EPICS INTEGRATION OF SIMPLE NETWORK MANAGEMENT PROTOCOL FOR RISP

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Abstract

The Rare Isotope Science Project (RISP) Control System is comprised of Ethernet-based devices and equipment. Control system is based on Experimental Physics and Industrial Control System (EPICS) Framework, known as a distributed control system through network. So, we need a way for integrating Protocol (SNMP). SNMP is based on the manager and agent model and it is similar to EPICS Channel Access (CA) protocol. Therefore, SNMP helps to develop a unified network-based control system with EPICS.

INTRODUCTION

The Rare Isotope Science Project (RISP) at the Institute for Basic Science (IBS) constructs the a heavy ion facility in South Korea. The RISP Control System uses various Ethernet-based devices and equipment, and most of these devices support Simple Network Management Protocol (SNMP). Therefore, SNMP is useful to build a unified network-based control system with Experimental Physics and Industrial Control System (EPICS), known as distributed soft real-time control systems for scientific instruments [1]. In this paper, we will be presented the devices monitoring system through the network, such as the Power Distribution Unit (PDU), VME Crate, and etc by using the RAON customized EPICS integration into SNMP.

EPICS INTEGRATION INTO SNMP

What SNMP Is?

SNMP is internet-standard protocol for managing and monitoring Ethernet-based devices. SNMP has three versions: v1/v2c/v3. Depending on the version, they have different features such as speed, authentication, encryption, and etc. SNMP is composed of a manager and an agent.

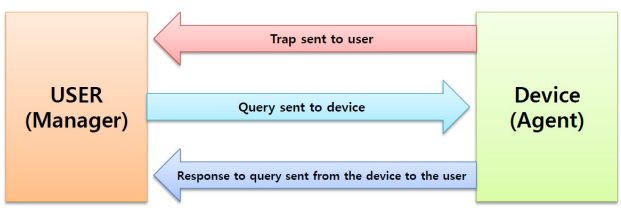

Figure 1: Relationship between a Manager and an Agent

As shown in Fig.1, Manager can send query requests to agent. Agent gathers data from the MIB which respond for the query manager requested. Also agent can send traps to the SNMP manager [2].

Why SNMP?

Many devices constituting the control system support SNMP. These devices can be integrated to to EPICS via SNMP MIB (see Fig.2). So, SNMP is prerequisite mandatory to integrate Ethernet-based devices into EPICS Framework.

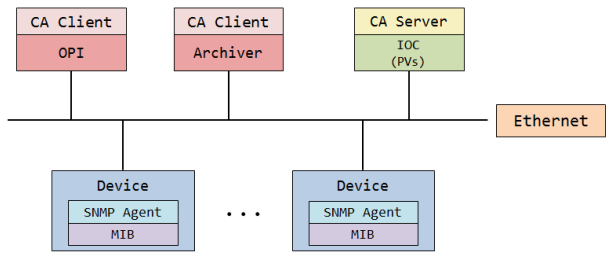

Figure 2: System architecture of RAON customized EPICS integration into SNMP

EPICS SUPPORT MODULE FOR SNMP

The EPICS community has developed the SNMP support module for 10 years, and the development for next release at FRIB is still in progress. We developed a network printer monitoring system by using NSCL/FRIB devSNMP.

Printer Monitoring System

The devSNMP is the most recent SNMP module by NSCL/FRIB [3]. As a first step, to integrate RAON EPICS development environment, we have developed the office network printer monitoring system before RAON customized EPICS integration into SNMP by using the devSNMP.

Customized Modifications

- Made snmp, snmpstrRecords
- Added calc menu, MJP, SVAL, OVAL field.
- Modified some codes

Software & Hardware

Software and Hardware used as follows.

