Characteristics and Development Prospect of Computer Automatic Patrol Inspection Technology

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Abstract. Due to the continuous progress of science and technology and the continuous development of economy, the traditional information system automation platform can no longer meet the requirements of the current reality. Therefore, it is urgent to design a new type of operation and maintenance automation platform. Starting from the demand of power grid enterprises, this paper introduces the operation and maintenance automation platform system, puts forward the design idea, technical means and system design framework.

1. Introduction
Information system is already an indispensable part of national network enterprises. Operation and maintenance automation of power grid information system is to use advanced and intelligent information system to maintain work automation, which is jumbled and periodic.

At present, the state grid corporation's information system operation and maintenance automation mode is still in a semi-automatic state, and the operation and maintenance work is still to wait until the information system fails before the operation and maintenance personnel take corresponding measures to remedy [1]. The quality and cost of investment cannot achieve the expected results, mainly reflected in the unscientific management mode, the low efficiency of passive operation and maintenance, and the lack of efficient operation and maintenance technology tools.

2. Computer Automatic Patrol Inspection Target

2.1. Comprehensive automatic inspection
To achieve comprehensive monitoring of the basic environment equipment, network equipment, host equipment, database and middleware system of the computer room to form a complete real-time monitoring system. Automatic collection of various monitoring indicators, timely detection of system defects and faults, to provide a unified working platform for different roles of operation and maintenance personnel. Modern means of quantitative and dynamic management are applied to patrol inspection of various operating equipment to promote scientific management of information system operation and maintenance [2], as shown in Figure 1.
2.2. Comprehensive analysis

(1) On the basis of comprehensive monitoring, an information construction and operation and maintenance of information technology management display window will be set up to effectively organize all management objects from the overall business perspective. Possible problems in each operation and maintenance link will be discovered in time, quickly located and potential risks discovered in advance.

(2) It provides the operation status display of various business systems, so that the operation and maintenance personnel and management personnel can understand the system operation dynamics through these data, and improve the system's data division and provide effective data support for information construction planning by establishing a scientific data analysis model.

(3) The daily management of the operation and maintenance department is the main line, and the completion of the inspection work is managed according to the data recorded in the inspection unit, realizing the informationization of the daily operation and maintenance management, strengthening the scientific and institutionalization of the operation and maintenance management of the information system, and improving Overall management level [3].

2.3. Achieve goals

![Figure 2. Overall inspection structure.](image-url)
The overall architecture of the information system automated inspection platform is shown in Figure 2.

1. The highly integrated and easily extensible automatic inspection platform for standardized information systems can automatically collect and analyze operation and maintenance data of various software and hardware equipment to form electronic inspection records, thus effectively improving the comprehensive operation quality of information systems.

2. The technical methods and means used for the normal operation of information systems involve operating systems, clusters, networks, backups, middleware, databases, application systems, monitoring and other related information technologies [4]. The standards for equipment status information collection need to include the objectives, scope, principles, and content of information collection, and clarify the basic elements of information equipment status parameters [5-6].

3. Through the information system automatic inspection platform, various related functions can be integrated on a display platform, so that the modules of the information system automatic inspection platform are clear and hierarchical. Each module is independent of and interrelated with each other. It can realize centralized monitoring and management of managed equipment and display users through Web.

3. Characteristics and Present Situation of Computer Automatic Patrol Inspection Technology

In the initial stage, IT infrastructure is usually in a small state. The scale of a few to dozens of machines is sufficient to meet business needs. Many companies do not necessarily have special operation and maintenance personnel or departments. While business developers complete their own business work, they also complete the equipment responsible for managing related businesses. With the advent of the cloud era, it infrastructure has rapidly developed into hundreds of thousands of servers. More business systems are online, and business personnel have no time to take into account the operation and maintenance work. At this time, the operation and maintenance personnel began to be specialized and independent. Various island operation and maintenance management tools are online to improve operation and maintenance efficiency, as shown in Figure 3.
However, after all kinds of operation and maintenance tools were put on line, it was found that operation and maintenance personnel still often had to act as "firefighters" to receive warnings, repair machines and go where there was downtime. Although there are operation and maintenance management tools to automatically collect monitoring data, there are still many problems, so that the operation and maintenance of underlying physical resources cannot be fully automated.

