Computer Room Dynamic Monitoring system for Large-scale Cloud Servers

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Abstract: With the rapid development of China's telecom industry and the continuous expansion of the scale of communication networks, the energy consumption of data centers accounts for a greater proportion of the cost of electricity used by telecommunications companies. Therefore, the energy-saving work of the data center computer room of the communication enterprise operator is the focus of its energy conservation. In the case where the communication room environment and the load of the communication equipment are determined, how to make the engine room ventilation and air-conditioning equipment perform high efficiency becomes the key to energy saving. Computer systems have become an important part of everyday business. The communication computer room runs in the core position of information management, exchange, and transmission. All equipment in the equipment room must be in normal operation at all times. Once a failure occurs, system operation, data transmission and storage will pose serious security threats.

1. Introduction

With the continuous development of information technology, the importance of enterprise informationization has been self-evident. More and more enterprises are starting to build their own data centers and independent computer rooms, using modern technology to manage and process data. The core secrets of the enterprise, such as business decision-making, market information, business development, human resources, project planning and daily operation, etc., and the entire computer room and server also bear the normal operation of supporting the modern production system of the enterprise, if there is an unexpected situation in the server or equipment room where the important data is stored, the loss of data, such as fire, flood or high temperature that may cause an incalculable loss to the enterprise.

At present, many enterprises in China still use the traditional computer room management mode to use manual laboratories to conduct inspections and management of the computer room. This kind of computer room management method is not only inefficient, high error rate, but also difficult to effectively cope with various emergencies. The use of the Internet of Things technology can make the monitoring equipment and the sensing equipment and the sensing equipment relate to each other, and establish a computer room environment monitoring system, which can perform real-time dynamic monitoring of the equipment room environment. This paper will start from the application of IoT technology, analyze the actual needs of the environmental monitoring system of Hang Seng's computer room, and design a computer room environment monitoring system based on enterprise needs. This system uses a variety of sensors and collectors, such as temperature and humidity transmitters, power monitors, magnetic sensors, water immersion sensors, smoke alarms and video surveillance equipment, etc., by connecting the above monitoring instruments to the Internet of Things. For the background monitoring center to transmit real-time monitoring data of the equipment room environment, and store the monitoring data into the system database to provide data support for the maintenance and fault analysis of the equipment room monitoring system.

Reliability is a necessary condition for the platform to be truly applied, and the reliability of the integrated system must be considered from all aspects. The embedded acquisition system is adopted for the central collection device (smart monitoring server). The security of the system is high and the stability is strong. The software is solidified in the hardware and is not attacked by viruses or hackers. The system has active dual data stream transmission, and implements self-test self-healing function

for IP address conflict and port data jam in the network; the software has encrypted user authentication and hierarchical rights management functions; self-management of monitoring system network and server fault conditions, including The fault condition record, fault data statistics and analysis, etc., through this function network management personnel can analyze the overall operation situation and trend of the equipment room environmental monitoring system, and provide the basis for network adjustment.

2. The Proposed Methodology

2.1 System Design.

The host computer processes, displays, and stores the acquired data, and can perform data query and report printing. At the same time, the host computer sends these data to the cloud database server at regular intervals. Users can use the terminal to access the cloud server to obtain the temperature, humidity, air conditioner or fan status of the communication room. The advantage of using a cloud server is that it can shield the difference between the terminals only the terminal has a browser and Internet access.

In the hardware design of the lower computer, the main control and the area controller use the STM32 microcontroller as the controller. STM32 MCU is a 32-bit microcontroller designed by ST Company based on ARM Cortex-M3 core. It is designed for high performance, low cost and low power embedded systems.

