Design and Research of Network Computer Room Management Platform in Smart Campus Environment

Rui Fu(✉)

Guangdong Industry Polytechnic, Guangzhou 510300, China

Abstract. As one of the important teaching infrastructure of the whole school, intelligent campus network room management is also an important application system of intelligent campus. This paper introduces the research and design of computer room management platform in big data environment.

Keywords: Big data environment · Smart campus · Network room

1 Introduction

The computing center has always been one of the important teaching infrastructure of our school. After more than 10 years of construction, it has completed more than 10 laboratory construction and transformation projects, and has reached the advanced level in computer configuration, network architecture, open management and utilization. At present, our school's computing center has built a three-tier switching LAN, which is equipped with billing server, file server, DHCP, FTP, web and other dedicated servers, and a dedicated gigabit optical fiber direct to the main node of the campus network. The computer center is also equipped with a self-developed computer room management system, which realizes open management, unattended computer room, overall management of computer arrangement, automatic real-time billing and other functions [1]. With the continuous advancement of educational informatization, many high schools have carried out the construction and use of smart campus, and educational informatization has shown its application effect in related scientific research. But relatively speaking, there are still many problems in the construction process of smart campus in high school, such as low utilization rate of information, insufficient platform resources and so on, which affect the process of campus informatization. The arrival of the Internet plus era brings new opportunities and challenges to the construction of the smart campus.

2 Proposed Work for Cloud Computing Technology in the Construction of Smart Campus

2.1 Background of Smart Campus Construction

The rapid development of information technology has promoted the reform of educational concepts and teaching methods [2–4]. With the development of cloud computing,

M. A. Jan and F. Khan (Eds.): BigIoT-EDU 2021, LNICST 392, pp. 633–642, 2021.
https://doi.org/10.1007/978-3-030-87903-7_76

Internet of things, mobile Internet and other new generation information technologies, New "smart campus" teaching management mode has been shown in people's face, such as anytime and anywhere interaction between teachers and students, ubiquitous personalized learning, intelligent teaching management and learning process tracking and evaluation, integrated educational resources and technical services, learning community of home school interaction, and campus culture of teachers and students growing together. Through the electronic campus and digital campus, the traditional campus has gradually stepped into the stage of smart campus, providing a collaborative and comprehensive intelligent perception environment for teachers and students, and providing convenient, personalized and intelligent information services for management, scientific research, teaching and life. However, in the face of many new concepts and concepts of educational informatization, most people do not have a clear understanding of its connotation and characteristics, confusing such concepts as smart campus, digital campus and electronic campus. Therefore, it is necessary to study and sort out the existing theories and concepts when doing a good job in the top-level design of campus informatization [5].Smart campus is shown in Fig. 1. Under this background, we need to work hard to solve the problems encountered in building smart campus, and promote the development of high schools. With the continuous development of information technology, the Internet era has arrived. Under the background of Internet plus, the campus informatization has made great progress, which has greatly enriched the daily learning and life of teachers and students. However, due to the slow construction process of smart campus, there are many problems, so we still need to further strengthen the relevant construction, so that it can really help teachers and students to learn and live, and effectively promote the development of campus.

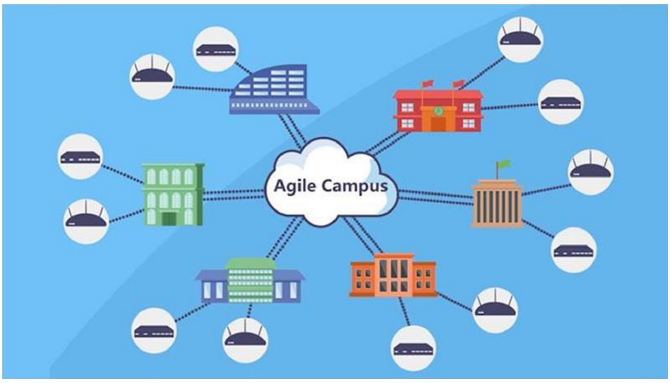

Fig. 1. Smart campus

2.2 Connotation and Characteristics of Smart Campus

The word "wisdom" refers to the ability to understand and solve things quickly, flexibly and correctly. "Wisdom" is a relative concept, which is not limited to human beings. Any system composed of objects has wisdom, but different in height. The characteristics of intelligent system proposed by IBM are more thorough perception and measurement, more comprehensive interconnection, and more in-depth intelligence.

