DEVELOPING A PLATFORM THAT INTEGRATES RIO GRANDE ENERGIA'S (RGE) OPERATION AND DISTRIBUTION CENTERS (OCC AND DCC)

This case presents the Elipse solution adopted by RGE to active requirements of performance, safety, reliability, and management of OCC's and DCC's

Augusto Ribeiro Mendes Filho
Elipse Software's Media Department

Needs

Rio Grande Energia (RGE) is the main power supply company acting in the north and northeast of Rio Grande do Sul state, in an area with some of the country's top socioeconomic indexes. It provides energy to 51% of the cities in the region, which by its turn represent's 34% of the state's area. RGE is part of the CPFL Energia Group, one of the largest private groups in the Brazilian power sector.

The company works with Total Quality Management, an integrative philosophy focused on achieving high levels of efficiency and quality in its services. This has led to RGE to invest heavily in human resources and technology as a means to face the challenges of operating and maintaining its power subtransmition and distribution system in accordance with established quality standards, in line with the desires of its consumers.

This case presents the Elipse solution adopted by RGE to active requirements of performance, safety, reliability, and management of OCC's and DCC's.

Solution

The Project

The SCADA system being used in RGE at the beginning of the project was responsible for controlling only the substations in the subtransmition system, and it was used only by the company's OCC (Operation Control Center). Because of this, the first challenge was to modernize the old system and replace it by another one developed on Elipse E3's platform, in order to aggregate these same supervisory and control functionalities to both the OCC and the DCC (Distribution Operation Center). To do so, the following solutions were adopted.

Restructuring the communication system

RGE was using private telephone lines (LPs) to communicate the substations and the OCC, using IEC 101, 104, and DNP3 protocols. A study to adopt satellite using VAT system has shown it was more competitive considering cost and availability of the system, being then adopted instead of telephone lines to the transmission and sub-transmission system. However, this solution proved to be inappropriate for distribution automation, because of its costs and also because of the unfeasibility of installing antennas at each point of the distribution system near the automation equipment.

The communication solution for the distribution network had to take into account the geography of the area served by RGE, largely consisting of mountains. So, the company opted for GSM-GPRS (Global System for Mobile Communication - General Packet Radio Server), comprising a pilot which monitors and controls a NU-LEC® CAPM5 key and a COOPER F5 recloser, via DNP3 communication protocol. Its technological performance, the installation costs, and the low monthly taxes charged by the cell phone operator, pointed to this technology as a viable one, from both an economical and a technical standpoint.

IT Structure

The IT structure adopted was introduced at RGE's Data Center, using the existing resources, and placing it in the management and maintenance processes executed by the company's IT department. This allowed the improvement of aspects such as security, monitoring, redundancy of critical systems, backup, ready-restoration, and information sharing, following the company's internal rules.

Shared operation between OCC / DCC

The decision to join both the OCC's and the DCC's operations into a single SCADA platform required that a set of rules of operation (determining the limits of each party and common areas of operation) were elaborated. To do so, it was determined that the devices to be operated by the DCC would only be those installed along the distribution networks (breakers, reclosers, and voltage regulators), while the OCC was responsible for operating the devices in substations (breakers, transformers, and circuit breakers), except for the breakers of the feeder modules, which could be operated either by the OCC or by the DCC.

At this stage in the process, the rules of management of operators in the control center were also defined, allowing different regions of control to be distributed to each operator, and also to relocate more or less operators for each area of operation, according to their severity level. Under the coordination of the DCC operation, a complete reevaluation of operative procedures of recomposition and programmed disconnections were put into practice. All this was done with careful attention to the security aspects of the shared operation between the operators of the DCC and the transfer of operational responsibilities between the OCC and the DCC.

The integrated operation allows operators to view all the available information in the system. However, only the operator responsible for the region where the device is located can actually issue a command on said device. By selecting the screen commands of a specific device, a visual indication is given to all other operators, showing that the equipment is being used.

