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Development of Active-X Component for use in WEB based Thermal Hydraulic Data Bank

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Abstract

An active-X component to use as the engine for the web-based thermal hydraulic data bank has been developed. The development of the active-X component was carried out primarily for employment in the web-based thermal-hydraulic databank. The active-X component was developed with the objective to minimize the size of the component and the data traffic while maximizing the functionality. For this end, the data is downloaded in a compressed format to minimize the downloading time, and Delphi language is used in the efforts to minimize the size of the active-X component as well as for fast execution time. The functionality of Active-X component was tested on ENCOUNTER data package by embedding the component in a prototype web-page under a server-client environment. The test demonstrated that the Active-X component functions as intended and that it is capable of very easy data retrieval and display.

1. Introduction

Development of a thermal hydraulics computer code requires extensive use of thermal hydraulic database for various purposes. The database is needed to develop thermal hydraulic models and correlations and to carry out verification and validation of the thermal hydraulics computer codes. Korea Atomic Energy Research Institute (KAERI) currently has a large collection of thermal hydraulic experimental data obtained through international co-operations and these data have been systematically categorized and archived in electronic form through a number of projects. The resulting electronic form of thermal hydraulic experimental data have been stored in a server computer and a web-page has been setup for retrieval of the data via internet at http://thcode.kaeri.re.kr/databank_home.htm. However, the current home page functions as just a simple storage place for unprocessed form of the data, and any user that wants to obtain the data needs to understand the format the data is stored and then to decode the data to convert the data into useful format. Such manual processing of obtaining the compressed data via internet and subsequent uncompressing and decoding of the data is an ideal candidate for automation with high prospect of great increase in the user convenience and efficiency. Thus, the aim of this project is to set-up a web-based thermal-hydraulic experimental data handling system that focuses on the user convenience features fast data acquisition and processing. As its first step, an engine

to be used in the web-page for data processing has been developed. In order to maximize the effectiveness and the efficiency, an ActiveX component has been chosen as the basis engine for the web-based thermal hydraulic data bank. Java type programming was not chosen because it was felt that the resulting engine would be slower and more difficult to maintain. A major disadvantage in using the ActiveX component for the engine is that the engine is only valid for windows based operating systems. The generation of the Active-X component was accomplished by using the Delphi programming language. Delphi was chosen because it can generate ActiveX component under rapid application development environment, it is capable of producing a well-structured source for easy maintenance, and most importantly because we have significant expertise in the use of Delphi.

2. WEB-based T/H Data Processing ActiveX Component

ENCOUNTER Data Format

The base format of the data used in the web-based T/H Databank is that used in the ENCOUNTER data of USNRC(United States Nuclear Regulatory Commission).[1] The ENCOUNTER data format was used in the "Verification of Best-Estimate Safety Analysis Codes with the Establishment of Thermal-hydraulic Data Bank" project carried out by KINS (Korea Institute of Nuclear Safety) in 1994.[2] The data structure of ENCOUNTER consists of header section, data section and keyword section as shown in Figure 1. A single data file may consist of a number of different data sets separated by header sections. In the current project these ENCOUNTER based data files are stored in a zip-compressed format to save storage space and to minimize the data download time.

Overall Flow of Data and ActiveX Component

In the development of current web-based databank, major emphasis was given to minimizing the time duration of the data transfer and subsequent data processing so that the response time to any user input is minimized. Next important development objective was to reduce the computational burden on the server computer so that when the server is being simultaneously accessed by a number of users, any significant performance degradation will not occur.

To best satisfy these objectives, it was decided to develop an ActiveX component that carries out the required data downloading and processing. Faster computation time is expected by the employment of an ActiveX as compared to other interpreter-based languages such as Java. However, the disadvantages are that user needs to install and/or update the component on his/her computer. The actual installation and update procedures are carried out automatically by the main web-page through the use of 'codebase' of html (hyper text markup language). A cab-archived version of ActiveX component is kept in the server and updated by the web-site manager and this version will be downloaded and then installed/updated as necessary via internet.

The overall flow chart of data and relevant processes are shown in Figure 2.

Functions of ActiveX Component

The ActiveX component is the major engine for the data download, preparation and

display. The html of the web-page will be responsible for the categorization and layout of the experiments and the experimental data. The ActiveX component will be embedded in the html and provide functions as described in the following. The main web-page, an example shown in Figure 3, of databank web-site directs the customer to his/her desired experimental facility. User then selects the experiment for which data is desired. Then the html calls the ActiveX component into action.