3.1. The Inevitable Manual Inspection
As shown in fig. 4, the operation and maintenance monitoring mode currently selected by most customers is to install Agent access equipment on the operating system to read hardware status data and business operation data. For all kinds of application hosts, databases and middleware servers of patrol inspection objects, index data extraction is implemented by SNMP, SSH and other protocols at the data extraction level. It needs to be configured for different manufacturers' equipment and different types of equipment to ensure that the inspection object matches the protocol index password. All data fetches for monitoring status are limited by the driver. The key point of the driver writer is the normal operation of the device, not the status monitoring of the device. Therefore, the hardware state parameters captured by the driver are always limited. This can also explain why many customers need manual inspection after they have launched the operation and maintenance monitoring software.

After the director or full-time staff has formulated the inspection plan, full-time staff shall formulate the inspection task according to the inspection plan, specify the frequency of the task (weekly inspection, daily inspection, monthly inspection and special inspection) when formulating the inspection task, specify the executor of the task (inspection personnel), and the inspection personnel shall perform the inspection task and be responsible for examining and approving the inspection task. The director, team leader and full-time staff are responsible for random inspection of these inspection tasks and multidimensional analysis and inquiry. The inspection process also requires a lot of people and working days, as shown in Figure 5.

**Figure 4.** Automatic inspection technology.
3.2. *Out-of-band solution to difficulties inside the band*

From a professional point of view, network management can be divided into out-of-band management and in-band management. In the general system, that is, the customer’s production environment to grab data, through the production network to read monitoring data belongs to in-band management. The biggest problem of this management mode is that when the system fails, the machine cannot be managed. And as mentioned above, the monitoring data obtained is limited. Almost all equipment manufacturers provide customers with out of band management interface, which is isolated from the production system. Under the management interface, the device manufacturer itself provides detailed hardware parameters. These hardware parameters come directly from more than a hundred sensors on the server, and state parameters obtained directly from the hardware level. The data is more detailed, comprehensive and intuitive.

![Diagram of network management process](image)

**Figure 5.** Multi-dimensional.

![Diagram of in-band and out-of-band monitoring](image)

**Figure 6.** Out-of-band and in-band monitoring
The out-of-band monitoring monitors the status of the server through the sensor, just like installing hundreds of cameras on the device, and constantly monitoring the running status of the device. Redundant power supply is offline, any memory capacity, memory frequency, memory slot information, HBA card slot information, etc. on the machine. Information that cannot be captured by these in-band software can be obtained through out-of-band monitoring.

3.3. Log analysis

Logs are a very broad concept in computer systems. Operating system kernel, various application servers and other programs may output logs. The content, scale and purpose of the logs are also different, so it is difficult to generalize. Logs in the log analysis method discussed in this paper refer to application logs and business logs. The inspection technology mentioned above can already perform inspection and monitoring on the operation status of the system level and the corresponding level, but it is difficult to make quick positioning or slightly complicated analysis on the operation status of the business, reflecting the problem of low utilization rate of logs. It is often that the customer has had a bad experience, and the operation and maintenance personnel are still manually troubleshooting the problem.

The log contains a lot of information that people are interested in. In the simplest way, we can get the PV value (page view, page access), independent IP number (i.e. the number of IP after deduplication), call chain, etc. of each page of the website. Slightly more complex, you can calculate the keyword ranking that users retrieve, the page with the highest user stay time, etc. More complicated, build ad click models, analyze user behavior characteristics, etc. Since these data are so useful, of course they should be analyzed. Whether it is a local analysis tool or an online analysis service, although they provide rich statistical analysis functions and can be configured to a certain extent, they are still limited. To analyze the slightly complex points, or to do log based data mining, you still need to complete it by yourself. In addition, most of the log analysis tools can only be used on a single machine, and the data volume is a little large.

4. Summary

With the rapid development of smart grid and the continuous innovation of information and communication technology, the requirements of power operation and maintenance of information technology are getting higher and higher. How to ensure the safe and stable operation of the information system and to discover and eliminate the hidden dangers of the information system in time is a great challenge to the information system operation and maintenance personnel of power enterprises. In order to realize the real automatic inspection, it is necessary to combine the existing advantage technology, multi-dimensional comprehensive analysis, comprehensive in band and out of band monitoring, log analysis, big data, AI technology, etc., and turn all the input into the final inspection goal. So as to improve the operation and maintenance efficiency and simplify the repeated work of operation and maintenance personnel.

Based on multi-dimensional monitoring data, the basic environment of the computer room is transparent, information network equipment is centrally managed and faults are automatically alerted. Based on the analysis of operation data, application data, business data and logs in combination with various platforms, the alarm will be converted into early warning, and manual processing will be converted into automatic alarm recovery. Based on past experience, the operation and maintenance knowledge base is generated to make the whole system run more stably.

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