EXPERIENCE AND PROBLEM OF 3W TECHNOLOGY AT CNS CYCLOTRON FACILITY

S. Watanabe, CNS, the University of Tokyo, Japan

Abstract

The computer control system based on the client-server system was extended to facilitate the WWW services aiming at browsing the operation status of accelerator facility. Generation of the real-time WWW contents and construction of the personal web server are key technology of this extension. The capable WWW services are browsing the operation status of CNS cyclotron facility and the radiation safety control. This paper describes the data logging system, generation of HTML files and the video server system relating with applied WWW technology.

1 INTRODUCTION

In 1984, a serial CAMAC system controlled with 16-bit minicomputer was constructed at the cooler-synchrotron TARN-II. In 1989, the computer system was replaced to the distributed computer system to enlarge the control functions covering the TARN-II and their beam transport line [1]. The distributed computer system comprises a host computer, two workstations and three personal computers linked with the DEC-net protocol. The host computer is a μVAX3400 with operating system of VMS. This computer system has been in operation until now. In 1992, This system was extended to the injector cyclotron of TARN-II. The extended system comprises a stand-alone CAMAC system and a PC where is linked with the host computer. The collected data utilise the beam diagnostics such as a calculation of beam optics of the transport line. In 1996, the distributed computer system was extended to facilitate WWW services such as a remote observation of the accelerator facility. The key technology of this extension is data logging system, real-time HTML file generation, personal web server and distribution of moving image data.

In the present paper, section 2.1 and 2.2 describe extended data logging system. Section 2.3 discusses a noise immunity of the network system. Section 3.1 and 3.2 describe a generation of real-time HTML files. Finally, section 4.1 and 4.2 describe a radiation safety control.

2 DTATA LOGGING SYSTEM

The Data logging system of the cyclotron facility is described in detail.

2.1 Hardware

A data logging PC is a main of the extended data logging system. This employs board bases 8 channels 12bits ADC with a peak hold circuit. The unified input voltage is ranging from 0 to 5 volts. A photo coupling circuit isolates an I/O bus circuit from the ground level. A switching speed of the multiplexing circuit is chosen at 50 micro-seconds/Ch. A cut off frequency of low pass filter of the front-end circuit is chosen at 30Hz.

The favourable signal sources are magnetic field, rf frequency, room temperature, vacuum pressure and beam gate valve. The board base FVC provides the capability of rf signal conversion ranging from 1 MHz to 50MHz. The room temperature has been measured by using analogue IC, AD590KF. A RAM based disk resource has been used as a scratch disk in the data logging PC to make sure the long-term operation. The data logging system linked with the WWW server is illustrated in Fig.1.

2.2 Software

Kernels of data logging program are written in MSC-V5 because of MS-DOSV5. The file transfer from the data logging PC to the host computer has been done in every data acquisition batch. The data logging PC have the following chained program modules:

- Data logging module to multiplex the 8 channels of analogue signals and to save the data file into the RAM disk. The time stamp is in-lined in the end of record of the data file.
- Data transfer module to communicate with host computer (μVAX3400) and to transfer the data file.
- Timing module to make sure the time interval of data acquisition and data transfer in every ten minutes.

2.3 Electromagnetic Interference

The cyclotron facility comprises the high power components such as a magnet, rf power source and a high voltage terminal. A boot up operation comprises procedures to start up a magnet power supply, rf power supply, high voltage power supply and so on. The boot up operation of the cyclotron facility may occurs an electromagnetic interference since the noise signal from the electric sparking influences a ground level potential. Due to the electromagnetic interference, any kinds of

operation troubles would be occurred in a low level control system such as the data logging system. Unfortunately, this boot up operation had influenced the data logging system of the CNS cyclotron facility many times.

The only one or few reasons are to be expected to improve the trouble shooting. The effective noise immunity from this electromagnetic interference is a use of an isolation transformer. The isolation transformer provides a laminated shielding electrode between the primary and secondary coils. The isolation transformer with a power rating of 1KVA has been equipped in the AC power line of the data logging system. After the installation of this isolation transformer, same troubles had decreased excepts the occasions of unexpected shutdown of AC power line. The selection of ground point of that shielding electrode is a key issue to decrease such the noise.

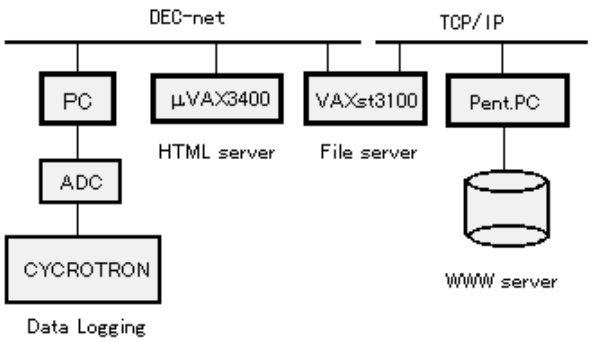

Fig.1 Data Logging System with WWW server

3 HTML FILES

3.1 Generation of HTML files

A general WWW client accesses the WWW server of CNS cyclotron facility to get the HTML files or text files stored in the WWW server. The computer network composed of the data logging system, HTML server, file server and WWW server has supported this WWW service. The HTML files have been generated by the µVAX3400 called HTML server. The HTML file comprises flash data in every ten minutes and an animated GIF files. There are two text files to show the history of the cyclotron operation such as the vacuum pressures. A daily log file is a summary of flash data. The summary of flash data is refreshed in every ten minutes. A previous day file is generated in every one handled flash data. So, the three kinds of data files are available to show the operation status of the cyclotron facility.