The activated ActiveX component carries out the following in order. First, it downloads the experimental data from server to client. Then it uncompresses the downloaded data and stores the uncompressed data in a default storage area of the client. A progressbar and an information bar at the top of the ActiveX display area show the status of the process so that for any long transfer user is informed of the progress. The data source is displayed in the "information-bar" at the end of the process. The list of the uncompressed files is displayed in the listbox under the "Measurements" category as shown in Figure 4. The uncompressed file is in ENCOUNTER data format.

As the user selects the desired "measurement" file, the ActiveX component reads the relevant data stored in the user's computer during the download and uncompress phase. Then ActiveX component decodes the ENCOUNTER-format data and displays the data list in another listbox under the title of "Instrument ID". User can then select the desired data from the listbox for the final processing. The "Instrument ID" listbox allows the multiple selections so that a comparison plot can be made. Upon receiving the user selection, the ActiveX component processes the data to generate a graph and a stringgrid and display these in separate tabsheets. Figure 5 shows the graph of selected data displayed in the tabsheet titled "graph". The same data is displayed in a text format in the tabsheet titled "data" as shown in Figure 6. User can print the graph, save the graph in a bitmap format or save data in text format. A link to e-mail is provided for easy report of any problem to the author of the program.

3. Results and Future Works

A sample web-page with embedded ActiveX data process engine has been published and a number of encounter databases has been tested for downloading and data processing with the embedded ActiveX component. The sample web-page was accessed from a number of representative locations including an overseas location, and it demonstrated that the ActiveX engine functions well. The user interface was assessed to be quite easy to use and the ActiveX provided good overall performance. With good internet connection, it was found that a data set of 50 MB in size can be processed in less than 30 seconds. The same data set was reported to have taken 10 minutes in the overseas location where the cause of the long time is suspected to be due to poor quality of the internet connection.

The current work is a demonstration of a concept for the design of a web-based thermal hydraulic databank with the aim of easy and fast data access through internet. For future works, it is planned to operate a sample web-site for a significant period of time to accumulate user feedback and response in order to catch any user problem or program bugs. These will be reflected in the improvement of the ActiveX component. Also, it is hoped that a more user friendly and visually pleasant web-site will result.

4. References

[1] NRC/DPRS Reactor Safety Data Bank, ENCOUNTER, EGG-RTH-7285.
[2] H. J. Kim et al., "Verification of Best-Estimate Safety Analysis Code with the Establishment of Thermal-hydraulic Data Bank", KINS/GR-041, KAERI/RR-003/94, June (1994).

Acknowledgement

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Card 1	IDENTIFIER	MSN	AID		Time	INTV
Card 2	EUCO	PF	BL	NODS		NOWD
Card 3 … Card n	Data (5E16.9)					
Card n+1	KEYWORD	SP	KN	DT	NOW	
Card n+Z	Keyword Data					
Card N+Z	Additional Keyword Data					
Card Z+1	IDENTIFIER	(same format as the case above MSN=1)				
	End of File					

Major Paramaters

MSN : Measurement Sequence Number
EUCO : Engineering Unit Code
AID : Aplpha-numeric Identifier Measurement Name
NODS : Number of Data Samplings

