SCADA SYSTEMS & SOLUTIONS FOR THE OIL & GAS INDUSTRY
9 - 11 June 2014  |  Kuala Lumpur  |  Malaysia

SCADA SECURITY PROTECTING OIL & GAS PRODUCTION AND INFRASTRUCTURE
12 – 13 June 2014  |  Kuala Lumpur  |  Malaysia

Your Expert Trainer
LEONARD SMART
An experienced trainer with over 40 years worth of industry experience.

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Course Objectives – How it will benefit you
SCADA systems managers are at a crossroads, tempted by new developments in technology but cautious because of their mission-critical responsibility. This three-day intensive training program is designed to present SCADA and industrial computing personnel with a clear understanding of just how their environment is being affected by the revolutionary changes in industry best practices.

The objective of this seminar is to provide an intensive, systematic treatment of classical solutions and new developments in SCADA technology, and deliver a thoroughly up-to-date view of emerging trends in this critical industry segment.

Course Agenda
The course has two key components, both focused on applications of SCADA to the oil & gas sector:

1. A hypothetical SCADA design problem is posed, assuming a small pipeline application. Students are given opportunity to apply the principles covered in class and are guided through an analysis process leading to a SCADA concept design.
2. A hands-on workshop component, in which students have opportunity to explore some of the important concept features of the Modbus and DNP3 SCADA protocols and view/analyze their operational features. If the hands-on activity is impractical due to lack of computers, students will be guided through an in-class demonstration of the workshop elements, and be left with software and instructions to replicate the hands-on part of the course on their own time.

Course Sessions

INTRODUCTION
Summary Features of Industrial Computing Applications
- A Prototype View of SCADA Systems
- SCADA, PLC and DCS Systems as used in the Oil & Gas Industry
- Networked Computing Issues that Apply to SCADA
- Data Communications and Computing Vocabulary Review

TELECOMMUNICATIONS SERVICES AND LINK PROTOCOLS
- Types of SCADA Networks
- Communications Media and Signals
- Wireless Systems Concepts
- Modem Types and Features
- Functions and Examples of Data Communications Protocols
- Error Detection and Control Methods

LOCAL AREA NETWORKS IN THE MASTER STATION AND IN THE FIELD
- Ethernet Networks and Configurations
- Industrial Adaptations to Ethernet
- Hub-Oriented LAN Configurations
- Intelligent and Switching Hubs
- LAN Connectivity; Bridges, Routers and Switches
- Solving Distance and Capacity Problems With Full Duplex Ethernet

CORE PRINCIPLES OF THE TCP/IP ARCHITECTURE
- Features of The Internet Computing Architecture
- Key Elements of The Internet Protocol
- Transmission Control Protocol Concepts

RELIABILITY, REDUNDANCY AND SAFETY ISSUES
- Reliability and Availability Definitions
- System Reliability Models
- Failure Modes
- Intrinsic Safety and Electrical Hazards

FEATURES OF THE RTU
- Oil/Gas Wellhead example: Typical data points
- Data Representation Formats
- Real Time Operations; Requirements and Features
- Role and Typical Features of the RTU
- Packaging Issues and Designs

PLC: AUTOMATING LOCAL CONTROL PROCESSES
- Open- and Closed-Loop Control Concepts
- Relay Logic and Ladder Diagrams
- Programmable Logic Controllers
- The Fieldbus/Modbus Architecture
- Ethernet Industrial Protocol (Ethernet/IP)

INSTRUMENT AND EQUIPMENT INTERFACES
- Traditional Computer Interfaces
- Balanced and Unbalanced Wiring Configurations
- RS-485 Bus Architecture Features
- Cross-Over Cables
- Analog Interfaces and Instrument Concepts

FEATURES OF THE MTU/HMI
- Classical Role of The Master Terminal Unit
- A Vital Component: The Human Machine Interface
- Graphical Display Developments
- Wall Systems; Map Boards and Projection Systems

SPECIAL APPLICATIONS; PIPELINE LEAK DETECTION AND CORROSION PROTECTION
- Leak Detection Measurement Challenges
- Data Correlation Across Numerous Sites
- Corrosion Protection Monitoring Presents Unusual Difficulties
- Basic Challenge: Data Recovery From Remote Sites

