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Design of Power Communication Anti-accident Maneuver Simulation System Based on Alarm Deduction

Shengchao Yan[1], Haobo Zhou[2] and Juan Qi[1]

[1] Nari Group Corporation/State Grid Electric Power Research Institute, PRC.
[2] Inner Mongolia Power (Group) Co., Ltd. Information Communication Branch, PRC.

Abstract. In order to improve the effect of the power communication anti-accident maneuver, and to enhance the ability of operation and maintenance personnel to judge and remove network faults quickly and accurately, series of key approaches are adopted, such as root alarm analysis and business analysis. Considering the relationship between the fault and alarm, power communication anti-accident maneuver system based on alarm deduction is realized. Ultimately the purpose of improving the quality and efficiency of the operation and maintenance personnel is achieved.

1. Introduction

With the construction of smart grid, power communication network has played an increasingly prominent role. Carrying out the communication network anti-accident maneuvers simulation activities on a regular basis is an effective means to improve the ability of operation and maintenance work. Therefore, the use of computer technology to study communications network anti-accident simulation system [1-4], can quickly improve the accuracy of communications professionals to determine the fault and accumulated experience in failure to improve business technical knowledge and operation and maintenance management level to ensure that all types of communications networks Business information flow.

Based on the communication resource management and comprehensive monitoring, the simulation system of power communication anti-accident maneuver described in this paper adopts the idea of synchronicity and anti-push between failure and alarm to take the roles of the interviewer, examiner and candidate Functional structure as the basis to simulate the simulation process, using fault alarm deduction, root alarm analysis and business impact analysis and other key approaches to achieve the purpose of anti-accident training simulation training to improve the communication professionals quickly and accurately determine and troubleshoot the ability.

2. System Design

2.1. Demand Analysis

In accordance with the system role to points, communication anti-accident simulation system is often composed of three parts: a copy of the function of the examiner and examinee functions.

The topic and who has three main functions: First, the director Q & A, including new topics and perform maintenance on existing title; the second is director simulation exercises, simulation exercises content that is set to begin setting simulation exercises, simulation exercises time and termination Select the need to participate in the simulation of the staff and so on. The third is to manage users, as well as examiners, examiners distribution system login account.

2.2. Basic Data

The system will make full use of the basic data (including communication sites, transmission equipment, communication optical cables, and bearer services) existing in the communication management system for resource allocation information [5], and obtain the following relevant basis through the interconnection based on the open Web Service interface data:

(1) relay protection, stability control, remote control, dispatching telephone, video conferencing and other important communications services;

(2) circuit (such as transmission channel, 64K circuit) and optical fiber (such as dedicated core) and other resources;

(3) transmission network resources (such as equipment, slots, ports, time slots), cable resources (such as cable segments, fiber core, etc.), wiring resources and space resources.

