

WEB-BASED ELECTRONIC OPERATION LOG SYSTEM – ZLOG SYSTEM

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Abstract

The Zlog system, which is an electronic operation log system based on Zope, has been used at the KEKB and PF-AR accelerator facilities in KEK since January 2004. Zope is a Web content management system based on several open source software components such as Python and PostgreSQL. By using the Zope system, we were able to develop our Zlog system in a short period because the Zope system includes a development framework for the Web application server. The Zlog system has also been introduced in J-PARC/KEK-JAEA and RIBF/RIKEN on the basis of its success at the KEKB and PF-AR. The Zlog system is quite portable even under different computer architectures. The Zlog system at the KEKB has accumulated approximately 1.5 million event entries thus far, and screenshot images captured during the operation can be stored and viewed along with the entries. In this paper, we describe the present status and component details of the Zlog system.

INTRODUCTION

The KEKB [1] operational logbook was based on handwritten notebook entries until the summer of 2002. Subsequently, an electronic operation log system built in MS-Access/MS-SQL was used from autumn 2002 to winter 2003 [2].

In the MS-Access-based log system, most entries have to be entered manually as the system was developed for the Linac control system and it has no linkage to the KEKB control system. Because operators are usually devoted to beam tuning, they cannot afford a large amount of time for data entries. In the summer of 2003, the KEKB control group examined the automatic entry of operation log (electronic operational logbook) records for reducing the time of the logbook entries. At that time, we established the technology of automatic entries into the Unix files of the operation content [3].

The addition of the function of automatically importing data from the file to the MS-Access-based log system was examined initially; however, it was found that its development period was prolonged. Therefore, we subsequently started developing an operation log system based

on Zope [4], whose technology development was advancing rapidly.

Because Zope is a Python-based Web application server whose RAD (rapid application development) is easy, it was found that we, who learned the Python language, could complete the development of the operation log in a short period. This Zlog system has been used since the winter of 2004 [5].

ZLOG SYSTEM STRUCTURE

The Zlog system consists of the Zlog core, PostgreSQL, and log monitor server. The Zlog core is a Web-based application for browsing and editing the operation log records. All the records of the operation log are stored in PostgreSQL, which is a backend database server. The log monitor server monitors certain events and automatically records them into the database. We discuss each subsystem in the following subsections.

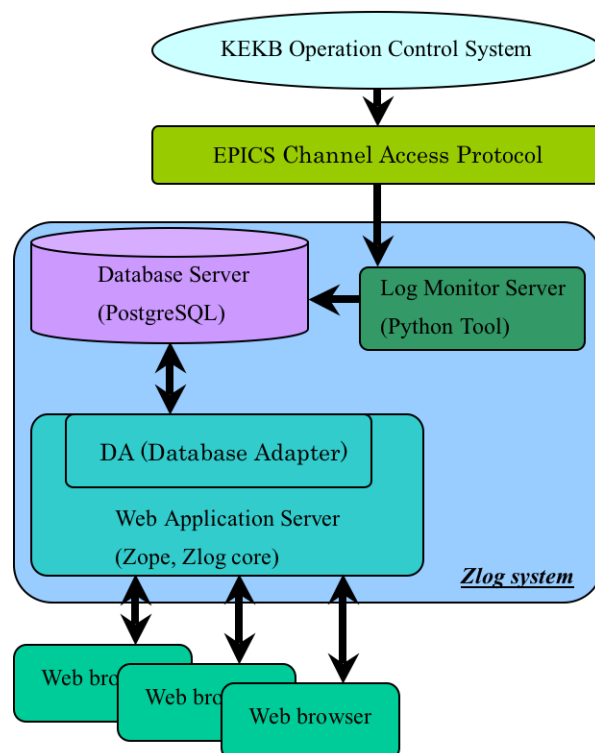


Figure 1: Zlog system.

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Database Server: PostgreSQL

Our requirements for the database subsystem are the capability of handling a large amount of data, a stable operation, and an effective management system for ease of construction and maintenance. We also planned for several kinds of operation logs to be constructed in the Zlog system. Considering these factors, we introduced PostgreSQL with a succession function.

