EPICS PV management and method for RIBF control system†

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For the RIBF, we constructed a control system based on the Experimental Physics and Industrial Control System (EPICS) for magnet power supplies, beam diagnostic instruments, vacuum control systems, and so on.[1] Different types of devices are connected via the EPICS Input/Output Controllers (IOCs) as front-end controllers for accelerator operation. For example, VME-based IOCs are adapted for magnet power supplies, and beam diagnostic and vacuum systems (e.g., Faraday cup and beam profile monitor) are constructed using Linux-based IOCs connected with N-DIM.[2] Additionally, CAMAC, GPIB, Programmable Logic Controller, and others are also utilized as control devices with EPICS for various applications in the RIBF control system. In October 2015, the EPICS-based RIBF control system consisted of 51 IOCs that contain approximately 110,000 EPICS records in total. Note that the EPICS record consists of some fields, and the behavior of the record is defined by cording the fields.

On the other hand, since the RIBF control system has been constructed by extending the control system of the RIKEN Accelerator Research Facility (RARF), the relationship among the IOCs, the Process Variables (PVs), and controllers are complicated. The PV is a named piece of data with a set of attributes in the EPICS-based system. Therefore, we have constructed a system to manage the EPICS PV to solve the complication of the relationship and PV name.

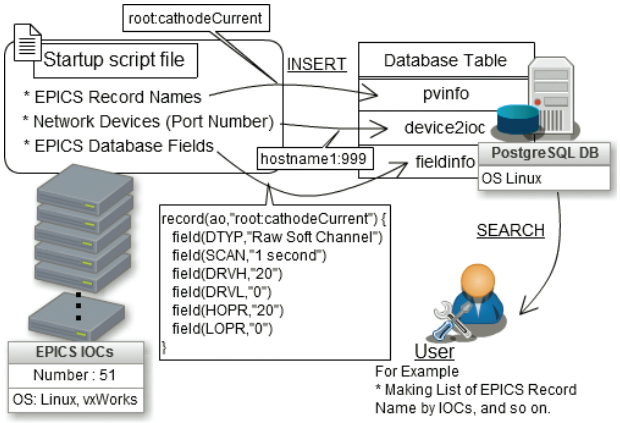

Fig. 1. System chart of the developed program and inserted data.

In the RIBF control system, common EPICS programs (EPICS-base, application programs, runtime database, and additional extensions programs) are stored in the network attached storage (NAS), and they are shared by all EPICS IOCs using the network file system or file transfer protocol. The NAS, manufactured by NetApp, provides a centralized system with a high availability. On the other hand, the IOCs mount common EPICS programs and the management server is also mounted with the shared storage to read common EPICS programs. Therefore, by reading the startup script files and accessing the EPICS runtime database files, the developed program can parse the runtime database files, which is coded in startup script file. In this developed system, the EPICS PV information is separately stored in the PostgreSQL-based database by parsing the startup script files and EPICS runtime database files (See Fig. 1). Additionally, the information of the network-based devices, which are managed by the IOC, is inserted in the database. This developed program is coded in PHP and is regularly invoked from Crontab services, which run on Linux; thus, the data are always in the latest state.

Because the EPICS PVs and fields information are stored in the PostgreSQL-based database, the information is available for use for various purposes by using the network communication. Therefore, we developed command-line-based tools to obtain the information, and it was implemented in the operational log system.[3] The operational log system is one of the electric log systems for recording and viewing the accelerator operating time and contents of an operated device.

By using this system, the names of the required PVs are never missed from the list because creating the lists with a program is easy. By developing Web applications, searching the IOC hostname from the EPICS record name becomes possible. Furthermore, because this developed system has an autocomplete feature, searching by EPICS record name is possible without requiring the completed EPICS record name.

Using the inserted information, alive monitoring will be implemented in the near future for the RIBF control system. By using alive monitoring system, it will become possible to enhance the reliability of the control system.

References
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† Condensed from the article in proceedings of the 15 th International Conference on Accelerator and Large Experimental Control Systems. Melbourne, Australia, (2015)

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