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Based on the Network Technology of Digital Campus Design and Analysis

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Abstract. In recent years, in order to meet the trend of popularization of higher education, expanding the scale of Chinese colleges and universities, and lead to university campuses scattered teaching resources, and information to be slow, poor accuracy and efficiency of the office problems have emerged. The construction of digital campus is not only working for the university scientific research, management provides a fast and convenient information service, and realize the education space and time, teaching contents, means and forms of further opening, largely improves the ability of teaching and scientific research ability and management level. This article through to the digital campus in the process of planning and design requirements, puts forward the conception and design of the construction of the digital campus network, then the digital campus network topology, design of core network, IP address assignment has carried on the discussion a rough. For the design of the digital campus construction provides a draft plan.

Introduction

Digital campus is the use of computer technology, network technology, communication technology to the school and teaching, scientific research, management and service life about all of the information resources to conduct a comprehensive digital; Using scientific and standardized management to integrate the information resources and integration, to form a unified user management, resources management and unified access control; To the school construction for the campus, also faces the society of a virtual university transcend time and space. Its overall goal is to build a complete and unified, advanced technology, efficient, stable, safe and reliable of the campus information system based on Internet/Intranet and the internal management system. Scatter on campus are relatively independent system of unified integration, eliminate information islands, to improve the students develop environment provide complete information solutions, to provide adequate communication platform, realize the education environment (equipment, classrooms, etc.),

resources (books, notes, courseware, etc.) to the active (teaching, learning, management and service, etc.) of the digital. On the basis of the traditional campus to build a digital space, in order to expand the reality of campus space, time, latitude, improve the efficiency of the traditional campus, extend the functionality of traditional campus, finally realizes the comprehensive informatization education process, so as to achieve the aim of improving education quality and management level.

Digital campus network information center as the core, network classroom, teaching and research section, lab, office, conference room, laboratories, library, teachers and students dormitory, such as school teaching, scientific research and management. Its functional architecture is shown in figure 1.

