

한국전력 송전 계통보호를 위한 웹 서버 개발

장영*, 최면승, 이승재, 민병운, 김성훈, 오성민
 명지대학교 차세대 전력 기술 연구 센터

THE DEVELOPMENT OF WEB SERVER FOR KOREAN ELECTRICAL DISTRIBUTION-SYSTEM PROTECTION

LI. ZHANG*, M.S. CHOI, S.J. LEE, B.U. MIN, S.H. KIM, S.M. OH
 Myongji University Next-Generation Power Technology Center

Abstract - Since faults often occur on power system, relay protection has become an important part to protect the equipments of power system efficiently and safely. Database can store the data about the relay protection efficiently, and these data must be shown to users through the web. Proset2000 (an overall program system to protect power system) can realize this function in some measure, but it needs to be developed. This paper is about the further development of Proset2000. In this paper, web of Proset2000 is made by ASP programming technology, and users can browse and search the useful data through the web. There are some new functions, such as the summary of setting values, the message board and the management of administrator.

1. Introduction

Failures of apparatus due to surges or other causes lead to faults on a power system. When the faults occur, the most important process is that steps to be taken to remove the faults from the power system as soon as possible. In modern power systems, the faults removal processes are executed by protection system automatically, without human intervention. Relay protection is a very important part of power system protection, and the setting value calculation is so complicated that it relates to a great deal of data. Database can store a lot of data, and it is convenient and efficient to be managed. So it is widely used in power system.

Due to the great progress made on the Internet, the World Wide Web (WWW) has become a convenient way to access information on the net. In this paper we use Active Server Pages (ASP) to access data from power system database, in order to provide a lot of useful information of power system protection to users.

The rest of this paper is organized as follows. In section 2, I'll explain the database organization of power system protection. In section 3, I'll explain how to use ASP to access data. In section 4, I'll show you the web of PROSET2000 briefly. The section 5 is the conclusion part of this paper.

2. Database Organization of Power System

Power system protection relates to a lot of variable data. Most of the power system components (transmission line, bus, panel) are changed frequently, and the calculation of the fault current also needs large numbers of data. Therefore we must analyze

these data, and find out the common elements, then organize the necessary data available. In order to realize the intercommunity of database, and provide the parallel data to the users who use the database at the same time, the system database must be organized.

Relay data includes two parameters: one is relay identification and the other is relay setting value. Different relay types have different settings, and the setting values are also different to each other, so the data of the setting values is very complex. Database is a valid approach to store this enormous data, and it is also easy to be managed.

There are two kinds of database that I will introduce to you in this paper.

2.1 File-Specific Database

This type of database stores the relay identification in one table and the setting value in the other table, and the setting values have their own setting names. It can provide specific information of the setting to users. The UML(Unified Modeling Language) Diagram of this kind of database is shown as figure 1:

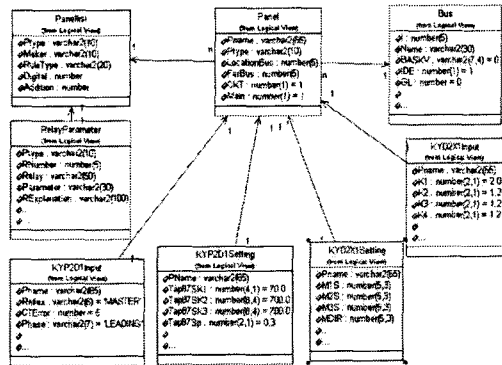


figure 1: UML Diagram of file-specific database

The panels of transmission line protection have different types, and different types have different relays, and these relays include many setting values. The setting values are determined by the inputs of power system that are satisfied the setting rules. The panel property of this transmission line protection is that the same type has the same relay. So we can use file-specific method to separate entities from the different types and reorganize the same property of setting into an entity.

2.2 Variable Flat-File Database

This type of database stores the values of variables in one table and stores the names of variables in the other table. It is simple to add the new name or value to the table, or to make a new table for the different relay type, and the number of the tables is not too much.

