
PRACTICAL RADIO TELEMETRY SYSTEMS FOR INDUSTRY



YOU WILL LEARN HOW TO:

- Implement simple radio telemetry links for SCADA systems
- Understand the jargon, terminology and latest techniques
- Design and install an effective radio telemetry link
- Perform simple path loss calculations
- Troubleshoot radio telemetry communication problems
- Specify the main components of radio, satellite and microwave telemetry links
- Conduct a site survey
- Implement effective security on radio, wireless and Ethernet networks
- Explain the infrastructure requirements for effective systems
- Outline future trends in SCADA and telemetry systems

WHO SHOULD ATTEND:

- Instrumentation and control engineers
- Electrical engineers
- Process development engineers
- Control systems sales engineers
- Control systems applications engineers
- Instrumentation technicians
- Process control engineers
- Consulting engineers
- Design engineers
- Maintenance supervisors
- Network system administrators

The Workshop

This course has been designed in conjunction with radio telemetry experts from throughout the world (the SCADA list) and aims at providing you with all the critical information that we can effectively transfer across to you in two hard-hitting days.

The course commences with a discussion of radio and wireless fundamentals to ensure everyone is brought up to speed with the basics. Antennas are then discussed, followed by fixed systems. The essentials of data communications (and Ethernet) are then reviewed as they apply to radio telemetry systems. A review of Wireless LAN systems is undertaken and a comparison of radio modems is given. The fast growing topic of cellular radio data services is discussed. Protocols are a key part of all radio telemetry systems and the important ones outlined together with the challenges associated with radio.

A brief overview of satellite and microwave systems is given for completeness, followed by performance analysis. A discussion on radio telemetry systems would not be complete without sketching out the key issues of SCADA systems and alarm management. The overall network architecture of radio telemetry systems is then detailed. The course is concluded by an examination of troubleshooting techniques and the vital topic of security and encryption.

A thread throughout the workshop reflects the today's emphasis on using open protocols and networking standards such as DNP3, TCP/IP and Ethernet, and off-the-shelf hardware and software to keep the costs down. A selection of case studies is used to illustrate the key concepts with examples of real-world radio telemetry systems in the water, electrical and processing industries. This workshop will also be an excellent opportunity to network with your peers as well as to gain significant new information and techniques for your next radio telemetry project.

Practical sessions throughout the two days of the course ensure that you can apply the course materials easily and effectively.

Pre-requisites

Knowledge of basic electrical concepts.

Practical Sessions

- Construction of wireless LAN network
- Signal strength site survey
- Extension of network with antennas and point-to-point links
- Microwave link path loss design exercise
- Performing an intermodulation products calculation
- Demonstrate use of encryption and authentication
- Protocol analysis of DNP3/Modbus and TCP/IP over wireless/radio network
- Design of an overall radio telemetry system

The Program

INTRODUCTION

RADIO AND WIRELESS FUNDAMENTALS

- Basics of electromagnetic transmission
- Analog and digital modulation techniques
- Spread spectrum
- Spectrum/frequency allocations

ANTENNAS

- Fundamentals
- Directionality and gain
- Diversity
- Specific types (directional and omni-directional)

FIXED SYSTEMS

- Wireless modems (serial)
- Wireless modems (Ethernet)
- Repeaters
- IEEE 802.16 (WiMax)

SERIAL DATA COMMUNICATIONS

- RS-232
- RS-422/485
- Industrial Ethernet

WIRELESS LANS

- IEEE 802.11a, b, g and n
- Medium access control
- Components
- Topologies
- Roaming

CELLULAR (MOBILE) DATA SERVICES

- Cellular basics
- 2G systems
- 3G systems
- Cellular (mobile) data services

PROTOCOLS

- Modbus
- TCP/IP
- DNP3
- IEC 60870-5
- IEC 61850
- Differences between these alternatives
- Potential problems with wireless networks

SATELLITES

- Theory of operation
- Available satellite services
- VSATTM

LINE-OF-SIGHT MICROWAVE

- Terrain mapping
- Fresnel zone and antenna height calculations
- Link budget
- Antenna selection

PERFORMANCE ANALYSIS

- Availability and reliability
- BER testing
- Complete system testing

SCADA SYSTEMS

- Terminology and overview
- Displays and HMI's
- Best practice configuration

INFRASTRUCTURE REQUIREMENTS

- Location
- Equipment selection
- Infrastructure

NETWORK ARCHITECTURE

- Design considerations
- Repeater types
- Network redundancy

TROUBLESHOOTING AND MAINTENANCE

- Equipment
- Procedures

SECURITY

- Introduction and terminology
- Firewalls
- Authentication
- Encryption
- Remote access to SCADA and telemetry systems

FUTURE DIRECTIONS AND REVIEW

SUMMARY, OPEN FORUM AND CLOSING