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, 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.

The Zlog system has been formally used since the winter of 2004 [4].

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 logbooks. We discuss each subsystem in the following subsections.

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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; 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 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 Figure 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
any date without restriction. However, the user cannot edit
the entries in the viewer interface. The display of the en-
tries 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 exa-
ample, in Figure 4, the log entries of PFAR are shown in the
khaki background and those of the KEKB are shown in the
azure background. The user can select the viewing condi-
tion 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).](image)

Search Interface

Figure 5 shows a screenshot image of the search inter-
face, 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.](image)

MERITS OF ZLOG SYSTEM

The Zlog system enables the automatic entry of the op-
eration log records. In addition, it has the following advan-
tages:

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

- There is little dependency of OS of the network termi-
  nals.

- 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 system, while simultane-
ously learning Zope, was accomplished in 2.5 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 months.
- The user interfaces were developed using HTML and
  CSS in 1 month.

The first version of the Zlog system, which comprised min-
imal functions, was developed in lesser time than antici-
pated. Subsequently, the Zlog system has been updated
periodically.

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

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