The UML Diagram of this kind of database is shown as figure 2:

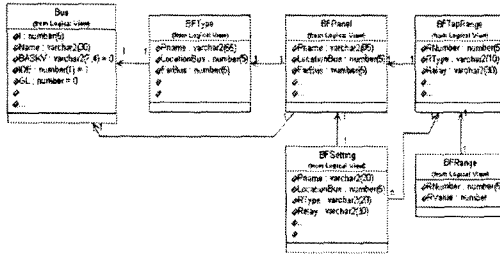


figure 2: UML Diagram of variable-flat file database

Because the panels of voltage transformer protection have no specific types, and the relays of panels are also different, we can't separate entity from types. So we use variable flat-file methods to store the data.

3. Using ASP to Access Data

The general users don't want to browse all the data, but the data that they are interested in of power system protection. Web is a simple approach to provide users the required information as conveniently as possible. ASP is one of the most important innovations to emerge on the web- for developers and users of the Internet.

ASP is a useful tool for creating dynamic web pages. We write programming codes that will generate the HTML for the web pages dynamically. Whenever a user browses to our web site and requests one of our ASP pages, the ASP codes are processed at that time by a special piece of software-the web server. This processing generates the HTML, which is then passed to the browser and used to create the page itself, on the user's screen. ASP is supported by a web server-Internet Information Server (IIS), and IIS is a part of the Windows operating system. There are quite a number of scripting languages used in ASP. The two most popular at the moment are VBScript and JavaScript. JavaScript was the first client-side scripting language, and the VBScript language is based on Visual Basic programming language. We use database of one sort or another to store data required in the creation of the web pages, and also to store data that is entered by the end-users and captured by the web server. We can use OLE-DB in ASP, via a set of programming interfaces known as the ActiveX Data Objects, or ADO. Through the WWW, intranets and other browser-based applications, the humble Web browser is becoming one of the most widely used interfaces between data and end-user. And the

construction is shown as figure 3,

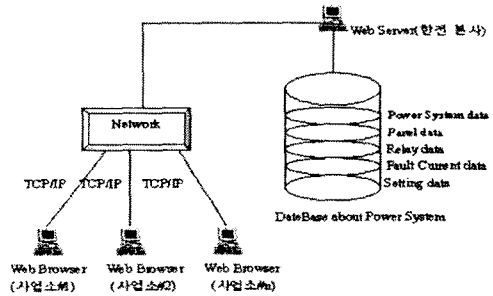


figure 3: web server construction of the power system

Open DataBase Connectivity (ODBC) is a standard for accessing data. It was designed to allow the programmer to use a common set of routines to access the data stored in databases, regardless of the type of database in which the data was stored. ADO is a set of objects that allow programmers to program their data access logic from languages like Visual Basic as well as scripting languages. In this paper, we'll apply ADO objects explicitly within the code of our ASP pages, instructing them to read records, update data, and carry out other tasks that relate to the data in our database.

Structured Query Language (SQL) is the universal language used for programming databases. There are four main different types of command that you can run against the database, and they are select command, insert commands, update command and delete command. A SQL select command gives us flexibility over what data we request, that we can be choosy over which fields and records we want to see. The SQL update, insert and delete commands are all used in the process of making changes to the database-changing records, adding new records and deleting records.

4. Web of PROSET2000

4.1 Homepage

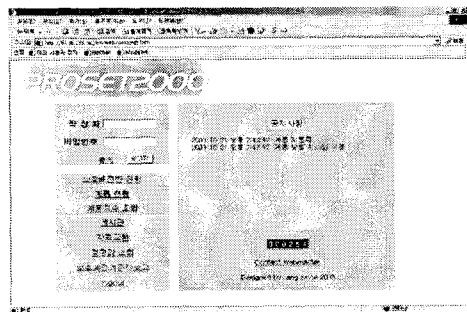


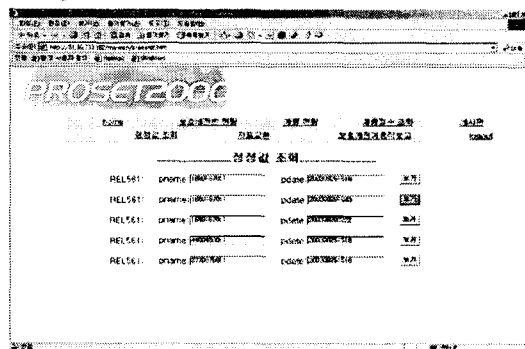
figure 4: PROSET2000 homepage

The homepage of PROSET2000 (figure 4) includes four parts. The first part is for users to login, the second part is some important notices of the administrator, the third part are counter and the

