

## DATA ACCESS VIA WWW IN NSRL CONTROL SYSTEM

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### Abstract

The control system of NSRL electron storage ring is being upgraded using EPICS. The control data are hold in the distributed database, which rested on several IOCs. To make these data archived for further use, we developed a system to periodically collects data from distributed database using Channel Access. A number of CGI programs make it easy to access the archived data via WWW. The program also provides several functions for analyzing the data. The results can be displayed in various modes.

### 1 INTRODUCTION

The electron storage ring of NSRL is a dedicated synchrotron light source, in which the electron runs at the energy of 800Mev [1]. The control system of the electron storage ring is in the progress of being upgraded under EPICS, and partly finished in some subsystem. It is necessary to archive the data for a wide variety of purposes. For the storage ring, there are one power supply for bend magnet, 8 power supplies for quadruple magnets and three power supplies for sextuple magnets, which all have two operating mode, ramping and stable mode. It is necessary to archive the set-point value and status of each power supplies (PS) to keep the process of ramping. The data archived also will be very useful to determine the reason caused the beam lost. Beam current value is another data need to be archived. With the archived beam current, we can get the differential life-time at different time, with which we can get the machine status by some comparison. The value of closed orbit position gathered from BPM also needs to be archived for historical use. By comparing with reference closed orbit, we can make our decision if the orbit become worse. With the progress of the upgrading, there will be more data need to be archived. There are several archiving solutions already available in the EPICS toolkit. In our circumstance, we'll use AR developed by EPICS collaboration to archive data. In addition to AR, we wrote a TCL script to transform AR-archived data into the storage format described in section 2 for easy access.

Nowadays, a large number of people are familiar with World-Wide-Web (WWW) [2] and web browser. The WWW-technologies, including HTML, CGI, JAVA applet, and so on, make it easier to access the data on the web regardless the platform you use. In this paper, we will focus on data organization and methods to access data, which include a number of CGI programs and

JAVA applets. A number of analyzing methods will also be described.

### 2 DATA ORGANIZATION

#### 2.1 Data Archiving

We use AR to archive the data from several IOCs. At present time, only channels that associate with ring power supplies and closed orbit can be archived. After the data are archived, a TCL script will transform them into the files described bellow, which all use SDDS protocol.

#### 2.2 Data Organization

In order for the data to be easily accessed, we developed a database structure, i.e. data file organization, which to some extent like the Unix file system tree. Fig 1 shows the structure of the database tree.

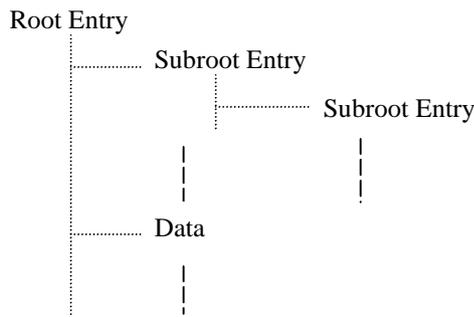


Fig 1 database organization

The data were divided into several groups according to which system they belong to or anything else the database builder want. For example, all the data for closed orbit position are belong to the same group. The data in this group can also be divided into several groups. At the top level, there is a root entry holds all the information of all the subentries and data in next level. There is also a subentry for each group of data and sub-subentry under this group. Database entries are held in files named xxxIndex.sdds, e.g. root entry in rootindex.sdds and COD (closed orbit distortion) entry in codIndex.sdds, in which they treat data and entries as the same thing. In the present version, each entry consists of three parts, NAME, TIME and PATH. NAME is a string used to identify the data. TIME is the time the data came into being. PATH is a string, number@filename, in which filename is the name of the file where data or entry rests, number is the page number in this file. The following a sample of codIndex.sdds.

```

SDDS1
&parameter name=par1, type=long, &end
&column name=col1, type=string, &end
&column name=col2, type=string, &end
&column name=col3, type=string, &end
&data mode=ascii, &end
! page number 1
5
1
"Q1SF00 Q1SF01 Q1SF02 Q1SZ01 Q1SZ02"
"{9:26:12 5/18/1996} {9:27:14 5/18/1996} {9:28:16
5/18/1996} {9:24:58 5/18/1996} {9:23:54 5/18/1996}"
"1@Q1S.sdds 2@Q1S.sdds 3@Q1S.sdds 4@Q1S.sdds
5@Q1S.sdds"

```

### 3 DATA ACCESS VIA WWW

#### 3.1 Way to access database

Fig 2 illustrates how the data are accessed. Anyone who is authorized can access the database via web browser. The HTTP server, i.e. HTTPD, provides basic HTTP based service. There are a number of CGI programs written in TCL language, which provide an interface between HTTP server and database. At first step, a CGI named *form.tcl* parse the form contents. Then the script will call other script according to the commands got from the form content to retrieve data and analyze them if needed.

