Analysis and Design of Equity System for Rural Joint Stock Economic Association Oriented to Big Data Technology Platform

Kanghua Peng[1], Jincheng Shi[2,*]

[1]*School of Information Engineering, Guangdong Engineering Polytechnic, Guangzhou 510520, China*
[2]*Science and Technology Research Office, Jinan University Guangzhou 510632, China*
*Corresponding author

Keywords: Big Data Technology, Hadoop, Rural Joint Stock Economic Association, Equity System, Rural Revitalization Strategy

Abstract: The joint stock economic association is a means to develop new countryside and a way to rejuvenate the countryside. To solve the contradiction between the continuous decrease of rural land and the preservation and appreciation of rural collective assets, the equity management system for joint stock economic association is designed and analyzed based on Hadoop distributed fie system (HDFS) and Hadoop Map Reduce programming model, which is applied to typical joint stock economic association to realize the unified management of more than 5,000 villager shareholders, increase the economic benefits by 50%, basically realizing the social benefits of rural revitalization.

1. Introduction

To implement the rural revitalization strategy, the first thing is to keep pace with the national big data strategy, so that the internet plus, big data technology and rural economy are deeply integrated, which is an important path and breakthrough for rural revitalization. As a comprehensive application of cloud computing technology, database technology, etc., big data technology helps people make scientific decisions by analyzing and counting massive data, so as to improve efficiency and realize appreciation [1].

The equity system for rural joint stock economic association oriented to big data technology platform is based on Hadoop, which is a highly scalable distributed batch processing system, including three parts, namely Hadoop distributed fie system (HDFS), Hadoop MapReduce programming model and Hadoop Common [2]. The business characteristics of the developed equity system for rural joint stock economic association are shown in the Figure 1.
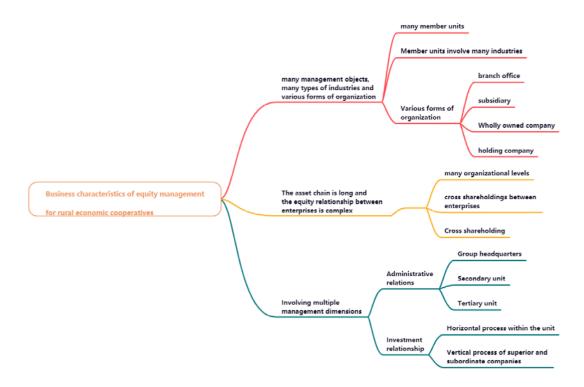
Figure 1: Business characteristics of equity management in rural joint stock economic associations

As shown in the Figure 1, business characteristics of equity management for rural economic cooperatives is characterized by a large number of management objects, many types of industries, and various forms of organization. It is included many member units, Member units involve many industries, Various forms of organization and so on for many management objects, many types of industries and various forms of organization. Long asset chain and complex equity relationship between enterprises is contained many organizational levels, cross shareholdings between enterprises, Cross shareholding etc. Multiple management dimensions involved is for Administrative relations and Investment relationship. It is large amounts of equity information and heavy information maintenance workload.

The object-oriented analysis and design method is adopted, and the model is established for each stage of system development by using UML. The use case diagram is used for object-oriented analysis of the system in the requirement analysis stage, and the class diagram and sequence diagram are used to describe the relationship between the system structure and modules in the design and implementation stage. The current popular Java programming language is used to facilitate the deployment of the rural joint stock economic association in the implementation [3].

The prototype of this system has been tested in Shadong Stock Joint Cooperative Economic Association, Shadong Street, Tianhe District, Guangzhou and Yinhe Stock Economic Association, Xinghua Street, Tianhe District, Guangzhou, showing a stable operation, thus maximizing the efficiency of collective asset management, benefiting the preservation and appreciation of collective shares and the stable development of rural joint stock economic association.

2. Method

The big data technologies mainly involved in this project that can be applied to the equity system for the rural joint stock economic associations are as follows.
    (1) Data warehouse

Data warehouse, as an integrated, time-varying, persistent collection of data used to support management decision-making process, is an effective means of data integration. With the deepening of the application of data warehouse, data warehouse system is increasingly applied to the commercial field, such as the equity system for rural joint stock economic association in this paper.

(2) Data mining

Data mining, based on the existing data warehouse, refers to the process of collecting and analyzing massive data, which is decisive for management decision-making, and involves many disciplines such as statistics, database and information technology, and is classified by mining methods as trend and evolution analysis, comparative concept description, clustering knowledge, association knowledge, heterogeneous knowledge, etc [4-6].