First, the main controller completes the initialization of the system. When receiving the data request sent by the host computer, a timer is started to limit the timeout period for receiving data. Then, the received packet is checked to determine whether the received packet is correct. If it is correct, the packet is parsed. The message is divided into a query message and a control message. If it is a control message, the main controller broadcasts a control message to each area controller; if it is a query message, it sends a query message to each area controller in turn. And a timer is started to determine whether the returned message is received at the specified time. If the received message is not received or received, the timer is turned off and the parameter to be collected by the area controller is set to 0xff, used to indicate that the timeout or the collected parameters are incorrect; if the correct message is received, the timer is turned off. If the packets of all areas are processed, the packets of all area controllers are finally packaged and sent to the host computer according to the customized communication protocol.

The centralized monitoring and early warning management software platform can be dynamically reorganized and expanded without affecting normal operation. The software platform adopts the international standard XML language, and through the stable data communication gateway, it can organically combine various systems such as access control, air conditioning, UPS power supply, communication power supply, fire protection system, video monitoring system, communication equipment management system and application system. In the process of using the system after the completion of the system, if a new system needs to be added, the integrated system can increase the integration function of the system without major changes, and truly integrate seamlessly. At the same time, the system platform with integrated development environment can ensure the openness of the system and truly meet the ever-changing needs of users, so that the maintenance cost of the system can be minimized.

When there is a problem in the operation of the equipment room, an alarm will occur and the event will be recorded for later inquiry. The alarm modes mainly include: on-screen display alarm, local sound and light alarm, intelligent voice telephone alarm, Email alarm and mobile SMS alarm. The system has a historical alarm record function. The database can store historical alarm records for a long time. It can retain the key parameters of the computer room for a long time, and perform some statistical analysis by querying and viewing the historical trend graph.

The data report is a comprehensive record and regular summary of the status of the system monitoring object during the monitoring of the equipment room. Generally, there are real-time data reports and historical data reports. Through the filter options of the report, the user can easily query

according to the predefined restrictions. The restrictions include the time period, the alarm location, and the alarm type. The system can collect statistics on failure rate and average obstacle history in different time periods and regions. The results of the query statistics can automatically form reports to be output through the printer.

2.2 Research Status of Computer Room Environmental Monitoring System.

With the continuous development of information technology, the scale of social computer room construction continues to expand, the types and quantity of equipment monitoring system equipment continue to increase, and higher requirements are imposed on the computer room environmental monitoring system and technology in terms of cost, environmental protection and energy conservation. To meet real-time, comprehensive, and stable requirements, to better understand the changes in the computer room environment. Any external factors may affect the stability and security of the equipment monitoring system, such as data security of threat monitoring systems, information storage and applications, etc. If the system failures are not handled in time, it will cause huge economic losses to the enterprise. At present, the financial, government, securities, consulting, and security fields have generated huge data and information application requirements, which put higher demands on the management of the computer room. In the event of system failures and anomalies, an unpredictable loss will result. In order to ensure the safe and stable operation environment of the equipment room, it is necessary to monitor and analyze the main influencing factors of the equipment room environment, and flexibly formulate countermeasures based on the monitoring and analysis results to minimize the system failure loss. There are also large differences in the enterprise information construction plans of different industries. Therefore, there are certain differences in the functional requirements of the computer room monitoring system. For some enterprises that have established the computer room monitoring system earlier, they mainly adopt the manual duty management mode. . However, with the continuous advancement and development of information technology, the types and quantity of equipment room equipment are increasing, and the manual computer room management mode can no longer meet the requirements of modern computer room management, resulting in high risk of equipment room failure. With the rapid advancement and popularity of information technology, more and more enterprises are beginning to build their own data centers and independent computer rooms. From the current state of construction and application of the enterprise computer room monitoring system, the computer room monitoring system mainly monitors the operation of the equipment room by monitoring environmental parameters, such as extracting temperature, humidity, safety system stability and other parameters to analyze the environmental safety of the equipment room to ensure enterprise information. The system runs safely and stably. However, most computer room environmental monitoring systems lack sufficient monitoring of the computer system itself, such as software and hardware working conditions, and there are large monitoring vulnerabilities. If there is a fault inside the information system, it can be eliminated through after-the-fact inspection. It is impossible to issue an alarm message when the fault occurs, which is likely to cause large economic losses. In addition, the current enterprise computer room environmental monitoring system cannot achieve comprehensive monitoring coverage, most of which belong to local or stratified monitoring systems, such as focusing on parameter monitoring of temperature, humidity or smoke, monitoring data is separately extracted and analyzed, and different monitoring cannot be performed. The parameters are integrated for comprehensive analysis and processing. In addition, the alarm function is relatively weak, mainly based on sound and light signals, and managers need to go to the scene to check for hidden troubles, and cannot provide detailed alarm information in the first time, which is not conducive to timely elimination of system failure.

