Annals of the University of Petrosani, Electrical Engineering, 21 (2019)

SCADA SYSTEMS ANALYSIS FOR INDUSTRIAL PROCESESS

RAZVAN SLUSARIUC[1], LILIANA SAMOILA [2], ILIE UTU[3], FLORIN GABRIEL POPESCU[4], ALINA DANIELA HANDRA[5]

Abstract: The paper presents an analysis of the operation and usage of SCADA data acquisition system. SCADA collects and records the values and statuses obtained from remote telemetry power system elements to enable control center operators to supervise and control the power system**.** The information transmitted by the automation systems of the remote control stations must be collected and processed at a central point. This function is performed by the network control systems that are installed in central locations, which are known as system control canters or control rooms.

Keywords: data acquisition, system, control, management, process, transmission.

1. INTRODUCTION

In order to maintain a reliable supply of electricity for consumers, an extremely complex process is needed, since most of this power cannot be stored, and the individual components of this process, forming what is called a power system, can be spread over a wide territorial area [1], [3].

The management of the electricity system, also called Energy Management, aims to monitor, control and optimize this process in real time [4].

The basic function of the control of the supply system is found in the control function of supervision and data acquisition (SCADA). SCADA collects and records the values and statuses obtained from remote telemetry power system elements to enable control center operators to supervise and control the power system [9].

Another important function is the decision support which completes this basic function to ensure the supply system management for a safe and optimal process [2].

[1] *Ph.D., Lecturer Eng.,University of Petroşani, razvansir@yahoo.com*
[2] *Ph.D., Associate Prof. Eng., University of Petroşani, branaliliana@gmail.com*
[3] *Ph.D., Associate Prof. Eng., University of Petroşani, ilieutu@yahoo.com*
[4] *Ph.D., Lecturer Eng.,University of Petroşani, floringabriel@yahoo.com*
[5] *PhD., Assistant, Eng., University of Petroşani, handra.alina@yahoo.com*

2. THE FUNCTIONS OF A NETWORK CONTROL SYSTEM

Network operators, with the help of control systems, obtain information from the network, usually in real time, which they can use as a basis for optimizing the supervision and control of the power system (figure 1).

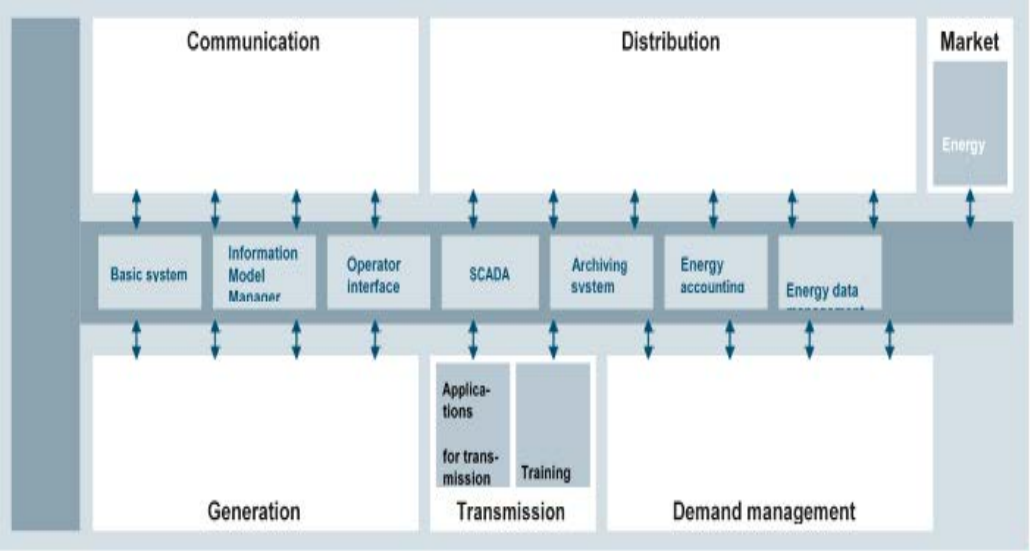

Fig. 1. Power control system - overview of the components

The information transmitted by the automation systems of the remote control stations must be collected and processed at a central point [8]. This function is performed by the network control systems that are installed in central locations, which are known as system control canters or control rooms.

