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Implementation of the Integrated Alarm System for KOMAC facility using EPICS framework and Eclipse

Young-Gi Song*, Jae-Ha Kim, Han-Sung Kim, Hyeok-Jung Kwon, and Yong-Sub Cho
Korea Multi-purpose Accelerator Complex, Korea Atomic Energy Research Institute, 181 Miraero, Gyeoncheon, Gyeongju 38180
**Corresponding author: ygsong@kaeri.re.kr*

1. Introduction

The Korea multi-purpose accelerator complex (KOMAC) alarm system was developed for offering a user-friendly, intuitive user interface [1]. KOMAC alarm systems have been implemented with Alarm Handler (ALH) of Experimental Physics and Industrial Control System (EPICS) extension and CSS Best Ever Alarm System Too (BEAST) [2]. For exclusive tool of alarm system, new alarm interface tool has been developed. The new alarm system consists of alarm detecting and processing part, alarm data logging part, and a client part. The alarm detecting layer is the component that monitors alarm signals which are transported to the processing part through message queue. The main purpose of the processing part is to transfer the alarm signals connecting an alarm identification and state of the alarm to database system. The operation interface of system level signal links has been developed by EPICS framework. The new alarm system is connected with KOMAC control systems using Channel Access (CA). In this paper, we will describe the new alarm system with infrastructure of EPICS-based IOC configuration for KOMAC facility.

2. Infrastructure

The Experimental Physics and Industrial Control System (EPICS) software tool provides the channel access communication protocol to make TCP/IP connections and transfer process variables among EPICS based IOCs. There are many tools that are used to make operator interface and to make a data archiving system. We improved EPICS based high level application such as alarm and data archiver system.

2.1 Control Network

KOMAC has three of the major networks. The first is the control network. The control systems for the system level control are distributed on the control network. All the control system is connected to the EPICS CA protocol by using Ethernet. The second is a timing network for a synchronized operation. The KOMAC timing system that is based on event distribution system provides synchronization of all the components for the accelerator and the beam lines. The other is an interlock network that is the connection of the interlock systems. The interlock system it to protect the accelerator machine in an unstable condition.

Channel archiver engines are operating under Linux machine. Total Process Variables (PVs) are about 10,000 and about 700 PVs in which 780 MB is achieved in a day at the file base and RDB (MySQL). RDB system of archiver data server is redundant with the MCCS software toolkit. The archiver database in MySQL is dumped to Network Attached Storage (NAS) system once a week. Figure 6 shows a redundant system for data archiver system and network storage system using NAS.

2.2 Alarm System

In order to apply more user friendly alarm system, the Best Ever Alarm System Toolkit (BEAST) as well as Alarm Handler (ALH) was adapted. It is based on Java and Eclipse on the Control System Studio (CSS) platform, using a Relational Database (RDB) to store the configuration and to log actions. It employs the Java Message Service (JMS) for communication between the modular pieces of the toolkit, which include Alarm Server to maintain the current alarm state, an arbitrary number of Alarm Client user interface (GUI), tools to annunciate alarms or log alarm related actions. The user interface of alarm system using CSS BEAST is shown in Fig. 1.

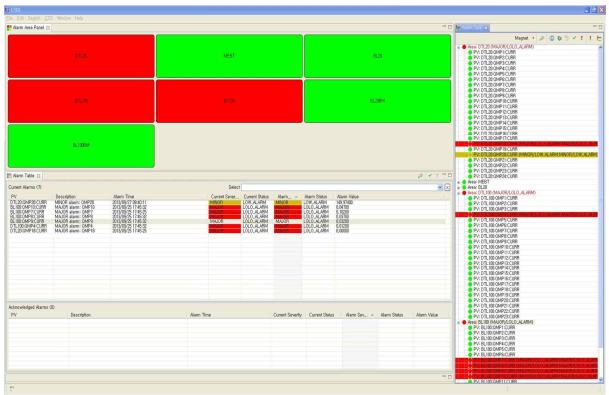

Fig. 1. Alarm user interface using CSS BEAST

The EPICS extension tool and BEAST are so static environment that user can't modify interface and functions. For exclusive tool of alarm system, new alarm interface tool has been developed.

3. New Alarm System

The purpose of new alarm system is to support intuitive user interface on alarm information and alarm history. The alarm system is implemented with EPICS Input Output Controller (IOC) for alarm server, eclipse-

mars integrated development tool for alarm viewer, and mariadb for alarm log.

