

DEVELOPING OF SMS MOBILE SYSTEM FOR PLS CONTROL SYSTEM

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Abstract

The PLS SMS mobile system is based on Linux PC platform. The SMS mobile system is equipped with a wireless SMS (Simple Message Service) interface giving an opportunity to use fault alarm interlock system. It was developed as a network-based distributed real-time control system composed of several sub-systems (EPICS IOC and PLC system). The mobile system sends simple message of fault trip signal to users' mobile devices with fault tag address and immediately sends warning or alert messages to mobile devices, or remote users are real-time monitoring the device fault states by mobile devices. Control systems can be set remotely by mobile devices in emergency situation. In order to provide suitable actions against system fault, SMS Mobile System will enable system administrator to promptly access, monitor and control the system whenever users want and wherever users are, by utilizing wireless Internet and mobile devices. This paper presents the Mobile SMS system for PLS Control System.

INTRODUCTION

Modern Industrial control systems tend to adopt a variety of intelligent wireless device controllers to interface front-end computers with active components of the industrial device. Some of the intelligent control systems come equipped with a wireless SMS (Simple Message Service) interface giving an opportunity to use fault alarm interlock system. Immediately send warning or alert messages to mobile devices. In order to provide against system fault, SMS Mobile System will enable system administrator to promptly access, monitor and control the system whenever users want and wherever users are, by utilizing wireless Internet and mobile devices.

The control system of the PAL (Pohang Accelerator Laboratory) is very complicated. The main control system was designed to be controlled by the EPICS. In these days, the control system would be integrated to mobile device. So through this project, we have developed the solution to integrate the mobile phone and EPICS.

SYSTEM CONFIGURATIONS

We tried two ways to integrate EPICS and mobile device. The one is to get the process data from existing HMI, the other is to get the process data from EPICS directly. Figure 1 shows the system configuration to get the process data from existing HMI system.

The SMS server acquires the process data from Intouch HMI system through TCP/IP, gets the other information

from EPICS Server and sends the SMS messages to allocated users by CDMA network.

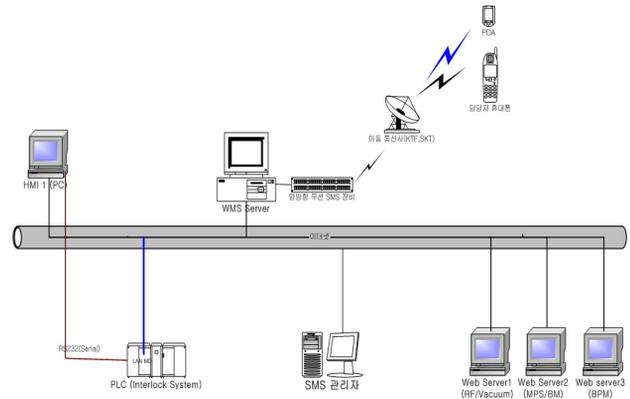


Figure 1: Structure of Mobile SMS Control System for PLS

In detail, the TCP/IP client program was installed to HMI PC, which can acquire the alarm data from HMI trigger function and send to the alarm tag in formations to SMS server. When the TCP/IP server program receives the alarm tag in formations from TCP/IP client program, it asks the PV data to the EPICS Data Server (MySQL) and sends the alarm messages to the allocated users with the defined descriptions and current PV value. In this system, the user can control the SMS server and get the needed data from his mobile phone by sending pre-defined user command SMS to the SMS server. For example, the user send "2VG01" SMS to the SMS server computer after about 2 seconds, they can receive the vacuum value of gauges in 01 section through their mobile phone.

We defined the four categories for user commands as followings. The first is the command for reading each process value, the second is for reading cell group data, the third is for reading total average and the forth is for reading cell group average. Because there are so many tags and users, we support the management system through the web. The following figure (Figure 2) is the example.

The other way, we use the OAGTel to access PV values of EPICS in directly. In the SMS server, the software monitoring PV values from EPICS hosts was installed as daemon program. It can send SMS alarm messages to the allocated user when the PV value is in the alarm range. The properties of monitoring PV Values can be re-defined as text format and the logic relationship between the each PV names as online. It is possible to modify the properties and logics as online, because the software was written by

script language.