Figure 1. Structure of ENCOUNTER Experimental Data

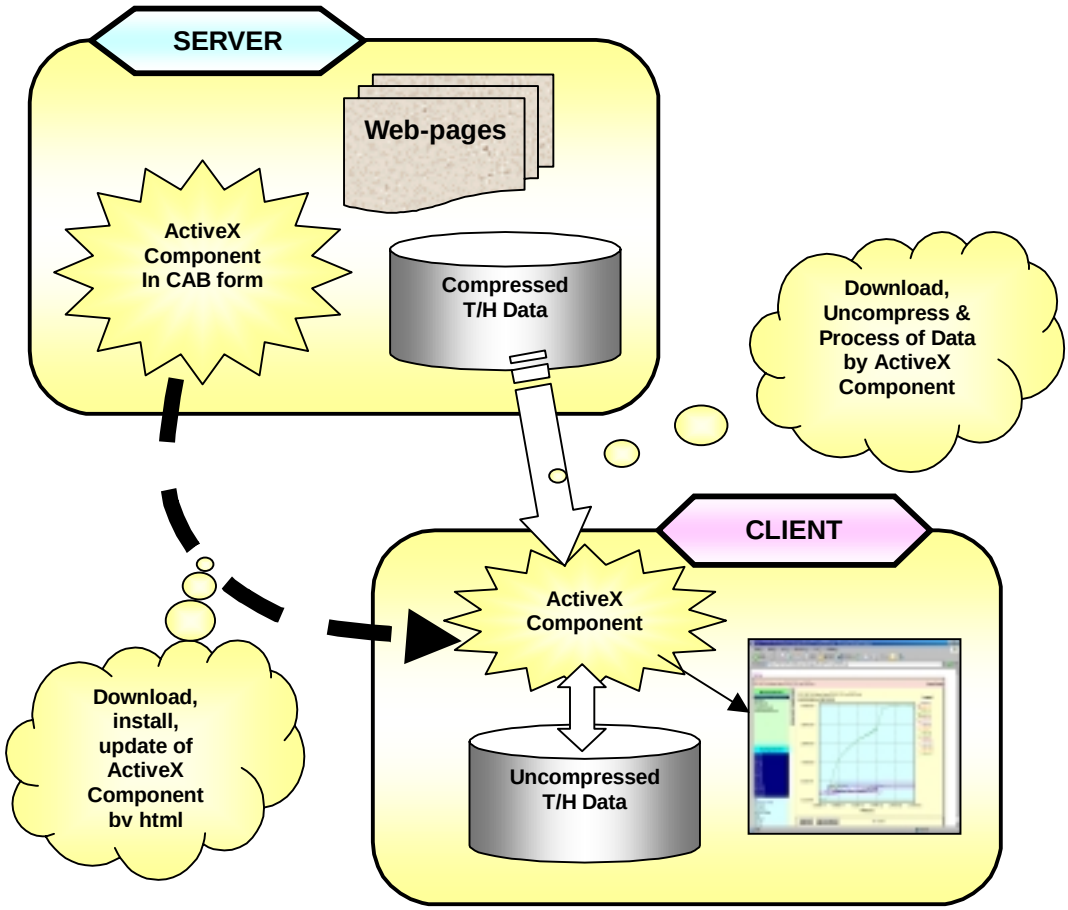

Figure 2. Overall Flow of Data and Processes

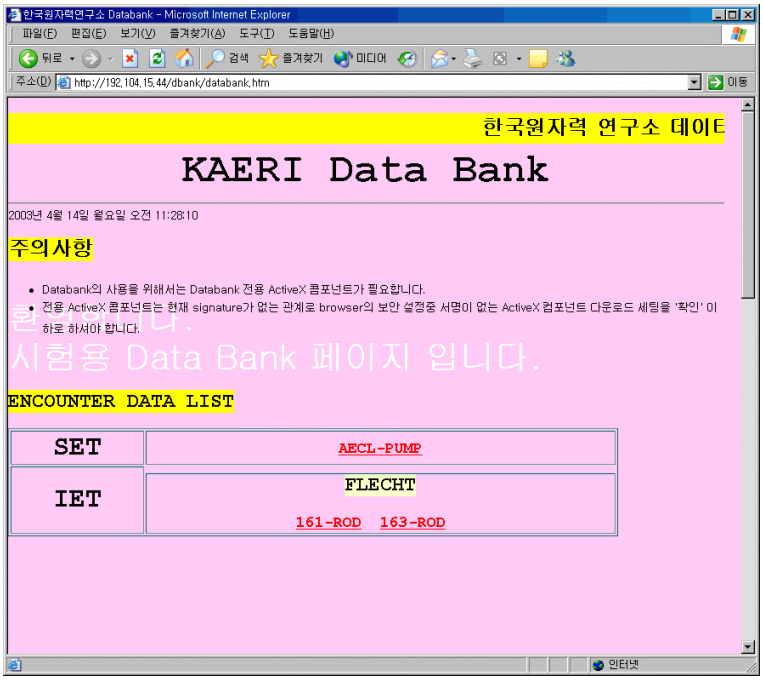

Figure 3. A sample Web-page of KAERI Data Bank

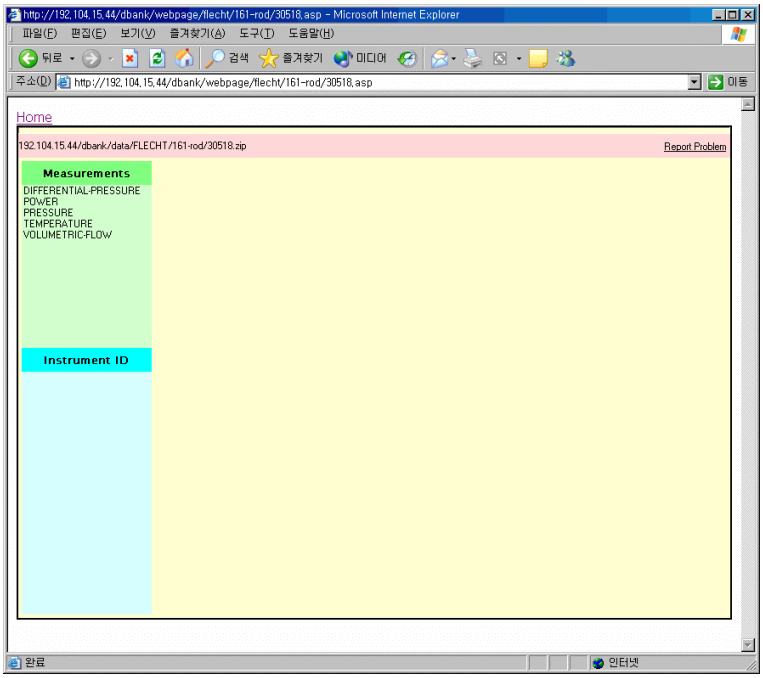

Figure 4. ActiveX Component Display Screen