SECURITY
- Sampler of Oil & Gas Security Incidents
- Points of Vulnerability
- Overview of Encryption and Firewalls
- Access Control and Intrusion Detection
- Unique Challenges of Wireless

DATA HISTORIAN/BACK-END SYSTEMS
- Historians: Concepts, Usage Models and Location Options
- Client/Server Concepts and Historian Transactions
- Back-end Systems: Modeling and Trend Analysis
- Data Warehousing; Archival Information Retrieval
- Open Systems; Concepts and Scope

PLANNING AND MANAGING SCADA PROJECTS
- Phases of a SCADA Project
- Specifications; Alternative Strategies
- Alternatives in Procurement
- Implementation and Commissioning

Who Should Attend
SCADA Systems and Solutions delivers essential information for technical professionals, operators and managers who need to understand and deal effectively with this class of computer-based networked systems.

Typical delegates include:
- SCADA Systems Personnel; Novice, Intermediate and Senior Process Engineers and Managers
- Operations and Maintenance Managers, Engineers and Technicians
- Hardware and Instrument Specialists
- Business System Analysts Who Support SCADA Interfaces
- System and Application Programmers
- Project Managers
- Telecommunications Support Personnel

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SCADA SECURITY: PROTECTING OIL & GAS PRODUCTION AND INFRASTRUCTURE
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**Course objectives – how it will benefit you**
SCADA and industrial networks operate as vital supporting infrastructure to the critical applications and processes that support all levels of oil & gas production and distribution. Their secure, safe, continued availability is not negotiable. This short course identifies challenges and defines solutions, so that the operational integrity of these mission-critical networked services can be confidently assured.

Thus, the objective of this course is to familiarize SCADA personnel with the security issues they need to be aware of and provide detailed knowledge of security threats and recognized solutions. Further, it provides students with the tools to assess and mitigate security vulnerabilities -- and appreciate the ways in which IT-oriented security measures will help, and understand where unique-to-SCADA approaches are necessary.

**Who Should Attend**
The course is suitable for SCADA professionals (managers, planners, support personnel), instrumentation personnel, IT professionals and SCADA vendors/designers.

Very little is assumed about existing security knowledge, but delegates should have a working understanding of SCADA and industrial networking technologies. For beginners, we recommend our SCADA Systems and Solutions -- as Employed by the Oil & Gas Industry course prior to this course.

This course is presented as a workshop program with a series of SCADA security analysis and design activities. Delegates will have opportunity to develop concepts and interact with others in creating strategies to support and maintain state-of-the-art industrial network security. If the hands-on activity is impractical due to lack of computers, students will be guided through an in-class demonstration of the workshop elements, and be left with software to complete the hands-on part of the course on their own time.

**INTRODUCTION**
- Security Challenges are Universal
- Increased Vulnerability Due To Open Systems Trend
- Increased Vulnerability From Motivated, Knowledgeable Attackers
- Some Documented SCADA Security Failure Incidents
- Oil & Gas Sector Benefits from Electrical Power Industry Initiatives

**OPEN SYSTEMS ISSUES PUSH THE AGENDA**
- Protocols of the Internet Architecture
- Ethernet and Other IT-derived Networks
- Fieldbus Standards
- IEC Standards
- Ethernet/IP and CIP
- Computer Operating Systems; Windows and Unix/Linux

**POINTS OF VULNERABILITY**
- The IT Infrastructure
- Leased and Shared Infrastructure
- The Sensor/Fieldbus Networks
- Wireless LAN Systems
- Rogue (Undocumented) Dial and Wireless Links
- Infected/Compromised Portable Equipment
- Network Management Systems

**SCADA NETWORK PROTOCOLS**
- Features Common to Most SCADA Networks
- The MODBUS Protocol and It’s Lack of Security
- Demonstration/Lab: MODBUS Dialog
- The DNP3 Protocol and Its Security Limitations
- The Near-Universal Trend to Ethernet-Based Networks

**ENCRYPTION**
- Starting With A Secure Physical Environment
- The Traditional Purpose of Assuring Privacy is a Minor Issue
- Traditional Symmetric Key Cryptography
- Public Key Cryptography and RSA
- Protecting Field Networks From Intrusion With Encryption

