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Build KOMAC Alarm System based on CSS BEAST Tool

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1. Introduction

Korea Multi-purpose Accelerator Complex (KOMAC) operates the accelerator that is a high current proton linear accelerator system. The linac is designed to accelerate a 20mA proton beam. This system is required for many peripheral devices. These devices must be controlled on the stable accurate system based on the Experimental Physics and Industrial Control System (EPICS). The EPICS is a distributed control system (DCS). The DCS provides independency platform to each control system.

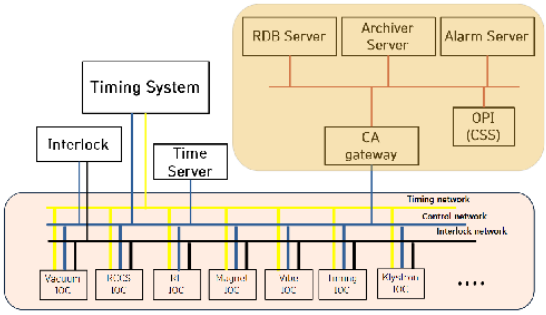

Fig 1. the layout of KOMAC control system

The Input-Output Controller (IOC) manages to process variable (PV) on EPICS. Each IOC communicates with hardware such as power supplies, vacuum controllers, PLCs, etc via Channel Access (CA) protocol. And the Client Graphical User Interface (GUI) is made by Control System Studio (CSS) Tool.

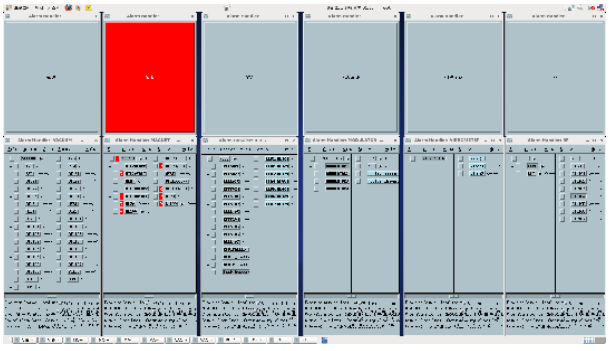

Fig 2. The Alarm Handler GUI

2. Alarm Handler

To inform the status of the linac to operators, Alarm system based on the Alarm Handler (ALH) had been implemented many operation parameters. The system communicates with more than 350 Alarm parameters. And recently TR104 beam line is added to control system. In addition, Many parameters have been added such as a Beam Loss Monitor (BLM), Beam Position Monitor (BPM), and etc. From now on, As The linac system expands, these parameters will increase more than now. Furthermore, some variables change on times because of environments, user demands. So the alarm sensitivities of minor and major have to change based on the variation. For example, The RCCS is controlled on the PID control system. The PID system monitored the delta Frequency (dF) and adjust dF values lower. Because this value is the difference between the resonance frequency to $\pm$ delta, this value is oriented to zero. when dF is adjusted to temperature, The PID change temperature setting values. Temperature settings of alarm sensitivity are multiplied $\pm$ 0.2, $\pm$ 0.5 each minor, major. Likewise, The magnet variables are altered to energy variation or user demands. And alarm settings are multiplied 80%, 50% each major, minor. But, The magnet alarm only occurs when magnet power is on. In order to this control, The sub-alarm IOC is made based on db with sub record. This IOC will provide alarm information to the alarm system based on CSS.

3.CSS Alarm system

The CSS Tool includes the Best Ever Alarm System Toolkit(BEAST) and it has good things than ALH Tool. At first, this system needs to operate RDB server and this server can manage to bigger size data of alarm parameters than ALH. Second, When an alarm occurs, The CSS Alarm System makes different annunciation each PV. So it makes easy the operator acknowledge more than before. Last, BEAST also provide log system about alarm information.

3.1 architecture

The Alarm System requires a database, IOC, JMS, AlarmServer, Annunciator, JMS2RDB. and this system is constructed to independency two servers that is RDB server and alarm server based on Centos6 Linux. GUI tool CSS is installed on Windows 10.

