Design and Planning of University Campus Network

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Abstract. The campus network is a large branch of various types of networks and has a wide range of applications. As the birthplace of new technology, in schools, especially universities, it is very closely connected to the Internet. The Internet was first successfully tested on campus. School Net guides computers into education, scientific research, management, and other areas, providing advanced computers and Internet applications for faculty and students. Due to a series of issues such as the campus network investment funds, network technology and management, the specific implementation of each campus network construction needs to be carefully investigated and analyzed. The purpose of this article is to explore the design and planning of college campus networks. In this article, we mainly propose the application of radio coverage and analyze the distance between the equipment and the bridge. The coverage of indoor wireless network determines the number and points of APs, and there are 80 laptops with AP access restrictions. When the number of portable computers is 20-30, the operating state of the entire workstation is optimal. Usually in the range of 35-110 m. Wireless network coverage in outdoor areas uses overlapping wireless coverage schemes to establish multiple wireless coverage base stations, thereby achieving wireless coverage throughout the campus. In terms of experiments, student dormitories, teaching buildings, playgrounds, and libraries will carry out signal and ping packet experiments.

Keywords: Colleges and Universities, New Network Technology, College Campus Network, Wireless Coverage

1. Introduction
In the past ten years, with the rise of the construction of smart campuses in colleges and universities, the rapid development of education informatization characterized by digital campuses, the basic educational administration and teaching management, personnel, scientific research, logistics system management, digital libraries, video-on-demand service systems, Various applications such as office automation systems, campus cards and flipped smart classrooms are profoundly affecting the way of work, life, learning, and thinking of college teachers and students, and have triggered new changes in teaching, management, and knowledge dissemination. With the continuous maturity of computer network technology and communication technology, many colleges and universities at home and abroad have successively established their own campus networks. The establishment of the campus network has greatly improved the teaching and research conditions of colleges and universities, and
facilitated the teachers and students and management personnel. Work and study have truly realized the management automation and office automation of colleges and universities. As the foundation of a smart campus or a digital campus, the construction of a basic platform for the campus network is particularly important. It must be required to build the campus network into an efficient network with high availability, high stability, manageability, controllability, and smooth expansion and upgrade.

Network security design is a very important part of a project [1]. At present, the school's network system lacks professional security protection measures. During the network maintenance and management process, it will face the following information security threats: No professional security protection system, fine-grained access control, network administrators cannot The rapid detection of the emergence of security threats, the lack of flexible and effective bandwidth control and quality of service control, the inability to respond to the aforementioned network security threats at the gateway level, the inability to perform unified security monitoring on the backbone network, and many other issues [2]. This is an important part of college education, and it is also a higher education for high-quality workers and middle and high-skilled manpower bases. It was established by planning the characteristics of vocational education and a unique campus network, which is the real problem facing universities [3]. The campus network should have a relatively advanced level, reflecting modern education concepts. In addition, according to the school's financial, physical, scale and other objective conditions, based on the principles of "pragmatic, advanced, easy to spread, easy to expand, and open", unified planning, phased construction, and take local measures. The goal is to finally create an advanced, simple and practical technical campus network.

In this article, we mainly propose the application of radio coverage and analyze the distance between the equipment and the bridge. The coverage of indoor wireless network determines the number and points of APs, and there are 80 laptops with AP access restrictions. When the number of portable computers is 20-30, the operating state of the entire workstation is optimal. Usually in the range of 35-110 m. Wireless network coverage in outdoor areas uses overlapping wireless coverage schemes to establish multiple wireless coverage base stations, thereby achieving wireless coverage throughout the campus.

2. Method

2.1 Wireless Coverage

WLAN is divided into many types. It mainly depends on how we use it in this way. It can communicate with each other without a central processor. When we want to be simple and do not need tedious management and operation, we can connect two adapters to the PC. It can be called wireless network, commonly known as peer-to-peer network [4, 5]. Dozens of pcs can be accommodated on the wired network, and the pc at each point can be connected to other points, whether mobile or non-mobile, so that the amount of data transmitted can meet our requirements [6].

A relay is a mutual transmission between two APs, and the relay uses EP to cover the wireless network and transmit to a location where many data signals are considered [7]. There is still a default effective distance between the two facilities. The room is only 200 m. It is only 350 m outside. If your campus is large, you need several access points to stay in touch with each user. In order to cover the entire wireless network, we need to find out the location [8]. Users can choose to use the wireless network within an established access point, which links users from coverage to another coverage without interrupting communication. The relay increases the coverage of the wireless network, and the relay has the function of an access point, but not an access point. The relay is not connected [9, 10]. Directional antennas can link two or more buildings, extend the wireless network to buildings one or more kilometers away, and install directional antennas on the roof of each building. After installation and installation, the antennas are aligned with each other and connected to a wired network via a bridge to transmit data.

2.2 Indoor Area Wireless Network Coverage
Generally, the number and points of APs are determined in the wireless network computer room, but the access restriction of 80 laptops is the AP restriction. When you have 20 to 30 laptops, the entire workstation works best. Typical coverage is 35-110 m [11]. The access point can be freely arranged according to the size of the room to be covered, and the device can be protected by not placing the signal on the ceiling by placing the device on the ceiling [12, 13]. We select and cover the company's MSR according to the actual needs of the school, and cover indoor areas such as the main building, library, laboratory building, office building, student dormitory and so on.

