

UPGRADE THE MACHINE STATUS BROADCAST SYSTEM BY PHP FRAMEWORK

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Abstract

To improve the display quality and enhance expandability of machine status broadcasting, the existing cable TV system will be replaced by web based interface to broadcast the machine status display via computer network. Web browser is used to easily access the machine status display page without installing other toolkit. Thus we implement a broadcast system by the PHP framework on Linux server to show main machine status, trend plots and images. Then we use a thin PC (loaded OS and browser) with LCD TV to show the full-frame display page. By means of it, the machine status display is clearer to be observed. On the other hand, to reduce impact on network bandwidth, we avoid using the additional applet to aggravate the network bandwidth. Our design will be based on low network loading to upgrade the machine status broadcast system. Moreover we will measure the variation of network throughput to learn the effect of numbers of accessing clients. According to the measurement result, we can estimate the relation between the network loading and numbers of accessing clients.

INTRODUCTION

The machine status broadcasting system is used to show the current operation status of the Taiwan Light Source (TLS, a 1.5 GeV synchrotron light source). The users can observe these display data easily through this broadcasting system within the NSRRC campus. The existed machine status broadcasting system was implemented by the cable TV system for more than 15 years ago. Each display channel is transmitted from the TV-out display port of PC which receives the machine status data from text server program and integrated by the LabVIEW. The machine status broadcasting system combines all display signals of PCs via specific equipments such as modulators, combiners and amplifiers. Then each display TV obtains the signal transmitted through a cable.

Network technologies are developing constantly, and the transmission speed is recently ever and ever faster, from 10 Mbps to 1 Gbps even 10 Gbps. Thus many applications transmit data through network interfaces now. The network provides the better availability to access easily, and it is partly instead of the traditional interface which using wires or cables to transmit. The Web applications are developed based on the network interface. It is convenient to access Web applications by using the Web browser of operation system. Recently many information systems support the Web interfaces to access easily.

For improving the display quality and enhancing expansibility, the machine status broadcasting system adopts the network interface to upgrade the machine status display. The upgraded machine status broadcasting system is implemented by the Web interface to display. To access the Web via the network browser without installing other toolkits or applets, it utilizes the PHP framework to achieve the broadcasting system. The PHP is a server-side scripting language [1]. The PHP program includes text, HTML tags and scripts, and returns to the browser as plain HTML. This is a powerful framework for making dynamic and interactive Web applications. At the implemented system also applies the AJAX (Asynchronous JavaScript and XML) mechanism to combine with the PHP framework [2]. The AJAX is based on JavaScript and HTTP requests [3]. This is not a new programming language, but a new way to use existing standards. The AJAX mechanism is used for updating changed data without reloading all frames in order to reduce the network traffic of Web applications effectively.

The display of Web based broadcasting system shows the main machine status, trend images and information of seminar announcements. Our upgrade design is based on the low network traffic, the better display quality and avoiding the use of additional applet to aggravate the network bandwidth. According to measure the network throughput, it evaluates the effect on the Web based broadcasting system and the relationship between the network throughput and numbers of accessing node.

WEB BASED MACHINE STATUS BROADCASTING SYSTEM

System Architecture

To implement a Web based machine status broadcasting system, adopt the LAMP (Linux-Apache-MySQL-PHP) platform as the client-server architecture. The Apache service loads the PHP program in the Linux Web-server. It uses the PHP program to access UDP packets from the server and archives machine status in the webpage. In addition applying the AJAX mechanism on the PHP program can abate the network traffic of client-server.

In order to broadcast machine status page, use a thin PC which loaded the operation system and the Web browser, and combined with a LCD TV. The screen of LCD TV is shown from the full-frame Web browser page to display the machine status data. The system diagram of Web machine status broadcast system is shown as Fig. 1. The resolution of LCD TV is 1280*1024 pixels to display the full-frame webpage from a thin PC. The broadcasting of the main machine status, trend images and seminar

announcements has the better display quality, and it is clear to observe.

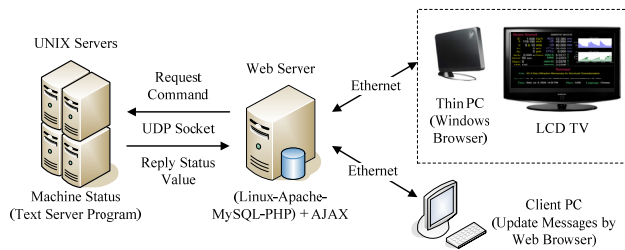


Figure 1: System architecture of Web based machine status broadcasting system.

