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APPLICATION OF INFORMATIONAL SYSTEMS IN OPERATION THE BIOLOGICAL WASTEWATER TREATMENT PLANTS

Natalia Ciobanu[1], Nicolae Secrieru[2], Dumitru Ungureanu[3], Valeriu Butanu[4]

Abstract **–** The modality traditional management and maintenance of WWTP plants is very inefficient or impossible, therefore it found advantageous to implement a management system, enabling the state to identify complex data acquisition, to plan and control these plants in any conditions. This paper discusses the vision of the authors of the SCADA architecture for monitoring the sewage and sludge collection/distribution systems and wastewater treatment plants, complying with the requirements on the leakages, and effectively reducing the operations and maintenance costs.

Key words **–** WWTP, SCADA, LAN, RDBMS

1 Introduction

Monitoring parameters in the treatment processes is an essential activity in wastewater treatment plants, it is closely linked to environmental monitoring in general. Its purpose is to track the degree of compliance with the legislation by monitoring the parameters of water quality at the exit of the treatment plant and to follow up the performance and efficiency wastewater treatment by monitoring parameters treatment processes.

This paper will discuss the system's evolvement, the architecture and it will demonstrate the system's successes in monitoring the sewage and sludge collection/distribution systems and wastewater treatment plants, complying with the requirements on the discharge, and effectively reducing the operations and maintenance costs.

2 SCADA system architecture for the wastewater treatment plant

The Chişinau wastewater treatment plant (WWTP) is located in the southeast of the city, approximately 7 km from the city center, beside the River Bic into which the final effluent is been discharged. With the low flows and the fact that it is within the city area, flowing ultimately into the Black Sea, under EU standards it would be classified as a sensitive watercourse (fig.1). The wastewater flow to the works is approximately 152,000 m^3/d, considerably below the works design capacity [1].

Studying the structure, capabilities and parameters WWTP Chisinau and taking into account the needs of the objects in discussion, initially we will formulate the basic requirements for conceptual SCADA system (fig. 2). The SCADA system shall provide a strategy for Real-time solutions that shall go beyond SCADA, offering the end user access to an open and enterprise-friendly data management system. Included

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in the SCADA system's family of products shall be a Graphical User Interface (GUI), a fully integrated Real-time subsystem, and a fully integrated Relational Database Management System (RDBMS).

Fig. 1. The Chisinau wastewater treatment plant.

The SCADA system shall also provide for easy and open integration with third party application software via non-proprietary industry standards. The SCADA system shall allow the user of the system the flexibility to accommodate diverse business applications and to provide capability to extend real-time data from the field to the enterprise by providing access to operational and historical data anytime, and anywhere.

The SCADA system architecture shall utilize non-proprietary industry standards all to enable transparent connectivity to other hardware, software, and networks. The objectives of performance, flexibility, expandability and open access are fundamental

