

The Construction of Hierarchical Command Centers

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Abstract. The construction of hierarchical command centers realizes that in the process of emergency command development, each command center needs to operate independently, each level has different working conditions, and each level has different concerns. It is the independent work setting of emergency command centers at all levels. The collection of working environments can effectively empower the construction of a new generation of emergency command systems.

Keywords: Emergency; command center; modeling.

1. Introduction

The State Grid Corporation of China covers a vast area, and the management models and emergency risks faced by each unit are greatly different. A single emergency system can no longer meet the emergency requirements of quickly and reasonably handling various emergencies and disasters[1]. In order to adapt to the application needs of different provincial companies, To promote the steady improvement of emergency management and meet the needs of the construction model of two-level deployment and five-level application of emergency systems, the design concept of "work space" is proposed, that is, the construction concept of hierarchical command center. This design concept realizes the requirements that during the emergency command process, each command center needs to operate independently, with different working status at each level, and different focus at each level. It is a working environment set up for emergency command centers at all levels to independently carry out work. The collection can effectively empower the construction of a new generation of emergency command systems and help decision-makers respond effectively to natural disasters[2], public emergencies[3], urban rail transit[4] and other emergencies[5].

The "workspace" has complete data access and preprocessing, four-element state tracking and emergency command capabilities. Among them, data access and preprocessing and four-element status tracking are the basis for the operation of the workspace, supporting the four stages of emergency command such as monitoring, early warning, emergency response and assessment.

In the system design, the command center is the concrete implementation of the work space. All personnel, monitoring information, business data, and resource information are managed based on the command center to

ensure that each command center has the ability to operate independently and realize a personalized work space.

2. System Overall Scheme Designe

2.1 Core Idea of The Command Center

In the process of emergency command, based on the independence of the command center, hierarchical collaboration, parallel implementation, and efficient operation are realized.

2.2 Data Source of The Command Center

The command center is created based on the six-digit administrative region codes of provinces, cities, and counties/districts. The original data can be obtained from the official website of the Ministry of Civil Affairs to obtain the latest national administrative regions (provinces, cities, counties/districts) and generate The SQL statement is initialized to the national administrative area table for hierarchical management. At the same time, virtual administrative areas are supported. The administrative code starts with 00, such as the headquarters command center. The area code is set to "000000" to ensure unique data on the entire network and avoid conflicts.

2.3 Configuration Page of The Command Center

The command center configuration page ensures the customization of the command center

The new generation emergency command system provides a command center configuration page and an "Initialization" button. By clicking "Initialization", all first-level nodes in the administrative region table will pop up for the user to select the province to initialize. After selecting one of the province nodes, submit it. The

selected province and all administrative regions under the province are initialized to the new generation emergency command center table.

This page also provides the ability to modify the command center[6]. However, since the command center is the source of all business operations, modifying the command center supports the modification of the command center name, marking the command center location through GIS[7], organizational association, and each command center access service address and other information modifications. Configuration and modification of other data shall be provided in the form of SQL statements after being reviewed and approved by a special person.

2.4 Use of of The Command Center

The command center has complete data access and pre-processing, four-element status tracking and emergency command capabilities. Among them, data access and preprocessing and four-element status tracking are the basis for the operation of the workspace, supporting the four stages of emergency command such as monitoring, early warning, emergency response and assessment.

- (1) All business data for monitoring, early warning, emergency response, and assessment should belong to the corresponding command center, supporting early warning and response to be executed in parallel through the same event in different command centers, operating independently, and improving operational efficiency;
- (2) Data such as meteorological environment, power grid status, equipment environment, and public opinion are collected through the monitoring items of the command center, and are associated with different command centers according to the monitoring items to ensure that the data source is unique and the data display is accurate;
- (3) There is no command center information for resource information such as teams, supplies, vehicles, equipment, etc. When applying for resources through early warning, response and other actions, it is associated with the specific early warning or response, and thus belongs to the corresponding command center;

2.5 Two-level Connection of The Command Center

The code of the command center is unique in the entire network. When the data is connected at two levels, it is only necessary for each province to synchronize the information of its command center to the headquarters. At the same time, all the data in the system is based on the operation of the command center. The relationship remains unchanged, and the data table can be directly synchronized. Very convenient, while ensuring data integrity.

3. Model Design

3.1 Basic Data of The Command Center

Basic data of the command center includes:

- (1) Command center code: generated based on a six-digit regional code. For special areas, a custom code is used.

The custom code must also comply with the principle of: the first two digits are at provincial level, the middle two digits are at municipal level, and the last two digits are at district and county level;

- (2) Command center name, command center abbreviation: used to display the command center, users can personalize settings on the command center configuration page;
- (3) Area code: 6-digit code formed based on the administrative area code (the first two digits are provincial, the middle two are city-level, and the last two are district-level and county-level), which are used to locate the command center;
- (4) Organization information: the organization corresponding to the command center, used to cooperate with the organization relationship and locate the command center to which the designated organization belongs;
- (5) Code of the parent command center: used to associate command centers at all levels;
- (6) Latitude and longitude[8]: mark the geographical location of the command center;
- (7) Service access address: Mark the access address of this level system.