This prevents the occurrence of dual access, and facilitates the externalization of information about the action being executed. Today, the system is in full operation at RGE's OCC and DCC, monitoring and controlling 61 subtransmission substations, 22 breakers, 45 reclosers, and a voltage regulator.

Aggregating meteorological information

Information from weather stations installed in some substations in RGE system was integrated to the SCADA system. With this, it became possible to assess the extent of displacement and adverse weather conditions, as well as their impact on the company's power grid. These data allowed the center to anticipate actions of maintenance teams' dislocation for specific regions.

Benefits

- Greater flexibility in disconnections, system rebuilding, and location and isolation of network regions presenting failures, which consequently improves performance levels.
- Standardization and integration of operative procedures between the OCC and the DCC, improving the human resource management in the contingency cases.
- Easier system performance analysis and easier reevaluation of recovery and disconnections procedures, by assessing cases in the corporate network's historical database.
- Easier training, dissemination and implementation of new operating procedures.

Conclusion and future improvements

The rigid requirements for power supply services' continuity and conformity indices, in addition to the growing insertion of modern, new devices for power systems automation and operation, revealed the need to expand the resources of the SCADA systems in RGE.

Some of the new applications and functionalities are: distribution networks' generation and isled operation dispatch; tension control mechanisms; functions for failure location and isolation; and the development and implementation of operation plans. Furthermore, the conception of these control centers should allow the monitoring the growing evolution of communication media, protocols, telemetry requirements, and network management functions.

Testimonials

Partnership developing and modeling the best SCADA system in Brazil

According to the OCC's supervisor, Ademir Perez, RGE's goal was (with the help from Sul Engenharia and Elipse Software) to have the best SCADA system in Brazil. And how was this level of quality achieved? Mr. Perez shares his opinion about it:

"First, we assessed the needs of all users and operators. To do so, electrical islands connected to breakers and reclosers were created. The next challenge was then to reduce the margin of electrical errors caused by massive information traffic on the islands, which were being sent directly to the operators. How could we fix it? It was simple. From the moment we were able to divide the control responsibilities on each island (up to the point when an event in the region 1, for example, could be acknowledged only by the operator responsible for that sector), the system's vulnerability was over, and it made its control and supervision easier. In fact, the entire work could easily be translated by a single concept: the database's better management and organization. In other words, we had a Ford Pinto and turned it into a Ferrari. And all of this happened because of one thing: creativity", said Perez.

Network Control

"Increased security, transparency, and organization." This was the exact answer given by the operational control division's manager, Rodrigo Bertani, when asked about the benefits brought by the Elipse solution to RGE's power distribution network. According to Bertani, this evolution was achieved due to a new philosophy adopted by the company: a philosophy focused on fighting the existence of conflicts in the decision-making process.

"The solution was carefully implemented to, despite its visibility, allow for greater function segregation. In a very large network, there are several people in several positions responsible for coordinating several activities. Regardless of its visibility, we also had to explore the issues concerning access permissions. Who is in control of that area? The whole permissions issue was handled very carefully. So even if an operator is able to view a different sector, they may only operate this nearby area if the operator responsible for said area grants them its command. Thus, it is not possible for two operators to handle the same area simultaneously, nor is it possible to have an area with no one controlling it, because the system only allows the operator to disconnect from the system when they transfer the command of their area to another operator. If another person wants to incorporate any new data to a sector that does not fall under their direct administration, they will first have to negotiate it with that sector's operator. It boils down to the following analogy: two people cannot drive the same car at the same time, and neither can a car go anywhere without a driver", illustrated Bertani.

TECHNICAL INFORMATION

Client: RGE - Rio Grande Energia

Systems Integrator: Sul Engenharia e Sistemas Ltda.

Elipse package used: E3 Master ilimitado com Hotstandby

Number of copies: 2

Platform: Windows 2003 Server

Number of I/O points: 28.000

I/O Driver: Driver IEC 870-5-101/102/104, DNP3