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# EPICS PV Management and Method for RIBF Control System

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## Abstract

For the RIKEN Radioactive Isotope Beam Factory (RIBF) project, the Experimental Physics and Industrial Control System (EPICS)-based distributed control system is utilized in Linux and vxWorks. Utilizing network attached storage (which has a high-availability system) as a shared storage, common EPICS programs (Base, Db, and so on) are shared by each EPICS Input/Output Controller (IOC). From the initial development of RIBF control system, it has continued to grow and consisted of approximately 50 EPICS IOCs and more than 100,000 EPICS records. Because RIBF has been constructed by extending RIKEN Accelerator Research Facility (RARF) in a previous project, the controllers for RARF are also utilized for RIBF control system. In this case, the dependence between the EPICS records and EPICS IOCs becomes complicated. For example, it is not easy to know the accurate EPICS record name information using only the device information. Therefore, we constructed a new management system for the RIBF control system to easily call up the detailed information. In the system, by parsing startup script files (st.cmd) to run EPICS IOCs, all EPICS records and EPICS fields are stored in the PostgreSQL-based database. By utilizing these stored data, we succeeded in developing Web-based management and search tools.

## Motivation

For system maintenance and development of Channel Access client, we need to identify the IOC hostname connected to the PVs.

- RIBF control system is constructed by extending RARF control system (previous project). Relationship between controllers and IOCs is complicated.
- Not use UDP broadcast for ca_search (EPICS_CA_AUTO_ADDR_LIST=NO)
- We would like to provide efficient system environment to search IOC hostname from PV name easily for developers and operators.

Development of PV management system for EPICS-based control system (Similar concept of IRMIS@ANL[1])

## Method of System Construction

By reading the startup script files and accessing the EPICS runtime database files, the program can parse the runtime database files. Therefore, we developed a program such that the information is separately stored in the PostgreSQL-based database by parsing the file.

- EPICS Substitution file and macro are also available.


| Table Name | Information Stored in the Column | Number of Records |
|---|---|---|
| iocinfo | Hostname of IOC | 51 |
| | Directory path of EPICS application | |
| | Startup script file name | |
| pvinfo | EPICS record name | 110,192 |
| | Record type | |
| fieldinfo | Field | 3,151,383 |
| | Field type | |
| device2ioc | Hostname for network-based device | 432 |

Table : Database Structure Used for Management System in the RIBF Control System (October 2015).

## Stored Information Usage **for Command-line Tool**

**It is very easy to make PV lists by a program !!**

- We use this feature to make PV list for caMonitor and the electric logbook.
- Some command-line tools are developed to obtain the information from DB.

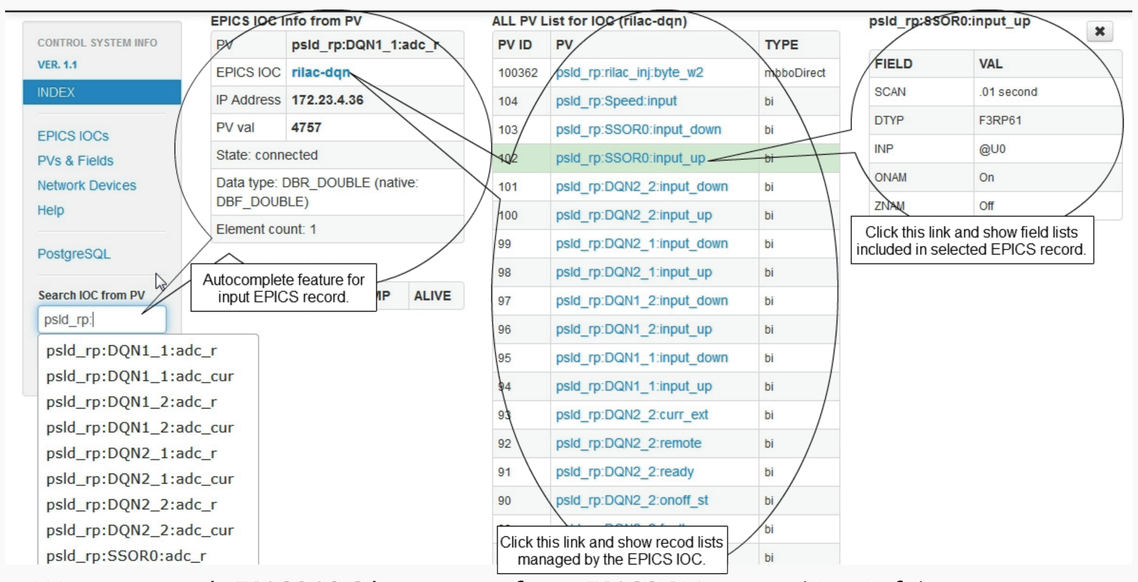
For example , making a list for all of the PVs including "psld_rp: XXXX:dac_set" .

```
$sql1="SELECT * from $table where PV like
  psld_rp :%:dac_set and active='1' order by pv_id";
```

Listing

| EPICS Record | EPICS IOC Hostname |
|---|---|
| psld_rp:S9_1:dac_set, | irb-mg2 |
| psld_rp:S9_2:dac_set, | irb-mg2 |
| psld_rp:S8_5:dac_set, | irb-mg1 |
| psld_rp:S8_6:dac_set, | irb-mg1 |
| psld_rp:IR2_S21:dac_set, | rilac2-mg2 |
| psld_rp:IR2_S22:dac_set, | rilac2-mg2 |

