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Research on the Design of University Supervisory System Based on Internet of Things

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Abstract. With the needs of the construction of colleges and universities, modern video surveillance system is not only a campus security requirement, but also an important part of the wisdom of the campus. In this paper, the campus video surveillance system is designed based on the Internet of Things technology, which realizes the digitization, networking and intelligence of the monitoring system, which can meet the requirements of the increasingly high user experience and can connect the intelligent campus seamlessly.

1. Introduction

With the accelerated pace of construction of colleges and universities, the campus area gradually expanded, the flow of personnel is also increasing, a variety of uncertain factors on campus security management has brought great difficulty, video surveillance means to maintain an important means of safe campus. However, there are still many university video surveillance system using analog and digital hybrid system cannot meet the modern digital campus and the development of intelligent campus construction requirements. Therefore, the construction of digital, network, intelligent video surveillance system, not only to meet the requirements of campus security, but also an important part of the wisdom of the campus.

2. The Outline of Internet of Things

Internet of things that all things connected to the network, including things connected with things, things connected with people. Internet of things has the following characteristics: First of all, the Internet of Things to have the ability to collect and identify information, that is, through a variety of sensors or radio frequency identification technology to obtain the information of things; Moreover, the Internet of Things is a network, the network must have the ability to transfer data, the Internet of Things must have the ability to pass real-time information to the Internet; Finally, the Internet of things through the massive data analysis and processing, with intelligent control capabilities. Now we generally put the Internet of things is divided into three layers, namely the application layer, network layer and sensing layer.

2.1 Sensing Layer Technology.

The sensing layer is mainly composed of some sensing modules, networking modules and controllers. The sensing layer nodes are mainly responsible for collecting perceptual information, and send the collected information to the gateway through the self-organizing wireless sensor network, and finally upload the information from the gateway to the host computer. For example, the current popular smart home, industrial monitoring applications are used in this technology.

2.2 Network Layer Technology.

The network layer of the Internet of Things is different from the network layer of the OSI model of the Internet. The network layer of the Internet of Things includes not only the Internet communication network but also the wireless communication network. Any access to the Internet operations belongs to the Internet of things. Such as mobile phone Wifi, ZigBee node, intelligent home gateway and so on.

2.3 Application Layer Technology.

The application layer mainly through the analysis and processing of information collected by the

perception layer, according to the analysis results to provide users with convenient services, such as intelligent home is through a variety of sensing equipment to collect internal information, so as to provide a convenient home life services. Developers can provide a wide range of specific services to customers through customization. Application layer is the core of the entire Internet of things technology and application layer technology directly affects the development and popularization of Internet of things technology.

3. The Key Technology of Internet of Things

There are three key technologies in the application of things: the first is the sensor technology, which is the key technology in computer applications. We all know that so far the vast majority of computer processing are digital signals. Since there is a need for a computer to convert the analog signal to a digital signal, the computer can handle it.

The second is that RFID tags are also a sensor technology, RFID technology is a combination of radio frequency technology and embedded technology as a whole integrated technology, RFID in the automatic identification, item logistics management has a broad application prospects.

The third is the embedded system technology is a combination of computer hardware and software, sensor technology, integrated circuit technology, electronic application technology as one of the complex technology. After decades of evolution, embedded systems are characterized by intelligent terminal products everywhere; small to people around the MP3, large aerospace satellite system. Embedded systems are changing people's lives, driving the development of industrial production and defense industry. If the Internet of things with the human body to do a simple analogy, the sensor is equivalent to the human eye, nose, skin and other senses, the network is used to transfer information to the nervous system and embedded system is the human brain, after receiving the information to be classified deal with. This example is a very image of the sensor, embedded systems in the Internet of things in the location and role.

4. The Video Surveillance Systems Based on Internet of Things

The monitoring system is based on the three-tier architecture of the Internet of Things. The basic steps are as follows: 1) The sensing layer collects the video and audio analog signals through the network camera and the pickup, and implements the A / D conversion. The digitized video and audio signals are passed through the video compression algorithm Such as MPEG-4 / H.264) and audio compression algorithms to transfer data to the network video server and the node server via IP packets. 2) The network layer is based on the Ethernet structure design, the network video service and the node server access the ethernet, in the storage video data at the same time the data submitted to the cloud server. 3) The application layer adopts the cloud server to implement the data storage and service deployment, and realize the integrated monitoring and management of the system. Administrators not only through the management software to achieve integrated management, through the Internet based on the Web to achieve access to the node server data, access to real-time monitoring status.

The development of Internet-related technology for the video monitoring of the digital, network and intelligent provides a very good support, so that the real information digital, coding compression and the opening of the agreement, to meet the higher requirements of users such as 24 hours a day real-time monitoring, anytime, anywhere to monitor the video, see the smooth flow, clear picture and so on. The main advantages are as follows: 1) Sensing point analog signal directly into a digital signal, to achieve seamless connection with other systems. 2) Based on the Ethernet network, the deployment area is more extensive, increase the equipment can be identified by adding IP address, with good scalability. 3) Support cross-gateway, cross-routing remote video, can constitute a more complex monitoring network.