Based on a comprehensive analysis of various definitions and views on smart campus, the author agrees with Jiang Jiafu's view that smart campus has multiple attributes of technology, education and culture [6]. It is a smart campus with high integration of information technology and education, deep integration of information application and education, and wide perception of network and information terminal.

Calculate a document. The calculation formula is as follows:

$$TF_{D_i,w} = \frac{n_{D_i}}{\sum_k n_{D_i,k}} \tag{1}$$

Calculate the inverse document frequency of the document:

$$IDF_{D_i} = \log \frac{|D|}{\left|p : w \in D_q\right| + 1} \tag{2}$$

The central node returns it to the system. At this time, the system EA uses formula 3 to decrypt the key K of D, so as to decrypt the ciphertext and get the plaintext document.

$$K^{'} = E_{PKE-A}(E_{ID_A}(K)) \tag{3}$$

$$K = D_{SK_{PKE-A}}(D_{SK_{IBE-A}}(K^{'})) \tag{4}$$

In order to ensure transparent encryption and sharing of encrypted files between different enterprises, we introduce a key management mechanism based on attribute encryption. In encb ox, each user has a master key (PKU, SKU) specially used to protect the file key, where PKU is the public key and SKU is the private key. The encrypted file key is called key lock. In practice, the key owned by the user is stored and managed in the intranet security gateway. For security reasons, encbox stores the key in the trusted platform module.

3 General Design Principles and Simulation

3.1 Standardization Principle

In the early stage of promoting the informatization construction of the school, there are mainly the following problems: the application system of each department is led by each department, lacking the long-term planning of the function and technology implementation scheme; the application system of each department mainly solves the current and local needs, and there is no overall cooperation among the departments, independent construction, maintenance and management, and some even cause the repeated construction of the system, It is disadvantageous to the continuous growth and utilization

of school informatization, resulting in a serious waste of resources. Therefore, according to the current national and industrial standards, the school information construction should first formulate and form a unified technical standard system to ensure continuous investment in construction and long-term application [7–10]. The current demand and long-term planning should unify the standard overall planning and construction.

3.2 Data Sharing Principles

Due to the lack of unified data standards, the business system of each department is relatively independent, and the data between the systems is difficult to share, which brings difficulties to the synchronous and unified processing of business cooperation and cross data sharing of each department. In the existing business processes, the systems used by each other can not provide the function of data exchange. When some data need to be exchanged across departments, the work also relies on manual, semi manual or e-mail to transfer information. Today, with the rapid development of information technology, such information interaction mode has lost the effectiveness and convenience of information sharing, and the work efficiency is very low. Therefore, it is necessary to establish data sharing mechanism and specification, realize the co construction and sharing of campus data, collaborative development and workflow reengineering of various business departments.

3.3 Principle of Openness

At present, the development platform, database and running environment of each application system of the school are very different, and there is no unified use and management platform. With the campus network application system and application resources more and more, business system development and maintenance mode is not unified, there are risks in technology upgrading, update and maintenance difficulties continue to increase, the application of the lack of effective organization and unified management, but the school information maintenance management and construction costs continue to increase. Therefore, the construction of smart campus needs an open platform to provide for the future demand change and expansion of the school. Through the open platform, it can continuously improve and flexibly meet the demand, and realize more convenient system maintenance and management [11–13].

3.4 One Stop Service Principle

According to the classification of management information system and teaching information system, the original information construction mode invests and organizes the implementation of education information engineering projects, which is a typical “tech-

nology oriented" thinking mode. In the process of information construction in the past, the phenomenon of "emphasis on construction, light application" and "emphasis on management, light service" is serious. It can not provide comprehensive and personalized information service for teachers and students, which not only leads to low investment efficiency of education informatization, but also has little impact on promoting education reform, promoting learning style change and improving education quality. Therefore, the smart campus needs to build a unified information portal, call for one-stop service, respect individual needs and services, and integrate the business processes of various business departments, so as to provide all-round services to teachers and students.

