CERTIFIED WORKSHOPS FOR INDUSTRIAL ENGINEERING

INDUSTRIAL COMMUNICATION PROTOCOLS AND NETWORK MANAGEMENT

Virtual and full-time based theoretical workshop with real practices.

Organized by Vester Industrial Training Center

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WORKSHOP CHARACTERISTICS

Full 3-day Workshop with theory and practice on the use of standards communication protocols used in industry, mainly the electric power industry, that involve the use of MODBUS, DNP3, IEC 61850 and IEC 60870-5 101 / 104. This training is designed to provide valuable knowledge about the connectivity and communication standards used in the electrical and remote-control industry. Widely recommended for professionals involved in the implementation of industrial automation solutions.

PARTICIPANT PROFILE

This Industrial Communication and Network Management Protocols Workshop is designed to train professionals working in the automation area, mainly those who develop, design, and implement projects that use the protocols studied in this training. It is also oriented to professionals who work in maintenance, commissioning, instrumentation, and areas related to projects. The participant obtains knowledge that can be applied immediately in their daily work.

OBJECTIVES

The main objective of this Workshop is to provide knowledge to work with the DNP3, IEC 60870-5-101 and 104, IEC 61850 and Modbus protocols

The previous objective is achieved through secondary objectives detailed below:

• Understand how an industrial communication network works.

• Learn how an industrial communication protocol is designed.

• Learn the individual characteristics and functionalities of each of the protocols to study.

• Obtain knowledge to diagnose and solve problems for each of the protocols to study.

• Perform practical exercises with real and simulation equipment for each of the protocols.

• Learn the selection criteria of each protocol according to its strengths and characteristics.

MATERIALS INCLUDED

- Training manual in digital format.
- Access to the virtual classroom.
- Digital certificate of successful completion.

All the necessary material will be sent by email before the first day of the Workshop.

PROTOCOLS TO ANALYZE DURING THE WORKSHOP

BASIC THEORY OF DIGITAL NETWORKS

Know basic theories of digital networks and its elements (Routers, Switch, firewall) and communication between intelligent electronic devices, with the purpose of learning the terminology, the specifications and the tools of remote-control systems and process control.

MODBUS

It is one of the first and most used protocols in the industrial world, for monitoring and remote control. The first standard was proposed by the company Modicon in the seventies and has evolved until today with the extension to connect via Ethernet network (Modbus-TCP). In the Workshop we will show about the benefits and limitations of this protocol, how each of the functions works and compare with other protocols covered in the course.

DNP3

Is originally proposed by a subsidiary of General Electric Company when 60870-5 protocol at the time was not yet the gold standard, but many of its features are derived from it, improving them. It is mainly used in the system of production and distribution of electricity and public services such as electricity and water companies. During the course of DNP3 protocol will be discussed in detail and make a comparison between this protocol and 60870-5.

IEC 60870-5

It is an international standard developed by the International Commission IEC (International Electrotechnical Commission) for monitoring power systems, control systems and associated communications. In this protocol, there are several extensions, which will be detailed: IEC 60870-5-101 (IEC101): represents the basic application of specific documents described in 1 and 5 of the standard and defines the protocol for monitoring DTE-DCE devices connected via serial cable.

IEC 60870-5-104 (IEC 104): is the extension of the IEC 101 protocol with the necessary changes to the Ethernet network and TCP/IP interface connection. The IEC 104 protocol is generally used for remote power systems in Control Centers and IEC 101/103 protocol is used for field remote interaction.

IEC 61850

The IEC 61850 protocol standard is designed to support the communication of all functions being performed in the substation. Its' main goal is interoperability; this is the ability for IEDs from one or different manufacturers to exchange information and use the information for their own functions. Moreover, the standard allows a free allocation of these functions and accepts any system philosophy, from a distributed architecture (for example, decentralized substation automation) to a centralized configuration (for example, RTU based).

SCHEDULE:

	Day 1	Day 2	Day 3

Network theory
- Models connection (DCE-DTE, client-server)
- ISO-OSI Model
- Architecture and devices
- Fieldbus and Ethernet
- Fieldbus Protocols
- ICMP, SNTP, PTP, SNMP

DNP3 Protocol
- History
- Features
- Architecture
- Format of frames
- Model and data classes
- Commands
- Unsolicited Events

Protocol 61850
-Protocol 61850
- Introduction
- Specifications and Related Documents
- History
- Features
- Architecture
- Data Classes, attributes, functional constraints
- Format of frames
- Practice

Theory and practice of networking

Internet Protocols
- Implementation of the ISO-OSI model in the Internet protocols
- Network Security
- Integration of information in industrial processes: architecture, alarms, events, data
- MRP, RSTP, VLAN
- Design a system for process control and data acquisition

DNP3 Protocol
--Operational messages
- Error Handling
- Levels of integration
- DNP3 and Ethernet
- Security

-- Model and data classes
- Commands
- Network architectures according to the IEC 61850 compliance
- QoS + VLAN
- Multicast address in 61850
- Practice

MODBUS Protocol

- History and applications
- Comparison with other protocols
- Communication modes ASCII and RTU
- Plot ASCII / RTU Message
- Class 0,1,2 Posts
- Data Format
- Control of communication errors and link maintenance
- Synchronization
- Common and specific controllers Commands

IEC Protocols 101, 104
- Time Synchronization
- Features specific to the electrical environment
- Error Handling
- Maintenance of the communication link
- Practical simulation problems and common mistakes
- Specifications and Related Documents
IEC 61870-5-1,2,3,4,5,6,7
- Format of frames
- Balanced and Unbalanced Communication

-- Comparison and differences with IEC 60870-5 protocols
- ICD, CID, SCL, SCD format files
- Substation Configuration Language (SCL)
- Practice

MODBUS-TCP Protocol

- Specific features and differences with Modbus
- Frames
- Extensions
- Client and server
- Practice and interrogation facility of a device

Protocols IEC 101, 103, 104

- Fields of intervention
- Differences and commonalities
- Variable and fixed frames
- Commands, Data, Features
- Practice and interrogation facility of a device

Comparison between 60870-5, DNP3, Modbus TCP, IEC 61850

- Differences and commonalities
- How to choose the remote-control protocol

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