PHP and AJAX

At the implementation of Web based machine status broadcasting system, the AJAX structure is adopted to combine with the PHP program. The AJAX is the JavaScript language which embedded into PHP program, and used to be the background process to deal with routine tasks. The diagram of client-server which cooperates with AJAX is shown as Fig. 2. First a client PC requests the PHP webpage from the Web server, and the Web server will response the webpage embedded HTML and JavaScript. The background operation of client-server will be processed by JavaScript to request and response. As the data changed or the update time expired, the background process of client PC requests to update the data to the server, and the server will send out the requested data to update the specific field at the PHP webpage without reloading all the data. This data updated method has the lower network traffic than general webpage with renewing overall components in each webpage frame. Hence our implementation based on this mechanism will effectively reduce the network throughput of client-server as refreshing the webpage frequently.

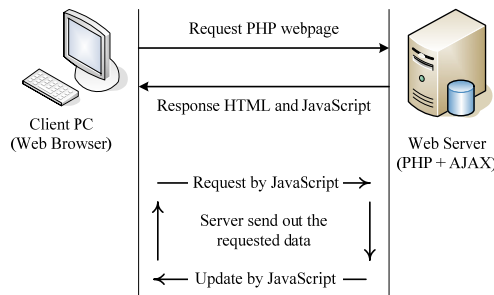


Figure 2: Data flow of client-server with PHP and AJAX.

Web Based Seminar Announcement

The display page of Web based broadcasting system integrates the information of seminar announcement. Adopting the MySQL database method [4] stores the broadcasting of seminar announcement. Through a Web browser of operation system the client user can update and edit the form webpage of seminar announcement information and the broadcasting time per announcement.

One block area of Web based broadcasting page displays the information of seminar announcement according to the setting broadcasting time in rotation. The system diagram of software modules is shown as Fig. 3.

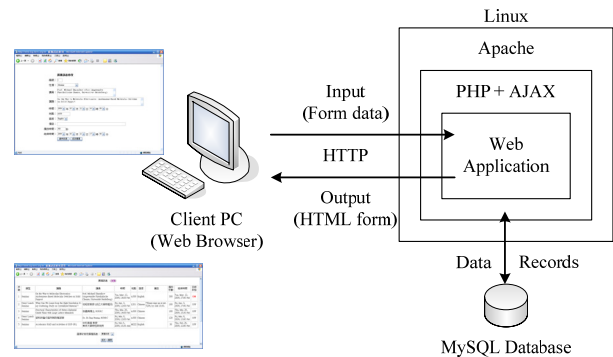


Figure 3: Software architecture of the Web based machine broadcasting system with seminar announcement.

A user webpage interface was also implemented to provide a convenient way for seminar information announcement. The seminar information is in table form, and it is easy to edit entry in the table. Management via Web interface for the seminar announcement is much better than even by another way. After certain lifetime, the announcement entry is removed from the active state. The entry in active state is shown in the webpage in rotate basis. Very good display quality was achieved which is almost impossible by the existed CATV system.

Trend Image

In the Web based machine status broadcasting system the trend images are added to show the history records of beam current and beam lifetime. Each trend image is a plot of 12 hours record values. At the Web server, the buffer data array is created to store the acquired timestamp and values of beam current and beam lifetime per second through the PHP program with AJAX mechanism. The PHP program can check the data records in 12 hours. If the data record is over 12 hours, it will be replaced. By using some specific image modules to combine with the PHP program, the PHP webpage draws the curve graph with values from buffer data array. To change the static plot packet to dynamic display the program adds a timer method to update the trend image to reload new data records. The software diagram of trend image is shown as Fig. 4.

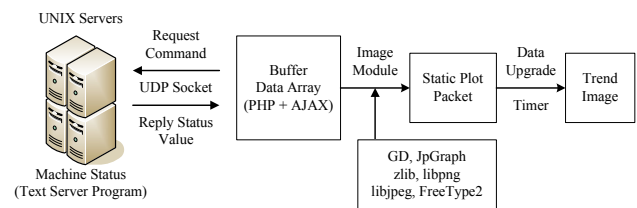


Figure 4: Software architecture of trend plots at the Web based machine broadcasting system.