The distinction between transmission management systems (TMS) and distribution management systems (DMS) is made according to the type of network managed (transmission or distribution). Prior to the deregulation, energy management systems (EMS) were used for integrated generation and transmission management, but after the deregulation, the separation of these two functions led to the creation of generation management systems (GMS) for the independent management of the generating units.

All types of network control systems use the so-called SCADA system platform As I said above, the term SCADA usually refers to a command canter that monitors and controls an entire production space. Most operations are performed automatically by the RTU - Remote Terminal Units (PLCs) or by PLC - Programmable Logic Controller Units (figure 2).

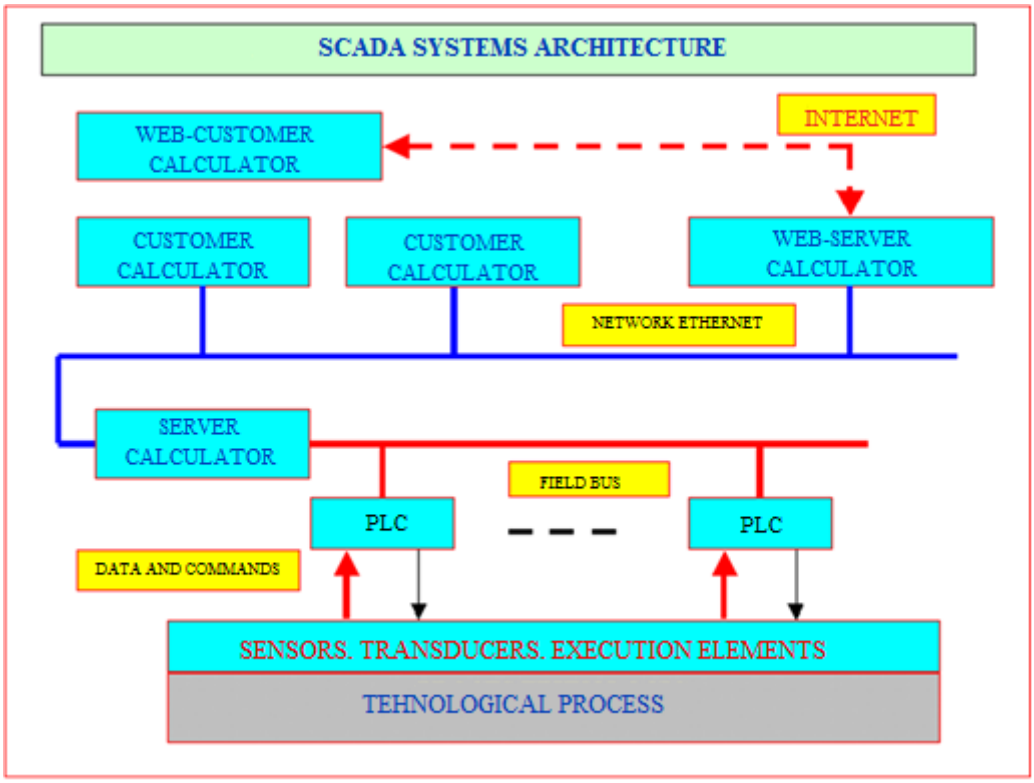

Fig.2. SCADA systems architecture

The control functions of the control center are largely limited to decision-making functions or general management functions.

3. THE GENERAL ARCHITECTURE OF SCADA SYSTEMS

A SCADA system consists of two main hardware components: Server (one or more) and viewer (client)

It is connected to the field elements (process) through the various procurement systems. The data acquisition systems are generally made on the basis of microcontrollers having the role of acquiring process data, supervising and controlling the functioning of the process [6]. Data acquisition is also achieved by using intelligent sensors that can be connected directly to the computer or through intermediary devices called "stations" or "masters" of communications that concentrate the data from several smart sensors. We will continue to call data acquisition and process control devices, "PLCs".

