Integration of standalone control system into EPICS-based system at RIKEN RIBF†

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The major parts of the accelerator components developed for the RIBF have been integrated into the Experimental Physics and Industrial Control System (EPICS), but several standalone control systems were carried over and certain new components were provided with their own standalone control systems. These non-integrated systems are grouped into two major categories. The first is hard-wired control systems and the second is based on a two-layer remote control system, which consists of controllers and client PCs without a middle layer.The RILAC beam Faraday cup control was categorized as a hard-wired control system. We replaced the hard-wired devices with an N-DIM[1], and an EPICS input/output controller (IOC) provides the channel access (CA) service. Similarly, the Hyper ECRIS control system has been constructed as a standalone system with a closed network, for which the main controller was a MELSEC-A series programmable logic controller (PLC) as two-layer system. Hyper ECRIS is usually controlled with a Microsoft Windows-based client PC located in the ion source room. In this work, the conventional control method was not modified, and integration into the EPICS system was supplemented by introducing an EPICS IOC as a gateway between the RIBF control network and the closed network of the Hyper ECRIS control system. In the present study, we developed EPICS device support for a MELSEC-A series PLC. Thus, we could construct unified operator interfaces by utilizing CSS/BOY[2] because it is possible to also control the Hyper ECRIS control system to control from EPICS.

For the linear accelerator and the cyclotrons, the RF control systems are implemented as a two-layer system consisting of a client, based on Wonderware InTouch[3], and an OMRON PLC. Since the accelerator operators are familiar with the InTouch interface, it would not be beneficial to replace the GUIs to send output control commands to the PLCs. On the other hand, there is a need to monitor the RF data along with the other EPICS-based data, such as vacuum pressures, by creating charts and graphs. Therefore, the two-layer systems were left as they were for the accelerator operation, but we inserted a middle layer, based on EPICS, to monitor the data. When a new instrument is introduced, the control system may not be compatible with EPICS because human resources are required to develop the EPICS device support software. We mention that National Instrument LabVIEW is a suitable platform for the rapid prototyping of a system. In RIBF, LabVIEW-based systems with a two-layer structure are utilized for the monitoring of the beam phase and intensity[4], and other parameters. In addition, commercial systems are also implemented to monitor the temperature. To attain data integration, we considered an approach for handling and sharing the data. Since there is a need to store and analyze the data for a system with a two-layer structure, we introduced MyDAQ2 as a common DAQ system for small non-EPICS-based systems[5]. The MyDAQ2 system can store data in a MySQL-based database by sending an ASCII command and allow viewing of the stored data via a Web application. One of the beneficial features of MyDAQ2 is that it is possible to easily develop a program to store data from other client systems. In addition, by utilizing a JavaScript chart library, we realized a chart feature with a significantly higher level of performance than the original MyDAQ2 chart feature, which used gnuplot. Thus, the administrator can store data from LabVIEW-based and commercial systems via MyDAQ2. In order to integrate the data for LabVIEW-based and commercial systems, we developed a system capable of handling the data stored in a MyDAQ2 by using EPICS CA. This system is illustrated in Fig. 1. Simply by inserting data into MyDAQ2, data in the CA protocol can be flexibly acquired, even if the system is a non-EPICS-based system. In our study, the control system integration was successfully completed, and we can currently handle the data of nearly all the RIBF components in an integrated manner.

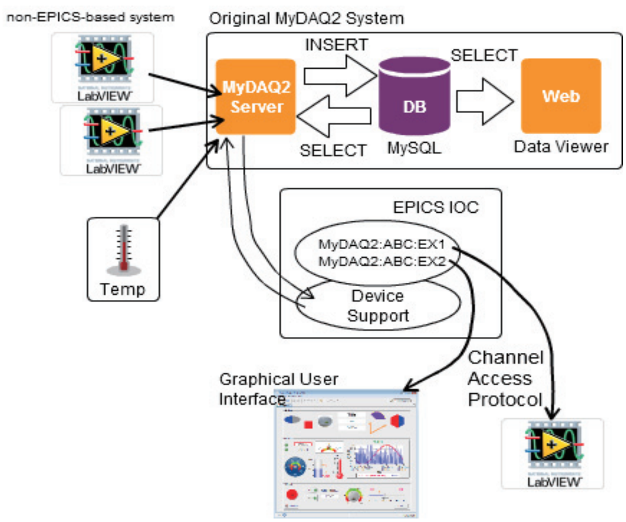

Fig. 1. EPICS IOC for MyDAQ2. Newly stored data can be obtained from the MySQL-based database via EPICS IOC.

References

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