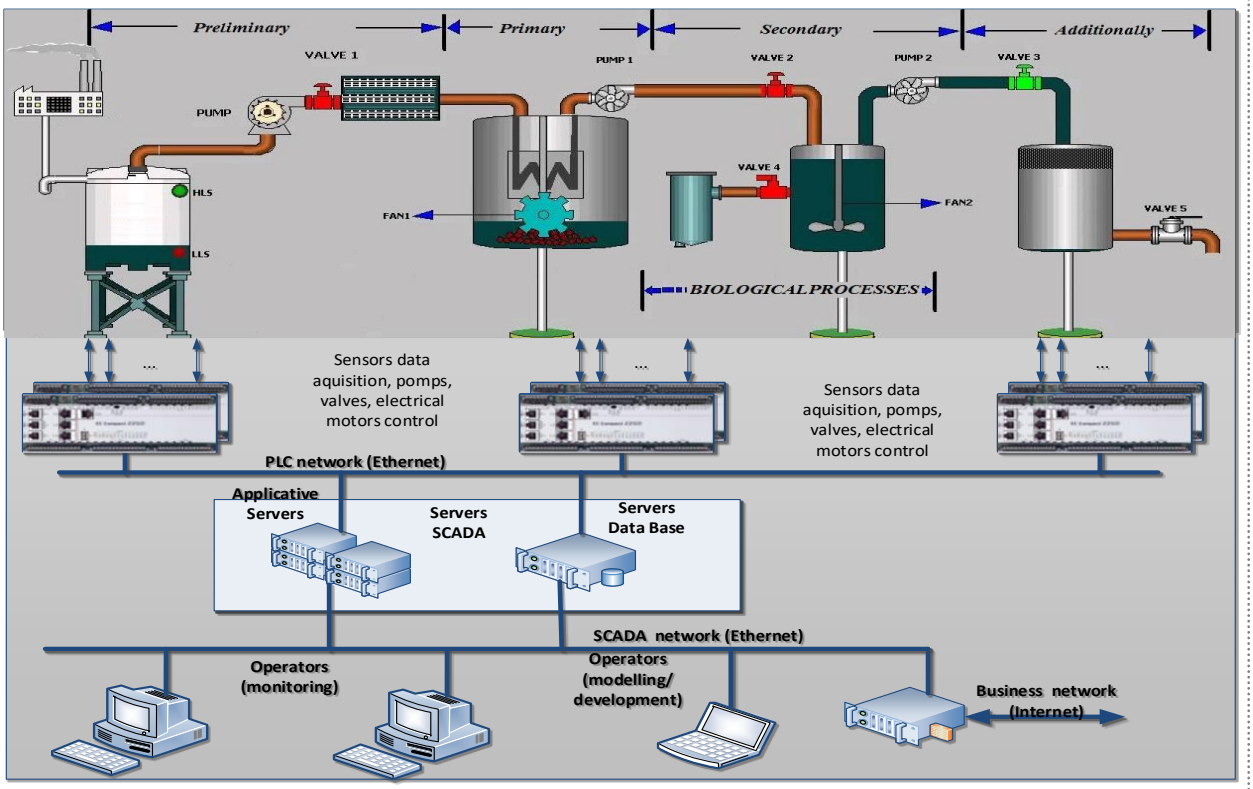

Fig. 2. The conceptual WWTP plant SCADA architecture

in determining the utility and longevity of any SCADA system. The SCADA system shall utilize a software architecture that allows functions to be mobile, flexible and

robust. Components must have the ability to share historical and real-time data between independent systems and geographical locations. The distributed system shall provide configuration options that allow multiple systems to share telemetry data, alarming, eventing, telecommunication, and control functionality. User permissions and security restrictions regarding all aspects of the system shall propagate seamlessly across the SCADA system's distributed architecture.

It is been proposed all computers in the SCADA system shall connect with each other using the latest industry standard Local-Area Network (LAN) and Wide-Area Network (WAN) technology. Multiple LANs, WANs, bridges, servers and routers shall complement each other to meet the requirements of system performance, reliability, security and expandability. System peripherals shall connect either directly to the system's LAN, through servers connected directly to the system's LAN, or attached to workstation parallel or serial ports. This shall allow access to any device from any computer in the system with the appropriate access authority. The system shall provide support for distributed network equipment such as networked printers, networked PC's, and mass storage/backup devices (fig. 3).

Based on the conceptual architecture, we propose real architecture of SCADA system for WWTP Chisinau, taking into account its characteristics and distributed geographical structure (Fig. 3) .

A SCADA System's components are comprised more CPU's (PC's and Servers), PLC's/RTU's, I/O Subsystems, Video monitors, Field Sensors, Control Devices (fig. 3) and lots of software that drives the I/O, runs the control algorithms, generates control outputs, displays graphics and monitored values, senses alarm statuses, and stores the monitored points in a series of data files that can be archived and recalled at a later time for analysis or process verification.

Control systems with multi-level architecture usually built on object principle, when the structure of the system selects a similar structure of the automation object, and each subsystem is local, that is, feedbacks are closed within this subsystem [2]. Each local subsystem performs a separate function that, given the logic of the whole system. Object principle of construction can simplify the design of a multi-level and to ensure its structural/architectural reliability. The philosophy of the design shall be simplicity and reliability such that the equipment shall have long trouble free service with low maintenance cost, low energy consumption and low disturbing impact on the environment.