The server is responsible for all the data collected from the process (it also creates the database, ensures the communication with the PLCs in the process);

CLIEN VIEWER

It is networked with the server, uses the data from it and ensures communication with the human operator. It may be missing on small systems (the server also performs the viewer function) [5].

The servers are connected to the programmable automatons through a very wide range of communication drivers (hundreds of drivers that ensure practically all the PLCs from the known companies).

A single server can communicate simultaneously with several protocols. New communication drivers can also be developed [7].

The servers and viewers are networked (Ethernet). The adopted web technology now allows the visualization of a process through the Internet environment.

4. MAKING A SCADA APPLICATION

Making a SCADA application involves a series of steps such as:

• identification and proper setting of the elements for data acquisition as well as of the equipment for command and control of the monitored process;

• creating a new project;

• definition and setting of tags;

• creation of graphic pages to mimic the monitored process;

• writing functions and corresponding setting of the graphic elements in the graphic pages to realize the mimic of the process;

• establishing the users of the application and setting their rights;

• testing and running the application.

The SCADA architecture displayed by specialists naturally allows the use of several application servers, depending on the complexity of the process driven and the functions that are implemented by the system (for example: database server, server for expert systems, server for diagnostics, etc.). For commonly used applications, a single server computer is used to implement system functions, exploiting the multitasking feature that the operating system has. In order to realize the interface with the operator it was decided in favour of using the MIS environment - Windows '95 made by the American company Microsoft. Windows is an operating and programming environment that provides users with a simple graphical interface, which is based on screen windows and modern means of interaction: menus, simulated on-screen buttons, graphical sliders, dialog boxes, icons and more [9].

The communications system is based on the TCP / IP protocol developed in the USA. It is the communication standard of the UNIX operating system.

Benefits of using SCADA in the energy system:

• stable industrial solution and fast technical support;

• flexibility in the further development of the system;

• centralized or remote control and monitoring;

• provides users with an easy operating mode;

• quick diagnosis of alarms and faults;

• preventive maintenance (proactive actions);

• increases the life of the equipment and machinery through proper operation (automatic operation mode);

• optimization of operational consumption / costs.

With proper planning and custom installation, a SCADA system becomes a valuable asset and with the evolution of technology an improvement is required and the SCADA system, a New SCADA, we could be said.

Ignition by Inductive Automation® is an industrial automation software platform that many companies and organizations have addressed to their HMI / SCADA needs.

Ignition has entered thousands of locations in over 100 countries since 2010. The powerful and robust platform allows SCADA system integrators to meet the demands of their customers, costing less than other SCADA software solutions.

Here are some reasons why many companies choose the Ignition platform (figure 3):

• Ignition uses modern IT practices that make it compatible with current components of the SCADA system.

• Its unique license model allows users to pay a fixed fee depending on the number of servers. Other SCADA providers usually charge per customer or label, but Ignition offers unlimited customers and labels.

• Ignition is available on the web: it can be downloaded and installed in minutes, and clients can be launched or updated instantly.