3.5 Construction Objectives

To build a harmonious and unified campus information service platform for all teachers, students and parents to participate. With teachers' professional development, students' comprehensive development and quality growth as the core, and based on the construction of various information resources and application systems of the school, it is oriented to the multi-level information application needs of school education and teaching activities, school education and teaching management, school education and teaching research, campus culture construction, campus life of teachers and students, etc., To provide comprehensive, comprehensive and personalized information resources sharing and business process collaborative services, and build an efficient and scientific educational information resources service and guarantee system [14–16]. We should build advanced information infrastructure, optimize and upgrade the existing campus network environment, computing resources and data storage resources, improve the campus information security system, and build a number of modern digital education and teaching facilities and IOT perception terminals. Build a smart campus basic support software platform to provide stable and efficient support services for various information applications of the school, including portal integration, unified user management, unified identity authentication, organization management, content management and other basic service support, and practice the sustainable and scientific development of school running efficiency.

In the construction of smart campus, our charging project is a big problem, so Fig. 2 and Fig. 3 simulate the state of smart campus from charging.

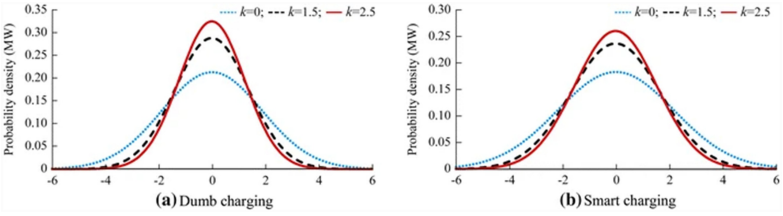

Fig. 2. Charging for smart campus

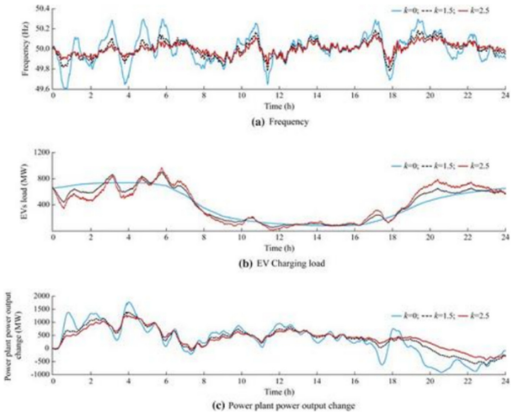

Fig. 3. Power plant for smart campus

4 Analysis Of The Current Situation Of Smart Campus Construction

4.1 The Efficiency of Information Application is not High

At present, although many high schools have established a digital campus which has begun to take shape, but when teachers and students carry out teaching research and learning, there are many problems, such as low rate of information application, lack of centralized information transmission and so on. Data and information are scattered in various departments, which can not achieve effective system collation and application. The way of data transmission is generally one-way transmission, which can not be accurate to the transmission target, and the transmission information is relatively random. At the same time, the high school in the construction of smart campus, can not realize the exchange of information with the outside world, such as teaching resources, curriculum content and other information exchange is still limited to the campus, this situation is not conducive to teachers and students in class time for information sharing and exchange.

4.2 Lack of Unity

The lack of information uniformity in the management of smart campus is one of the most common problems in the process of building smart campus. Due to the large number of people in high school campus and the complexity of departments, there are various kinds of management and services, such as payment of accommodation related fees, score query, and meal card recharge, which need the support of platform system. As a result, many high schools have different technology platforms and various information systems in the construction of smart campus, It makes the platform more chaotic [17]. At the same time, because the information of different platforms are stored in different databases, they can't exchange with each other effectively, resulting in a large number of useless data in the smart campus system, which can't be unified. Therefore, it brings some disadvantages to the normal teaching and research.

4.3 The Infrastructure is Lagging Behind

Because the smart campus needs a lot of capital investment and human investment, as well as technical support, the current high school in the construction of the project, there will be facilities lagging behind. From the current situation of high school smart campus construction, it is unrealistic to only rely on the development of the school itself. Therefore, relevant departments should actively promote the construction of smart campus, provide financial and technical support for it, and ensure that the high school smart campus can achieve more rapid construction.

5 Measures for the Construction of High School Smart Campus Under the Internet Plus Era

In the Internet plus era, building a smart campus is the real need of education. Therefore, how to promote the construction of high school smart campus under the background of Internet plus is the problem facing the high school. The following analysis of several measures on the construction of smart campus.

