# BEAM LINE CONTROL AND DATABASE

Yoshihiro Suzuki
Institute of Particle and Nuclear Studies, KEK, Japan

*Abstract*

This paper describes the design and test result of the prototype control system of the beam line in the J-PARC's experimental facilities. The system is based on the control system of the current beam lines, EP1, Neutrino, EP2, K2, π μ, π 2, T1, and K0 in KEK's experimental halls. The system is consists of a Windows based Personal Computer, PSC (Power Supply Controller), POD (Programmable Operation Display with touch-panel) and newly introduced Database MySQL. The database is opened for experimental users and the J-PARC's central control room. MS-SQL is also introduced for SCADA and the Web based HMI (ASP.NET Web application).

## INTRODUCTION

The J-PARC (Japan Proton Accelerator Research Complex) is a joint project of KEK (High Energy Accelerator Research Organization) and JAERI (Japan Atomic Energy Research Institute). The site is located in the northern part of the Kanto plains, and is far from 50km northeast of KEK. The Nuclear and Particle Physics Experimental Hall and the Neutrino Facility are under construction. The first beam is expected to be delivered to the experimental hall in 2008. For the reduction of the cost and time of the construction, many magnet power supplies are transferred from KEK to the J-PARC's experimental facilities. In those facilities the magnet power supply of beam lines are expected to be efficiently maintained by minimum personnel. In such situation, the magnet power supply control system is designed based on the control system of KEK's experimental hall. The newly improved part of the system is the adoption of database. Two databases, MySQL and MS-SQL are adopted. The easiness of the access to databases has examined.


Figure 1: J-PARC Facilities.

## SYSTEM CONFIGURATION

The basic configuration of the magnet power supply control system for J-PARC's experimental facility is shown in Fig-1. The PSC is eight magnet power supply controller, and has function to control and monitor power supplies. By the PSC's function, the load of the controller PC is minimized. The work of the PC is to get new data of magnet power supplies from PSC, and watches the renewal of the database to get the new operation data. When the operation data (the current value of magnet power supply) is updated, the PC transfers the current data to the PSC.

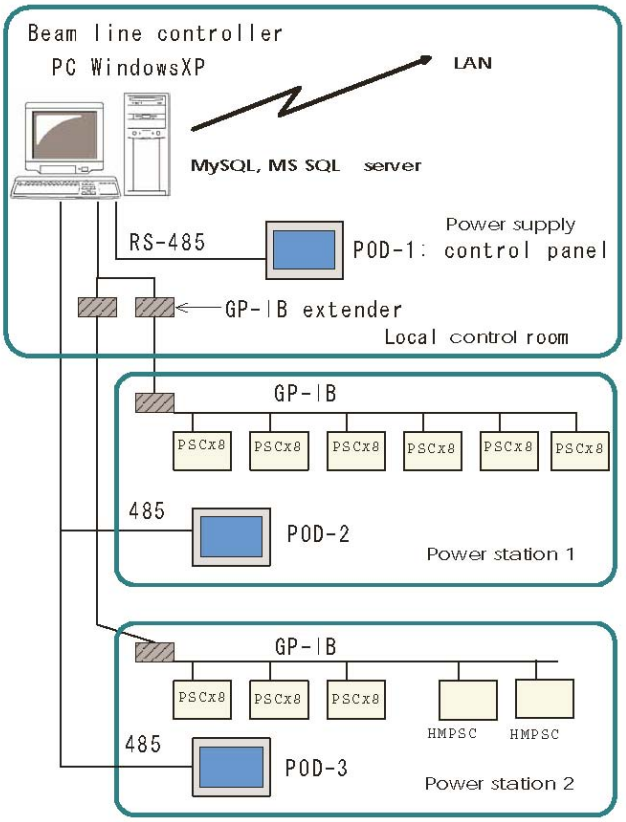


Figure 2: Magnet Power Supply Control System.

### *PSC, HMPSC, POD*

The PSC receives data from the PC to operate magnet power supplies automatically; those procedures are polarity switching, check and reset interlock circuit, turn on main power, current setting and monitoring. HMPSC is the controller of a high current pulse power supply