3. Conclusion

The SCADA system is proposed to describe a multitude of computer-based control systems that allow operators and facility personnel to monitor and control a facility's equipment either locally or remotely. The SCADA system will automate much of the control process such that WWTP plant operators can focus on other task. SCADA systems are also installed to collect and store information for reporting, troubleshooting, maintenance indications, and much more.

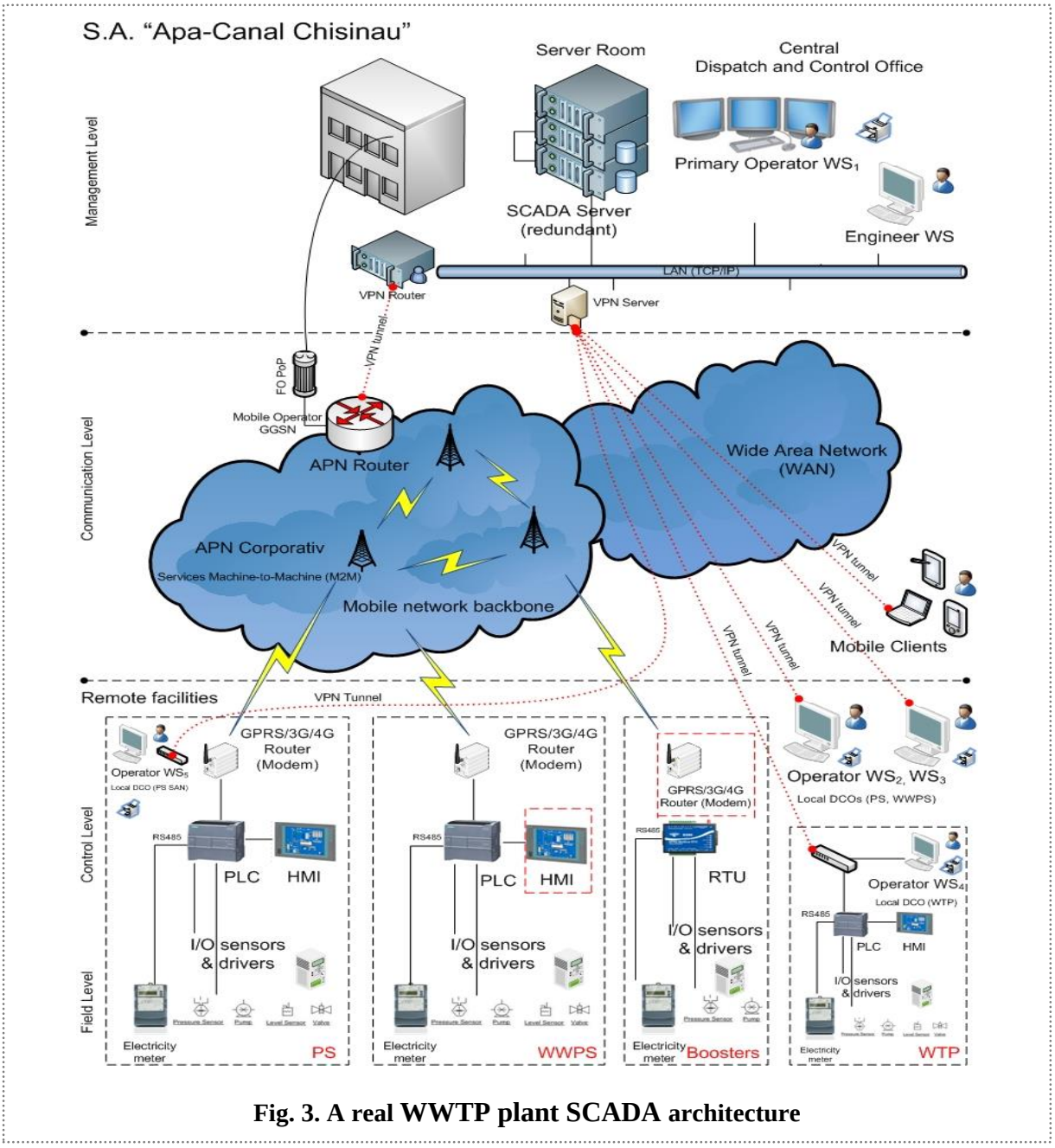

Fig. 3. A real WWTP plant SCADA architecture

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