As shown in Fig 3, The Alarm system consisted of 3 steps. The first step, IOC and RDB provide information of Alarm variable. Second, Alarm server communicates with them and make command to communicate with JMS. Last, JMS send and receive the message with an annunciator, JMS2RDB.

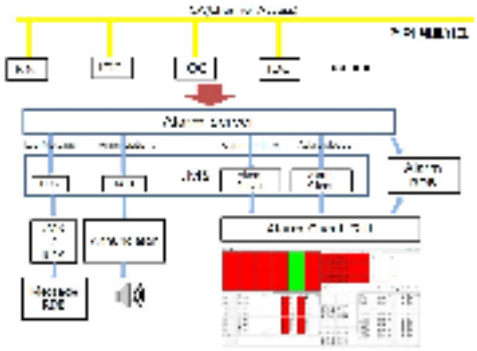

Fig 3. The architecture of alarm system

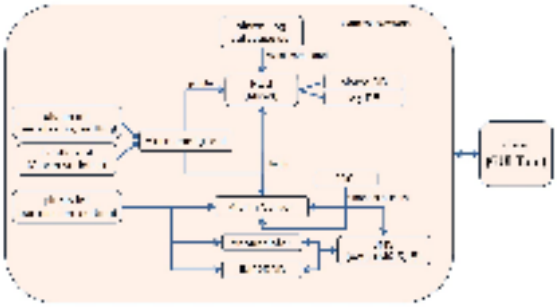

Fig 4. System diagram

3.2 System Building

Before the alarm system is constructed on the control network, the environment variable must be satisfied with the required system. So the system had been checked it was preferentially installed that OS, java, and CSS correctly version. Other variables are also installed the required version. After that, The alarm system read the information of PV from MySQL that is RDB system. So MySQL makes a database with tables for storage of PV information. And the information file that is made by XML form can plug into tables on the database via plugin AlarmconfigTool. The plugin file has access permission to MySQL and jms. It also has CA address and topics and settings variable. Through that, Server can access the RDB server. The server needs to jms for communication with jms2RDB and annunciator. JMS is installed activeMQ 5.15 Version.

Fig 5. Operation mode GUI

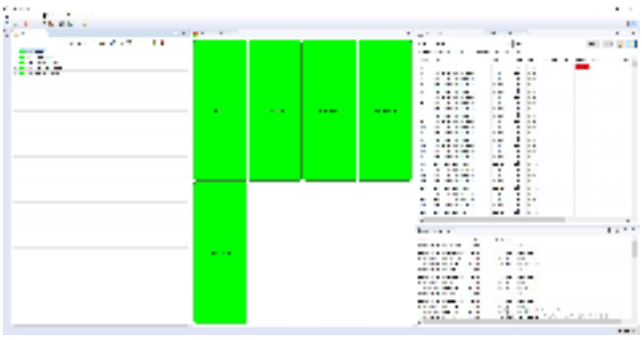

Fig 6. Weekend mode GUI

3.3 Operation on CSS GUI

The CSS provides alarm tool BEAST. The tool consisted of area pannel, alarm tree, annunciator, alarm table, and message history. Area panel shows each group determined in the config file. In order that the operator can acknowledge directly easily where the alarm occurred, the group is divided to vacuum, magnet, RCCS, modulator, vibe, RF, temperature, and water-leak. Alarm tree shows all of the PV and can choose another mode comfortably. There are three modes. operation, maintenance and weekend mode. Alarm table shows all of the alarms that have occurred is distinguished whether operator check acknowledge. Annunciator makes alarm sounds that are read as descriptions. It is determined in the alarmconfigtool plugin process. Message history shows logs that include PV name, current status, alarm cause, occurrence time and end time.

5. conclusions

The CSS alarm system operates with ALH alarm system now. When alarm occurred, these systems are double-checked. And it shows CSS alarm system working alright. It also connects well with archiver, so can check directly without another GUI.

From now on, After the system status is checked, CSS alarm system will be operated independency to Control system. And the GUI will change with the opinion of operators for user-friendly interface.

REFERENCES

[1] Experimental Physics and Industrial Control System (EPICS). URL:http://www.aps.anl.gov/epics
[2] CS-Studio Guide Alarm System reference manual. URL :http://cs-studio.sourcegorge.net/docbook/ch14.html