THE OPERATION LOGBOOK SYSTEM AT KEKB LINAC AND RING

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Abstract

The operation logbook system of KEKB linac and ring has been developed and operated with the relational database composed of MS-SQL and MS-Access on PCs. The operator interface to the system is provided through the Web or MS-Access with Visual Basic. The operation of the logbook system started in 1995 at the linac. It was also introduced to KEKB ring and PF-AR in 2002 with a little restructuring. Operators put accelerator information through MS-Access in Japanese language. The accelerator status record is stored automatically through the control system when it changes. The number of such logging items per day is about 500. With introduction of this system, accelerator experts can monitor real-time information anytime, anywhere through a web browser. And they often find and resolve problems remotely from offices or homes.

INTRODUCTION

In the KEKB linac, we have used PCs introducing DOS PC as an operator console from the end of the 80s. In 1996, the DOS-based console system was replaced with Windows system [1]. The following points were preferable for us: a) enhanced capability of multi-byte code (Japanese characters) handling, b) good development environment of graphical application, and c) low cost.

Before 1995, the operation logbook was recorded with handwrite by operators. With this method, it was difficult to reuse and search the past data. In order to improve such situation, we have developed database of the accelerator operation log (the operation logbook system) using Windows PC and relational database (MS-SQL/MS-ACCESS) [2]. Recently, the Internet become popular, and also it becomes more requests such that the accelerator experts like to see the operation logbook through the web browser. To realize the requests, a web interface has been developed in 2000.

In the KEKB ring and PF-AR, the logbooks were recorded by handwriting. As reusing the logged data was difficult, the logbook system of KEKB linac was embedded into KEKB ring and PF-AR.

THE CONTROL SYSTEM OF KEKB LINAC AND RING

The control system of KEKB linac is composed of three classes, the server class with 5 Unix servers (HP Tru64 Unix), the subsystem class with various front-end (27 VME, about 140 PLC, 11 CAMAC), and operator interface class with the console system, the touch panel, X-terminal, etc [3]. In order to control the accelerator, the server program is prepared for each device type and a homemade RPC (Remote Procedure Call) is used for KEKB linac communication between the clients and servers.

The control system of KEKB ring is based on EPICS tool kit, which is developed in an international collaboration. EPICS is composed of two classes, the operator interface class with several Unix servers (HP Tru64 Unix and HP HP-UX) and subsystem class with the about 100 VME computers. Script language of SAD/Tkinter and Python/Tkinter are mainly used for the accelerator control.

OPERATION LOGBOOK SYSTEM

The configuration of Console System

The operator console system of KEKB linac and ring consist of 3 server PCs (Windows2000 Server) and 8 console PCs (Windows2000 Pro), which communicate each other via Microsoft Network (Fig 1). The operation console system communicates with the KEKB linac control system through the Gateway PC. Each PC communicates with the Gateway PC using OLE, and the Gateway PC communicates with each device server program on Unix server (control system) via RPC. The change the accelerator is also distributed in UDP/IP to each PC through Gateway PC.

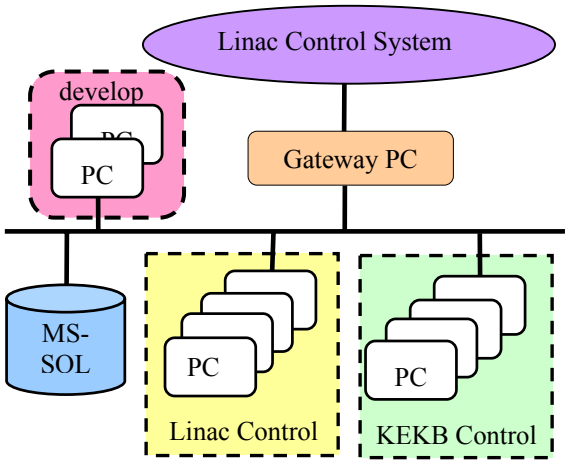

Fig.1: Configuration of console system

Operator Interface

MS-ACCESS was introduced as an operator interface, because of easy management database (MS-SQL) and development of the user interface and Windows affinity. MS-ACCESS is a front-end, and it decreases the CPU load of MS-SQL. The console PC and MS-SQL are connected by ODBC, and an operator can enter the current status of accelerator in Japanese (Fig 2). Data size was about 60MB per year from 1995 to 1998 (including the evaluation period). In this period, accelerator operation time was short because of the construction of KEKB ring and the upgrade of KEKB linac. After 1999, the injection into KEKB ring started and the data size is increasing year by year (Fig 3). In Fig3, 03 denotes from January to June in 2003. The number of records became 101,950 during six months.