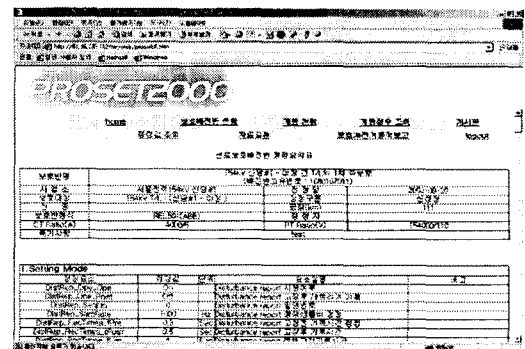
designer. And the fourth part, which is also the most important part of our project, includes many contents, such as the status of power system protection, the setting values, and message board, and so on.

4.2 Setting Value Summary

Setting value is the vital information of the power system protection. Here is an example shown as figure 5: the setting type is REL561, we can get the setting values of it.



(a) REL561 data



(b) Setting Values of REL561

figure 5: setting value summary

4.3 Message Board

The general users can write message, modify message, delete message, search message, and they can upload and download files in the message board of PROSET2000 (figure 6).

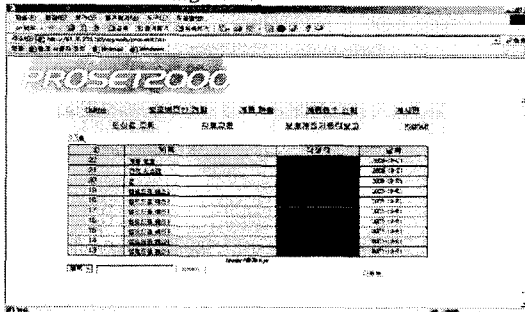


figure 6: message-board

4.4 Data Search

This is the basic function of PROSET2000. When we input some conditions, we can get the results that are shown as figure 7.

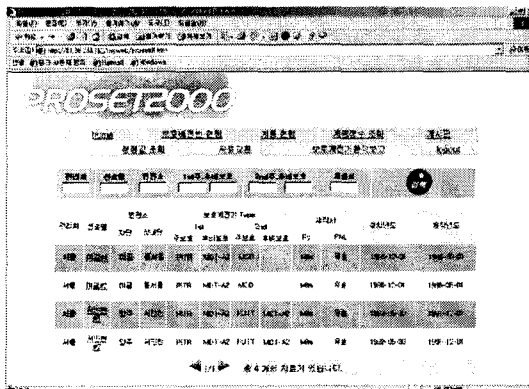


figure 7: data search

There are other functions of PROSET2000 web.

5. Conclusion

In this paper, we developed the database organization of power system protection. We also further developed web of PROSET2000. Through it the general users can search data, or browse the setting values, or upload /download files. The administrator can manage all the data easily. The reliability and efficiency of the power system protection had been improved.

Acknowledgement

Authors would like to thank Ministry of Science and Technology of Korea and Korea Science and Engineering Foundation for their support through ERC program.

References

- [1]John Mclain, Sherman M. Chan & Don Choe. "Relay Database Design", IEEE Computer Applications in Power, Vol 8, Page 16-20, July 1995
- [2]Chris Ullman, David Buser, Jon Duckett, Brian Francis, John Kauffman, Juan T. Libre & David Sussman. "Beginning ASP 3.0", May 2002
- [3]장홍목 저. "ASP로 액티브 서버 만들기",Feb 23. 2002
- [4]김세연, 김호경 공저. "ASP 30일 완성",2000
- [5]William D.Stevenson, Jr. "ELEMENTS OF POWER SYSTEM ANALYSIS", 1995
- [6]이승재, 최면승, 강상희, "한국전력 송전계통 보호 정정업무 전산화 시스템", 대한전기학회 제50권 11호 pp3-7, 2001년 11월
- [7]"계통보호 종합전산 프로그램 개발", 한국전력공사 중앙 급전사령실, 2000년