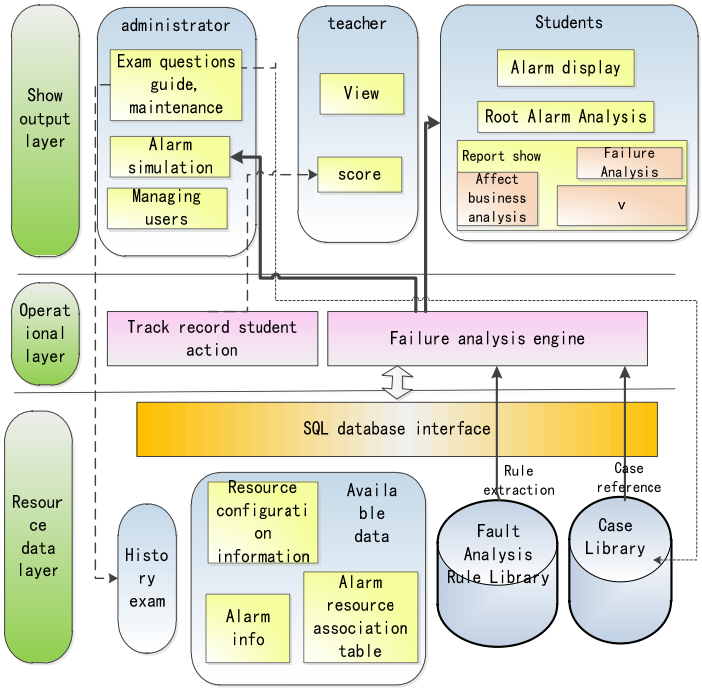

Figure 1. System Architecture

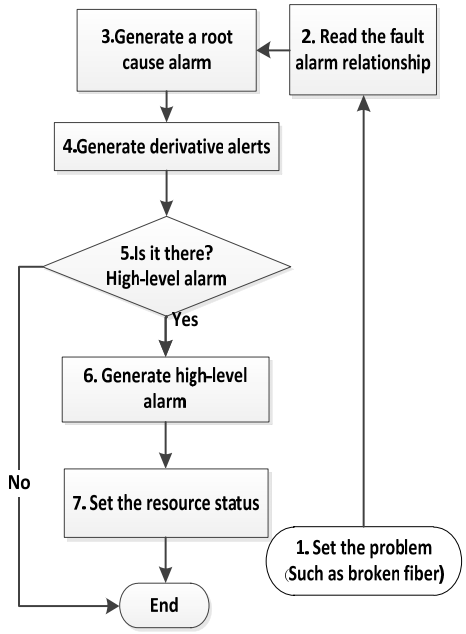

Figure 2. Fault Alarm Flowchart

2.3. System Structure

Based on the above considerations, the design of the system structure shown in Figure 1.

(1) Resource data layer: The data used in the exercise simulation comes from the replication of the real-time database of the communication management system and includes the system's unique rule base, case base and test database.

(2) Operational layer: The fault analysis and processing engine uses the fault analysis rules to combine the resource configuration information and alarm information for alarm presentation, root alarm analysis, service area analysis and correlation analysis, and determines the root failure with reference to the case base.

(3) to show the output layer: According to the questions, examiners, candidates three different roles to show the specific operation.

3. Key Approaches

In order to realize the flexibility, practicability, authenticity and reliability of the anti-accident maneuver simulation system, the key is to realize the alarm deduction management. The system adopts the following key technologies.

3.1. Fault Alarm Deduction

Based on the correlation between the fault type and the alarm objects, a fault alarm cis-push model is set up to implement the process of generating root alarms, derivative alarms and high-level alarms from faults. The specific method is as follows: establishing a fault alarm relation table according to a specific communication network resource type, and establishing an association model between network resource objects; and according to a fault alarm relationship table and a resource association model, establishing a root type alarm and a derivative alarm and a high-level alarm. The associated model, the final formation of failure alarm deduction model. Based on the above model, the design of fault alarm deduction algorithm, the process shown in Figure 2.