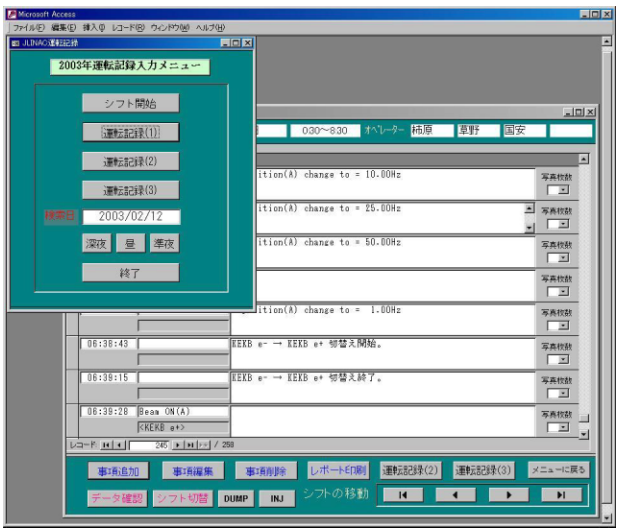

Fig.2: Operator interface

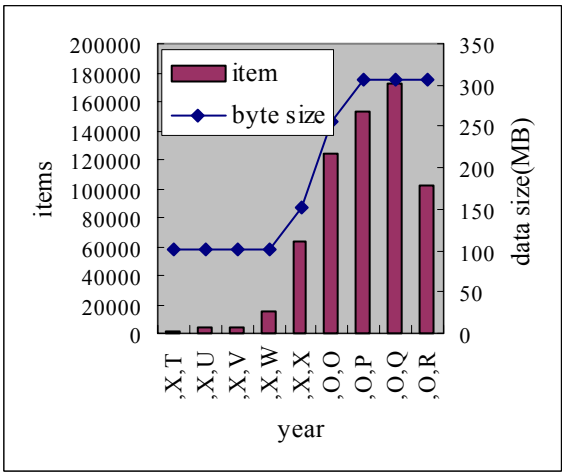

Fig.3: items and data size of operation logbook in KEKB Linac

Web Interface

The configuration of Web interface in an operation logbook system is shown in Fig4. The Web Server (Apache), which provides the Internet with information, is connected to KEK laboratory network and the network for KEKB linac control. Since the direct data communications were difficult between a Unix server and MS-SQL server, we prepared an application (Web Log) in the middle. The Web Log acquires data from MS-SQL every 5 minute, and writes into the file on Unix server through SAMBA [4].

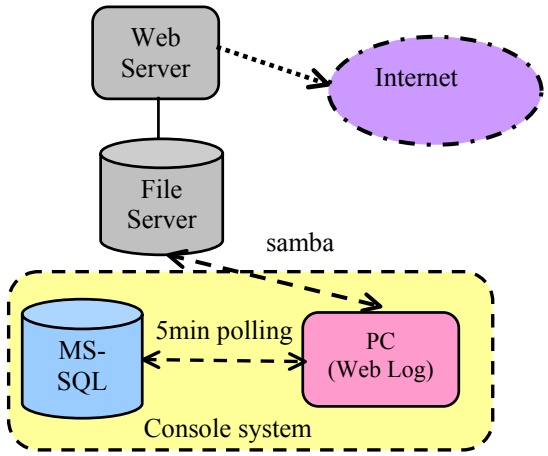

Fig.4: Configuration of Web interface

Automation Log

After 1998, the commissioning of KEKB ring became more active every year and the data logged by operators had become huge. This forces an operator to input large amount of data and it became an obstacle in another service of an operator. To solve this problem, we have developed the application (Fig 5), which records the operational information automatically, for example, beam on/off, the iterative change of beam and so on. The information sent through the gateway PC is logged in database by an application developed with Visual Basic.