The operation log of the KEKB comprises 1.5 million event entries and 1500 entries are accumulated everyday; however, it is working smoothly. We can set up another PostgreSQL server for a behaviour test without any additional cost because PostgreSQL is free software.

Log Monitor Server

The log monitor server monitors the operation data from the machinery and inserts them into PostgreSQL. The data are received through the EPICS (experimental physics and industrial control system) channel access protocol. The log monitor server converts the data into character strings in an appropriate format before insertion into PostgreSQL.

Web Application Server: Zope

Zope is a tool for developing Web applications. Users can browse through and enter data using the user interface of the Web application. Zope has the following features:

- Its development is also possible through the Web.
- It includes the function of a Web server.
- It is easy to handle Japanese characters on multi-platform.

Zope contains an object termed “product”, which is a kind of template of the application. The following two products are the major components of the Zlog system.

- DA (database adapter): This is one of the products of Zope. Data exchange between Zope and PostgreSQL occurs through the DA.
- Zlog core: This is a Web application designed at KEKB for the operation log using the Web application development function of Zope. Users can enter the data in the operation log, edit it, and browse through it using the user interfaces of this application with a Web browser.

ZLOG CORE

In this section, we briefly explain the development of the interface of the Zlog core. Any terminal in which a Web browser is installed can be used to access the Zlog system.

Each interface can be accessed by typing its URL in the Web browser. We can use these user interfaces in KEK wherever a PC terminal is available.

Edit Interface

Figure 2 shows a screenshot image of the edit interface, which is a user interface for manual entry and the editing

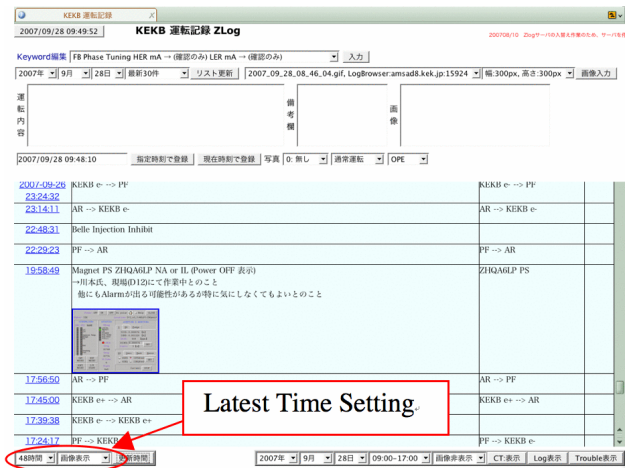


Figure 2: Edit interface.

of operation log records. In this interface, the latest records (maximum of 48 hours up to that point) are displayed. In addition, the insertion of images, such as screenshots of operational terminals, to the operation log is possible. The time range of the display can be selected from the menu, which is denoted as “Latest Time Setting” in Fig. 2. The display is automatically updated to show the latest entries. To prevent the modification of records that are more than 2 days old, a limit is imposed for the time range. To edit entries older than 2 days, permission from the manager is necessary.

Viewer Interface

Figure 3 shows a screenshot image of the viewer interface, which is a user interface for browsing through the operation log. When a user selects the date and time (in units of 8-h shifts) using the “Select Date” drop-down menu and presses the “LOG DISPLAY” button, all the entries of the selected date and time are displayed. The user can select

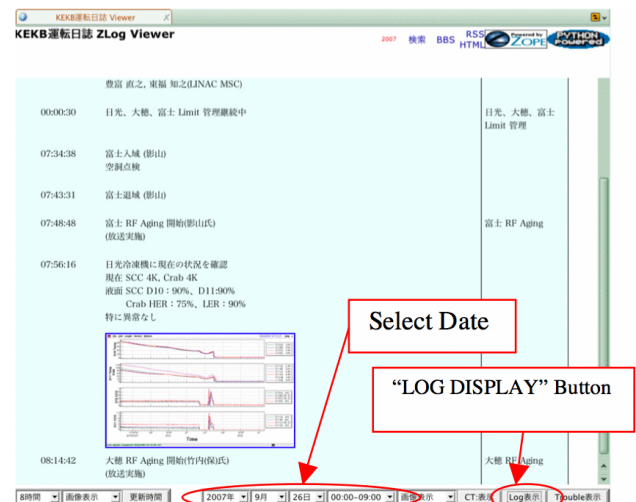


Figure 3: Viewer interface (single).

any date without restriction. However, the user cannot edit the entries in the viewer interface. The display of the entries is updated automatically as new entries are added.

