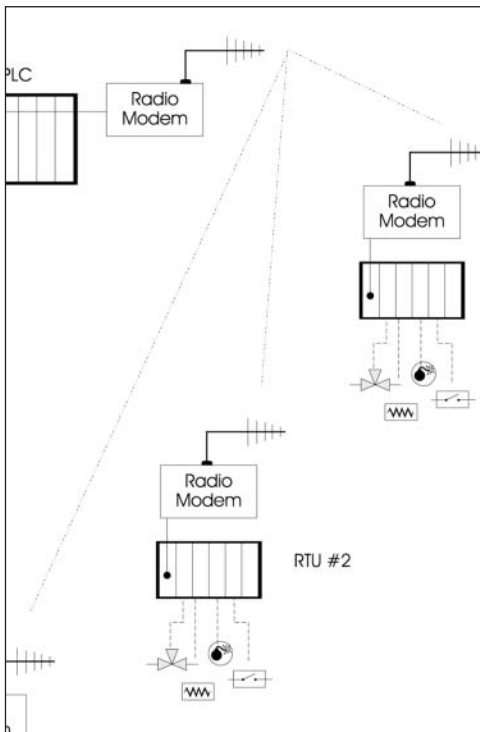Practical

DNP3, IEC 60870.5 & MODERN SCADA COMMUNICATION SYSTEMS

for Engineers & Technicians

YOU WILL LEARN HOW TO:

- **Apply the fundamentals of DNP3, 60870.5 and associated SCADA Protocols**
- **Apply 'best practice' for your SCADA Standards and Protocols**
- **Troubleshoot simple SCADA Protocol problems**
- **Design, install and commission your next SCADA communication system effectively**

WHO SHOULD ATTEND:

This workshop is designed for personnel with a need to understand the techniques required to use and apply SCADA, DNP3 and IEC 60870.5 industrial communications technology as productively and economically as possible.

This includes engineers and technicians involved with:

- **Control and Instrumentation**
- **SCADA and Telemetry Systems**
- **Process Control**
- **Electrical Installations**

- **Consulting**
- **Design**
- **Process Development**
- **Control Systems**

Who may be:

- **Technicians**
- **Managers**
- **Project Engineers**
- **System Engineers**
- **Process Engineers**
- **Maintenance Engineers**
- **Maintenance Planners**

- **Software Engineers**
- **Maintenance Supervisors**
- **Field Technical Support Staff**
- **Project Management**
- **Design Engineers**
- **Electrical Engineers**

IDC TECHNOLOGIES

Technology Training that Works

THE WORKSHOP

This is a comprehensive two-day workshop covering the essentials of SCADA Communication systems focussing on DNP3 and the IEC 60870.5 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 and IEC 60870.5 protocols where their 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 and the IEC 60870.5 protocols are covered.

It provides you with the tools to design your next SCADA system more effectively using DNP3 and IEC 60870.5 protocols and to draw on the latest technologies.

PRE-REQUISITES

A basic working knowledge of SCADA and Data Communications such as IDC's "Practical Data Communications" workshop is useful but not essential.

WORKSHOP OBJECTIVES

At the end of this workshop, you will be able to:

- explain the fundamentals of DNP3 and the IEC 60870.5 and associated SCADA protocols
- demonstrate knowledge of the "Nuts and bolts" about selecting DNP3 and IEC 60870.5 based systems
- 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
- apply the DNP3 and IEC 60870.5 protocols to your next SCADA project
- troubleshoot simple problems with these protocols
- provide a working explanation of SCADA Protocols and how they should be structured and applied
- apply "best practice" decisions on the best and most cost effective use of SCADA Open protocols for your company

PRACTICAL SESSIONS

There are six practical sessions and exercises throughout the two days;

- Demonstration of an IEC 60870.5 and DNP3 System
- Throughput calculations
- Design of a Radio Based IEC 60870.5 System
- Analysis of DNP3 and IEC 60870.5 Protocol
- Design of Overall System
- Troubleshooting and Testing

THE PROGRAM

DAY ONE

INTRODUCTION
- DNP3, IEC 60870.5 and SCADA Protocols

BASIC TERMINOLOGY
- Terminology and overview - signalling, circuits, channels, lines, trunks, bandwidth, channel capacity
- 2-Wire versus 4-wire/Full versus Half Duplex systems
- Dial up versus Leased Line
- Connection Oriented versus Connectionless Communication
- Circuit Switching versus Packet Switching

FUNDAMENTALS OF SCADA COMMUNICATIONS
- SCADA system hardware
- RTUs and PLCs
- Central control stations
- Communication architectures
- Basic Standards - RS-232/RS-485
- OSI Seven Layer Model
- SCADA Protocols - HDLC, Modbus

PREVIEW OF DNP3 & IEC 60870.5
- Basic Structure
- Why use them
- Benefits
- Interoperability and Open Standard
- Features of IEC 60870.5
- Distributed Network Protocol (DNP3)

FUNDAMENTALS OF DNP3 & IEC 60870.5
- Fundamental Concepts
- Layer Analysis
- Understanding Message Structure
- Data Objects
- Development
- Physical Layer
- Datalink Layer
- Transport Layer (pseudo-transport)
- Application Layer
- DNP3 over TCP/IP and UDP/IP
- IEC 60870.5 over TCP/IP and UDP/IP

DAY TWO

ADVANCED CONSIDERATIONS OF DNP3 & IEC 60870.5
- Subset Definitions and Conformance Testing
- Interoperability between IEC 60870.5 Devices
- Polling and Communication Options
- Implementation in terms of software and hardware

DIFFERENCES BETWEEN DNP3 & IEC 60870.5
- The IEC 870 and DNP3 Standards
- IEC 60870-5-103
- IEC 60870-5-101
- Differences between DNP 3.0 and IEC 870
- Which one is better?

INTELLIGENT ELECTRONIC DEVICES (IEDS)
- Description of IEDs
- Examples of IEDs eg Modern Electronic Relays
- Installation and Commissioning
- Troubleshooting

ETHERNET & TCP/IP
- CSMA/CD and Ethernet
- Token Passing
- TCP/IP
- IEC 60870.5 and DNP3 Applications

FIELDBUS & SCADA COMMUNICATIONS SYSTEMS
- How do these fit in with DNP3 & IEC 60870.5
- Profibus
- Foundation Fieldbus

RADIO & TELECOMMUNICATIONS CONSIDERATIONS
- VHF, UHF and microwave point to point and multipoint
- Radio Propagation and path considerations
- Public Switched Telephone Network (PSTN)
- New Wireless Communications Systems

APPLICATIONS
- Substation Automation - electrical
- Water utilities

FUTURE DEVELOPMENTS
- UCA 2.0
- The future of IEC 60870.5 and DNP3

ON-SITE TRAINING

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✔ Customise the training to **YOUR** workplace.

✔ Have the training delivered when and where you need it.

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