- Software
  - Debian Linux 7 Wheezy
  - Net-SNMP v5.4.3
  - EPICS v3.14.12.4

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  - NSCL/FRIB devSNMP vRC8
  - CS-Studio v3.2.13a
- Hardware
  - Printers (Xerox ApeosPort-IV C3375, Kyocera FS-9530DN)

User Interface for Printer Monitoring System

We developed User Interface (UI) by using CS-Studio of EPICS to check the information such as the remaining amount of supplies, and paper jam with Office environment monitoring (see Fig.3).

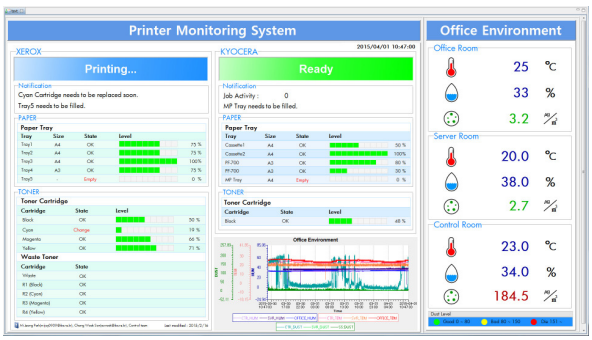

Figure 3: Printer and Office T/H/D monitoring system UI

RAON CUSTOMIZED EPICS INTEGRATION INTO SNMP

With the success of the network printer monitoring system, we decided to develop the RAON customized EPICS integration system, because it is not easy for users to access to the accelerator area where all devices are installed due to the operation and distance limitation.

Feature

- Uses Net-SNMP APIs
- Supports only two records:
  - snmp (float, integer, gauge)
  - snmpstr (string, BITS)
- **Supports SNMPv3 (R/W):**
  Here the feature what we have developed
  - authentication
  - encryption
- User can select the SNMP version for each record
  - recommended: Read (SNMPv2c)/Write (SNMPv3)
- Information of the SNMP Command is defined in each field: HOST, COMM, OIDS, AUTH, PRIV

Current Support Devices

- **APC Power Distribution Unit (PDU)** (SNMPv1/v2c/v3rw)
- **Wiener VMEbus Crate** (SNMPv2c/v3rw) (Hardware firmware development is partly done by Wiener)
- **Network equipment** (Brocade, ASUS) (SNMPv2c)

User Interface

APC PDU7921

We can monitor the states of P/S, load, outlet, and control the voltage, load, and outlet. Also we can control each outlet (see Fig.4).

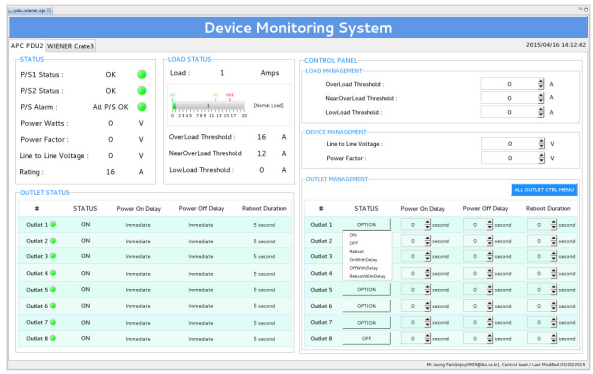

Figure 4: APC PDU monitoring system UI

Wiener VMEbus Crate (Smart Fan Tray)

We can check the states of crate, power, fans, temperature sensor and control them at the same time (see Fig.5).

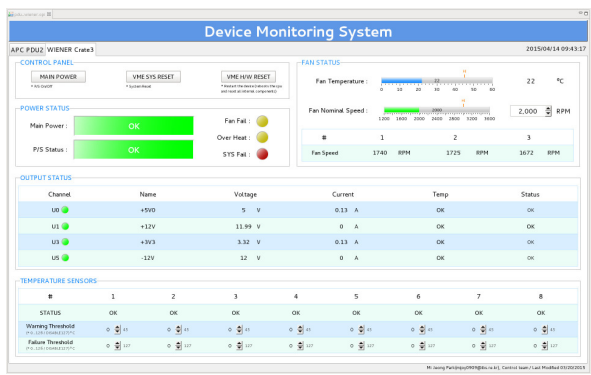

Figure 5: Wiener VME Crate monitoring system UI

Brocade Network Switch & ASUS Router

We can monitor states of Brocade Switch and ASUS Router. Also We can see usage information (CPU, Memory) of Router (see Fig.6).