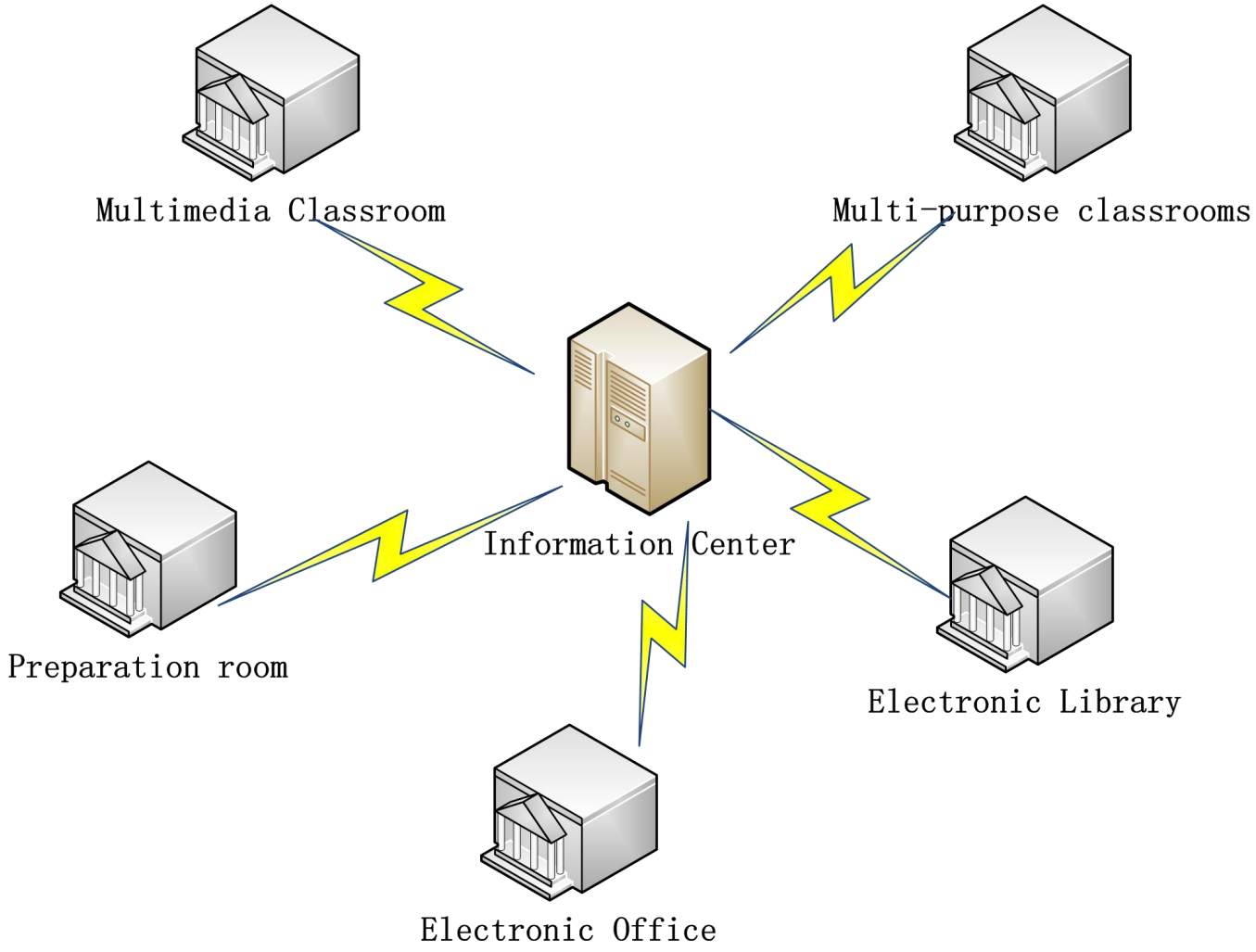

Fig.1 The function frame of digital campus

Digital campus construction of the main work will be on the integration of existing systems, trying to make the existing system of information consistency, integrity and reduce the redundancy. And constantly strengthen the construction of network infrastructure, rich digital service content. Through the digital campus construction to improve education quality of teaching, promote the competitiveness of the school, build better talent training environment. Digital campus has a

traditional campus incomparable advantages. First of all, digital campus has broken the constraints of the space, the concept of the classroom is no longer limited to traditional sense of the classroom, but at the same time in the learning state of the learner in network environment group of network space, information space and virtual space, reflect the openness of space. Secondly, through the digital campus network remote education, any learners can at any time according to their own need to arrange my study plan, enjoy equal education resources[1]. Again, digital campus great extension of the traditional teaching methods and content, teachers teaching as the main way of teaching was gradually replaced by the learners' autonomous, interactive, personalized learning, and teaching content from the traditional book knowledge also extended to the entire Internet information space, reflect the autonomy of learning and teaching contents of universality.

Digital campus has the following several important features:

(1) Digital campus based on network technology school informatization integrated application system.

(2) Digital campus information device interconnection to run as technical support, school application software and education resources as the core, to construct modern education mode for the purpose.

(3) Digital campus to school information technology to provide a full range of services, including teaching, management, scientific research, office, exchange of information and communication, etc.

(4) Digital campus construction is to rethink the future of the school.

The Main Technical Analysis

Digital campus is on the basis of the traditional campus, the use of advanced information means and tools, the reality of campus the digital resources, the formation of a digital space, makes the reality on campus in time and space. It is based on the network, from the environment (including equipment, classrooms, etc.), resources (such as books, notes, courseware, etc.), to the active (including teaching, learning, management, service, office, etc.) of all digital[2]. The campus network system structure and application of the nervous system of the whole campus, campus information and service. In the digital campus, by modern methods, easily realization of school teaching, scientific research, management, service and other activities of all process, to improve the quality of teaching and scientific research level and management level.

Digital campus as a comprehensive solution of information construction of colleges and universities, it is not only provide a basic computer and network hardware platform, more important is according to the characteristics of colleges and universities to provide comprehensive software

system, and use of the software system to realize the modernization of management. Therefore, the construction of campus network requirements are shown in figure 2 below.