2.3 Outdoor Area Wireless Network Coverage
All of these areas require full wireless network coverage, such as outdoor locations on campus, such as public areas between the ground and school buildings. According to the actual outdoor conditions, multiple wireless base stations were established using overlapping wireless coverage schemes to achieve wireless coverage of the entire campus [14]. Select a company's MSR equipment and complete key tasks in a specific project implementation. Two independent carrier frequencies of the outdoor unit MSR, one is connected to the collective MSR using the MESH network mode, and the other is set to a mode with a backhaul function, thereby achieving the main task of the access layer. The system uses MSR equipment as a bridge between the wireless network and the controller, and is responsible for data connection tasks. These facilities are mainly located in auditoriums, education buildings, libraries, student activity centers, cafeterias and dormitory roof MSR facilities. Considering the transmission range and forwarding of the signal, the wireless network of the wireless MESH network forming structure will automatically adjust the routing to form a new feedback route, improve the network speed, and ensure the normal operation of the network.

3. Experiment

3.1 Experiment Purpose
The validity of the campus network design and planning is verified.

3.2 Subjects
The design of college campus network proposed in this paper.

3.3 Experimental Design
The campus wireless network uses an AP wireless network constructed by a company in order to ensure easy management and security of the wireless network and barrier-free circulation, thereby ensuring that the wireless network has functional requirements such as manageability, security, and seamless roaming, especially in the future. Operation and maintenance management can become more simple and effective. Perform signal and ping packet experiments in campus buildings, student dormitories, playgrounds, and libraries. How to deploy the network in accordance with the actual situation of various colleges and universities, and seamlessly connect the indoor and outdoor wireless networks, can meet the characteristics of campus teaching buildings, such as building height. In order to solve the trouble of wired network wiring, the wireless backhaul function is sometimes used outdoors. At the same time, due to the use of a variety of combined methods, many nodes can be omitted, reducing costs. While ensuring the normal and simple operation of the campus network, it also needs to provide support for future wireless network research and development. The security of the network is very important for colleges and universities. What is implemented in the school is the use of limited network technology to connect wireless network nodes to support higher levels of security protection. Wireless networks need to meet security requirements and encryption protection.

4. Discussion

4.1 Student Dormitory
The building structure of a university dormitory building is generally a dormitory on one side of the corridor or a dormitory on both sides of the corridor. The dormitory is generally constructed of reinforced concrete. The shielding strength of both materials is relatively strong, and the attenuation of obstacles is shown in Table 1. 

| obstacle                             | Attenuation (dB) |
|--------------------------------------|-----------------|
| floor                                | 32              |
| Wall with window                     | 3               |
| Metal door in reinforced concrete wall| 35.6            |
| Brick wall near metal door           | 5               |

Wireless networks are unlikely to reach every room through walls, and their coverage is concentrated in every bedroom. Select the device MSR and use a directional antenna, then install it in the hallway. It is recommended that the signal penetrate only one wall or not. The number of AP devices should be installed according to the actual situation.

4.2 Indoor and Outdoor Area Wireless Network Signal Coverage Strength Test

Certain networks in the dormitory outdoor environment radiate along the main roads of the main campus. Place the equipment and antenna on the roof of the dormitory, and then descend by radio waves. The surface of the device fan is the area that the antenna can cover. Uses MSR for four outdoor wireless MESH equipment products. MSR has two independent carrier frequencies. One carrier frequency is connected to the MSR using the MESH network mode, the MSR is connected to the core network BRAS, and the other carrier frequency is set to the access mode. We tested the coverage of the school wireless network signal. For many users, we have obtained some measurements. The basic structure of a student dormitory is the same. Run Net Stumble with a professional tester and wireless laptop, place the AP at the same location on each floor, and test the strength of one of the information points. When receiving a signal at a hotspot, if the normal value is 80 dB or higher, green indicates the strength of the radio signal.

Two independent carrier frequencies of the outdoor unit MSR, one is connected to the collective MSR using the MESH network mode, and the other is set to a mode with backhaul function, thereby achieving the main task of the access layer. The system uses MSR equipment as a bridge between the wireless network and the controller, and is responsible for data connection tasks. These facilities are mainly located in auditoriums, teaching buildings, libraries, student activity centers, cafeterias and dormitory roof MSR facilities. Considering the transmission range and forwarding of the signal, the wireless network of the wireless MESH network forming structure will automatically adjust the routing to form a new feedback route, improve the network speed, ensure the normal operation of the network, and design the system successfully. Using a professional tester and Net Stumbler software, perform a targeted outdoor LAN signal test in the same way as an indoor test. Test the wireless AP installed on top of the multi-agent. The test point is about 150 meters away from the wireless AP, and green indicates more than 80 dB, which indicates that the coverage of the wireless signal can meet the basic requirements of network construction. Some areas are covered in red, which indicates external interference but is within acceptable limits.
5. Conclusion

In this article, we mainly propose the application of radio coverage and analyze the distance between the equipment and the bridge. The coverage of indoor wireless network determines the number and points of AP, and there are 80 laptops with AP access restrictions. When the number of portable computers is 20-30, the operating state of the entire workstation is optimal. Usually in the range of 35-110 m. Wireless network coverage in outdoor areas uses overlapping wireless coverage schemes to establish multiple wireless coverage base stations, thereby achieving wireless coverage throughout the campus. In terms of experiments, student dormitories, teaching buildings, playgrounds, and libraries will carry out signal and ping packet experiments.

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