after Data Download and Uncompression

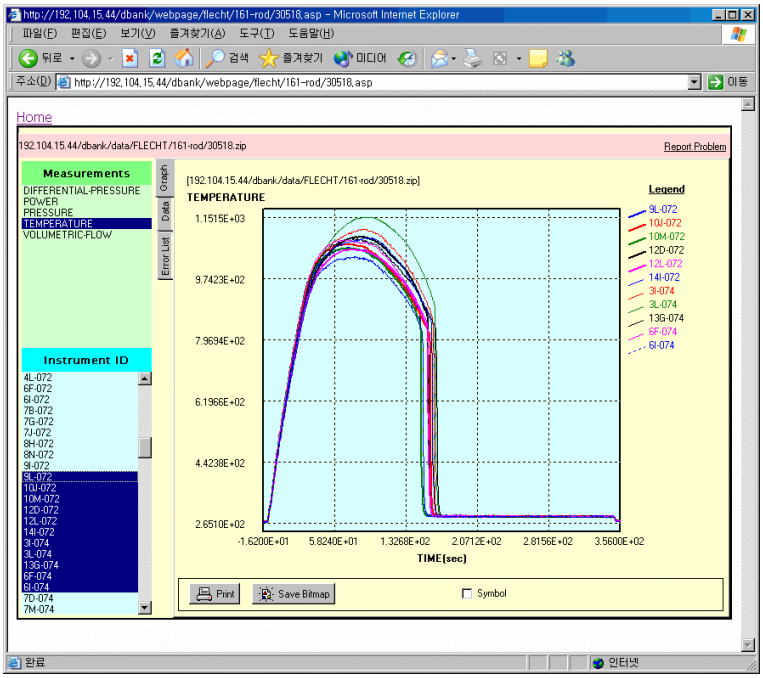

Figure 5. A Graphic Display of the ActiveX Component on the Experimental Data

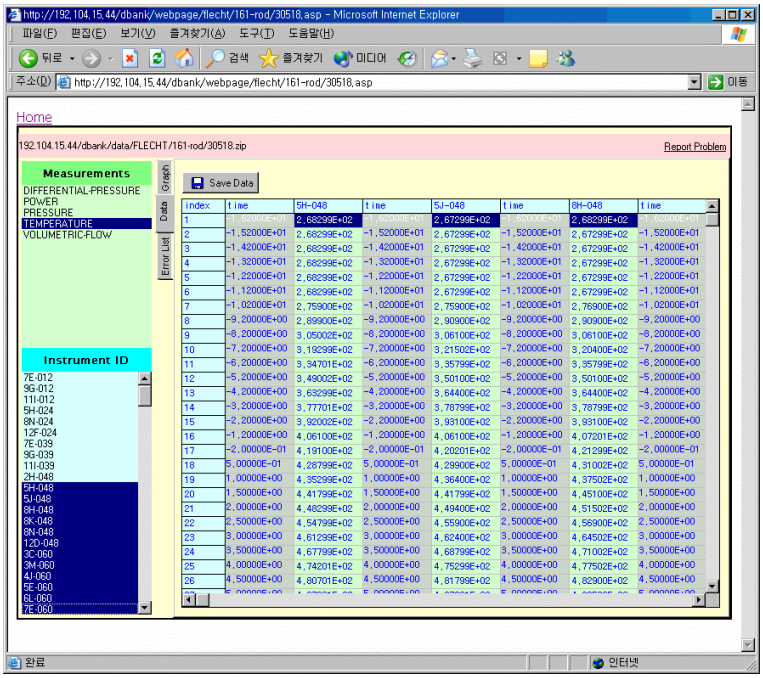

Figure 6. A Text Display of the ActiveX Component on the Experimental Data