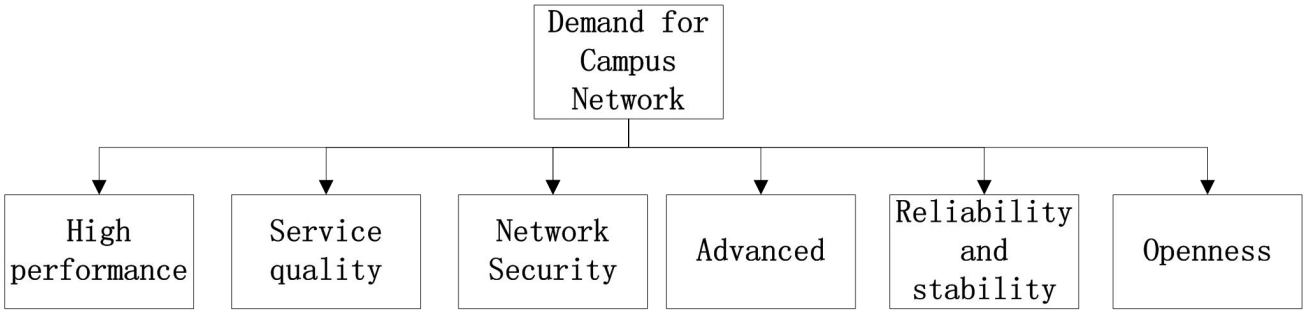

Fig.2 Demand for campus network

(1) High performance requirements

Multimedia interactive teaching, on the performance of the network demand is very high. So the construction of campus network technology of network must be high bandwidth networking; Key exchange equipment must support the line rate of exchange, to ensure the data exchange of non-blocking; In addition from the network structure design, need to take into account some high flow distributed deployment of multimedia applications, in order to reduce the flow across the backbone, to improve the performance of the network.

(2) The key business service quality assurance requirements

Due to the particularity of the education system, and its generic type almost covered all types of application of the Internet, including Email, FTP, web browsing, database query, cooperative computer aided design (CAD) and computer-aided education (CAE), computer based education (CBE), collaborative research, remote education, video broadcast, video on demand, vole and video conference and so on application type.

(3) The network security requirements

Entire network access authentication, is very important to the security of campus network security: campus network information point distribution is very wide, compared with general enterprise network, campus network user mobility, information point has the problem of random access to use. Students and foreign unidentified users, find any information in the campus network, can enter the campus network, can be arbitrary interference and destruction of the normal operation of the campus network platform and application system.

(4) Advanced needs

Advanced means that it is not easy to lag behind, in the future network renovation and extension, can fully protect the existing equipment and technology investments. So the campus network using

the network technology must be mature, the strong vitality of the technology, to be able to get continuously development and support.

(5) Reliable stability requirements

Reliable and stable network platform, is the cornerstone of the implementation and promotion of the application service system. With the further development of the school education informatization and deepening, the school teaching activities will be more and more dependent on campus network, campus network paralysis or frequent failure will seriously affect the teaching activity, the daily business and school image[3]. Network platform design must be from equipment, network topology structure, network technology and so on several aspects to ensure reliable stability of the campus network.

(6) Open demand

System design must be open and flexible, adopt the open technical standard, avoid system interconnection obstacle.

The Digitized Campus Network Design

Digital campus network architecture is shown in figure 3. A department within a network of various structure containing function layering and do a layer should follow the unification of the agreement. Network architecture collection also known as "protocol and hierarchical collection". Digital campus network system design, the first is to choose the network architecture, its core is to determine to adopt the set protocol[4]. It is the basis of planning the construction of campus network.

Digital campus network system construction should be used in the world recognized industry standard TCP / IP protocol, the whole network system architecture as the core protocol. When the network requires remote access requirements, use asynchronous communication protocol.

(1) Backbone

Digital campus construction, the backbone is the core of the data stream, the data stream while shouldering the deployment task. Digital campus backbone core switching designs usually divided segments form a secondary / tertiary subnet way. Core equipment reliability and security, powerful performance switching equipment, can achieve redundancy and load balancing. This is the biggest advantage of the management and maintenance are in line with forward-looking. Networking can significantly enhance performance through the router network management and maintenance mode. Internet router network is divided into three levels, it is very easy to manage. This technique in a larger digital campus network, particularly the need for more centralized control and maintenance of applicable campus network. Virtual Private Network (VLAN) as a network solution, the management has specific advantages on mobile terminal, when the large-scale network with, it is necessary to

match by routing technology to achieve, so in the larger network applications VLAN, to tie in with the three-tier exchange function switches.