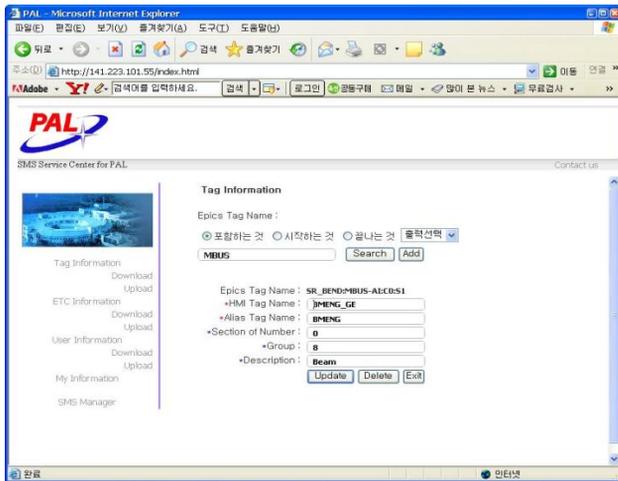


Figure 2: SMS Server Web Browser

SYSTEM SOFTWARE

Our main focus was to integrate TCP/IP with EPICS and we have therefore implemented several functions in the DLL to support EPICS. Special attention was given to maintain time correlation of data through the use of time stamps and time stamped events.

The IOC uses the Channel Access protocol for communication with other nodes and provides the infrastructure to manage the creation and processing of data structures known as records. Records are the data types of EPICS and support both scalar data and arrays bundled with attributes such as the process variable's name, processing rate, units, and alarm limits. The DLL supports these attributes. Two devices support routines, one for initialisation and one for processing are required for each record type that is supported by the IOC. These routines are modified to make calls to the DLL.

Initialisation

An EPICS IOC starts by loading the binary software image and then a "dbd" file containing a description of all the data records and enumerated types used in the in-memory database. The instances of variables are defined in "db" files. During processing of a "db" file, record and device specific routines are called to initialize the record. The DLL is called during each record instantiation to create the shared memory variable and link the record data field to the shared memory variable.

In the diagnostics applications at PLS EPICS Server the IOC is responsible for completely initializing the DLL using data in the "db" file. The SMS client program or any other program could initialize the shared memory if desired.

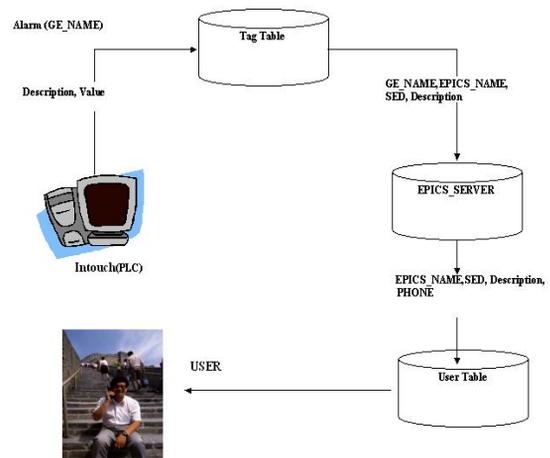


Figure 3: SMS Communication Procedure

Communications Procedure

The connection between the SMS Sever and the EPICS Web Servers are established using the TCP/IP socket mechanism. The SMS Sever is a client and the EPICS Sever Systems are servers. The SMS Sever has only a simple connection mechanism i.e. the "socket mechanism" rather than Remote Procedure Call (RPC) that supports rich client-server mechanism. The communications between the PLC HMI in the control room and the SMS Server are based over TCP/IP. The PLC HMI is send fault trip signal to SMS Sever with fault tag address. The SMS Server sends fault trip signal and tag name to system administrator by SMS character. He request system state values uses alias tag name by SMS. The SMS Server read system state value from EPICS data Server used request tag alias message. The SMS Server sends reading system state value to administrator. As shown in figure 3, it's shown the communications between the PLC HMI in the control room and the SMS Server.

User Interface

We use INTEL Pentium 4 host computer in the SMS Mobile control system. The host computer also serves as a development environment for Fedora 3 Linux, which is the operating system of IOC. We currently use the version R3.14 of EPICS on this host machine. A test of the latest release of EPICS software, R.3.14 .4, is under way. The graphic user interface of the SMS Mobile system is two friendly graphic pages on the display screen of the control console. One is for the SMS Mobile system routine operation that includes system status and control parameters of the device system. The operator and machine engineer can fine tune and control the device level electronics of the SMS Mobile system through this page. The other pages, display all the important

parameters of TCP/IP network states, VMEbus analog & digital In/output values etc. The purpose of this pages display is focusing on global system status and debugging value of SMS Mobile system.

CONCLUSION

The developments described in this paper have enabled the tried and tested PLS mobile SMS system. The SMS mobile system was designed in the late 2005s for use on the PLS, which started operation in 2006. The installation of the application program tools was straightforward and well documented. The automatic alarm tag configuration of the tools needs some development in the MySQL DB, the creation of tables and SQL scripts to correctly format the data. This shall be improved in the final installation. Future work includes a solution based on a web interface. Otherwise, the Mobile system using PDA is still under development for the

future use. The possibility to easily add new functionality to the tools is very useful. In our case, from new add definition of the alarm tag new requirements have been declared by the users, mainly concerning the development of external interfaces for the SMS server.

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