

Industrial Communication Protocols and Network Management

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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

The Industrial Communications Protocols and Network Management 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.

Materials included

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

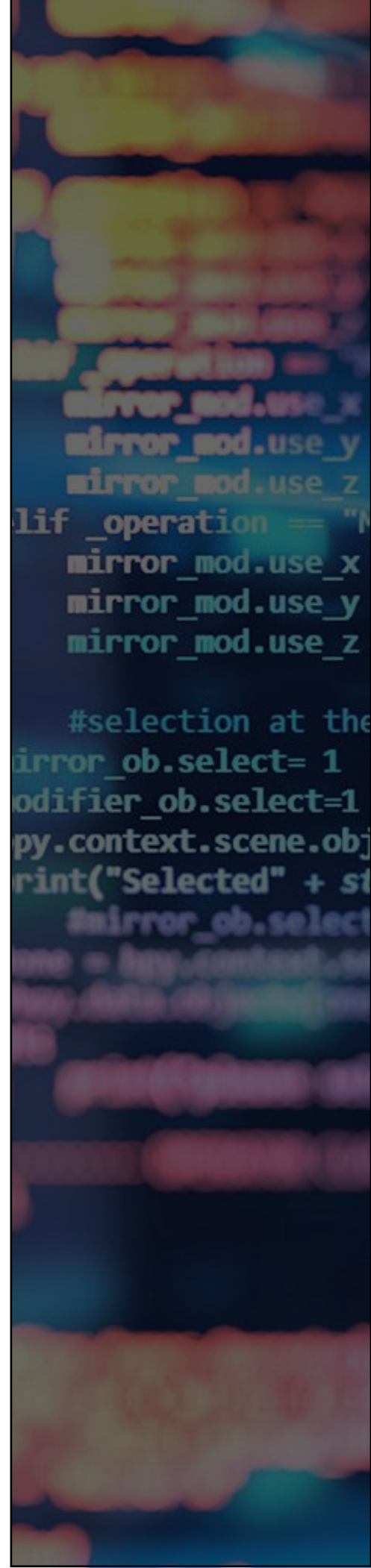
*All the necessary material will be sent by email before the first day of the Workshop.

Objectives

This workshop aims to provide enough knowledge to work with DNP3, IEC 60870-5-101 and 104, IEC 61850, and Modbus protocols.

This will be achieved through the 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 everyone of the protocols.
- Obtain knowledge to diagnose and solve problems for each one of the protocols.
- Perform practical exercises with real and simulation equipment.
- Learn the selection criteria of each protocol according to its strengths and characteristics.



This workshop will review the following protocols:

BASIC THEORY OF DIGITAL NETWORKS

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 this workshop we will teach the benefits and limitations of this protocol, how each of its functionalities work and compare them with other protocols reviewed in the course.

DNP3

It was originally proposed by a subsidiary of General Electric Company, back when the 60870-5 protocol was not yet the reference standard, but many of its features are derived from it. It is mainly used in the system of production and distribution of electricity and public services such as electricity and water companies. While reviewing protocol DNP3, this will be discussed in detail and will be compared with protocol 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.

Protocols to analyze during the Workshop

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).



Workshop schedule

Day 1

Network theory

Connection models (DCE-DTE, client-server)
ISO-OSI Model
Architecture and devices
Fieldbus and Ethernet
Fieldbus Protocols
ICMP, SNTP, PTP, SNMP

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

MODBUS Protocol

Time Synchronization
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

MODBUS-TCP Protocol

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

Workshop schedule

Day 2

DNP3 Protocol:

- History, features, architecture and format of frames
- Model and data classes
- Commands
- Unsolicited Events

DNP3 Protocol:

- Operational messages
- Error handling
- Levels of integration
- DNP3 and Ethernet
- Security

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

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

Workshop schedule

Day 3

Protocol 61850:

Introduction

Specifications and Related Documents

History

Features

Architecture

Data Classes, attributes, functional constraints

Format of frames

*Practice

Model and data classes and Commands

Network architectures according to the IEC 61850 compliance

QoS + VLAN

Multicast address in 61850

*Practice

Comparison and differences with IEC 60870-5 protocols

ICD, CID, SCL, SCD format files

Substation Configuration Language (SCL)


*Practice


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

Differences and commonalities

How to choose the remote-control protocol

Workshop information

 **Training duration:**
3 days (5h per day / 15 hours)

 **Format:**
Online
Face to face
Private

 **Language:**

English

Spanish

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