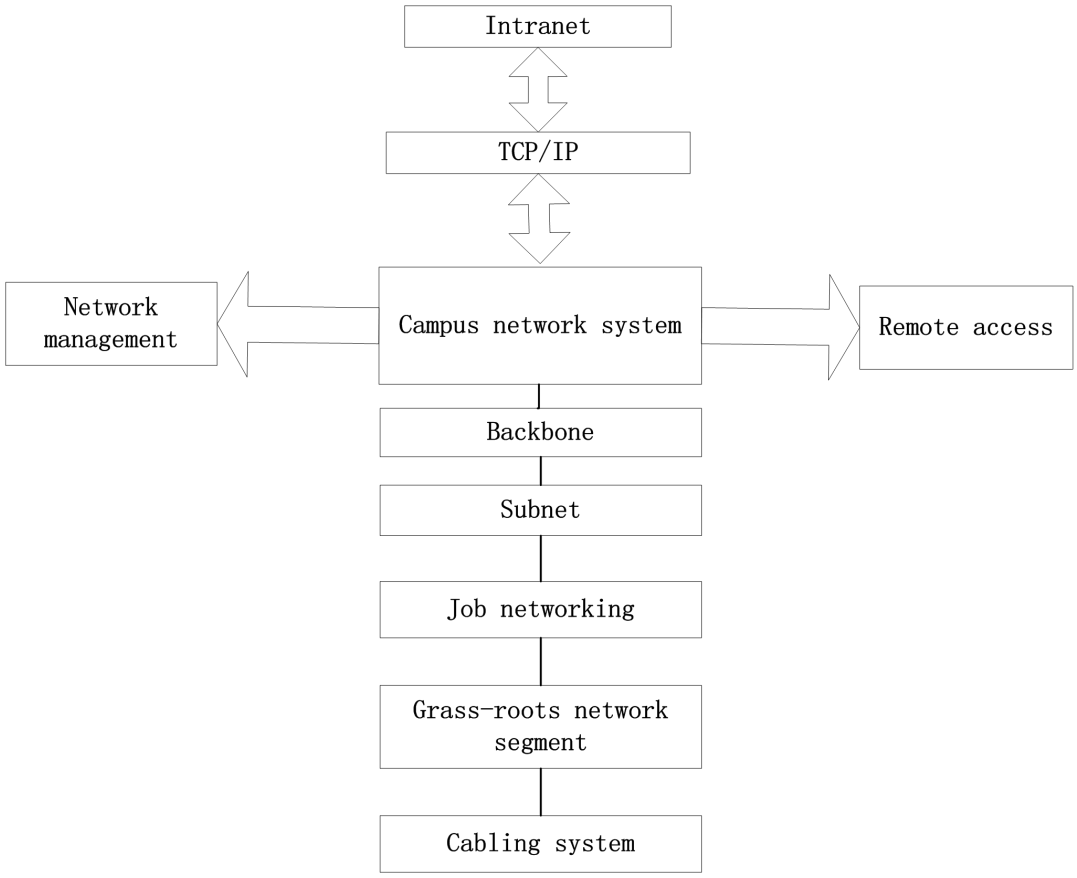

Fig.3 Digital Campus Network Architecture

(2) Remote Access

Digital Campus in the remote access control solution to the main telephone dialing so that users can easily access the school network through remote login. By RAs (Remote Access Server) and Modem (modem) portfolio, using the PPP remote terminal, dial-up access to the campus network to achieve remote access, provide access control connection (Access List in RAS remote access port also calls for the user on the RAS authentication and authorization controls. Although solved remote terminal access to the campus network, but dial-up is the primary means of network attacks, strengthen security controls on the inevitable from the technology and management.