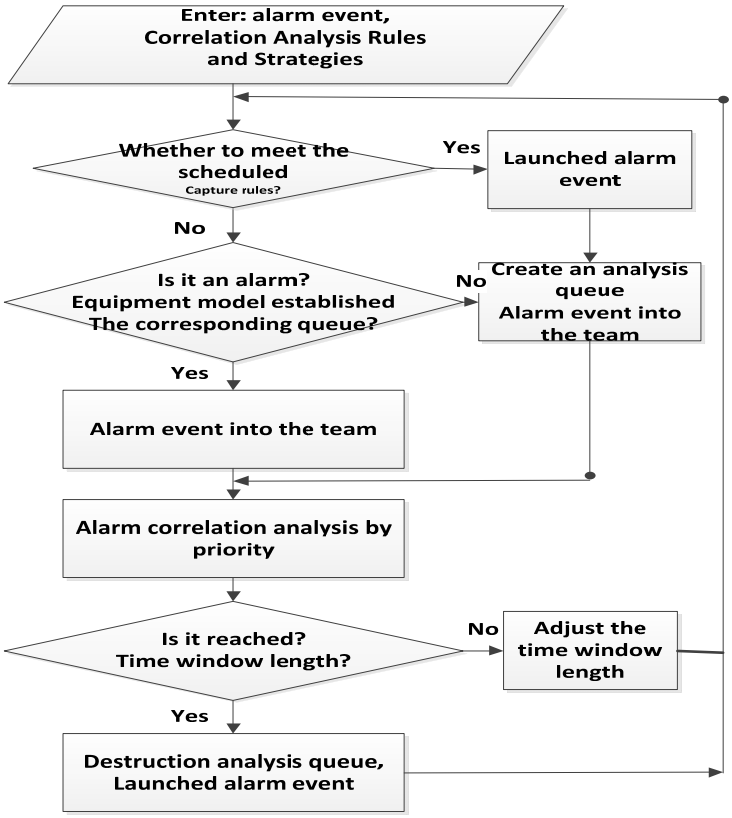

Figure 3. Root Alarm Analysis Flowchart

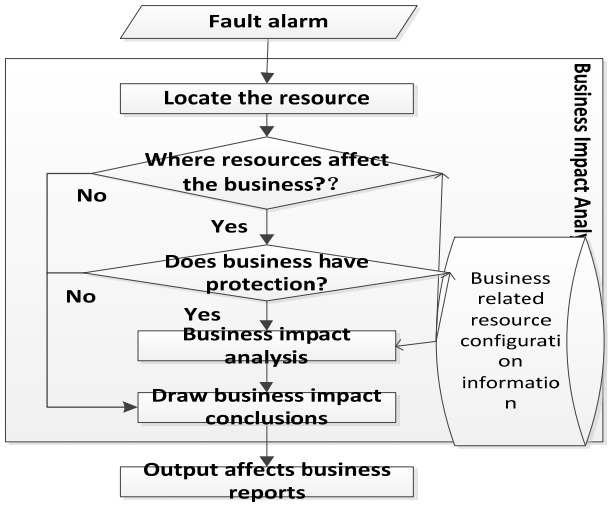

Figure 4. Business Analysis Diagram

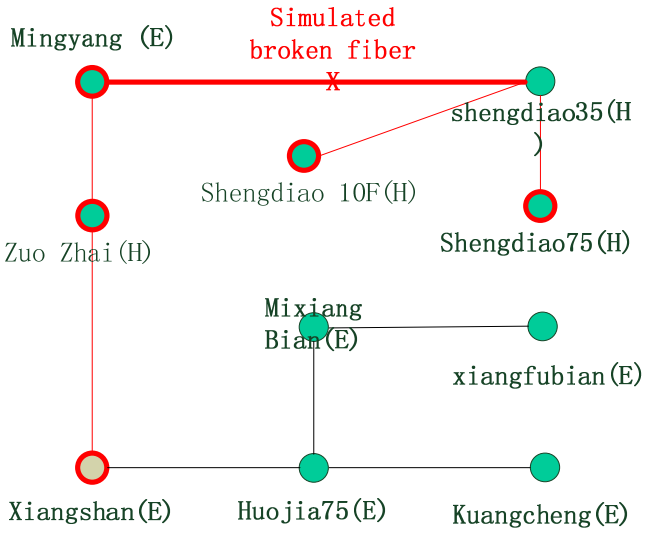

Figure 5. Simulated Fault Case

3.2. Root Alarm Analysis

The root alarm analysis uses the reverse-thinking idea of fault-to-alarm to make a further comprehensive analysis of the alarm information and locate the root cause alarm from the related alarms [6].

The specific implementation method is as follows: all alarms are divided into several correlation analysis and processing queues according to the degree of alarm correlation, and each of the queues performs correlation analysis separately according to conditions such as area, equipment, system and time, filters out homologous and related repetitions, times To, False and other alarms, get the root of each queue alarm group.

Then the rest of the queue alarms are grouped according to their relevancy levels to conduct a correlation analysis.

Finally, the root alarm analysis results are displayed in a hierarchical structure. Process shown in Figure 3.

3.3. Business Impact Analysis

The business analysis model is established by using fault alarm information, resource failure and business related resource configuration information to analyze the affected circuits and business scope when the fault occurs.

The specific implementation method is as follows: taking a simulated fault in a device or a pipeline as an example, generating alarms such as LOS (receiving optical signal loss) and AIS (all 1signal), and determining a root alarm according to a root alarm analysis model and an algorithm. Business analysis as shown in Figure 4.

3.4. Rule-Based Troubleshooting

Failure analysis and processing relies on the alarm correlation rule base and troubleshooting base in the resource data layer. The system provides the maintenance and management of rule bases and case bases, electronically analyzes the operation and maintenance experience of operation and maintenance personnel, and forms rules for alarm analysis and troubleshooting. These rules include: alarm dependency rules, resource dependency rules, alarm and resource association rules, and alarms And resource mapping association table, circuit and business relationship; and the new exercise simulation targeted to form a case for future reference. When a fault occurs, the rules match and a large number of related alarms are generated. Candidates can customize the corresponding rules and reference case base for root alarm analysis, affecting business analysis, correlation analysis and determine root failure [7-8].

4. Conclusion

The anti-accident maneuver simulation system designed in this paper can effectively improve the ability of operation and maintenance personnel to quickly determine the fault. In the follow-up, the functions of the anti-accident maneuver simulation system will be expanded. Based on the above design method, the simulation system of power communication anti-accident maneuver is developed as a sub-function system of communication management system and successfully applied to a provincial power company shown in Figure 5.And methods can be further studied and extended to analyze the cause of the root cause of the fault and apply it to the communication network fault diagnosis and intelligent analysis of the impact of the alarm business scope, from alarm to failure, intelligent business analysis.

5. References

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