5.1 Grasp the Direction of Smart Campus Construction Under the Background of Internet Plus

It not only needs technical support, but also needs high school to sort out the idea of effective application of information technology. Therefore, in the construction of smart campus, first of all, we need to grasp the idea of construction, that is, the focus of the current construction of smart campus and what problems need to be paid attention to in the process of construction. Smart campus is a new stage of teaching informatization, which is upgraded from digital campus. Different from digital campus, digital campus pays more attention to the application, sharing and analysis of information, while smart campus pays more attention to how to provide services for teachers and students with the most humanized and intelligent services, so as to improve the use experience of teachers and students. Smart campus uses more advanced and fast computing methods, such as cloud computing, big data and other technical means, which effectively combines high school scientific research, teaching and management, and constantly reflects the personalized, standardized and comprehensive service [18]. Therefore, the future development direction of smart campus should jump out of the thinking of digital campus period, think about how to use the Internet to make comprehensive use of the information in the campus, so as to provide more quality information services for teachers and students, and realize the ultimate goal of building smart campus.

5.2 Construction of High School Campus Integrated Information Service Platform

In the Internet plus era, high school wants to build smart campus. First, it needs to start from the technical aspect, change the status of all kinds of system applications being restricted to the desktop, take new technology as the main information carrier, and effectively create an integrated information service platform, which includes information

interchange and intelligent application, thus changing the state of information dispersion in high school campus. Through the service platform, information can be unified. When teachers and students use information and carry out related management, they can complete it in a database, improve the utilization rate and interaction rate of related data, effectively save costs, and improve teaching efficiency and management efficiency. This is the focus of the construction of high school smart campus in the future.

5.3 Provide Organizational Foundation for Smart Campus by Strengthening Campus Internal Management

At present, there are many reasons for the lag of the construction of many smart campuses, not only in technology, but also in the management of the school itself. For example, many high schools manage teaching, teacher management, scientific research and other information separately. Even if special management departments and agencies are set up, most of their responsibilities are related to the construction of campus infrastructure, lacking the right to dispatch and use relevant information [19]. These reasons lead to the construction of smart campus, All kinds of information can not be effectively transmitted and circulated. Therefore, in the construction of smart campus at the same time, we also need to strengthen the internal management of the campus, to achieve innovative system reform, so as to provide a solid foundation for the promotion of smart campus.

5.4 Increase the Investment in Infrastructure and the Establishment of Guarantee Mechanism in the Process of Construction

Smart campus is a long-term and systematic project, which cannot be completed at one time. Therefore, it is necessary for the school, relevant departments and the whole industry to work together to form a kind of cooperation, and jointly provide some help for the construction of smart campus. At present, many schools are faced with the lack of infrastructure and construction resources, which has become the biggest challenge in the construction process of many campuses. It is not enough to build a smart campus only by the efforts of the school. In the process of construction, we need to actively find partners, encourage relevant enterprises to actively participate in the construction of smart campus, make use of their own advantages and mature services to contribute to the smart campus and speed up its construction process. In addition, the security maintenance of the smart campus system is also very important. In the high school smart campus platform, in addition to teachers can use the system to manage information, the school will also manage some students' personal information and financial information [20–24]. Therefore, it is necessary to protect the security of the information, otherwise, if the information is lost, In view of this situation, it is necessary to employ network professionals in the process of construction to carry out security maintenance on the high school network. The focus of maintenance is to improve the security of information. Therefore, it is not only necessary to implement security maintenance on the system, but also need to carry out maintenance on internal related equipment such as library and canteen, Only in this way can we ensure the security of information and realize the normal operation of smart campus.

6 Conclusions

This paper mainly analyzes and studies the process of smart campus construction based on cloud computing. In order to complete the overall development planning of Kunming No.1 middle school education informatization and the informatization development goal of phased and step-by-step construction, this paper analyzes and studies the connotation and characteristics of smart campus, and the guiding significance and characteristics of cloud computing technology in school informatization construction. Aiming at the construction of education cloud platform with unified data center, unified identity authentication and unified information portal, this paper puts forward the overall planning and design scheme of smart campus based on the concept of cloud computing. According to the idea of construction by stages and in batches, the first phase network construction is designed in detail, and the network construction solutions for the school to implement procurement, system integration and project acceptance are provided. Under the new background of Internet plus, high schools need to focus on cooperation with enterprises to speed up the pace of information management in campus management and services. Meanwhile, we should build a smart campus service platform based on the characteristics of the school itself, so as to provide better standardized and comprehensive services for teachers and students, and realize the new development of the campus under the Internet plus background.

