Visualization system of power communication room based on Internet of Things

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Abstract. With the rapid development of Internet of Things (IoT) technology and power communication technology, the operational stability of the communication room has become an important factor for the safe and stable operation of power communication equipment. Realizing the real-time monitoring and unified management of the power and environment of the computer room is of great significance to ensuring the stable and reliable operation of the communication equipment in the computer room. In view of this, this paper proposes to use the IoT technology to design a set of visual data system and display system interface. The commissioning and operation of the system show that the system can realize real-time monitoring and centralized management, which is of great significance to the safe and stable operation of the converter station.

1. Introduction

At present, most of the power communication room management mode is still manual management. Although power grid companies have invested a lot of money in unattended management in recent years, the communication room is unable to effectively manage the resources of the power communication room due to the complexity, variety and different interfaces of the equipment [1-2]. This requires a centralized monitoring system which can monitor the running condition of the power communication equipment, the power of the machine room and the operating parameters of the environment in real time, so as to ensure the safe and stable operation of the power communication machine room.

IoT technology has been widely used in smart city, intelligent transportation and other fields. Literature [3] designed a physiological information management system for seafarers based on IoT technology, and established a physiological information database for seafarers, which improved the management level and efficiency. Literature [4] uses ZigBee network communication technology in the advanced IoT technology to design an electricity safety monitoring system for socket group in student dormitory to realize timely alarm and circuit cutting of electricity fault and reduce hidden trouble of electricity fault. Literature [5] uses RFID, sensors and other IoT technologies to study a set of power communication equipment management system scheme in line with the characteristics of power communication room. To sum up, it can be seen that the use of advanced IoT technology can effectively improve the management level and intelligent level of each system.

In order to improve the management ability of the data and information of the power communication room, a set of visualization system for the power communication room based on the IoT is designed to realize the real-time monitoring and centralized management of the converter station information. This article shows the overall design architecture of the visualization system of the power communication...
room based on the IoT, and the designed visualization interface. This design is applied to the converter station, which is of great significance to guarantee the safe and stable operation of the converter station.

2. Overall architecture design

The IoT can realize the connection between anything and anyone anytime, anywhere, and ideally can provide any path or any service under the network [6]. Usually the IoT architecture is shown in Figure 1. The perception layer is to perceive various devices and the environment of the power grid through IoT devices such as sensors and terminals; the communication layer is a communication technology that realizes common IoT applications and information exchange between various heterogeneous devices; the processing layer is processing equipment And combine them to reflect more information; the application layer is a large number of related application products developed by relying on IoT related technologies, such as intelligent transportation and smart home.

![Figure 1 Architecture of IoT](image)

In the context of the construction of the power IoT, the use of IoT technology and 5G communication technology to build a management system. Among them, the perception layer is to perceive all links in the communication room station through intelligent inspection equipment, online monitoring devices and new IoT devices. The network layer comprehensively adopts 5G+LoRa+5.8 GHz technology [7] broadband and narrowband hybrid networking to expand and transform the OTN large-capacity backbone transmission network and data communication network of Siping Station, and finally realize the whole station's 5G, LoRa and 5.8 GHz three The indoor and outdoor full coverage of a wireless terminal access method provides terminal wireless access channels for the Siping station online monitoring system, intelligent management and control system and other intelligent monitoring and monitoring systems, and solves the problem of safe and reliable access to high-bandwidth and large-connection services and various types of The last 1 km communication needs of the intelligent sensing service. Among them, 5G can realize applications such as smart grid end-to-end slicing, power edge computing, drones, robot intelligent inspections; LoRa technology can be used in a variety of network environments, and is suitable for large-scale use scenarios with small data volumes, such as environments Monitoring, electrical monitoring, cargo management, personnel positioning; 5.8 GHz wireless private network realizes wireless high-definition video monitoring, inspection robot applications, mobile office, remote dispatching, emergency communication and other business applications within the coverage. The platform layer is to build a smart IoT management platform to realize the management and processing of various data. The application layer uses the data of the platform layer to realize intelligent applications, such as intelligent linkage of main and auxiliary equipment, active management of fire hazards, intelligent diagnosis of faults and defects, man-machine self-service inspection, intelligent management and control of mobile operations, real-time interaction of command and decision-making, and converter station management and control Panoramic visualization, to achieve a highly intelligent power communication room.
3. Visual data system design
The visual system of power communication room based on IoT technology integrates IoT technology, intelligent control technology and communication network technology. The whole system is composed of intelligent monitoring equipment, IoT cloud server and communication network. Intelligent monitoring equipment includes various monitoring equipment, acquisition cards, sensors, transmitters and field bus, to perceive the scene. The cloud server of the IoT provides flexible real-time data access mode and real-time push of status monitoring and alarm information. The intelligent terminal collects the data to the data processing center for processing, and the processed data is provided to users through the communication network for access. 5G+Lora+5.8 GHz technology wide and narrow band hybrid networking, WiFi and 3G/4G network constitute the ubiquitous, ready to access network system. Users can realize the control and interaction of the overall architecture through the operation of real-time monitoring, alarm display and processing, parameter setting, data management and other operations of the intelligent terminal equipment, which makes the detection system and management system more intuitive and convenient.

3.1. Visualize the main data interface
The monitoring and operation of the traditional power communication room are scattered, which brings inconvenience to the management. This design uses the IoT technology to realize centralized monitoring and unified management. The system can display the real-time monitoring status of line topology, business channel diagram, cabinet details and battery data.

3.2. The alarm information
As shown in Figure 2, the system divides the alarm messages into three categories according to the severity of the alarm messages, namely, the emergency alarm, the main alarm and the secondary alarm. According to the seriousness of the alarm information, make different processing schemes. When the monitoring object has an alarm, the system will record the alarm record and display it in the system, and the detailed situation of the fault is more intuitive. According to the alarm information of the system, the operation and maintenance personnel can find the cause of the fault and troubleshoot the fault more quickly and accurately.

Figure 2 Alarm information interface

4. Conclusion
The operation of equipment in the power communication room provides a reliable environment to ensure the safe and stable operation of important equipment in the power communication room, reduce the workload of maintenance personnel, quickly locate equipment faults, and improve the efficiency of operation and maintenance. Using advanced IoT technology and 5G communication technology, a set of visualization data system designed to realize the centralized display of power communication room data, and highly visualization. This system greatly improves the centralized management of the power
communication machine room, provides convenience for the on-site work of operation, maintenance and maintenance personnel, and also provides guarantee for the safe and stable operation of the converter station.

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