The generation of those data files is a routine of application program in the host computer. The application program is written in FORTRAN. A time sequential control to execute this application program is under the control of command procedure of the VAX-VMS operation system. First, the application program read the low data transferred from the data logging system. Subsequently, the application program calculates the physical values to show the present status of the cyclotron facility. The scaling and the offset correction of the physical values are carried out in the application program. The time stamp means the logging time at the cyclotron facility. Finally, the application program writes the text file in according to a rule of the HTML.

3.2 HTML File transfer

The HTML file or daily log file has been transferred to the WWW server. For convenient, the transfer of HTML file is described in this section. First, the generated HTML file is copied to the VAXst3100 with the DEC-net protocol. At the VAXst3100, HTML file is transferred to the WWW server by using the TCP/IP protocol. The FTP command is used to transfer the HTML file.

The logged file in every one handled shot is transferred after the small change of file name. The file transfer program may use the wild card to transfer the data file. This logged file is stored in the Pentium machine because of large disk sizes comparing with the µVAX3400 or VAXst3100.

The file transfer has been carried out in every ten minutes. A readout trouble at the HTML server would be expected since no synchronisation is available between the data logging system and the WWW server. The readout sequence has been protected with the aid of the VMS function of the HTML server. The same WWW services are available at TARN-II to show the measured vacuum pressures of the ring and beam transport line.

4 RADIATION SAFETY CONTROL

The newest radiation safety control system is described in detail.

4.1 Video server system

The video server system has been equipped in the present radiation safety control system to enable the distribution of an image files. The video server system provides the digital output terminals to control a video switch circuit. [2] The video switch circuit enables us the selection of image sources such as an ITV camera and a computer graphic panel signal of the sequence controller mentioned above.

The video server system distributes the moving image data whenever the WWW client requests the distribution. The WWW client receives the distributed

image files with the aid of the plugging software. The privileged client may use the administrative commands to control the video server, ITV camera and a registration of the WWW client to receive the image files.

4.2 Moving image data

The ITV camera has been equipped in the control room of the cyclotron facility. The ITV camera provides a remote control function such as a zoom up function of the digital panel meters of the control desk. An RS232C interface of the ITV camera enables us the remote control by using the video server system.

The gate monitoring system based on the sequence controller comprises a distributed sensing system and display system. The distributed sensing system enables us the remote sensing of the gate switches such as a status of the radiation shield doors. A computer graphic panel of the gate monitoring system gives current status of the shield doors, radiation level and interlock systems.

The example of WWW pages to browse the operation status of CNS cyclotron facility is illustrated in Figure.2. [3] The left page shows operation status of the CNS cyclotron and the right page shows moving image data from the gate-monitoring system.

REFERENCES

[1] S.Watanabe *et al.*, "Computer Control System of The Cooler-Synchrotron TARN-II", The Fifth JAPAN-CHINA Joint Symposium, Osaka, Japan, Oct. 1993

[2] http://www.megachips.co.jp/

[3] http://www.cns.s.u-tokyo.ac.jp/

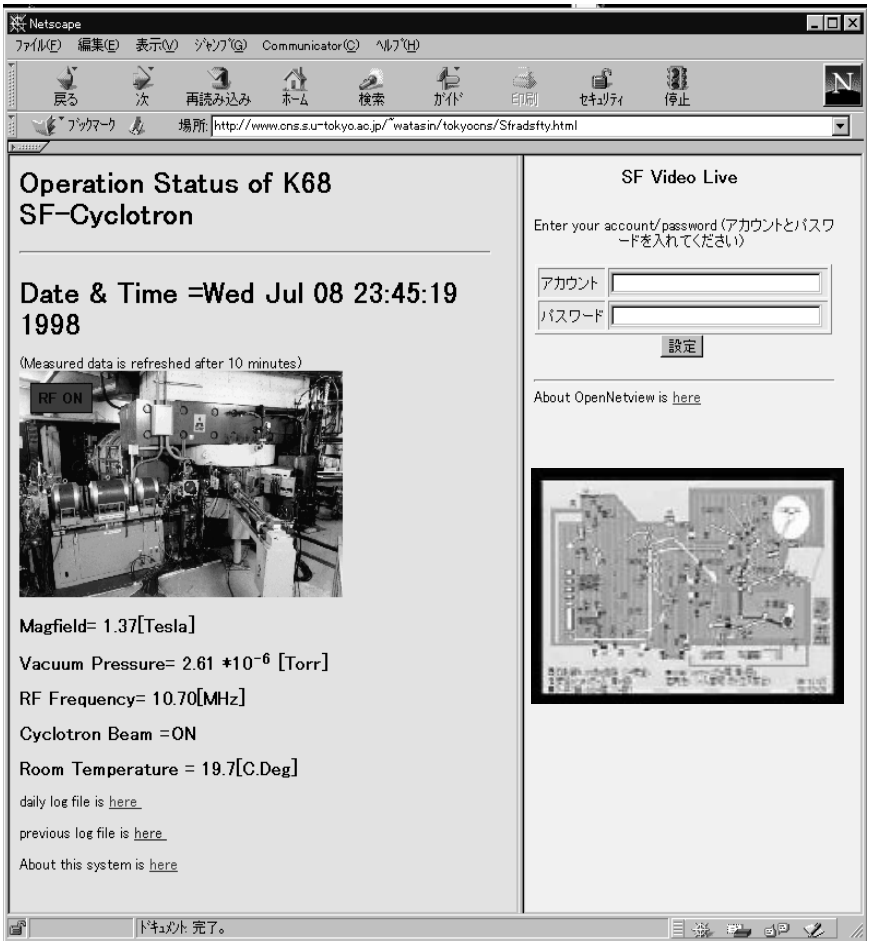

Fig.2. WWW pages to browse the status of CNS cyclotron facility