Research on Smart Grid Data Layout Strategy Based on Cloud Computing

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Abstract. This paper first analyzes the experimental conditions of smart grid data layout based on cloud computing. Then the specific experimental content is analyzed, mainly including global layout and dynamic layout. Finally, taking performance and load balance degree as breakthrough points, the advantages and disadvantages of different layout schemes are analyzed. The purpose is to give a reference to the related personnel so that they can master reasonable data layout strategy and realize reasonable application of cloud computing technology.

1. Preface.
In the process of power system operation, communication is mainly adopted to realize interconnection and improve the coordination of power grid operation. While provincial power dispatch centers will systematically and reasonably manage and maintain power grid parameters. Therefore, it is necessary to build a more perfect power system model on the basis of cloud computing, to improve the simplification of models between adjacent power grids, and to complete computer emulation, so as to provide the basis for realizing power marketing, power protection, power monitoring and power dispatching.

2. Experimental Conditions for Smart Grid Data Layout Based on Cloud Computing
In the research of this paper, the strategy of data distribution in smart grid is mainly explored through experiments. In this process, a large amount of data will be modeled, analyzed, and then tested by examples. Among them, the parameters involved in this paper mainly include the following eight aspects: (1) Parameter 1, which is the number of data centers; (2) Parameter 2, which is the capacity of the data center; (3) Parameter 3, which is the number of data sets; (4) Parameter 4, which is the minimum number of input data sets for different tasks; (5) Parameter 5, which indicates the maximum number of input episodes in each task; (6) Parameter 6, which indicates the maximum number of times in different data sets that can be used; (7) Parameter 7, which indicates the upper bound of the data set itself; (8) Parameter 8, which indicates the number of test cases generated [1].

Based on the above parameters, the global layout strategy and dynamic layout strategy can be analyzed by genetic algorithm, and the final results are compared. Specifically, the experimental steps taken are as follows: (1) Initialize CloudSim packets so that their parameters can be materialized. (2) Building a data center, including building a host list, PE list, host parameter configuration, etc. (3) Create data center agents. (4) Complete the creation of the virtual machine and set the parameters,
including memory, CPU number, MIPS, ID, scheduling policy, virtual machine, monitor, external storage, broadband, etc. (5) To create a cloud task, it is mainly to set its parameters and determine the task quantity. (6) Clear invocation strategy. (7) Start the emulation mode. (8) Statistical emulation results.

3. Specific Content of Smart Grid Data Layout Based on Cloud Computing

3.1. The global layout

In the process of experimental analysis of global layout strategy, it can be compared with clustering layout and random layout. Therefore, the analysis needs to be completed from two levels, and any parameter must remain unchanged. If the parameters need to be adjusted, the results should be compared systematically. Among them, in the first case, parameter 8 is added while parameter 1 remains unchanged, and then the data-intensive of the process is checked to analyze the changes in time consumption, the number of transmission, etc. The second case is to keep the parameter 8 unchanged and expand the parameter 1 to compare the final experimental results.

Combined with the final experiment, it can be found that if the data set is increased in the process of this experiment, the solution results of the above three schemes will show the characteristics of increasing time consumption. However, the overall efficiency of the global layout scheme is significantly higher than that of random layout and cluster layout. In addition, if the data sets are equal, the global layout scheme is the best in terms of time consumption [2].

In addition, if the data set is in a gradually increasing condition during the experiment, the final calculation result will indicate that the number of transmissions will also increase. The most obvious is that the random scheme is the worst. However, between the clustering strategy and the global strategy, they can achieve the same degree of data sets and the same number of transmission in the process of crossing. In other words, the latter two schemes have good effect in data transmission. However, after the intersection, if the data set continues to increase, the opposite result will appear.

In general, it can be found through experimental comparison that in the data distribution of smart grid, the global strategy can effectively control the problem of time consumption. At the same time, in the process of carrying out the experiment, it will show its advantages with the increasing number of data transmissions. Therefore, it is necessary to apply the global layout strategy in this process to ensure that the data can be fully used and to provide guarantee for the stable operation of the power system.

3.2. Dynamic layout

In the process of experimental analysis of dynamic layout, it is also necessary to compare it with random layout and cluster layout. In addition, two different situations need to be analyzed: the first case is that parameter 1 is unchanged and parameter 8 is added. In this process, observe the differences in the number of transmission and time consumption during the execution of data intensive applications. The second case is to keep parameter 8 unchanged, expand the number of parameter 1, and then compare and analyze the final experimental results [3].