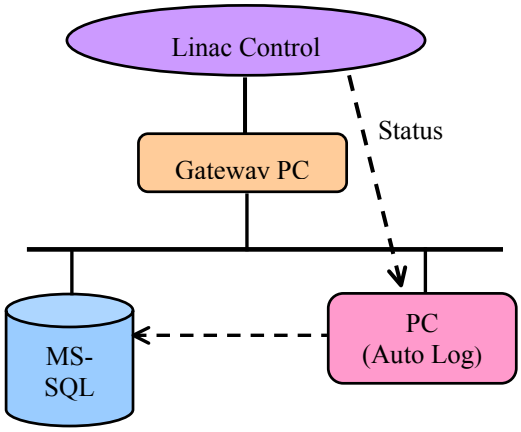

Fig.5: Configuration of Automation log

Because the operation logbook system in KEKB linac operates very well, this system was installed into KEKB ring and PF-AR in the summer of 2002. This system introduced with a very little restructuring (chart structure, operator interface).

DIRECT COMMUNICATION WITH AN UNIX SERVER

The operation logbook system runs on a closed Microsoft Network and it cannot communicate directly with Unix servers, which rule the KEKB linac control system. Another software is required between them and it is expected that further extension of the function will be difficult without it. We evaluate the followings to realize the direct communication.

Extension of existing database system

A direct communication between a Unix server and MS-SQL requires the Tabular DataStream (TDS) protocol in Unix server (Fig 6). Combination of UnixODBC [5] and FreeTDS [6] was evaluated to enable the communication with the existing database system from 2 Unix servers (Tru64, Linux).

Since Tru64 Unix is 64-bit OS, and FreeTDS is not designed for 64-bit OS, it was excluded from the candidate for the evaluation. On Linux, the communication is possible without any problems. However the communication with the operation logbook system could not work correctly in acquisition of data, because the operation logbook system uses Japanese characters in the table name of the database. To change of the table name into English was turned out to be difficult, because many applications ever need to be modified.

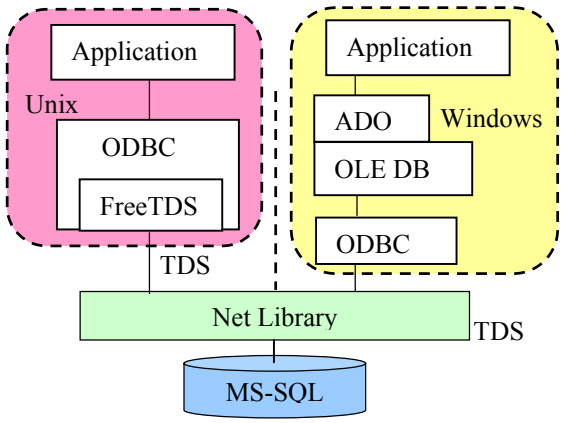

Fig.6: Connect to database

Change the database system

Conversion of Operation logbook system to a database system on Unix server makes the communication from each control system to the database system easy. Oracle and PostgreSQL are given as database system on Unix server. Although, Oracle has higher shares in industry and has high performances, it is very expensive. On the other side, PostgreSQL is a freeware and has a lot of users. A stable performance and continuous maintenance can be expected. The evaluation of communication between PostgreSQL on Tru64 Unix and a Windows application went smoothly without any trouble. We are now considering these two methods further.

Future logbook interface

The present logbook system is used with the text base, so that the image of devices and screen, etc, cannot display on web browser. To solve this problem, it is necessary to change MS-Access into another operator interface, for example, Zope, which can display he images on web browser like Zope interface [7]. Zope is an open source, cross platform (Mac OSX, Linux, Widows, etc) and support database and SQL.

CONCLUSION

We developed the operation logbook system with the relational database composed of MS-SQL and MS-Access on PCs. With this new system, accelerator experts can monitor real-time information anytime, anywhere through the web browser. Information can often be very helpful for an accelerator expert, when the machine failure. In addition, automation log system makes operator more free from input procedures.

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