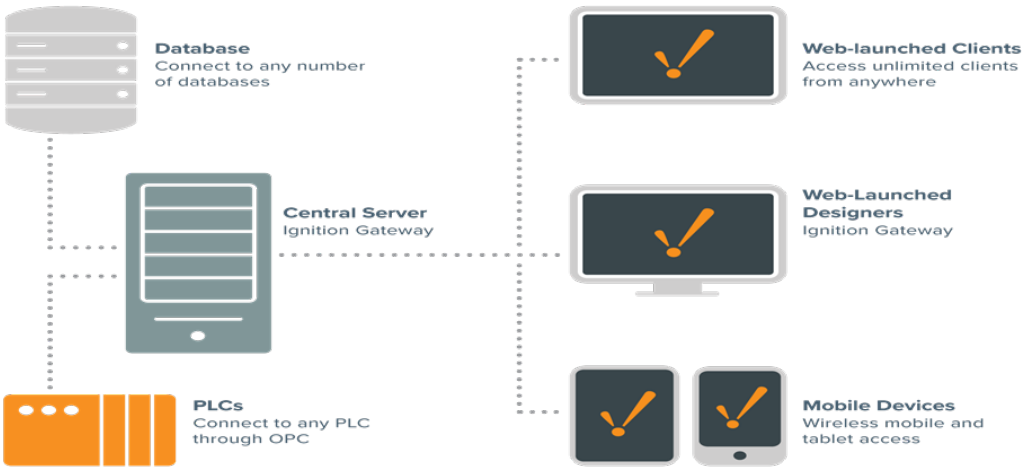

Fig. 3. Ignition SCADA Architecture

The Inductive Automation motto is "Dream It, Do It" and is the perfect embodiment of what Ignition can do. While his bold statements may seem too good to be true, a software demonstration proves how powerful he really is.

The market for industrial control systems - of which monitoring and data acquisition (SCADA) is a key issue - is expected to reach $ 181.6 billion by 2024. This means that industrial professionals anticipate a CAGR of almost 11.5% in the period 2018-2024. of the industrial industry of things (IIoT) and of a fast growing global energy

sector, economists note that the market is likely to reach even higher heights than predicted.

5. CONCLUSIONS

Although cloud-based data storage and processing systems have provided viable technology for consumers for some time now, the concept is still relatively new in the industrial sector. This means that we are currently at a new frontier in the development of cloud-based technology for industrial applications.

When companies rely on SCADA systems, they no longer have to worry about setting up control or backup centers. Cloud infrastructure can now be easily integrated and capitalized to the advantage of a manufacturing company. With the need to eliminate hardware and capital equipment, it is easy to see why SCADA has become such a prolific option for industry.

REFERENCES

[1]. Buica G., Antonov A.E., Beiu C., Pasculescu D., Dobra R., *Occupational health and safety management in construction sector – the cost of work accidents*, Quality-Access to Success, Volume 18, Issue S1, pp. 35-40, 2017.

[2]. Marcu M., Popescu F. G., Slusariuc R., Arad S., Handra A.D., *Overview of control methods for induction motor drives*, Annals of University of Petrosani, Electrical Engineering, Vol. 19, pp.57-64, Petroşani, 2018.

[3]. Niculescu T., Pasculescu D., Pana L., *Study of the operating states of intrinsic safety barriers of the electric equipment intended for use in atmospheres with explosion hazard*, WSEAS Transactions on Circuits and Systems, Volume 9, pp.430-439, 2010.

[4]. Pasculescu D., Romanescu A., Pasculescu V., Tatar A., Fotau I., Vajai Ghe., *Presentation and simulation of a modern distance protection from national energy system*, Proceedings of the 10 th International Conference on Environment and Electrical Engineering – EEEIC 2011, Rome, Italy, 2011, pp. 646-650.

[5]. Risteiu M., Marc G., *Elemente de tehnologia informatiei*, Ed. Universitas, Petrosani, 2000.

[6]. Patrascoiu N., *Sisteme de achizitie si prelucrare a datelor. Instrumentatie* Virtuala. Ed. Didactica si Pedagogica, Bucuresti, 2004.

[7]. Samoila, L., Arad, S., Petre, M., *Application for simulating the short-circuit current and the transient recovery voltage*, IEEE 16th International Conference on Environment and Electrical Engineering (EEEIC), pp. 2159-2163, Florence, Italy, 2016.

[8]. Stochitoiu M.D., Marcu M., Utu I., Niculescu T., Popescu F.G., *Modern concepts and its application for energetically security requirements at different connected sources*, 18th International multidisciplinary Scientific Geoconference SGEM 2018 Conference Proceedings, Vol. 18- Informatics, Geoinformatics and Remote sensing, Albena, Bulgaria, pp. 591-596, 2018.

[9]. * * * http://www.automatizari-scada.ro/