Construction of industrial operation and maintenance network based on cloud computing

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Abstract: The construction of industrial operation and maintenance network based on cloud computing has become a key means to realize intelligent manufacturing. This paper helps to improve the later operation efficiency of industrial system by studying the synergistic relationship between cloud computing and industrial operation and maintenance. This paper studies the construction mode of industrial operation and maintenance network based on cloud computing, discusses the construction mode and key points of industrial operation and maintenance network object layer, edge layer, transmission layer and cloud, and proves that industrial operation and maintenance network through cloud computing can effectively improve its own manufacturing level and management quality. In the construction of industrial operation and maintenance network, the effective application of cloud computing can effectively improve the level of diagnosis and monitoring.

Key words: cloud computing; Industrial operation and maintenance network; Remote operation and maintenance technology

Introduction: After the completion of the construction of the industrial system, due to the need to use for a long time caused by wear, automated operation and maintenance technology is weak, in the use of the process of failure will cause greater losses. Through cloud computing, industrial operation and maintenance network construction, the use of remote operation and maintenance technology can maximize the effective operation of industrial systems. In the construction of industrial operation and maintenance network, the effective application of cloud computing can effectively broaden its application scope, and promote its diagnosis and monitoring level to reach a higher level. Generally speaking, the construction of industrial operation and maintenance network based on cloud computing will be an important trend of the future development of remote operation and maintenance technology.

1. Overview of cloud computing and remote operation and maintenance technology

1. Cloud Computing

Cloud computing is a new technology product, in which traditional network technologies include utility computing, network storage technology, distributed computing, load balancing and grid computing and so on. The reason for the application of cloud computing is that it wants to integrate several different computing objectives and entities based on the network system, so that it can become a system with sound, powerful and comprehensive computing power. The development of cloud computing is based on the necessary premise of the Internet, which can expand the scope of delivery through the network when delivering content, but also to achieve high-speed delivery. In the new era, the scale of network users shows a trend of continuous expansion, resulting in more abundant data content, and then promote the overall expansion of the network system, in order to effectively meet the user's network system operation requirements, it is necessary to transform the transmission path. Under the background of the increasing network traffic, the work of maintaining the network system will face greater pressure, not only that, due to the lack of network operation and maintenance support equipment, the support ability of the system gradually tends to be fragile. Based on the current environment of rapid development of science and technology, network information system has been moving from the past core specialty to the direction of data specialty. However, network operation and maintenance has shown a more obvious centralized characteristics, which will greatly reduce the number of operation and maintenance equipment, thus weakening the actual maintenance effect. As far as the current situation is concerned, the pressure on network maintenance is still showing a rising trend. In order to improve the security and stability of network system operation, network operation and maintenance has become an important way for most enterprises to improve the quality of their own development. At present, China's operation and maintenance network construction level according to the regional distribution shows a more obvious difference, the economically developed areas are much higher than the economically underdeveloped areas, and this high level is difficult to effectively transfer to the underdeveloped areas, China's operation and maintenance network construction still has a long way to go.

2. Remote operation and maintenance technology

Since the birth of the concept of intelligent manufacturing, operation and maintenance technology has ushered in its own development opportunities, from the previous monitoring of field status and fault diagnosis to network-based condition monitoring and fault diagnosis, and now has changed to cloud computing and big data based remote operation and maintenance. On the basis of operation and maintenance technology, has formed a set of a variety of functions as one of the system, the system contains the basic functions involved in the management of equipment spare parts, predictive maintenance, fault diagnosis and condition monitoring and so on.

2. The construction of industrial operation and maintenance network based on cloud computing

1. Construction of object layer of industrial operation and maintenance network

In the industrial operation and maintenance network, the object layer is at its bottom, is the main source of remote industrial operation and maintenance network data, relying on sensors to monitor the status of the equipment itself as the monitoring object can collect

parameters, and these data can be uploaded to the upper level in real time. For the remote industrial operation and maintenance network, the object layer belongs to its basic components, and undertakes the status monitoring responsibility in the operation and maintenance network. The construction of industrial operation and maintenance network takes condition monitoring as an important basis. If it is difficult to effectively collect the relevant parameters, the remote industrial operation and maintenance network will not be able to effectively play its own functions. Under normal circumstances, there are obvious diversity and complexity in the industrial site itself, and there are also significant differences in the factors that need to be considered in the construction of object layer in different industries in the industrial field. In this paper, when studying the construction of industrial operation and maintenance network based on cloud computing, three different industries such as large-scale high-end heavy equipment, CNC machine tools and electronics industry are taken as cases, as follows.

(1) Large high-end heavy equipment

The actual environment of the manufacturing site of large high-end heavy equipment is usually harsh, and there is no good network infrastructure. Each equipment needs to collect more parameters, and some core equipment works more frequently during data and parameter collection. Therefore, when building an industrial operation and maintenance network suitable for this environment, the construction of the object layer should focus on how to ensure that the collected equipment status data can be transmitted effectively and in real time, and explore the transmission of sufficient data to the upper layer under the condition of network conditions.