The business model of equity management system for rural joint stock economic association is shown in the Figure 2:
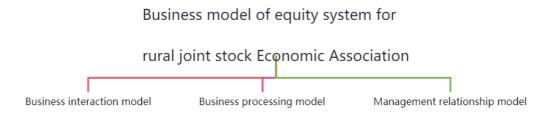

Figure 2: Business model of equity system for rural joint stock economic association

As shown in the figure, the equity business interaction model of the rural joint stock economic association, in which the interaction objects of the equity management department in business processing are the company leadership, relevant functional departments of the company, shareholder units, investment units, etc. The equity department is an information provider when it deals with the shareholder unit, because it submits equity information to the shareholder unit and initiates business applications and an information receiver when it deals with the investment unit because it receives the information submitted by the investment unit and accepts business applications. The equity department mainly provides information, initiates business applications and receives feedback information with other departments and company leadership within the company [7, 8].

3. Experiment

Before developing the equity system for the rural joint stock economic associations, the business demand scenario of the rural equity management and the user demand, as well as the module functions of it based on the business demand scenario should be made clear, so as to determine the big data processing tools and framework used in the equity system development process [9,10]. The equity system for rural joint stock economic association oriented to big data technology platform can be divided into the following steps from the platform deployment and data analysis process:

(1) Redhat system installation

CentOS is used as the underlying platform of the equity system for rural joint stock economic association. In order to provide a stable hardware foundation, the hard disk needs to be configured according to the actual conditions when RAID is performed on the hard disk and the data storage node is mounted. RAID2 is made for namenode of HDFS to improve its stability, and the data storage and operating system of the equity system for rural joint stock economic association are placed on different hard disks respectively, so as to ensure the data security and system stability.

(2) Distributed platform and component installation

The equity system for rural joint stock economic association uses Hadoop open source system, and the core of Hadoop is HDFS, on which the commonly used components are Yarn, Hive, Zookeeper, Hbase, Sqoop, Spark, ElasticSearch, Impala and so on. In the equity system for rural joint stock economic association, Hadoop, as a software platform for developing and running large-scale data processing, realizes distributed computing of massive data in a cluster composed of a large number of cheap computers, as shown in the Figure 3.
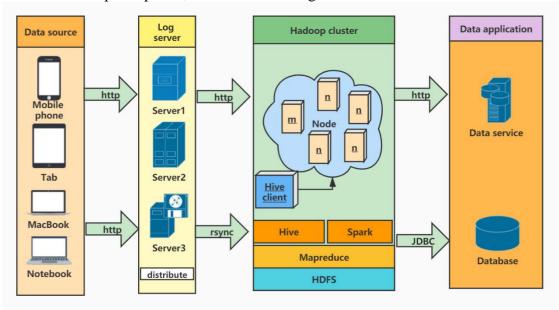

Figure 3: Hadoop framework of equity system for rural joint stock economic association

The core designs in the illustrated Hadoop framework are HDFS, which is a highly fault-tolerant system that can stably provide high-throughput data access even if deployed on an ordinary computer, and MapReduce, which is a programming model that can extract data from massive data and return result sets. Data source is mobile phone, tab, macbook, notebook etc. Log server is distributed. Hadoop cluseter is contains multiple nodes, as hive client. Data application is data service and database. In the rural equity system, Hadoop is fully competent for data storage and analysis of rural equity.

(3) Data import

Sqoop, the tool for importing data of equity system for rural joint stock economic association, can import data from files or traditional databases to distributed platforms, and import data of equity system for rural joint stock economic association into Hbase. Faced with data from various sources such as third parties, the main work of data access is to integrate these scattered data together and conduct overall analysis, as shown in the Figure 4.
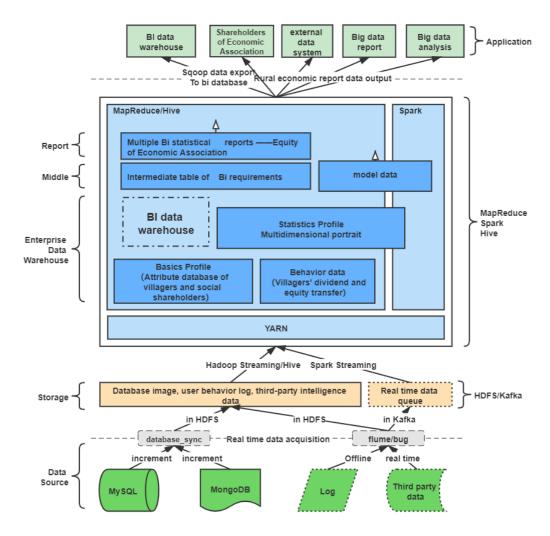
Figure 4: Big data warehouse system of rural joint stock economic association

BI data warehouse is most important. Data sources mainly includes MySQL, MongoDB, Log and Thirdpartydata, including incremental access, offline and real-time access, etc. Storage is Database image, user behavior log, third-party intelligence data and so on, includes real time data queue. Enterprise data warehouse, middle, report are used. The application is shareholders of economic association, external data system, big data report, big data analysis and so on.