Acknowledgement. A study on the construction and application of network learning space in higher vocational colleges based on Yunzhongtai (Project No .19 JX06240).

References

1. Jiafu, J., Yong, Z., Yulong, W., Li, Z., Huang, M.: Construction of smart campus system based on education cloud. J. Modern Educ. Technol. **23**(2), 109–110 (2013)
2. Ronghuai, H., Zhang Jinbao, H., Yongbin, Y.J.: Smart campus: the inevitable trend of Digital Campus Development. J. Open Educ. Res. **18**(4), 12–17 (2012)
3. Yan, W.: Overall architecture model and typical application analysis of smart campus construction. J. China Audio Vis. educ. **32**, 88 (2014)
4. Qintai, H., Kai, Z., Nanhui, L.: Development and transformation of education informatization: from "Digital Campus" to "smart campus." J. China Audio Vis. Educ. **324**, 38 (2014)
5. Fang, P.: Application of intelligent image technology in optimizing management of network computer room. J. Health Voc. Educ. **16**, 51–53 (2007)
6. Wei, C.: Discussion on the management of school network computer room. J. J. Taiyuan City Polytech. **04**, 147–148 (2007)
7. Guoxun, Y.: Construction and maintenance management of medium and small communication network room. J. Sci. Technol. Consult. Guide **14**, 42–43 (2007)
8. Shujun, W., Yueming, L.: Exploration of network computer room management and maintenance in higher vocational colleges. J. Career Circle **05**, 16–17 (2007)
9. Qunli, L.: Management and maintenance of network computer room in school. J. Sci. Educ. Wenhui First Ten Issues **01**, 185–186 (2007)
10. Xinyao, W., Qiang, Z.: Development and application of paperless examination system. J. J. Chengdu Aviation Voc. Tech. Coll. **04**, 48–50 (2006)

11. Cui, L.S., Li, H.: Application of protection card in network computer room management. J. Hebei Educ. Teach. Ed. **2006**(12), 39–40 (2006)
12. Qunli, L.: Development and design of open automatic network computer room management system. J. Cult. Educ. Mater. **35**, 143–144 (2006)
13. Qunfa, F.: Discussion on network management and maintenance of school computer room. J. Today Sci. **2006**(11), 116 (2006)
14. Computer based automatic network maintenance j. 29–79
15. Zhihui, Z.: Two classics in the management of student network computer room. J. J. Hengshui Univ. **03**, 59–60 (2006)
16. Qingju, H., Chang, L.: Selection and application of teaching and management software for network computer room. J. J. Hubei Univ. Technol. **04**, 148–152 (2006)
17. Aidong, B.: Management and maintenance of network computer room. J. Educ. Inf. **13**, 60–61 (2006)
18. Shen, L.: Thinking and practice of network computer room management J. Information technology education, (06), 72–73 (2006)
19. Juan, L.: Application and analysis of network cloning technology in computer room management. J. Agric. Netw. Inf. **04**, 111–112 (2006)
20. Yuling, S., Minfeng, C.: Management and maintenance of network computer room. J. Sci. Technol. Inf. Acad. Ed. **03**, 311 (2006)
21. Haitao, W., Jidong, M.: Tasks and responsibilities of hospital network manager. J. J. North China Coal Med. Coll. **01**, 112–113 (2006)
22. Hui, C., Dong, P.: Research on the application of intelligent image technology in the management of university network computer room. J. Audio Vis. Educ. Res. **12**, 67–69 (2005)
23. Xiufeng, L.: Discussion on management and maintenance of network computer room. J. China Mod. Educ. Equip. **12**, 5–7 (2005)
24. Shouyu, W., Lingyun, Z.: My opinion on Teaching LAN management. J. Fish. Econ. Res. **06**, 45–47 (2005)