3.2 Special Data of The Command Center

Special data of the command center includes:

- (1) Map stroke[9]: The command center based on the administrative code can be displayed normally on the map, but some custom areas cannot be displayed normally. This field is used to display these special areas;
- (2) Special account: used to generate and use authentication information required for mutual access between upper and lower systems.

3.3 Generation Rules of Command Center Code

The command center code is generated based on the administrative region code, and its basic composition is a two-digit provincial code, a two-digit municipal code, and a two-digit district and county code. The advantage of this is that it can clearly locate the administrative regional unit to which the command center belongs, clarify the relationship between the command center and its subordinates, and facilitate the management of daily emergency duty and the deployment of emergency-related resources.

For example, the State Grid Jinan Power Supply Company's mapped administrative area is Jinan City, Shandong Province, and the administrative area code is 370100, so the command center code of the State Grid Jinan Power Supply Company is set to 370100. The administrative area mapped to the State Grid Licheng District Power Supply Company is Licheng District, Jinan City, Shandong Province, and the administrative area code is 370112, so the command center code of the State Grid Licheng District Power Supply Company is set to 370112. From the command center code 370112, it can be clearly seen that Licheng District Power Supply Company is a county-level company, and its jurisdiction is Licheng District, Jinan City, Shandong Province. Its superior command center is 370100 at the municipal level, that is, Jinan City Power supply company, this is the complete

information that the command center code can give. Just like the coding function of the command center mentioned above, through 370112, you can query what meteorological, power grid, and public opinion data are currently available in Licheng District, Jinan City, and what are the ongoing early warnings, emergencies, and actions in Licheng District, Jinan City, and then query the results. Those teams, materials, vehicles and other resources that are active or on standby in Licheng District, Jinan City.

However, some special units themselves do not completely or truly fit the actual administrative region. For the existence of these special units, the command center code has some custom values.

The generation of command center coding custom values is also based on the basic rules of command center coding (two-digit provincial code, two-digit municipal code and two-digit district and county-level code), but because these special units cannot be mapped to specific administrative area, so it is replaced by 26 uppercase English letters (A-Z).

For example, the State Grid Jibei Power Supply Company has jurisdiction over part of the Hebei area, so when generating the command center code, AA0000 is assigned as the command center code of the Jibei Power Supply Company. Jibei Electric Power Company has jurisdiction over power companies such as Tangshan and Qinhuangdao. Tangshan and Qinhuangdao can be mapped to specific administrative regions. Therefore, when generating Tangshan's command center code, its administrative code 130200 is used as the command center code. A problem will arise at this time. From the Tangshan Power Supply Company's command center code 130200, it is impossible to tell the superior command center it belongs to. Therefore, it is necessary to combine the dimension of the parent command center code to accurately locate the Tangshan Power Supply Emergency Command Center. superior command center.

The same problem, in addition to these divided administrative regions, there are also some special power grid companies. For example, the State Grid Shandong Ultra High Voltage Company, which is a business support and comprehensive unit and cannot be mapped to a specific administrative region, will have its command center code set to 37AA00. It can be seen from the code of this command center that the ultra-high voltage company belongs to the subordinate unit of the Shandong Provincial Company.

4. Function of The Command Center

4.1 Function of The Command Center Code

The command center is the key step that connects the entire system. Whether it is various meteorological, environmental, power grid, and public opinion data in the monitoring stage, or various actions in the early warning and emergency stages, as well as related resource data such as materials, vehicles, and teams, it is based on the most basic dependence of the command center. If this key dependency is missing, it will be difficult to link the

activities of each stage and achieve unified deployment. The code of the command center is the soul of the command center.

The meteorological environment, power grid status, equipment environment, public opinion and other data themselves do not belong to the command center, but the corresponding command center code can be found through the area where they occur, so that they can be attributed to the corresponding command center, and then the corresponding command center (power supply company) will receive corresponding data. Based on this data, relevant personnel in the command center can take corresponding actions, such as issuing early warnings, to deal with possible impacts on the safe and stable operation of the power grid.

Early warning and emergency response are warnings and actions for a special event. For example, every summer is the season of high incidence of typhoons in the southeast coast. Frequent typhoon activities will have a great impact on the safe and stable operation of the power grid. For these typhoon activities, the Meteorological Observatory will issue typhoon impact range warnings. Based on these warning ranges, it is possible to quickly locate which areas will be affected. Based on these affected areas, corresponding typhoon warnings and even typhoon warnings can be issued from top to bottom. Emergency events, and then guide relevant teams, vehicles, materials and other resources to prevent or repair hidden dangers to the safe and stable operation of the power grid.

