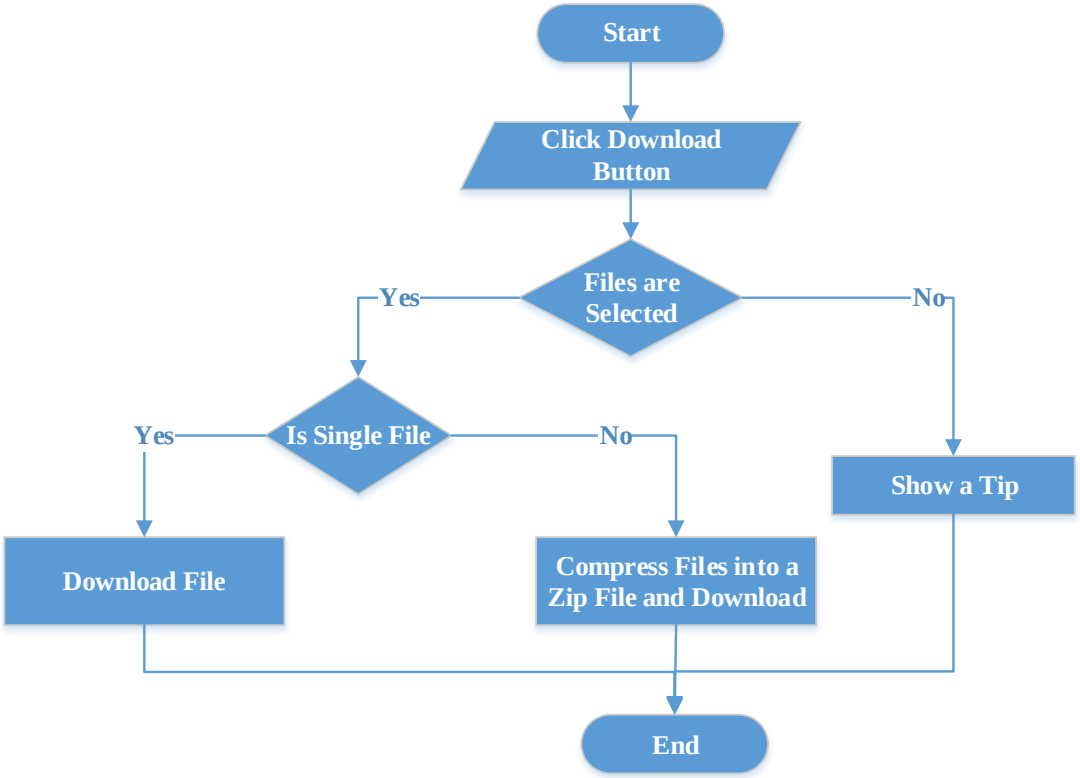

Fig. 7 The flowchart of download file

5. Conclusion

Now cloud computing technology has a great influence on education, economy and enterprise. The emergence of cloud disk is one of the applications of cloud computing technology. People have more and more demand for data storage, and they are also very concerned about the security of data storage. This system is registered by users, and generates their own private storage space. Other users cannot access the information in their own cloud disk. Therefore, the security of this system is guaranteed. Because the cloud disk includes functions such as creating new folders, uploading files, downloading files, deleting files, and searching for files, it can be applied to digital campuses and small and medium-sized enterprises.

Acknowledgements

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References

[1] Armbrust, Michael, et al. "A view of cloud computing." Communications of the ACM 53.4 (2010): 50-58.
[2] Jain, Nilesh. "Review of different responsive css front-end frameworks." Journal of Global Research in Computer Science 5.11 (2015): 5-10.
[3] Król, Karol, and L. Szomorova. "The possibilities of using chosen jQuery JavaScript components in creating interactive maps." Geomatics, Landmanagement and Landscape 2 (2015): 45-54.
[4] De Andrade, Paulo RM, et al. "Cross platform app: a comparative study." International Journal of Computer Science & Information Technology 7.1 (2015): 33-40.
[5] Dalmasso, Isabelle, et al. "Survey, comparison and evaluation of cross platform mobile application development tools." Wireless Communications and Mobile Computing Conference (IWCMC), 2013 9th International. IEEE, 2013:323-328.
[6] Zhang, Dandan, Zhiqiang Wei, and Yongquan Yang. "Research on lightweight MVC framework based on spring MVC and mybatis." Computational Intelligence and Design (ISCID), 2013 Sixth International Symposium on. Vol. 1. IEEE, 2013:350-353.
[7] Bele, Sanghesh B. "An Empirical Study on 'Cloud Key words: Cloud computing, Architecture, VM, SLA, SaaS, Paas, Iaas, Daas, Cloud Service Provider, Cloud computing metaphor." (2018).
[8] Freet, David, et al. "Cloud forensics challenges from a service model standpoint: IaaS, PaaS and SaaS." Proceedings of the 7th International Conference on Management of computational and collective intelligence in Digital Ecosystems. ACM, 2015:148-155.
[9] Győrödi, Cornelia, et al. "A comparative study: MongoDB vs. MySQL." Engineering of Modern Electric Systems (EMES), 2015 13th International Conference on. IEEE, 2015:1-6.
[10] Albaroodi, Hala, Selvakumar Manickam, and Mohammed Anbar. "A proposed framework for outsourcing and secure encrypted data on OpenStack object storage (Swift)."Journal of Computer Science 11.3 (2015): 590-597.