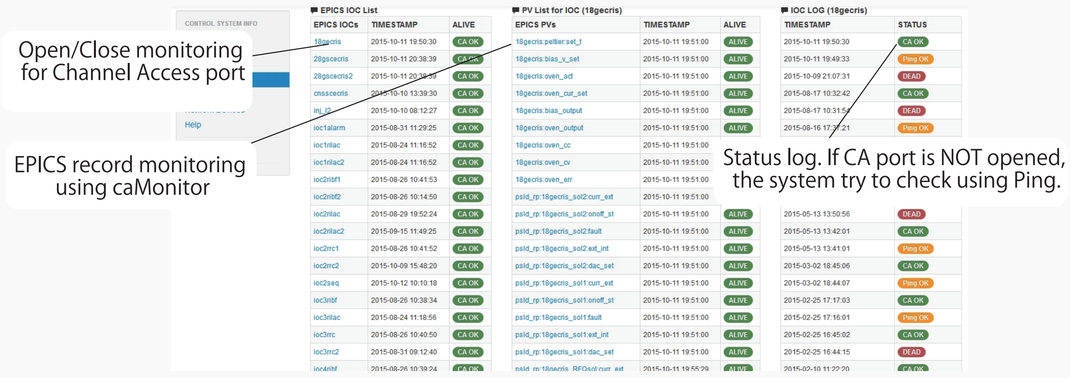
## Stored Information Usage **for Web application**



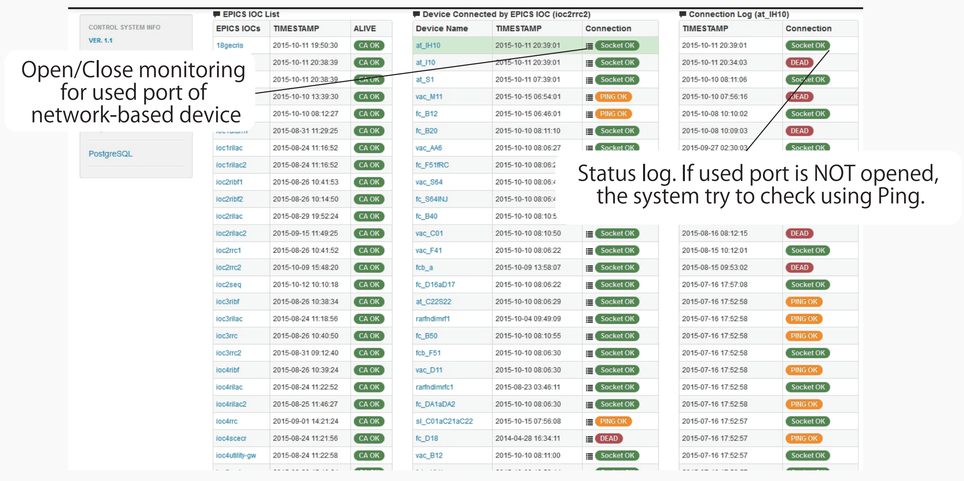

- We can search EPICS IOC hostname from EPICS PV name. (≒cainfo)
- Without requiring the completed EPICS record name, because of autocomplete feature.
- We can check all records and fields without source code.

## Stored Information Usage **for Alive Monitoring** (90% complited)

Generally, alive monitoring is performed by a system that checks from the outside whether the computers continuously work.




- Alive monitoring for EPICS IOCs and records.




- Alive monitoring for network-based devices.

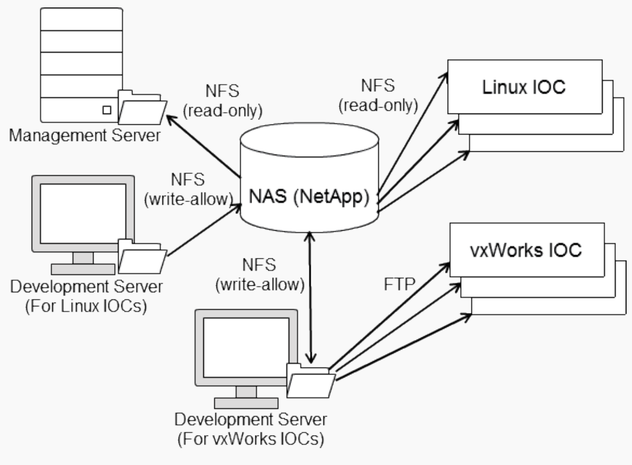
Not only IOCs but also all network-based devices will be monitored using the IP address and port number in this system.
Therefore, we will be able to check both the port open/close and the ping states.

## RIBF Control System and Shared Storage

Common EPICS programs (EPICS-base, application programs, runtime database, and additional extensions programs) are stored in the NAS, and they are shared by all EPICS IOCs using the NFS or FTP.

| IOC Platform | Connected Control Device | Type | Number of IOCs |
|---|---|---|---|
| Linux x86 | ● N-DIM<br>● PLC<br>● GPIB<br>● Other network-based devices | Soft IOC | 24 |
| Linux x86 | ● CAMAC | Embedded IOC | 6 |
| Linux f3RP61 | ● PLC | Embedded IOC | 14 |
| vxWorks | ● NIO | Embedded IOC | 7 |

Table : Current Status of the Type of EPICS IOC




[1] D. A. Dohan et al., Proc. ICALEPCS2007, Knoxville, Tennessee, USA (2007), p. 82.

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