The Key Technology of Operation Smart System Seamless Information Integration and Test

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Abstract

This paper, which is in the pattern of operation smart system integration, with the demand of effective integration of the information flow and breaking through the information blockings between operation systems, mainly researches about unified modeling of operation systems as well as the technology of the MMS (Manufacturing Message Specification) seamless information and the testing technique. It not only significantly solves the challenges, which include the unified modeling of operation system and the seamless communication between operation systemgs and smart substations, but also achieves the seamless integration and sharing of the operation smart system information flow. The correctness and effectiveness of the models and methods which are mentioned before, are verified by engineering practice applications.

Keywords: unified modeling, MMS, information integration, operation smart system, model consistency, seamless communication

1. Introduction

With the continuous advance of China's Smart Grid construction, operation smart system has evolved an intelligent network of energy flow, business flow and information flow. Energy flow and business flow are the foundation of the security and stability of power grid operation. Information flow is interation link of the professional data and information, and is a necessary condition of normal operation of energy flow and business flow. Information flow directly restricts energy flow and business flow, and it which is not smooth will limit efficient delivery of energy flow and business flow. Although the work group of IEC(International Electrotechnical Commission) defines the standards of information exchange and interfaces between applications, each standards have different emphases, and it needs model

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transformation and interface adapter to keep information interaction in power grid. Such as IEC61970 and IEC61850 standards describe the CIM (Common Information Model) and substation model, and define the different means of communication.

With the increasing of power grid scale and the continuous progress of integration of the operation smart system, power grid automation system is gradually to be integration and intelligent. The efficient operation of information flow must be established on the basis of information seamlessly integrated. This paper in-depth researches unified modeling of operation system, seamless communication and information seamlessly integration testing and so on. It aims to solve information flow efficient integration and breakthrough the problem of information interation between business systems. It lays an important foundation for the development of smart grid.

2. Unified Modeling

Unified modeling is the basis of information seamlessly integration. Power grid operation systems models primarily include IEC 61970/61968 CIM and IEC 61850 SCD (Substation Configuration Description) which are defined by IEC organization. IEC 61970 CIM defines the models of power generation, transmission and substation and so on. IEC 61968 CIM describes distribution and asset model. IEC 61850 SCD describes substation information models. However, the models have advantages and disadvantages, such as the definition of operation systems is so simple in IEC 61970 standard model that unable to meet the requirements of advantage analysis. The definition of power grid device in IEC 61850 model standard is relatively simple, such as busbar is not defined, and the definition of the isolator is too simple. So it can not completely describe power grid models. These models need to extend and map to realize information integration[3][4].

The research in this paper based on IEC 61970/61968 CIM and combined with the model definition method of IEC 61850 standard model to extend part of IEC 61970/61968 CIM. This method can build power grid unified models and describe the power grid operation systems models. At the same time, this paper extends IEC 61850 model.

2.1. IEC 61970 standard model extension

In order to describe the operation system model accurately, this paper refers to the operation system model description method in IEC61850 to extend IEC61970 model. Extension model as Fig.1.

![Fig. 1. The expanded model based on the IEC 61970 standard](image-url)

Firstly, SecondaryEquipment class is extended which derives from Equipment class and become the
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