SUCCESS STORY

LARGE HADRON COLLIDER AT CERN

PcVue platform manages thousands of safety alarms while handling a continuous growth of the application.

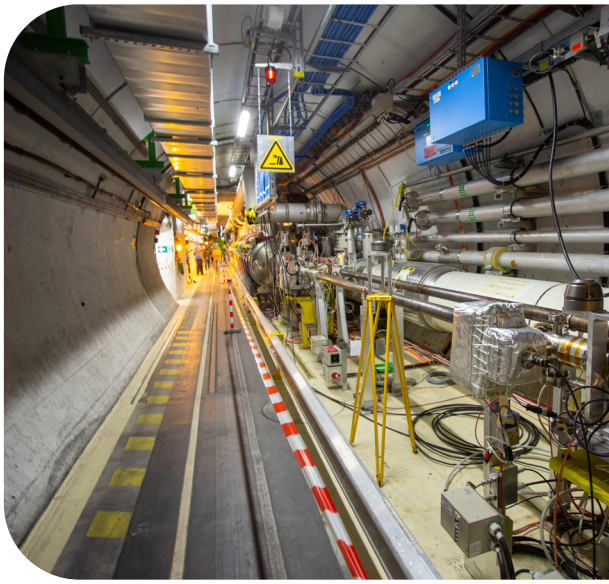
CERN, the European Organization for Nuclear Research, is one of the world's largest and most respected centers for scientific research. Its business is fundamental physics, finding out what the Universe is made of and how it works. At CERN, the world's largest and most complex scientific instruments are used to study the basic constituents of matter - the fundamental particles. By studying what happens when these particles collide, physicists learn about the laws of nature.

The instruments used at CERN are particle accelerators and detectors. Accelerators boost beams of particles to high energies before they are made to collide with each other or with stationary targets. Detectors observe and record the results of these collisions. Founded in 1954, the CERN Laboratory sits astride the Franco–Swiss border near Geneva. It was one of Europe's first joint ventures and now has 20 European member states.

THE PROJECT

In 1994 CERN approved one of the most ambitious scientific projects of our era: the creation of the greatest and most complex particle accelerator in the world, the Large Hadron Collider (LHC), at a cost of nearly €7M ($9.5M USD). With this tool the researchers are intent on studying the elementary particles that make up matter, but also anti-matter, by recreating the initial conditions of the Big Bang, with the objective of clarifying the mystery of the creation of the universe.

The accelerator consists of a ring 27km (17 miles) in circumference at a depth of 100 meters (325 ft.) below the Franco-Swiss border. In the year 2000 CERN launched a competition for a contract for a higher-performance safety system for the accelerator. Eventually SPIE, a European leader in electrical, mechanical and HVAC engineering, energy and communications systems, chose PcVue, a SCADA software from ARC Informatique for its flexibility to suit the specific requirements at CERN.



DYNAMIC SUPERVISION

The implementation of a supervisory system across such a geographically distributed site is complex and the degree of difficulty is heightened by the need for continuous development.

This requires an on-line database to be available to handle an increasing number of data variables. Thanks to the collaboration between ARC Informatique and SPIE, an innovative solution has been developed for a system able to be updated both dynamically and independently.

The applications extract the required information from a database of around 300,000 variables stored in Oracle.

BUSINESS OBJECTIVE

Safe operation of the Large Hadron Collider

Scientists working at CERN come from all round the world, hence another aspect that illustrates the dynamic nature of the supervisory system is the use of workstations with multilingual capability.

PcVue was able meet the necessary specifications to reach Safety Integrity Level 2 (SIL2) for the IEC 61508 standard of secure operation.

MANAGEMENT OF THE ALARMS

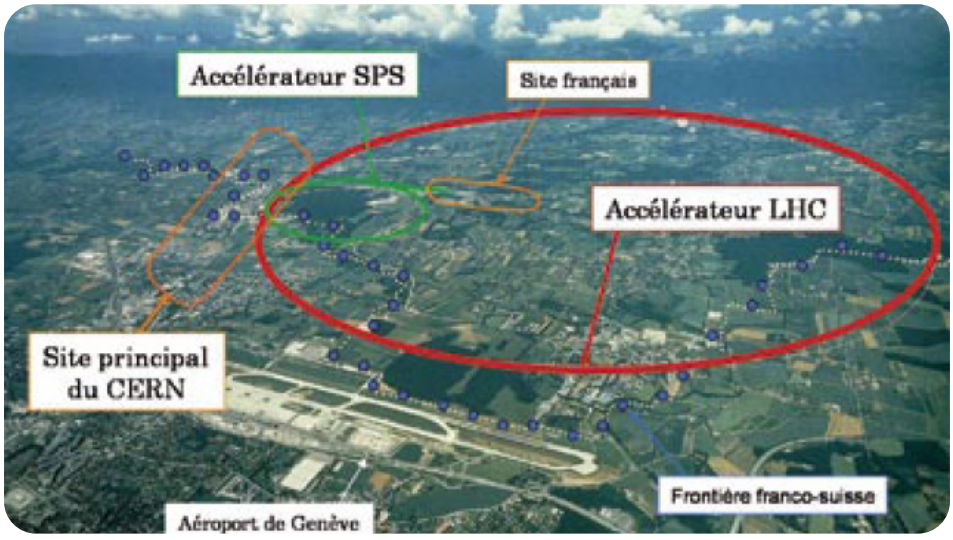
The LHC project required the implementation of a central control room such that all of the supervisory terminals for CERN's 3 accelerators are in one location and able to monitor all safety related alarms. The alarms, managed by 2 file servers, are arranged in 4 levels of priority. Overall there are around 21,000 alarms that can be sent to the control room.

Management of the alarms results is particular important due to the layout and dimensions of the whole installation so it is seen as vital to implement the most efficient supervisory system possible.

The supervisory system is a fundamental element of the project but the most complex part to implement has been a redundant network for alarm management. This redundant TCP/IP network connects the various LSACs (Local Safety Alarm Controller) for automatic display of alarms in the 33 different safety zones and the SAMC (Safety Alarm Monitoring Center) with its data acquisition file server.

Each of the safety zones has 2 redundant PLCs for acquiring the alarms. These have been installed with touch-screen Panel PCs that act as PcVue clients with the same functionality as the central stations. The alarm management system was already operational before the LHC system was activated.

Everything is measured, published and archived, from curves of gas detection in the buildings to transmission times for the alarms. The criticality of the system further requires no more than 100 minutes of downtime a year. Given the importance of the application, everything has to be flawlessly under control.



KEYS TO SUCCESS

- Manage one or several buildings in a centralized and cohesive manner
- A centralized control room connected to 33 local alarm monitoring centers
- Manage 300,000 variables for a dynamic list of equipment
- Manage 21,000 alarms
- Accommodate multiple languages
- Achieve 99.98% reliability

RESULTS

The solution with PcVue meets the specification to reach Safety Integrity Level 2 (SIL2)

ARC Informatique

Headquarters and Paris office
2 avenue de la Cristallerie
92310 Sèvres, France

+331 4114 3600
Hotline: +331 4114 3625

arcnews@arcinfo.com
www.pcvue.com

ARC Informatique is ISO 9001, ISO 14001 and 27001 certified