3.1 Configuration

All alarm PVs are managed by the database schemas that include pv_info schema, alarm_detect schema, alarm_ack schema, and group_info schema. The conceptual configuration is explained in Fig. 2.

The pv_info schema manages PV alarm information such as alarm type, alarm major or minor value, and alarm enable or disable. The alarm detect schema manages the time and value when alarm occurs, and acknowledge confirmation. The alarm_ack schema manages acknowledge date, time when alarm occurs, and acknowledge user.

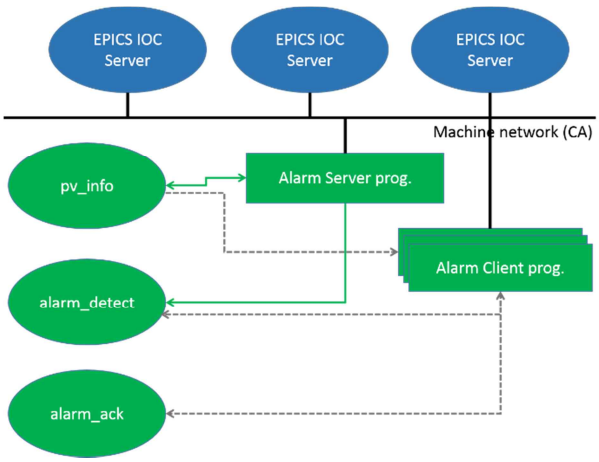

Fig. 2. Configuration for alarm system

3.2 Alarm Server Program

An EPICS IOC is implemented for alarm server program as shown Fig. 3. It is possible to reuse records. A combination of PV data can be constructed using CALC record. The implementation of alarm server using EPICS IOC has the advantage that Seq and EPICS modules can be used.

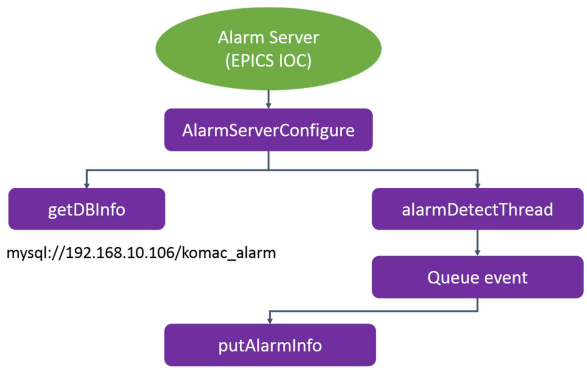

Fig. 3. Conceptual diagram of alarm server program

3.3 Alarm Viewer

An integrated development environment for alarm user interface is used with java vsersion 1.8, eclipse-mars, Java Channel Access (JCA), Java implementation of Channel Access (CAJ) library, and Mariadb-connector library as shown in Fig 4 and 5.

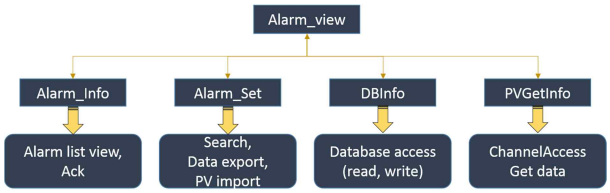

Fig. 4. Alarm viewer configuration

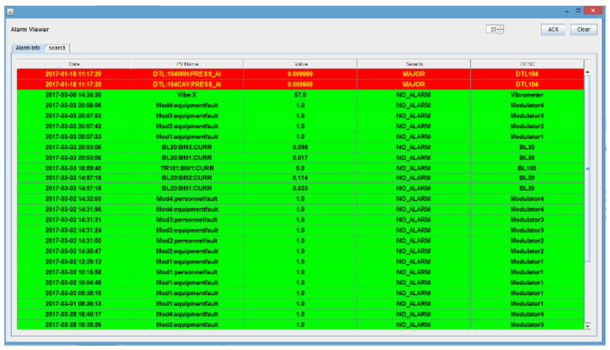

Fig 5. New alarm viewer of alarm interface

4. Conclusions

EPICS tools have been used for monitoring device alarm status. The KOMAC alarm system was developed for offering a user-friendly, intuitive user interface. The alarm system is implemented with EPICS IOC for alarm server, eclipse-mars integrated development tool for alarm viewer, and mariadb for alarm log. The new alarm system supports intuitive user interface on alarm information and alarm history.

Alarm view has plans to add login function, user permission on alarm acknowledge, user permission of PV import, search and report function.

ACKNOWLEDGMENT

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[2] Experimental Physics and Industrial Control System (EPICS). URL:http://www.aps.anl.gov/epics.