5. The Specific Design of Campus Video Surveillance System

The overall structure mainly includes the buildings, sub-control room, monitoring center and monitoring network. The details are as follows: 1) The buildings mainly include the teaching building, etc., the main building entrance and the internal must deploy a number of monitoring points, so each building should be equipped with the corresponding node server. In addition, the main point of the campus monitoring station equipment can be accessed to the nearest building. 2) Each building has a monitoring room, sub-control room to achieve real-time monitoring and basic management of the region. 3) Monitoring center is the highest monitoring and management departments, to achieve real-time monitoring of the region and integrated management. 4) The buildings and other monitoring points are finally interconnected through the monitoring network. The monitoring network is based on the Ethernet design. The backbone network can be based on the existing campus optical cable or the spare cable or other laying.

5.1 Sensing Layer Design.

Data acquisition system mainly includes the following parts: 1) Data acquisition equipment mainly includes a variety of network cameras, infrared on the radio alarm and alarm button, to achieve real-time data collection, but also to achieve the alarm linkage. When the front-end monitoring device is in normal working state, once the alarm condition is detected, the alarm signal is transmitted to the network alarm, through the sound and light alarm, while the monitor jumps to the alarm area camera image. 2) The network video server NVR is used for the storage and reading of the node data stream. The front-end data acquisition device forwards the data stream to the network video server and the storage server in the region in real time. The client can also download the data from the local network video server Take the flow. 3) Sub-monitoring room through the client to achieve all the monitoring points in the region real-time monitoring, to achieve the building monitoring system and network video server management and control. 4) Switches and routers to divide the virtual LAN VLAN, the data acquisition device according to the established strategy to access the monitoring network.

5.2 Network Layer Design.

At present, the campus backbone network bandwidth, the current majority of the campus network has been transformed, has a considerable scale, there are already "gigabit backbone", some schools have even achieved "dual core" and "10 Gigabit backbone" Backbone network platform for the digital campus and the future construction of the wisdom of the campus laid the hardware foundation. It can be based on the existing campus Ethernet to build a monitoring network, according to the development of the strategy in the access level routers and switches at all levels of VLAN (virtual local area network), can effectively prevent network storms, improve the security of the monitoring network, the impact of the network. Network transmission media data transmission related to the entire monitoring system image quality and the use of effects, the common transmission medium coaxial cable, twisted pair and fiber, for different occasions, different transmission distance, should choose a different transmission medium The For the campus environment, as follows: 1) Outdoor data collection point is generally far away from the equipment access, but also to effectively prevent the impact of lightning on the signal transmission, so the choice of fiber as a signal transmission medium for a few kilometers to tens of kilometers Of the long-distance video transmission, can effectively combat lightning and other electromagnetic interference to ensure that the data transmission signal stability. In addition, when the indoor data mining point access distance is far, up to 500 meters or more also use optical fiber transmission. 2) When crossing a complex electromagnetic environment (such as accessories with high-power motor), the use of optical fiber transmission. 3) Building entrance and internal monitoring points, using more than five types of twisted pair transmission. In summary, the campus environment monitoring information transmission medium is mainly used optical fiber and twisted pair, to meet a large number of video data transmission.

5.3 Application Layer Design.

Application layer equipment is mainly deployed in the monitoring center, mainly composed of the following components: 1) Management server: not only to achieve data collection equipment and user management, but also to achieve monitoring and management, storage management, log management, alarm management and other management functions, A comprehensive management platform. 2) Streaming media server: real-time data stream can be forwarded to multiple clients, can ease the data collection device flow pressure, effectively saving network bandwidth, the general single streaming media server service capacity of 500 CIF real-time data stream The At the same time, support the data playback on demand VOD, and some other management functions. 3) Storage server: the use of cloud server or data disk array, responsible for video surveillance data backup storage. Store video data forwarded by the network video server NVR or streaming media server, support distributed storage, be able to store massive amounts of data, and support fast data retrieval. 4) Decoding server: to achieve the high-definition data stream decoding, and the data output to the large-screen display or TV wall. 5) Web server: Publish and deploy B / S-based Web management system, through Web access, to achieve a unified management of data collection equipment. 6) Alarm server: to achieve the alarm event and management, and integrated with the network alarm system to support the client linkage (video images, sound and light display, information overlay), PTZ linkage, channel video, alarm output linkage and other the way. 7) Client: Monitor all data acquisition devices in real time by accessing the Web server.

5.4 Application Layer Security.

Application layer server to assume the monitoring system important storage and management functions, it is necessary to take the appropriate security measures and equipment to improve the application layer server security. Using high-performance hardware firewall to monitor, limit, change data flows across firewalls, handle access policies and encryption algorithms in hardware devices, and process real-time video streams at gigabit transfer rates, including packet analysis, classification, encryption, decryption and session matching. Network viruses are also a serious threat to network and server security, so the deployment of a strong anti-virus system is very necessary. Antivirus systems should provide high-performance protection and flexibility to protect the security of gateways, servers, and workstations, and should provide centralized policy management to provide scalable, cross-platform virus protection for application tier servers.

6. Conclusion

Based on the technology design of the Internet, this paper designs the campus video surveillance system, which specifies the specific design of the sensing layer, the network layer and the application layer. It adopts the digital network high-definition camera and the network video server to meet the requirements of 24-hour monitoring and of the requirements of the layout, the arrangement of different cameras to achieve the purpose of all-round monitoring.

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