Therefrom, it can be found that if the data set is increased during the experiment, the final solution of the above three schemes will all show the characteristic of increasing time consumption, but the dynamic layout strategy is relatively high in efficiency and less in time consumption. At the same time, if the data set is gradually increasing, the above three schemes will show the trend of increasing the number of transmission, but the most obvious is that the random scheme has the worst result. However, there is a cross phenomenon between clustering strategy and dynamic strategy. In other words, if the size of the data set reaches a certain standard, the number of transmission of the two data sets is the same. And before reaching the intersection, the transmission efficiency of the dynamic strategy is obviously better than that of the clustering strategy. After crossing, the situation will be opposite, but the gap is not obvious.
In the process of this experiment, if the number of data centers is increased, the final three schemes all show the result of increased the number of transmission, but the change trend is smaller. According to the experimental results, it can be clearly found that the random scheme has the worst effect. However, the dynamic strategy and clustering strategy mentioned in this paper also have intersection. Before the number reaches the intersection point, the number of transmission is better for the dynamic scheme, and then the opposite is the case. In general, in the process of smart grid data layout, dynamic strategy can be used to complete data layout and solution, to control the time consumption problem, and to effectively improve the efficiency of data transmission. Only in this way can the final effect be ensured to meet the requirements of power system operation.

4. Comparison of Data Layout Methods of Smart Grid Based on Cloud Computing

Through the above experimental comparison, it can be found that there are certain differences between different data layout strategies, mainly in the aspects of time control, the number of transmission, etc. Therefore, in order to give full play to the role of cloud computing and ensure the stable operation of smart grid, it is necessary to reasonably select the data layout mode in combination with the actual situation. Under this premise, the stability of power grid operation can be improved, help and support can be provided for the effective dispatching of power resources, and the related demands of power users in electricity utilization can be met. Therefore, it is necessary to clarify the similarities and differences between the global layout scheme and the dynamic layout scheme. In this regard, the author, based on his own working experience, compares the layout of smart grid in detail from two aspects of performance and load balance.

4.1. The layout scheme performance comparison

First, if the operation of smart grid is relatively stable, in the process of data-intensive application, the global layout scheme and dynamic layout scheme can be experimentally analyzed. In this process, the characteristics of different layout schemes can be mastered, thus selecting a more efficient way. In this experiment, it is found that if the data sets show an increasing trend, both the dynamic layout scheme and the global layout scheme will obviously increase in time, but the global solution scheme is more efficient and obviously better than the dynamic layout strategy. The reason is that the time consumption of global dynamic layout is slow in increasing speed. At the same time, if the data sets are equal, the global layout scheme consumes less time. For this reason, if the number of data sets has been showing a growth trend, its advantages will be even more obvious.

In the process of experiment, if the data set is gradually increased, the final solution of the two schemes will also show the result of increasing the number of transmission. Among them, if there is no big change in the number of data sets, the dynamic layout scheme has a better effect, while if the data sets continue to increase, the final result will show the opposite trend, but the difference between the two is not obvious. If the number of data centers increases gradually, the results of dynamic layout scheme and global layout scheme will also show an increase in time consumption, but the global layout strategy is more efficient and less time consuming. In addition, if the number of data centers is the same, the global layout plan will take less time and the gap between the two will become larger[4].

Combined with this experiment, it can be found that if the global layout scheme can be applied in the process-oriented data-intensive application of smart grid, the main reason is that its advantage of time consumption is more obvious, and it can also be effectively controlled in terms of the number of transmission. However, due to the intersection between the global layout strategy and the dynamic layout strategy, and before and after the intersection, the advantages of the two layout strategies are different but not obvious. That is to say, power enterprises need to combine their actual needs to realize reasonable selection of global layout scheme and dynamic layout scheme to ensure their performance meets the operation requirements of smart grid. Otherwise, it is difficult to give full play to the advantages of different strategies and even cause adverse effects on the operation of power system.
4.2. Comparison of load balance in comparison

If the global layout scheme and the dynamic layout scheme are applied to the relatively stable smart grid data distribution, the load balancing degree of different schemes can be compared with the results of this experiment. Then the results are used as the basis for the scheme selection to realize the full application of the data information such as the difference between the two parties. In the process of carrying out this experiment, it is found that if the number of data sets is continuously increased, the final results of dynamic layout scheme and global layout strategy will all show the trend of decreasing debt balance. However, the final result of dynamic strategy is obviously better than that of global strategy.

In addition, if the number of data centers is continuously increased in the process of this experiment, the final result is: the load balance degree of dynamic strategy is basically maintained in a balanced state, while the load balance degree of global layout scheme will show a downward trend. In other words, the overall effect of dynamic layout strategy is found to be significantly better than that of global layout in the whole process of this experiment, and its own load balance degree can provide valuable support for the operation of smart grid.

Based on the above experiments, it can be shown that for the data-intensive data distribution in smart grid, it is necessary to make a reasonable choice of layout scheme according to its own actual needs. Among them, the overall effect of the global layout scheme is obviously better than the overall effect of the dynamic layout, which can realize the full use of the data center. The reason is that in the process of data layout, the global layout strategy can solve the global problem, thus making more scientific plans and strategies. The strategy of this plan can guide the development direction of electric power enterprises, guide them to pay more attention to their own overall, and avoid problems such as deficiencies and deficiencies in the process of formulating the plan.

5. Conclusion

To sum up, based on cloud computing technology, this paper analyzes the relevant experimental conditions of data layout in smart grid. Then the specific experimental content is explored. Finally, the advantages and disadvantages of different layout modes are analyzed in combination with the experimental results, which is convenient for the selection of modes in combination with the actual situation and ensures a safer and more stable operation of the power grid.

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