§33. Migraion of the LHD Monitoring System

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In order to keep the statility of Large Helical Coil (LHD), LHD real-time monitoring system[1] has been working to monitor the several physical status of LHD vaccuum vessel, such as, the tempratures, magnetic fields, and so on. This system has been working since the first dischage of the LHD plasma experiment. Because the system was developed more than 10 years ago, the system uses the obsolete standards such as SBUS based digitizer. The SBUS was a computer BUS used for Sun SPARC workstations, but currently, they have been replaced with PCI BUS. Therefore, even if hardware trouble occurs, it is difficult to replace the broken components with others. Furthermore, most of the user interface was implemented as Java Applet. This enables the users to use web browser to control the system without installing other software compoents. However, it uses JDK (Java Development Kit) 1.1. Therefore, it requires Netscape Navigator 4.x to run the application, and it doesn't run on other major web browsers, such as, Internet Explorer or Firefox. The development of Netscape Navigator 4.x has been stopped since 1998. Therefore, the LHD monitoring system was strongly required to migrate to other system. As a minimum requirement of the new monigoring system, it must display both the past and the real-time data. Futhermore, for smooth migration, the user interface of the new system was not changed a lot; they must be web based applications.

Fig.1 shows the overview of the new system. The new system replaces the SBUS based data acquisition system with the LABCOM system[2] that uses newer standards, such as CompactPCI. At first, the LABCOM system was developped to work as a batch system; it stored digitized data into the local memory during plasma dischage and the data was moved to the storage after the discharge was over. Then, the transd sever sent the data in the strage to the client in reply to the request. Beause of this mechanism, the user couldn't watch the data during the discharge. Therefore, the rtransd (realtime transd) server was developped. The rtransd server sends the data to the client continuously without stopping the data acquistion. The new monitoring system uses rtransd to display real-time data.

Fig. 2 shows the RealTime Graph which displays the real-time monitoring data. Same as the previous monitoring system, RealTime Graph is a Java applet application, but it uses JDK 1.4, therefore, it can run on most of the current web browsers, such as Internet Explorer, Firefox, and so on. In order to get the data from the rtransd, the RealTime Graph must communicate with rtransd. However, because of the security reasons, a normal Java applet has various restrictions. For example, it cannot connect to the servers other than the server which it is downloaded from. Therefore, a normal Java applet cannot connect to the rtransd. To cope with this problem, the RealTime Graph was developped as a signed applet. The signed applet is an applet that is signed by the certification file. When the signed applet is downloaded, the web browser asks the user if the applet is granted to use restricted functions. Once it is granted, the application is free from the Java applet restrictions, and it can connect to any server.

In order to display the past data, there is another problem that cannot be solved by the signed applet. Because Java interface of retrieving the past data is not provided, it must use C library. To call C library from Java, it must install C library in advance, but it spoils the benefits of Java applet. Therefore, the authors provide the relay server to relay past data from the LABCOM system to the client. The client communicates with the relay server using RMI (Remote Method Invocation) and the relay server invokes C library using JNI (Java Native Interface) to get the past data.

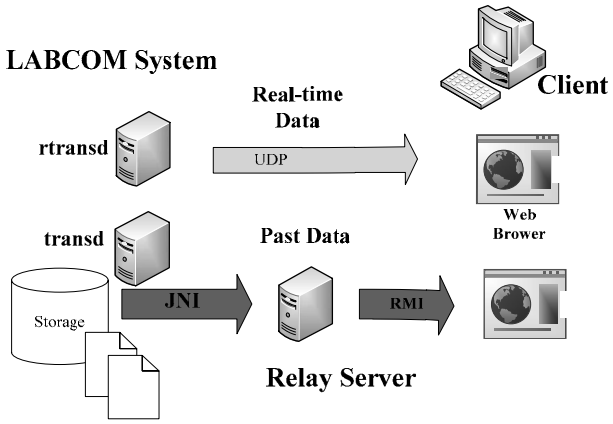

Fig1. Overview of the new system

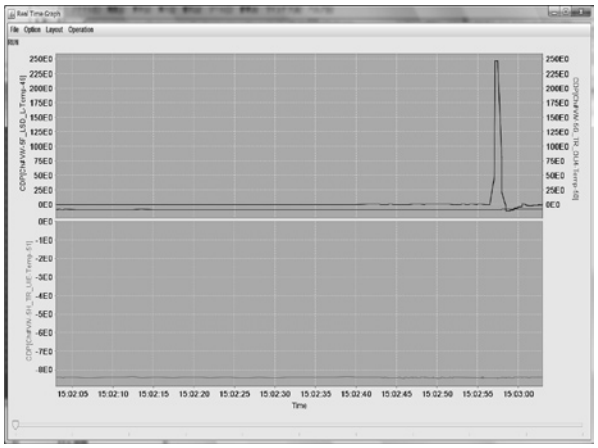

Fig.2 RealTime Graph

1) Yamaguchi, S., et.al : Fus. Eng. Des. **48** (2000) 9
2) Nakanishi, H., et.al : Fus. Eng. Des. **82** (2007) 1203