A WEB BASED REALTIME MONITOR ON EPICS DATA

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INTRODUCTION

The web based realtime monitor on EPICS data :

- Captures EPICS data through CAJ interface and saves it in the web server memory.
- Displays EPICS data on web browsers(IE、Firefox).

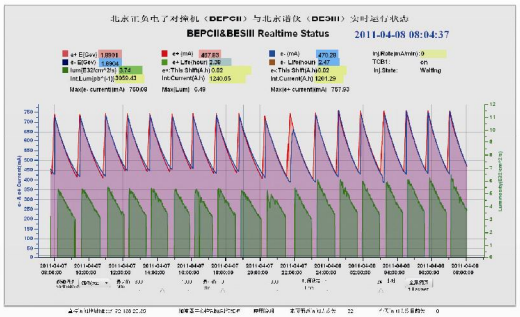
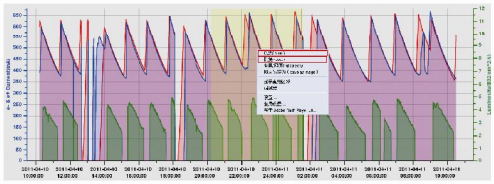
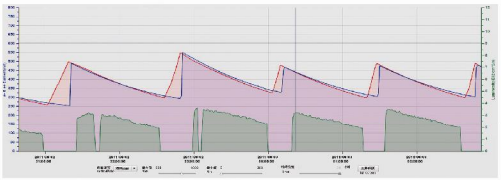


CHART EFFECTS

Zooming(before)

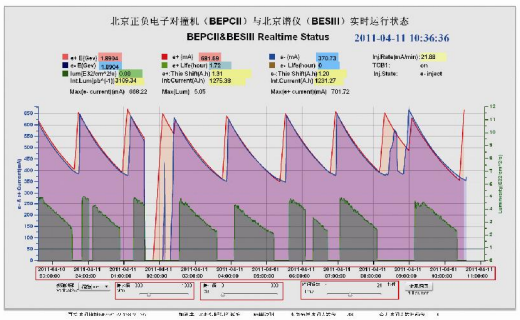


Zooming(after)

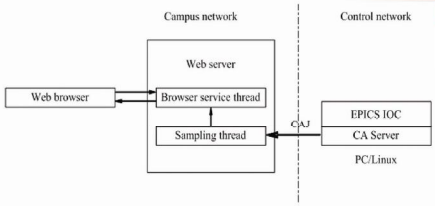


Data tips showing

Chart adjusting



ARCHITECTURE



The web based monitoring system works as follows:

- The sampling thread connects CA gateways or IOC servers and keeps CA connections in server's memory.
- Through CAJ interface, the sampling thread gets EPICS data from CA gateways or IOC servers. Then all the EPICS data is saved in server's memory.
- When visitors view the web page of the monitoring system, the service thread in web server will return the initial EPICS data from the web server's memory to browsers.
- The browser parses EPICS data from the web server and displays it on web page in patterns of charts and texts.
- By regular interval (10s,30s or 1m), the browser sends a request to the web server, gets latest EPICS, and then refreshs the charts and texts.

TECHNICAL VIEW

- Flex for web UI
- Java for application on the web server
- BlazeDS for the bridge between Flex and Java
- CAJ for interface between EPICS and Java application
- Json as data format transferred from web server to browser
- Log4j as logs management for web app
- EPICS data stored in memory of web server

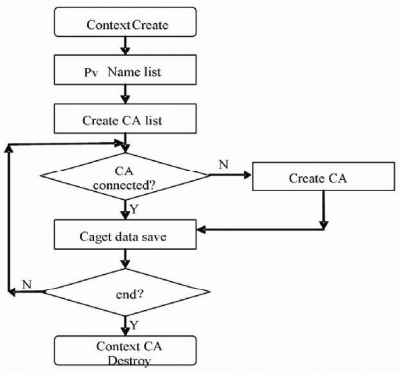
JAVA APPLICATION IN WEB SERVER

Java applications in web server mainly includes the sampling thread and the browser service thread.

The sampling thread creates CA connections and keeps all of them in server's memroy. Then it gets EPICS data from IOC servers or CA gateway and saves it in server's memory (as an "application" of web server). All procedures above executes every regular interval (10s,30s or 1m).

The browser service thread returns EPICS data in format of Json to browser from server's memory. Then the Flex application in browser displays the data on web page.

WORK FLOW OF SAMPLEING THREAD



As we know, CA connections take time and CA's UDP broadcasting times by times when recreating CA connections will cause the network traffic. To reduce the time consumed by making CA connections and the network traffic, CA connections should be kept in server's memory so that the sampling interval will be minized

FIEX APPLICATION IN BROWSER

- Data initialization module
- Data refreshing module
- Timing module
- Full screen module
- Data tips showing module
- Chart adjusting module

TEST ENVIRONMENT

- HP Compaq dc7700 (Intel(R) Core(TM)2 CPU 6420 @ 2.13GHz 2G)
- Centos4 linux (synchronizing clock through ntp)
- Tomcat6.0 as web server
- Jdk1.6
- Jprofiler for memory test and thread test
- Apache ab for load test

PERFORMANCE

A web server of tomcat has been built and running almost 2 months without breaking down.

The test shows:

- The chart can run in many kinds of browsers (IE or Firefox/Mozila)
- No EPICS data is lost(once data is lost,it is recorded in the server's log)
- Minimum sampling time=1s
- Concurrent visitors>100
- Web page response time <3s
- Successive working time of server >2 months
- Low load of web server

A simple version of the system without special effects (zooming ,chart-adjusting and fullscreen) has been available on the web and you can visit the address http://202.122.32.134:8080/RealTimeLineChart/

CONCLUSIONS

This system takes BEPCII running parameters including energy, beam current, lifetime and luminosity as example and fetches these EPICS data through CAJ interface. These parameters can be displayed in IE in a real time curves which can be updated automatically. The web page of the monitoring system is designed by Flex and provides some flex functions including chart-zooming, chart-adjusting, data tips-showing and full screen. On the web page, it's easy for users to adjust the time span and zoom the chart. In order to improve the sampling performance, CA connections stays in the web memory. Since this system is thin based on browser/server, it is very easy to deploy and can be used in other projects