As the equity system for rural joint stock economic association is a business scenario with high real-time requirements, open source Strom, Spark streaming and so on can be used for data access. Data preprocessing is realized by extracting available features from massive data and establishing a wide table.

(4) Data analysis

Data analysis includes two steps. The first step is data preprocessing, which can prepare for the following modeling analysis. It mainly extracts available features from massive data, establishes large wide tables, and creates data warehouse where tools such as HiveSQL, SparkSQL and Impala will be used. The second step is data modeling analysis, which carries out data modeling according to the data and characteristics collected in the first step, and returns the results, where Spark is used in the equity system for rural joint stock economic association.

(5) Data visualization

After modeling the data analysis, it is necessary to display the returned results, that is, data visualization, in two ways: one is row data display, the other is column search display.

ElasticSearch and Hbase are the main tools for data display of equity system for rural joint stock economic association based on big data platform. The former can realize column index and provide fast column search function, while the latter is a powerful database which can provide ms-level row search.

4. Conclusions

For the establishment of the equity system platform for rural joint stock economic association oriented to big data, the following main conclusions are drawn.

(1) Better stability

In terms of the use of the equity system for rural joint stock economic association, stability is its greatest advantage, which is reflected in the fact that it can execute data and backup programs through multiple machines, thus greatly improving the stability of the equity system of the rural economic association. However, due to this reason, imperfect allocation of multiple machines will lead to a series of problems, which is also the greatest disadvantage.

(2) Stronger scalability

How to quickly expand the equity system for rural joint stock economic association to Hadoop platform and expand new machines based on it is a key issue in the application of cloud computing and other fields. In the actual operation of the rural economic association's equity system, adding or reducing machines to meet the new shareholders' requirements requires further consideration on how to safely and rapidly expand the platform while retaining the original functions, which is a problem to be solved in the actual application.

(3) Higher efficiency

After the development and construction of the equity system for rural joint stock economic association oriented to big data technology platform is completed, the performance will be greatly improved compared with the old system, such as system stability, running speed, data accuracy, resource utilization rate and system usability, etc., all of which will be improved by more than 50%. In addition, the business coverage will be more comprehensive. Moreover, the implementation of hierarchical authorization for the equity management system business will boost management quality and efficiency, clarify the responsibilities of the management structure from top to bottom, deepen the management level, and effectively promote the construction of equity business personnel team and strengthen the management of equity business personnel.

Reference

[1] Peng, K. (2021) Research and Application of Equity System Development of Rural Joint stock economic association Oriented to Big Data Technology (Blockchain Technology)//Cyber Security Intelligence and Analytics: 2021 International Conference on Cyber Security Intelligence and Analytics (CSIA2021), Volume 1. Springer International Publishing, 3-10.

[2] Huang, R.Y. (2021) Design and application of library personalized service system based on reading big data. Office business, (09), 164-165.

[3] Zhu, Y.R., Zhong, H.F., Huang, D.C., Shi, R.B., Wen, Y.H. (2021) Design of intelligent cold chain temperature control system under big data and blockchain application scenario. China storage and Transportation Corporation, (05), 188-190.

[4]Gui, H.X., Xue, J., Wang, Q.Q. (2021) Research on employability evaluation and cultivation of information management and Information System Specialty under big data. Journal of Xichang University (NATURAL SCIENCE EDITION), 35(01), 116-119+128.

[5] Deng, Q.Z., Wang, W.Q., Wang, B. (2021) Design and implementation of report application system for first-line stations based on real-time database data. China informatization, (01), 60-62.

[6]Peng, K.H., Huang, Y.F., Yao, J.M. (2018) Comparison of automatic test paper generation for database technology course based on various artificial intelligence algorithms. Computer system application, 27(03), 210-216.

[7]Peng, K.H., (2021) Blockchain Equity System Transaction Method and System Research Based on Machine Learning and Big Data Algorithm. Wireless Communications and Mobile Computing, 1-14.

[8] Liu, Y., Wang, X.Y. (2021) Design of intelligent monitoring system based on ultra high definition and artificial intelligence applications. Radio and television information, 28(01), 98-101.

[9] Peng, K.H. Research and application of equity information system of economic association based on cloud technology. Information system engineering, (09), 101-102+104.

[10] Shen, Y. (2020) Application performance monitoring system. Dalian press, 05, 147.