In the above two situations, the role of the command center coding is to quickly locate the corresponding command center based on special data and the possible impact scope of special events, remind and facilitate the relevant power companies to take accurate and appropriate actions, and respond to possible The occurrence of hidden dangers to the stable and safe operation of the power grid.

4.2 Function of Map Stroke

A basic requirement of the new-generation emergency command system is map-based command, that is, all data can be displayed on the map. The first step of map command is to require all data to be displayed on the map. In the previous discussion, it has been repeatedly emphasized that all data will be associated with the code of the command center. Based on this major premise, the command center needs to be displayed on the map.

Most of the command center codes are generated based on the administrative area codes. These command centers based on the administrative area codes can be quickly displayed on the map and can clearly and accurately describe the outline of the command center.

For a customized command center code, the command center cannot be drawn on the map through its mapped administrative area code. In this case, the map stroke dimension needs to be used. This dimension is used to satisfy Special command center required for map stroke display. In the map stroke dimension, the specific administrative area code array is stored. For example, for the above-mentioned Jibei Power Supply Company, the

map stroke dimension stores the administrative area codes of Tangshan, Qinhuangdao and other jurisdictions. In addition to being used to display the outline of the command center on the map, the map stroke dimension also plays an important role, which is to display the jurisdiction area of the special command center. Because the jurisdiction area of a command center is consistent with the area outlined on the map, the jurisdiction area and the drawn outline have the same value. An important purpose of jurisdictional areas is to locate the command center to which monitoring data (meteorological environment, power grid status, equipment environment, public opinion, etc. data) belongs, thereby facilitating subsequent data processing.

4.3 Function of Organize Information

Due to the complexity and fineness of the grid organization structure, not every organization will have a corresponding command center, so it is necessary to find the command center to which a designated organization belongs through the relationship between the superior and the subordinate of the organization.

The command center corresponds to a power grid company, which is a unit in itself. However, a power grid company is composed of many departments, and the department itself will not produce a command center. The employees of a power grid company are under the department, so in this case, when you need to locate a person to a specific command center, you need to quickly and accurately find out the relationship between the command center and the organization, and between the organization and the organization.

In the organizational information dimension, the organization corresponding to the command center is maintained, which establishes the relationship between the command center and the organization, and the relationship between the organizations already exists, then a given relationship can be found based on the relationship between the organization and the organization. The organization's closest parent organization is associated with the command center, thereby finding the command center to which a given organization belongs.

This logic of finding the command center to which a designated organization belongs avoids maintaining a huge relationship between organizations at all levels of the power grid and the command center. Instead, it simply maintains the relationship between some designated units and the command center. This avoids the need for changes in the power grid's organizational structure. Transformation leads to changes in the command center and organizational relationships, making historical data unable to be traced.

Of course, in addition to the need to locate the command center to which the organization belongs, it is also necessary to locate the command center to which other elements belong. These elements include but are not limited to people, materials, equipment, etc., and these elements have one thing in common, which is that they are all related to the organization. , so as long as there is a relationship between the organization and the command

center, it is equivalent to having the relationship between all the elements and the command center. At the same time, doing so also avoids the data stored in the command center model from being too bloated and improves the utilization of the model. and efficiency.

4.4 Function of Service Access Addresses and Special Accounts

The service access address mainly stores the address of the entrance to the new generation emergency command center system at all levels. This field is mainly used to solve cross-cluster and cross-region access of systems at all levels (mainly provincial systems and headquarters systems). Special accounts are used to generate authentication information required for cross-system access.

The new generation emergency command system adopts a two-level deployment and five-level application deployment method. The headquarters and provincial levels each deploy a set of services. The provinces, cities and counties share a set of services, and the headquarters uses a set of services. The two-level deployment consists of headquarters and provincial levels. The problem of direct mutual access between level-level systems is that due to the information security needs of the State Grid, provincial-level and headquarters systems are deployed in different regions and different clusters, and different regions and different clusters cannot be directly exposed. Therefore, mutual access between the headquarters and provincial systems can only be achieved by adding security policies to designated IPs and ports. The service access address stores the access addresses of systems at all levels. However, simply opening IP addresses and ports cannot be accessed. All types of access also need to be authenticated, and the element required to generate authentication information is a special account. This constitutes all the elements needed for secure cross-system access.

5. Summary

This article explains the model of the new generation emergency command system command center, which provides a basic carrier and dependency for the operation of all elements and activities of the entire system. And during the period of operation of the new generation of emergency command system, it has been fully tested. Of course, during the period of time the system was running, this model also had some shortcomings. Next, based on these shortcomings, this model will be continuously improved to ensure efficient and stable operation of the system.

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