(3) Interconnection

In the construction of the campus network, School Link developed to meet the standards, but also coupled with other external networks, and even Internet access inside. At present, have adopted the international TCP/IP protocol as the connection standard Internet/Intrane, the digital campus can choose a variety of way to access Internet, such as: border router mode, DDN lines and metro access. Digital Campus publish information, to be achieved through a dedicated server to protect the security, because of its rich content services, the workload so great, should be used at least more than one speed,

I/O capability of high-end servers to achieve information released hardware requirements. Working server cluster in the external network environment, all servers in the cluster configuration information and data are required to do a backup, and a corresponding rapid recovery programs to ensure the rapid recovery of systems and data, to avoid being attacked or when the server fails influence publicity.

(5) Design of subnets

In the construction of digital campus, the two sub-networks should be based on the actual physical location of the school and should be dated less data traffic system planning. In general, the two networks to cover some of the layers of a building or building unit as a division of subnets, connect to the network management center via fiber optic cable between the floorer. All two relatively independent networks, using the same TCP/IP

(6) Job Network Design

Job Network is the bottom of the network, can be divided in a flexible manner mode, press office, by geographical location may need to be flexibly adjusted depending on the circumstances. The layer of the network connection device is an access switch, the table and the terminal equipment connected to the work of the network switch to access network resources, the network should work to provide at least Fast switching capabilities of the desktop.

Design of campus network topology, core network, IP address assignment

(1) Campus network topology

Nowadays, college campus network has become the construction of digital campus provides the hardware support platform, the Internet has become the school teaching, management, scientific research, life almost all aspects, such as indispensable an important tool, these caused the growth of information into geometric forms in the campus network[5]. People is higher and higher requirement for the performance of the campus network; More and more requirements for the services provided by the campus network, this makes the choice of the reasonable network topology become one of the most important aspects of the construction of campus network. At present the industry mainstream design patterns could be divided into three levels: the campus network core layer, convergence layer and access layer. The core of the core layer is mainly refers to in charge of the whole campus network export equipment, namely high-end core equipment within the network center; Network convergence layer that is usually sub-center, it usually is located in the center of the piece building in campus network, responsible for down of all buildings in the area of the network access, upward directly connected to the core equipment, plays an essential role in campus network; Access layer, often referred to as pavilions the structure of the network equipment, it is responsible for building network access all information available[6]. The three layers of network structure make up the campus network

in the expansion of the common star topology structure, the connection between them relations as shown in figure 4:

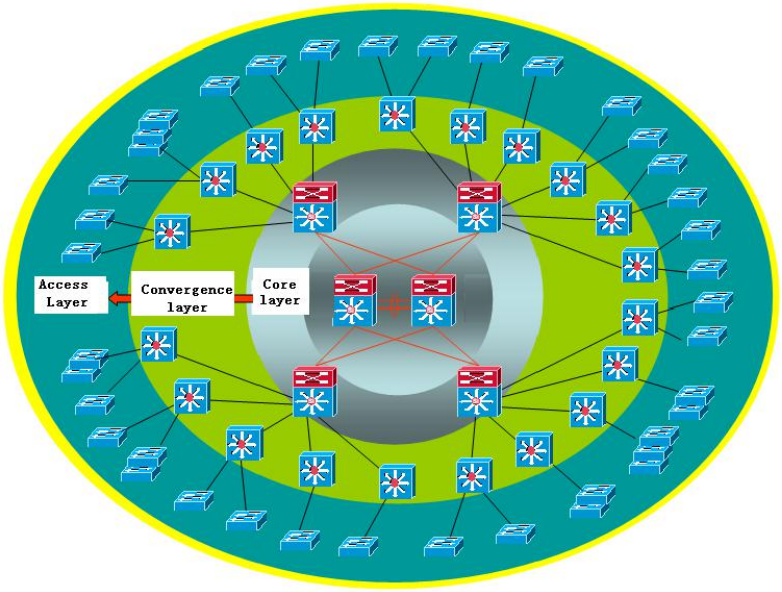

Fig.4 The schematic chart of the three layers network

Core layer is the backbone of campus network, mainly to provide fast forwarding of packets and exchange function, realizes the fault screen repair and the exchange of interval between different levels of connection. Therefore, given these function configuration, core layer requires high power, scalable routing switch, according to the practical experience, need 2 and above the equipment.