Figure 4 shows another type of viewer interface, which displays multiple operation logs in a single list. For example, in Fig. 4, the log entries of PF-AR are shown in the khaki background and those of the KEKB are shown in the azure background. The user can select the viewing condition using the menus and buttons present in the upper part of the window. An automatic update is not available in this interface.

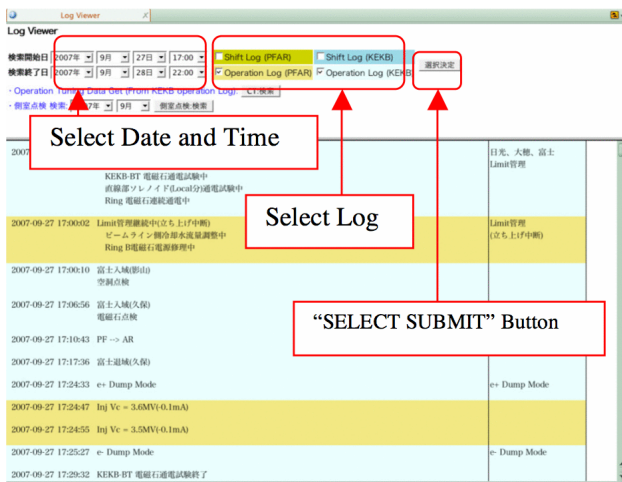


Figure 4: Viewer interface (multiple).

Search Interface

Figure 5 shows a screenshot image of the search interface, which is a user interface for searching for operation log records. A keyword search is possible. The user can select any date without restriction.

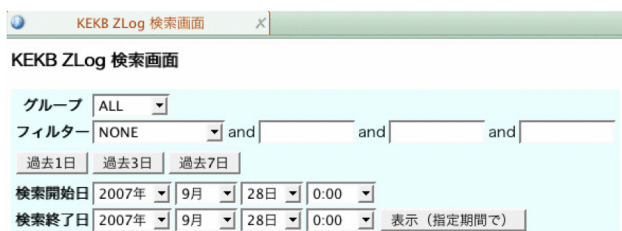


Figure 5: Search interface.

MERITS OF ZLOG SYSTEM

The Zlog system enables the automatic entry of the operation log records. In addition, it has the following advantages:

- Users can browse through and edit the operation log wherever a network terminal is available. The development of the Web application is also possible from the network terminal.

- There is little dependency on the OS of the network terminals.
- Because the system is developed in the Web server, no additional procedures such as data conversion are necessary for publishing on the Web.
- The Zlog system is object oriented, and it is superior in serviceability.

Because the Zlog system has flexible expansibility, it has been introduced in J-PARC, the RI beam factory of RIKEN, and the vacuum system management at KEK as well. Therefore, we are working on the portability of each part of the Zlog system. It takes only a few days for porting to other environments.

The development of the Zlog core, while simultaneously learning Zope, was accomplished in 2×1.25 man-months. The breakup of this time period is as follows:

- Learning the structure, usage, and technical details of Zope was accomplished in approximately 1.5 man-months.
- The user interfaces were developed using HTML and CSS in 1 man-month.

The first version of the Zlog system, which comprised minimal functions, was developed in lesser time than anticipated. Subsequently, the Zlog system has been updated periodically.

The system continuously accumulates more than 1,500 operational event entries at KEKB and PF-AR everyday. It is a valuable basis for the analysis of the operational efficiency. Thus, it is indispensable for KEKB and PF-AR.

ACKNOWLEDGMENTS

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