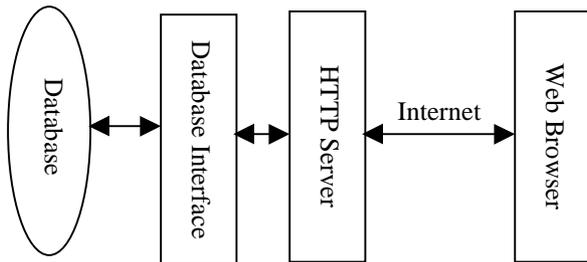


Fig 2 Way to access data

#### 3.2 Client Description

Fig 3 is a sample screen of data display in netscape web browser. A netscape window is divided into three areas, i.e. three frames. Frame 1 used to display the entries at a certain level. In fig 3, it shows all the entries for closed orbit. If an entry is pressed, the data will be displayed in frame 2. Frame 2 is used to display data. The default display mode is plotting a 2-dementional curve. It can also display the data in text and 3D curve if specified. Frame 3 is used to do more complicate analyzing. It can send a set of commands to the server. With these commands combined, we can do many

interesting works. For example, when analyze closed orbit, we can first set a reference orbit, then plot the displacement of a certain orbit with respect to this reference orbit. We can also display a set of orbit in a 3D curve, plot a set of orbit in a same 2D curve.

#### 3.3 JAVA Applets

There are two JAVA applets used to plot data in various modes.

- *plot.class*, used to plot 2D and 3D curve.
- *bar.class*, used to plot 2D bar for the data.

#### 3.3 Security Consideration

It is always necessary to pay attention to security problem. We use two methods to restrict users accessing the database. One is user-name checking, the other is IP address checking. Only a number of authorized users can access the database, and only on the computers in the local network of the lab can access the database.

### 4 CONCLUSION

Our control system is a media scale one. Such a system to archive and share data is basically meets the demand of many people and research work. We will improve the communication methods using JAVA. We will also improve the data archiving, which will directly build the data into the database. In such way, the delay time between data archiving and database building will be reduced.

### REFERENCES

- [1] Weimin Li, The Control System of The Main Magnet Power Supplies in NSRL, this proceeding.
- [2] B. Jeram et al, ICALEPCS'97, Beijing, China, 1997, p.330

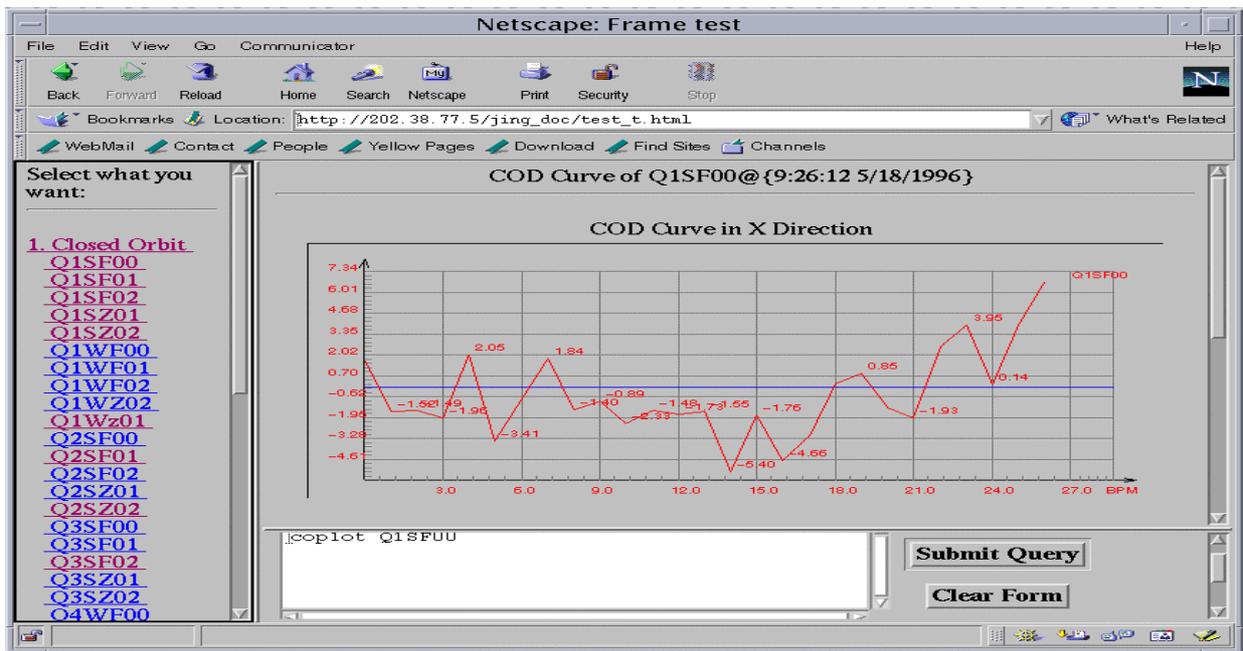


Fig 3 Screen of data display in netscape web browser