PERFORMANCE MEASUREMENT

The Speed Meter toolkit is used to measure the network throughput in bandwidth of client-server in the web based broadcasting system [5]. First the implemented system is measured the throughput of a client-server in one hour to accumulate the average data. The measurement result is shown as Fig. 5. The average incoming throughput is 6.5 KB/sec, and the average outgoing is 7.49 KB/sec. Total is 13.9 KB/sec which is less than 15 KB/sec. Very low network bandwidth of this Web based machine status broadcasting system is needed.

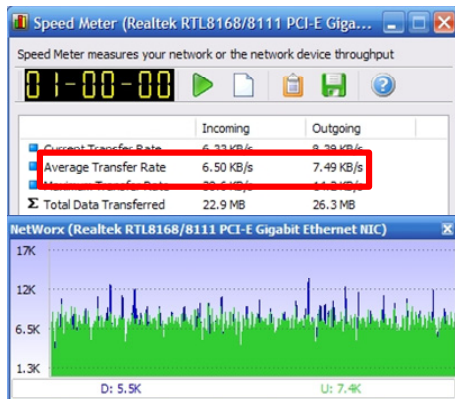


Figure 5: Measurement result of network throughput of Web based broadcasting system.

To estimate the network traffic contributed by this web page based broadcasting system, measurement results of single access client is used. Per throughput of client-server is about 15 KB/sec, and total throughput is this number multiply by the numbers of clients. If the network backbone is 1 Gbps and the number of display stations (or PC clients) is 50 clients simultaneously, evaluate that the network usage rate is less than 1% of the network bandwidth. This traffic is negligible and will not degrade the network performance.

CURRENT STATUS

Now the implementation of web based machine status broadcasting system is shown as Fig. 6 and 7. The display is divided into three parts. The TLS operation machine status is shown on the upper-left corner. Beam current and lifetime trend for last 12 hours are shown at upper-right portion. Lower part shown meeting, seminar, and colloquium announce information. The display can be combined English and traditional Chinese. The page can be accessed via the intra- and inter- net by standard web browser. The fix display client is used a thin PC combined with a LCD TV with the full-frame display page at specific locations around the NSRRC buildings.

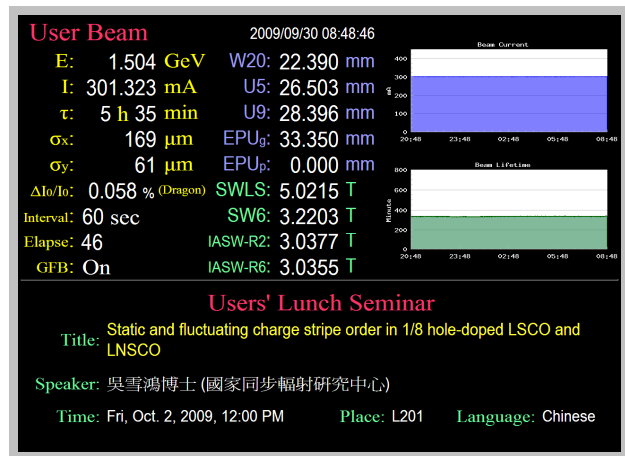


Figure 6: Full-frame display page of Web based machine status broadcasting system.

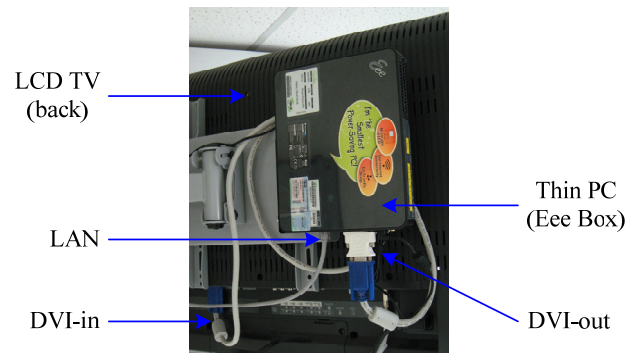


Figure 7: Actual LCD TV which combined with a thin PC to display the full-frame broadcasting webpage.

SUMMARY

Due to the limited display resolution of the existed analogue CATV system, it cannot display all necessary information in one screen; and many channels are needed to deliver variety information for different users with different preference. Based upon the advanced of computer network and low cost high resolution display available, new webpage design can provide concise and comprehensive information in one page, and can satisfy most of users requirements. More display pages can be added if necessary. Current webpage implementation provides a low cost solution and better access environment without special and costly equipments. It is better than using another technology (IPTV, digital TV and etc.) in every aspect included cost and convenience.

REFERENCES

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