(2) Numerical control machine tool

At this stage, the development level of the industrial operation and maintenance network for the industrial scene of CNC machine tools has reached a higher level, each independent CNC machine tools are equipped with standardized and standardized communication interfaces, and most CNC machine tools have corresponding fault diagnosis capabilities and status monitoring functions. In the case of CNC machine tools in the production workshop, the internal environment is often better than other industries, and the parameters generated when carrying out status monitoring for CNC machine tools are relatively fixed. However, because there are many manufacturers of CNC machine tools on the market, there are big differences in the communication protocol equipped with CNC machine tools themselves, and the signals generated by different models of CNC machine tools are not the same when describing the same kind of failure. Therefore, in this case, the object layer of industrial operation and maintenance network should pay attention to the way of networking during construction. At the same time, study how to accurately identify the monitoring information of each CNC machine tool.

(3) Electronic industry

The electronics industry is one of the more important industries in the industrial field, and the on-site environment is also relatively harsh when carrying out production activities, not only that, in order to meet the corresponding production needs, there are often a variety of equipment on the production site. In this kind of industrial scene, the generated data itself has the characteristics of complex types, faster generation speed and huge scale. The data comes from a number of different equipment, such as reducers, exhaust fans, blast furnaces, pumps and fans, etc., and the generated data types also show diverse characteristics, including not only electrical signals, but also some audio and even video signals. In addition, because the production site environment of the electronics industry is more complex, and there is also a large noise during production, so in the application of the industrial Internet, the determination of the status monitoring position and the choice of sensor type should be more fully considered. Generally speaking, the content of the object layer in the electronics industry during the construction period basically includes how to provide support for the collection of data of various types of equipment in the production site and the heterogeneous data of the industrial system, the determination of the status monitoring location, the selection of sensing equipment and the definition of the network structure.

2. Construction of the edge layer of the industrial operation and maintenance network

In the industrial operation and maintenance network, the responsibility of the edge layer is to effectively connect the upper cloud with the industrial site. Its functions involve collecting, caching, cleaning and processing various data, and also include protocol adaptation and equipment access. In most industrial scenarios, the setting of the edge layer is essential, because although the cloud can realize the functions of the edge layer, compared with the latter, the cloud itself has weak real-time performance, high dependence on the network environment, and more funds need to be invested during network transmission. Taking the industrial application scenario of the electronics industry as an example, it has been mentioned above that in such industrial scenarios, the generated data itself has the characteristics of complex types, fast generation speed and huge scale. Therefore, it is difficult to directly transport these data to the cloud level. Based on this, when constructing the edge layer of industrial operation and maintenance network, This level can be divided into four different aspects: first, in the field of equipment, the role of this aspect is mainly to perceive and process information; Second, the network field, the function of this field is to transform the heterogeneous protocols existing in industrial application scenarios, such as TC/IP, RS-485 and so on; Third, the data field, the function of this field is to clean all the data, so as to effectively relieve the pressure of data transmission; Fourth, the application field, the function of this field is to adjust the production capacity and quickly dispose.

3. Construction of transmission layer of industrial operation and maintenance network

For industrial operation and maintenance network, the main role of the transport layer is to connect the cloud and the factory, and upload the data generated by the factory to the cloud with the help of private networks, mobile networks or the Internet. In the process of building an industrial operations network, the selection of the network transport layer should be based on the specific situation to determine the appropriate network form. In our country, for the network transmission rate, security and quality and other content have established a relatively sound industry standards and national standards, coupled with the domestic four network operators are the main body to provide network services, so some industrial enterprises in the operation period often do not pay enough attention to network security, which is

worth supplementing and improving in the future industrial operation and maintenance network construction.

4. The construction of industrial operation and maintenance network cloud

In the remote industrial operation and maintenance network architecture, the cloud is at the top position, and its responsibility is to process the data contained in the entire system. The cloud can analyze all the data, and on this basis complete the establishment of life prediction model and fault model, so that these models can be used for predictive maintenance and fault diagnosis. The cloud integrates various functions such as the management of equipment spare parts, predictive maintenance, fault diagnosis and condition monitoring through the means of the platform, and displays visual results to users. Users can access the cloud platform with the help of intelligent mobile terminals to inquire what they need. In the future development, the remote operation and maintenance mode based on cloud computing will become the inevitable trend of development. As we all know, cloud computing itself has a strong computing power, can be generated in the industrial field of huge data processing, not only that, the cloud contains data from a number of different levels, the amount of data is more sufficient, so the generated prediction results and diagnostic results are more accurate. Not only that, the versatility and flexibility of the industrial operation and maintenance network based on cloud computing are also stronger.

Summary: In summary, in the context of the continuous promotion of China's intelligent manufacturing strategy, it is foreseeable that cloud-based remote operation and maintenance technology will be an important direction of the subsequent development of operation and maintenance technology. In comparison with the current remote operation and maintenance technology, it can be found that the applicability of cloud-based remote operation and maintenance is more obvious, and it has more powerful diagnosis and prediction ability and computing power. However, it is worth noting that if you want to fully apply cloud computing and remote operation and maintenance technology to industrial scenarios and establish a remote industrial Internet based on cloud computing, you still face a lot of work, including improving the platform's own capabilities, transforming the existing industrial environment and so on. After the existing problems are effectively solved, the industrial operation and maintenance network will become an essential key component of the overall technology of intelligent manufacturing.

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