Convergence layer cut-off the division of the core layer and access layer, the network security, such as control implementation media transformation, establish a VLAN routing, etc. Settings of the whole digital campus network, should have no less than four gather nodes, four nodes the role of each are not identical, we can be used for the first node gigabit switches, interface service as the port of entry, and connect the redundancy for the second core switches on, the second node can be used in the library, andto realize petascale gathered to exchange a lot of high end connection. Mouth, and a third node can be used within the scope of the students gather living areas, such as male and female students dormitory or concentrated area, so that we can achieve many MB port connection, conditional colleges generally set up a fourth node for increasingly externalization meeting area, for business meeting or gathering provides maximum port access.

Access layer can help client implementation of the final access terminal, also can rise to control the flow and the filter function, have corresponding security properties[7]. In terms of access layer configuration choices, using the intelligent switches must have better performance of network security, at the same time should be stackable, at the same time, the ports provide ways to ensure that the number of adequate and specifications, generally for 10/100 m port, at the SAM platform, on the

basis of the original design scheme to realize the centralized management requirements, gigabit interfaces, in practice the effect is good.

(2) Core network design

By adopting two or more than the number of configurations, thus ensuring supply and coordination between the role, when the core switches appear problem, can in the free switching mode to realize the network normal operation, ensure the end user's experience, the teaching process, the daily learning, extracurricular life won't cause obvious negative impact, the greatest degree of assurance the overall smooth running. First, the core switch hardware security should pay attention to the application of the software configuration of the same to the dual power supply, the twin-engine, to prevent problems due to an engine or power source, will not result in the situation of the network interruption, complete automatic switch in the millisecond time, realize data storage security and stability of the core equipment. Second, the core switches on the data plane, management plane, control plane separation management for these three planes, the main purpose is to shunt volume of data, or in order to guarantee the abnormal situation in (malicious attacks cause the problems of data flow, OSPF protocol, etc.), the network administrator can still login to ensure the effect of the network equipment..

(3) The IP address assignment

In our process of building digital campus network, the IP setting to correspond to the corresponding network topological structure, at the same time, also must pay attention to the network good ductility. Usually, IP address assignment to to meet the basic requirement of routing protocols, efforts to achieve built-in routing table length, CPU and memory to reduce or loss, to promote the efficiency of algorithm and calculation speed of fast state as a whole. Will be of reference to the allocation of IP addresses the following principles: one is to ensure that different IP reasonable assigned to different physical network segment, there can be no superposition or repeat occurs; Second, don't make the whole design is too complicated, affect the normal transmission speed of the network; Three consecutive way is recommended to dispatch of IP addresses, improve algorithm; Fourth, attention to keep the IP address of the corresponding distribution, convenient to right at the end of the implementation by the strategy of optimization.

First, the allocation of public IP process is also an area or the user of the classification process. Therefore, it is recommended that the personnel can be used according to different machines to allocate the address, for example: the campus researchers use the address and the address is used by network administrators belonging to different categories of; For some special cases of IP address footprint is bigger, can give independent setting in the planning stage, in turn, the demand for smaller, merger, using an IP address; Second, the private IP address and public IP address configuration, the

planning should first consider the private IP address configuration, the secondary network design is a very effective solution, outer net external access requirements, by designing the secondary network can be effective in addressing readjustment.

Conclusion

Digital campus is on the basis of the traditional campus, the use of advanced information means and tools, in a unified management and security strategy, the digital campus of various resources, the formation of a digital space, makes the reality on campus in time and space. Digital campus network is a digital, computer network as the foundation, the use of advanced information technology and network technology to the campus activities, daily management, student life and other comprehensive information collection, collation, classification, processing and application. Through the construction of digital campus network, can effectively improve the school education teaching management work efficiency, also can significantly improve the level of education work. Digital campus has become the essential information infrastructure in colleges and universities, as the network architecture of digital campus construction and equipment configuration and management, digital campus is the key to efficient application and operation.

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