H1DCM, A NEW DETECTOR CONTROL AND MONITORING SYSTEM FOR THE H1 EXPERIMENT

L. Bystritskaya, I. Cheviakov, G. Eckerlin, L. Favart, G. Franke, M. Hensel, X. Janssen, V. Jemanov, S. Karstensen, H. Klehr, F. Krivan, R. Roosen, Z. Zhang, A. Zhelezov

Abstract

The e-p collider HERA at DESY as well as the experiments have been considerably modified for higher luminosity running during a 12 months shutdown. The required modifications for the control system of the H1 experiment were studied by the H1 detector control and monitoring (H1DCM) project. A variety of subsystems, with designs of the early 1990s as well as systems based on new technology are to be controlled and monitored by a common detector control system. The new control system is based on the commercial supervisory control and data acquisition system PVSS II from ETM/Austria.

H1DCM is running now since more than one year with great success. We are controlling CAEN and LeCroy based HV systems, the slow control for the super conducting solenoid of H1 and the luminosity system of H1. Other Slow Control systems are also included into this system for driving Motors, reading rulers, temperatures and air pressure to calculate and steer the HV. ORACLE, HTTP and WAP interfaces are matter of courses.

THE IDEA

Since the very beginning of H1, several computer systems were used without a common control system. The communication among each other was based mostly on ftp connections and therefore rather complicated. Another big problem was, that the hardware became old and getting spare parts was like a hunting game.

In spite of the fact that everything works, H1 decided to install a new SCADA control system, which was able to substitute the old hardware, running on Linux PCs, has a low cost solution (relatively to the experiment) and is fulfilling all requirements of a modern, flexible and easy handling control system.

At the same time CERN has done a lot of tests with more than 100 commercial control systems. 10 systems has become to a nearer selection. The PVSS II of the ETM Company in Austria was the winner of all tested systems. H1 decides to take over this software to use it at DESY.

Since than a friendly PVSS joint venture between DESY and CERN has become true.

THE STRUCTURE

H1DCM is very flexible. To include or remove a system is simple. All systems are connected to each other with TCP/IP connections. Each system is working autarchic. Figure 1 shows the structure of H1DCM.

The circles are representing a full stand-alone Linux- or Windows-PVSS system with its connections to the hardware, mostly realised with TCPIP.

Figure 1

Every system is connected to the “distributor System” in the centre, which has the main connection to the outside world. There is also the possibility, that the systems can make connections among each other.

THE DIFFERENT SYSTEMS

Only a few components of H1DCM will be explained here, to give a short overview of the possibilities we realized.

Distributor System

The status of the HERA collider is mainly responsible for the action inside H1. To react fast on the HERA status it is indispensable to have a system, which gets all information of the other systems and sends out commands.

In the centre of Figure 1 is the “distributor System”. We plan to install here “global control” for all systems. A finite state machine will help us to solve complex coherences of the different detectors. Up to now, a shift crew does this.

WAP, HTML

To get a fast and easy way to display data for everyone inside the DESY intranet, H1 is using the HTTP [1] and WAP server of PVSS. As all data are available in the "distributor System" it is possible to provide them. WAP exposes at H1 as a tool that is more and more used, to get the online information very fast and without a browser. Figure 2 shows here an example of the H1WAP display at a wireless phone.

Figure 2

Archiving / Oracle

Two kinds of archiving are used in H1DCM. Short time archiving is done directly in PVSS on every system for specified datapoints (values). The definition of storing-frequency, length and smoothing can be made individually for every single datapoint.

Long time archiving is done inside ORACLE. Via PVSS it is possible to make an easy connection to Oracle under Linux and Windows. It is foreseen a standard connection with standard user tables. User specific connections are also available, to create i.e. a special user tables inside Oracle.

HV Systems

The CAEN Modules SY127, or SY527 controls most of the H1 HV Detector systems. LeCroy HV power supplies drove a few others. The CAEN hardware is connected via the serial CAEN bus and a VME V200 controller. VMIC VME Linux PCs are running directly the drivers for communication between PVSS and the Hardware. The driver is written in JAVA, to be independent from the VME CPU hardware. Also logic is implemented into the JAVA driver, which allows running the CAEN modules without a connection to the PVSS control software

Solenoid

Inside H1 is a large super-conducting magnet, which has to be handling very carefully. Three years ago, we decided here to remove the old OS9 control and replace them by the new SCADA system. The solenoid was the first detector part, which was running with PVSS. Here we have mainly serial and CAN-bus connections.

Central Slow Control (CSC)

The H1 Slow control was running under OS9 and MacIntosh computers. To provide the important information to other detectors was really hard. For the first step, we are porting the monitoring software "ARGUS" from MacIntosh to a Linux PC. Then all slow control data flows over the PVSS II system to ORACLE and other detectors. A better reaction of detected errors by the CSC will be reached in this way.

HARDWARE

The requirements to the hardware were:

- Standard PCs must be sufficient for the control system.
- The availability of getting spare parts has to be warranting.
- Old, not replaceable hardware must be able to integrate into the new environment.

SOFTWARE

The decision, to buy a commercial SCADA system was decided with the knowledge of the former years of H1 and its control software. To get a product that includes all features of a modern control system, like archiving, alarm handling or standard interfaces for hard- and software was just as important as the possibility to develop own user interfaces and drivers.

An other important point was the prospect of fast professional support. The experiences of the past shows, how essential it is, not to be the expert of all appearing questions, but to go on with the actual problem.

PVSS II

PVSS II [2] is used as a remote control system for local control. The open driver concept is available to the customer for proprietary developments. There are no restrictions with regard to target computer, operating system, network, peripheral connections, interfaces and terminals. Connection to other systems - whether PC networks or PPS systems - is supported. The ADO, ODBC, SQL interface and the API interface allow full integration of business and technical DP. Branch-specific, tailor-made solutions are possible as is the setup of a consistent quality assurance in manufacturing companies. The flexible datapoint concept facilitates the mapping of external data structures.

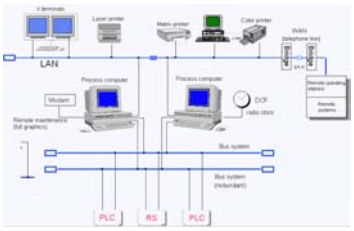

Figure 3

PVSS II is scalable. Systems with up to several hundred or several ten thousands of datapoints are possible. Small PC solutions, control systems with ten or more operator's terminals, single-terminal systems as well as redundant systems. Figure 3 shows an example of one possible system configuration.

REFERENCENCES

[1] http://www-h1.desy.de/h1det/h1dcm
[2] http://www.pvss.com