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# PRACTICAL DNP3, 60870.5 AND MODERN SCADA COMMUNICATION SYSTEMS



## **YOU WILL LEARN HOW TO:**

- Explain the fundamentals of DNP3 and associated SCADA protocols
- Apply the best current practice for data communications for SCADA systems
- Specify the most up-to-date hardware and software requirements of the data communications system for instrumentation and control
- Have a good working knowledge of the DNP3 Protocol
- Apply the DNP3 Protocol to your next SCADA project
- Troubleshoot simple problems with the DNP3 protocol
- Explain how IEC 61850 is structured and works
- Provide a working explanation of SCADA Protocols and how they should be structured and applied
- Apply “best practice” decisions on the most cost effective use of SCADA open protocols for your company

## **WHO SHOULD ATTEND:**

This workshop is designed for personnel with a need to understand the techniques required to use and apply SCADA and DNP3 industrial communications technology as productively and economically as possible.

## The Workshop

This is a comprehensive two-day workshop covering the essentials of SCADA communication systems focusing on DNP3 and the other new developments in this area. The workshop commences with a brief review of the fundamentals of SCADA systems hardware, software and the communications systems (such as RS-232 and RS-485 Ethernet and TCP/IP) that connect the SCADA operator stations together.

A solid review is then done on the DNP3 protocol where its features, message structure, practical benefits and applications are discussed. The course is intended to be product independent but examples will be taken from existing products to ensure that all aspects of the DNP3 protocol is covered.

It provides you with the tools to design your next SCADA system more effectively using DNP3 to draw on the latest technologies.

## Practical Sessions

There are seven practical sessions.

- MODBUS communication
- DNP3 Packet Interpretation
- RTU Configuration Software
- DNP concepts
- Setting up IP Address on Network
- Protocol Analysis of DNP3 Protocol
- DNP3 over Ethernet

## The Program

### OVERVIEW

- SCADA systems
  - OSI reference model
  - IEC 60870.5 and DNP3.0
  - Local Area Networks, Ethernet and TCP / IP
  - UCA and IEC 61850 protocols
- ### FUNDAMENTALS OF SCADA COMMUNICATIONS
- SCADA systems
  - Remote Terminal Units (RTU)
  - The master station
  - Communication architectures
  - Communication philosophies
  - Interface standards: RS- 232 and RS- 485
- ### MODBUS protocols
- ### OPEN SCADA PROTOCOLS Dnp3 AND IEC 60870
- Interoperability and open standards
  - Development of standards
- ### FUNDAMENTALS OF DNP3
- Fundamental concepts
  - Understanding DNP3 message structure
  - Physical layer
  - Datalink layer
  - Transport layer (pseudo-transport)
  - Application layer message handling
  - Application layer message functions
  - Data object library
- ### ADVANCED CONSIDERATIONS OF DNP3
- DNP3 subset definitions
  - Interoperability between DNP3 devices
  - Implementation rules
  - Conformance testing
  - DNP3 polling and communication options
  - Time synchronisation
  - Secure authentication

### CONFIGURATION OF DNP3 OVER SERIAL LINES

- General description
- Water industry example

### REVIEW OF ETHERNET AND TCP/IP PROTOCOLS

- IEEE 802.3 CSMA/CD ('Ethernet')
- Physical layers
- Media access control
- Ethernet frame format
- Fast and Gigabit Ethernet
- Switched Ethernet
- TCP/IP model overview
- Internet protocol
- ICMP, TCP and UDP

### DNP3 OPERATION OVER LAN AND WAN NETWORKS

- Routers
- Types of routers
- Routing protocols
- Wide area networks
- Digital transmission hierarchies
- WAN protocol overview
- DNP3 over TCP/IP and UDP/IP
- Link layer confirmations
- Time synchronization over LAN

### OVERVIEW OF IEC 60870-5 PROTOCOLS

- Introduction
- The IEC 60870-5 standards
- System topology
- Data link layer
- Addressing
- Message transport
- Application layer
- Interoperability
- IEC 60870-5-104 (T104) architecture

### DIFFERENCES BETWEEN DNP3 & IEC 60870.5

- Differences between DNP3.0 and IEC 870
- Which one is better?

### INTELLIGENT ELECTRONIC DEVICES (IEDS)

- Definition
- Functions
- Examples of GE power automation IEDs

### IEC 61850 OVERVIEW

- Introduction
- Basic features of IEC 61850
- Data modeling
- Abstract communication service interface
- Information (data) exchange model
- Communication model
- Substation configuration language
- Conformance testing
- Benefits of IEC 61850

### FIELDBUS & SCADA COMMUNICATIONS SYSTEMS

- Introduction
- Profibus
- Foundation Fieldbus

### FUTURE DEVELOPMENTS

- The future of DNP3

### SUMMARY, OPEN FORUM AND CLOSING