From the point of view of the Internet of Things function setting, it mainly establishes information connection between people and things, people and people, and things and realizes information interaction and comprehensive application. Therefore, the Internet of Things is mainly composed of a sensing layer, a network layer, and an application/middleware layer. The sensing layer is mainly responsible for object information collection, identification and transmission. The network layer is mainly responsible for information interaction and internal communication, and the network layer

mainly uses wired and wireless communication technologies to establish communication links. The application/middleware layer is mainly responsible for connecting data communication between the network layer and the Internet of Things, such as business requirement analysis, business data sharing, intelligent analysis, etc., mainly as business information systems, communication systems, intelligent systems, management systems, and Backstage support system, etc. The application layer mainly provides various functional support while such as data acquisition, real-time monitoring, intelligent modules, production control, green energy conservation, green office, and security management. From a theoretical perspective, the Internet mainly realizes the communication relationship between people, while the Internet of Things expands the communication service to a wider field, that is, on the basis of human-to-human communication, it expands to people and things, and Communication on the object. Many times, IoT facilities are connected to the Internet. However, from the perspective of functional applications, the Internet of Things has a wider application space than the Internet. People use the Internet of Things to establish closer communication with the object, conduct more in-depth exploration of the objective world, strengthen the transformation and control of the external environment, and continuously promote the development of history. The Internet of Things and the ubiquitous network correspond to different needs and concepts, but they are sublimation and optimization based on human-to-human communication. Through the establishment of communication relations between people and things, things and things, people's understanding is constantly improved as level and the ability to transform the objective world. Since the Internet of Things is sublimated and upgraded on the basis of the Internet, it pays more attention to communication and communication with the physical world. Therefore, the Internet of Things is an important link to the ubiquitous network.

2.3 Data Acquisition Device.

After installing the operating system on the computer, establish communication with the service application and database, run the monitoring system on the computer, and coordinate the operation and interaction of various information within the systems. The computer establishes contact with each application module and provides automatic warning for system administrators. It can meet the all-weather monitoring needs of computer room environment monitoring system, and can operate normally under the windows environment, and can be combined with RS232. Various models such as USB and 10/100Mbps are compatible. Therefore, the equipment environment monitoring system decided to use the industrial computer as a hardware component.

Other devices used in the monitoring system, such as smoke sensors, magnetic sensors, and water leakage monitoring sensors, have a high level of automation. ZigBee communicates wirelessly with the IO interface to support real-time data transmission. These three sensors are also called non-intelligent sensors. The data type processed by the non-intelligent sensor is the switch vector. ZigBee can monitor the working parameters by monitoring the current of the IO port. ZigBee knows the sensor working state and ZigBee connection status when scanning the IO port. If the connection is disconnected, an alarm message will be sent immediately.

3. Conclusion

With the rapid development of informatization, the communication computer room has become an indispensable and important part of all major units, playing a vital role in daily production and management, and the operational safety of the computer room will also receive widespread attention. Based on the actual situation of the computer room security, based on the experience of several engineering projects, this paper designs the software and hardware implementation plan of the computer room environment monitoring and alarm system. The design fully considers the system's effectiveness, real-time, reliability and also the scalability. The implementation of a news unit communication room shows that the design fully meets the requirements of the computer room security monitoring and alarm.

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