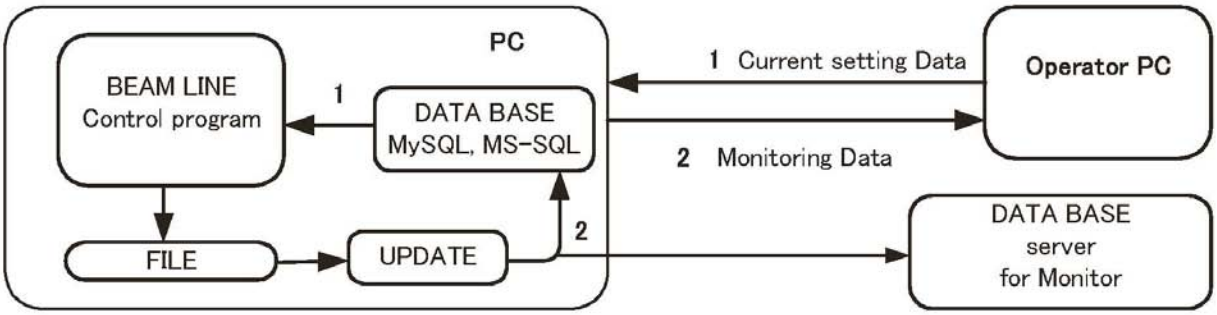


Figure 3: Data flow of the database.

synchronized to the proton beam from the 50GeV synchrotron, and has similar function to the PSC. The POD is an operation panel operate magnet power supplies. The features are editing and advanced display function which reduce the load of the PC.

### *Update of database*

MySQL and MS-SQL are installed in the PC. The update program is written in LabVIEW. Figure 3 shows the data flow of the database. The outside database server limits the over access to the PC. The current setting data is accepted the inside database of the PC.

## ACCESS TO THE DATABASE

There are two kinds of program development in the database access. One is usual program installed in client's operation PC. The program has been developed using MySQL ODBC driver and ActiveX to access the database. Language LabVIEW or Agilent VEE has a good efficiency in the development. The other hand is Web application program (ASP.NET Web application) which is developed in Dot-NET language. Dot-NET and database MS-SQL make the good combination to shorten the development time.

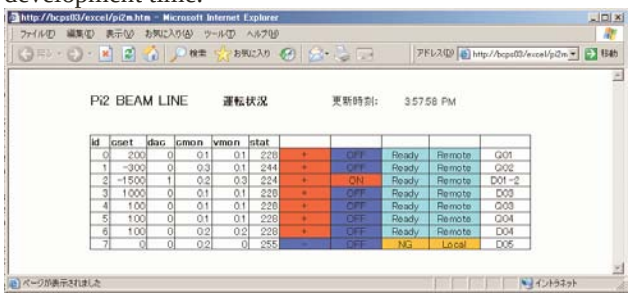


Figure 4: Web page, Beam line Status Display, uploaded periodically by MS-Excel.

Commercial product SCADA and MS-SQL are also good combination to realize distributed system; control, monitor, logging, and alarm system.

MS-Excel and MS-SQL or ODBC are the good combination. MS-Excel is the alternative to some function of SCADA; monitor, logging, periodic print out, and periodic upload of web pages. Figure 4 shows the web page of a beam line status uploaded by MS-Excel and its macro program.

Figure 5 shows a web page of ASP.NET Web application programs developed in VB.NET. The web page allows beam line users to monitor or change current value of magnet power supplies.

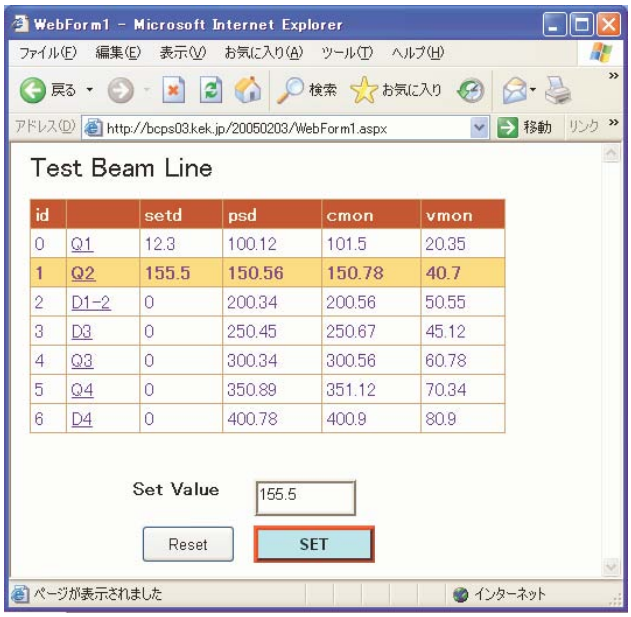


Figure 5: Web page developed in VB.NET.

## CONCLUSION

By the introduction of the database, it was confirmed that the new function could be easily added in existing system. It is the essence of distributed system. In the development of web-based human interfaces, the selection of MS-SQL database and Dot-NET language is effective.

## REFERENCES

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[2] Y. Suzuki, et al., "Control and Timing of the 250kA Pulse Magnetic Horn", ICALEPCS'97, Beijing, China, November 3-7.