**FIREWALLS AND PERIMETER SECURITY**
- Firewall Design Objectives
- Survey of Firewall Types
- Network Address Translation
- Creating and Populating a SCADA DMZ
- Field-Level Firewalls in the SCADA Network

**ACCESS CONTROL AND AUTHORIZATION: MANAGING USERS**
- Limitations of User ID’s and Passwords
- Multi-Factor Authentication Methods
- Microsoft’s Active Directory Services
- RADIUS, TACACS and Diameter Authentication Services

**INTRUSION DETECTION AND PREVENTION**
- NIDS Principles and Features
- Deployment Scenarios
- Packet Signature and Traffic Pattern Analysis
- Strategies For Dealing With The Volumes of Data

**WIRELESS SECURITY ISSUES**
- Wireless Technology Offers Compelling Advantages
- Early Misadventures With Wireless Security
- TKIP and the WPA/IEEE 802.11i WiFi Standards
- Private Point-to-Point Wireless Services
- Cellular/Mobile Data Networks; Benefits and Risks

**CREATING AND DOCUMENTING A SECURITY SOLUTION**
- Essential Elements of a Secure Environment
- Promoting User Awareness
- Elements of an Effective Security Policy
- Defining a Model for Internet Access
- 10 Essential Steps to Improving SCADA Security

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About your Expert Trainer: Leonard Smart

Leonard Smart has over forty years of professional experience in the telecommunications field, most of which has been specialized in the area of computer networking and industrial systems. Following graduation from U.B.C., he spent five years with GTE Lenkurt Electric in Vancouver, where he helped develop products in the areas of microwave transmission systems, digital communications and mini-computer-based SCADA systems.

He led a team investigating the data characteristics of VHF/UHF radio channels and developed prototype protocols for a wireless data terminal that delivered interactive data services to radio-equipped vehicles. This pioneering mobile data system saw widespread use by a number of major police forces and commercial dispatch fleets throughout the world.

Mr. Smart managed a key SCADA and industrial data communications planning and design project for Saudi ARAMCO, and was responsible for preparing detailed performance and reliability projections for these systems. He has been responsible for project management, budget control and project planning for a number of large energy-related networking and supervisory control projects domestically and overseas. He acted as communications project manager for the Enbridge Pipeline (then InterProvincial Pipelines) system which was successfully constructed from Norman Wells (Northern Canada) to Zama, Alberta. This responsibility included all aspects of planning and procurement of telecommunications facilities and SCADA infrastructure for the pipeline operation.

In other areas, Mr. Smart has been assigned responsibility for a number of consulting projects in computer message delivery systems, computer data network design, transmission systems and voice telephony. A sampler of the projects he has led includes:
- Preparation of a multi-vendor networking plan, for a large, Chicago based manufacturing corporation confronting interoperability challenges.
- Designing multiply connected, comprehensive industrial LAN and backbone LAN/MAN systems for a large aluminum smelter application, and two major U.S. naval installations in Europe.
- Designing, fabricating, programming and fielding microprocessor-based data collection and reporting systems for an environmental emissions monitoring application at oil refineries.
- Weather services network design, involving some 500 locations throughout Canada requiring reliable, cost-effective data communications, many of which were remotely sited.
- Reengineering design for a waste-water pipeline and pumping SCADA system for a major Canadian water management authority.

Since his first encounter with a consulting assignment that gave him opportunity to teach a professional training course in 1983, he has increasingly focused his career on this personally rewarding role. He is in high demand as a uniquely experienced presenter, having successfully delivered over 600 training courses in some 20 countries worldwide. His repertoire of subjects ranges from industrial applications of networking technology (SCADA and related control systems) through more traditionally IT-oriented applications, which include Internet Architecture (TCP/IP), Mobile Computing and Network Security.

Len is a registered Professional Engineer in the Province of British Columbia, Canada, and is a Life Member of the IEEE. His amateur radio call sign is VE7CTX.
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Name: ____________________________________________________________  
Job Title: __________________________________________________________  
Department: ______________________________________________________  
Telephone No.: _____________________________________________________  
Email: ____________________________________________________________  

Delegate 2  
☐ Mr  ☐ Ms  ☐ Mrs  ☐ Dr  ☐ Others: ________________________________  
Name: ____________________________________________________________  
Job Title: __________________________________________________________  
Department: ______________________________________________________  
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