SUMMARY

RISP Control System uses various Ethernet-based devices. We need the device monitoring system through the network on EPICS Framework. SNMP is useful to expand the realm of Ethernet-based devices. So, we have integrated EPICS into SNMP by using devSNMP and SNMP APIs for customizing RAON Control System environment and developed EPICS records such as snmp, snmpstr. And then, we have developed UI by using CS-Studio. In the future, we will test the stability of EPICS IOC and apply to various Ethernet-based devices such as UPS, MOXA, and etc. This monitoring system is important because the number

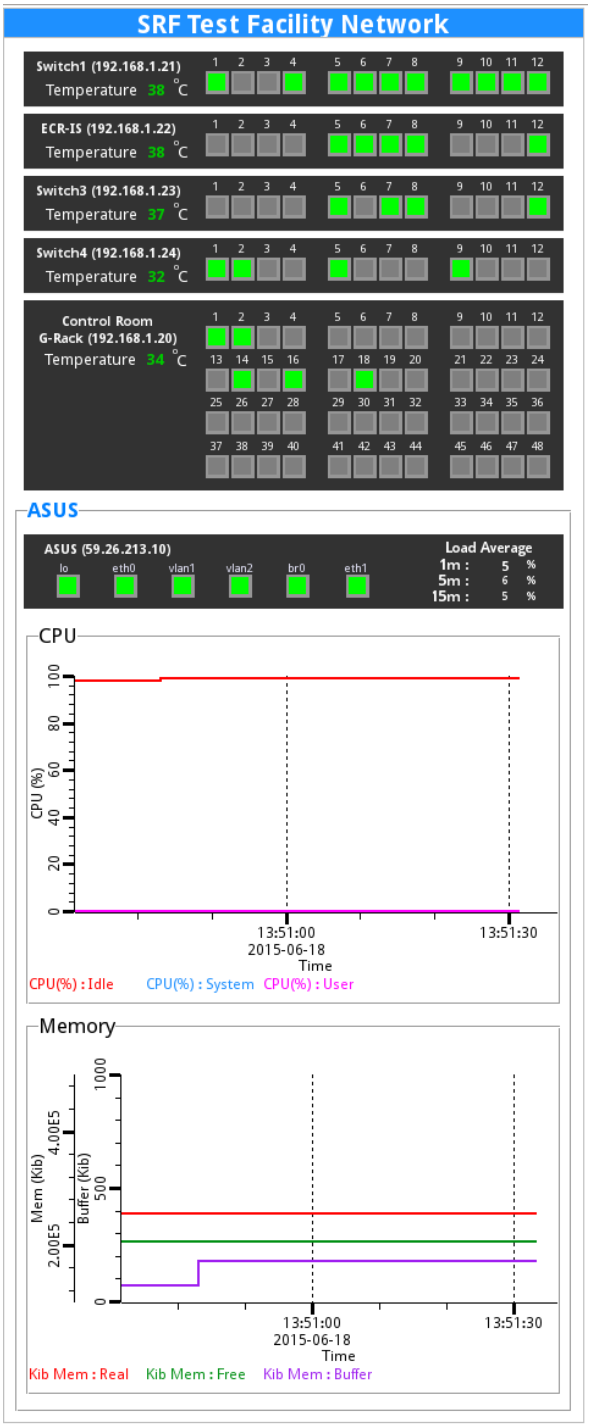

Figure 6: Brocade Network switch & ASUS Router monitoring system UI

and type of the device increase in the future. It will help us to manage efficiently network devices, make consistency in control system, and improve maintenance.

ACKNOWLEDGEMENT

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