

Practical

WIRELESS ETHERNET and TCP/IP NETWORKING



YOU WILL LEARN HOW TO:

- Understand current wireless networking offerings on the market
- Apply today's wireless technology to industrial automation
- Implement your own simple Wireless LAN (WLAN) for your office and industrial plant and interface it to Ethernet
- Implement simple radio telemetry links for SCADA systems
- Explain the strengths and weaknesses of the different wireless technologies
- Describe the operation of standards such as IEEE 802.11
- Implement effective security on your Wireless and Ethernet networks
- Be able to conduct a site survey in preparation for a Wireless implementation
- Understand the basic terminology and jargon used in this area

WHO SHOULD ATTEND:

This workshop is designed for personnel with a need to understand the techniques required for using and applying wireless communications technology as productively and economically as possible.

This includes engineers and technicians involved with:

- Control and Instrumentation
- Consulting
- IT Personnel
- Process Control
- SCADA and Telemetry Systems
- Design
- Electrical Installations
- Process Development
- Control Systems
- Maintenance Supervisors
- Project Management
- Equipment Manufacturing
- Regulatory and Legal issues



Technology Training that Works

THE WORKSHOP

The use of Wireless and Ethernet in industrial and plant floor environments has grown dramatically in the last few years. Industrial users face a wide range of options when designing and implementing plant-level Wireless and Ethernet networks. Great success is being achieved using Wireless provided certain ground rules are applied such as ensuring a robust wireless link, correct integration with the wired communications systems and proper data security.

The most important objective of wireless communications networks must be to achieve similar capacities, bandwidths, responsiveness, reliability and availability to that of wire based communications with an emphasis on the unique needs and challenges faced by industrial networks.

This workshop commences with an overview of wireless communications and how radio works. Wireless Local Area Networks or WLANs (IEEE 802.11) are then examined. A practical discussion of Ethernet has been added as this is always a key ingredient in a successful Wireless implementation strategy. Ethernet is the obvious choice for industrial control networking worldwide. While the basic structure of Ethernet has not changed much, the faster technologies such as Fast Ethernet and Gigabit Ethernet have increased the complexity and choices you have available in planning and designing these systems.

Finally the all important topic of troubleshooting of Wireless and Ethernet networks is examined with a summary of the typical problems you are likely to encounter from a two station network all the way up to a system comprising 30,000 PCs.

This workshop addresses these issues in a clear and practical manner, thus enabling you to apply the technology quickly and effectively in your next project. At the end of the course you should have a clear understanding of the choices available to you in designing and implementing your own wireless and associated Ethernet networks.

PRACTICAL SESSIONS

There are 15 practical sessions ranging in difficulty from the very simple to more challenging on the second day. Full support will be provided by the instructor to ensure that all participants ranging from the novice to the more experienced user will derive maximum benefit from these sessions.

- Install and configure an access point
- Connect a simple wireless and Ethernet network
- Configure IP addresses and subnet masks
- Analysis of ARP/ICMP/IP/UDP/TCP using protocol analyser
- Troubleshoot simple problems
- Perform a path loss calculation
- Demonstrate use of encryption and authentication
- Implement virtual private networks (VPNs) to tunnel through insecure wireless links
- Isolate Wi-Fi networks with firewalls & VLANs
- Controlling access with MAC filtering
- Configuring the access point firewall
- Deploying multiple access points and repeaters to permit roaming
- Measuring and reducing interference
- Extending the network with antennas and point-to-point links
- Deploy flexible, cost-effective Wi-Fi networks with access points and routers

THE PROGRAM

Day One

INTRODUCTION

- The Wireless LAN revolution
- Advantages of Wi-Fi (mobility/flexibility/scalability/cost/global interoperability)
- Definitions and acronyms
- Wi-Fi technologies (802.11a, b and g)
- Review of Ethernet, TCP/IP and Ethernet

WIRELESS FUNDAMENTALS

- Basics of electromagnetic transmission
- SNR, frequencies, channels
- Radio block diagrams
- Radio propagation: attenuation, fading, multi-path
- System performance: coverage, error rates, availability, response times
- Quality of Service (QoS)
- Filtering
- Analog and digital modulation techniques
- Spread spectrum techniques: FHSS, DSSS
- Multiplexing techniques: TDM, FDM, TDMA, CDMA
- Cellular concepts: cells, frequency reuse, hand-over, network components
- Spectrum/frequency allocations
- Channel sets
- Classical Radio Telemetry systems

ANTENNAS

- Basics
- Directionality and gain
- Path loss
- Distance calculations
- Diversity
- Specific types: Omni, half wave dipole, Yagi, parabolic reflector, panel

WIRELESS LAN CONCEPTS

- Topologies
- Single and multiple cell coverage
- Components: access points, bridges, client devices, accessories
- System redundancy

FIXED SYSTEMS

- Satellite and point-to-point microwave
- LMDS and MMDS

WIRELESS LANS: IEEE 802.11

- Overall concept
- Specifications: IEEE 802.11, 802.11b, 802.11a, 802.11g
- OSI layer implementation
- Medium Access Control
- System components
- Antennas
- Topologies: BSS, ESS
- IP roaming
- Security issues (IEEE 802.1x, WEP, EAP, EAP-TTLS, LEAP, Radius)
- Commercial implementations

WIRELESS PANS: BLUETOOTH/IEEE 802.15

- Overall concept
- Practical Implementation

SELECTION OF WI-FI COMPATIBLE EQUIPMENT

- Network adapters
- Access points
- Routers
- Antennas
- Peripherals
- Configuring network adapters

INSTALLING & CONFIGURING ACCESS POINTS

- Defining infrastructure requirements - Wireless only, Point-to-point, Connecting to a wired LAN
- Determining number of access points
- Configuring the Basic Service Set (BSS)
- Modifying the Service Set ID (SSID)
- Configuring DHCP and Internet access

Day Two

OVERVIEW OF ETHERNET

- Ethernet Standards
- Logical Link Control Frames
- Transmission Media and Access Techniques
- Media Access Control Protocol
- Full Duplex Ethernet
- Auto negotiation
- Ethernet Cabling (Twisted pair, Fibre Optic)

LAN COMPONENTS

- Repeaters
- Switches
- Bridges
- Routers
- Gateways

PROTOCOLS THAT WORK WITH ETHERNET

- TCP/IP
- Modbus and Ether/IP
- IP Addressing
- Routing on the networks
- Error and Control messages
- User Datagram Protocol (UDP)
- Utilities with TCP/IP

ANALYSING, TROUBLESHOOTING & OPTIMISING THE LAN

- Measuring signal strength and quality
- Tuning the access point parameters
- Basic Utilities
 - Protocol Analyser
 - Ethernet Performance
 - Troubleshooting of Ethernet

SITE SURVEYS

- Purpose
- Interfacing with existing
- LAN infrastructure
- Cabling issues
- Mounting issues
- Procedures
- Documentation

SECURING YOUR ETHERNET & WI-FI NETWORKS

- Assessing network vulnerabilities
 - Unencrypted data
 - SSID broadcast
 - War-driving
 - RF flooding
- Virtual Private Networks
 - Ensuring privacy with VPN technologies
 - Implementing a short-range VPN
 - Tunneling through the wireless LAN and the Internet to a remote enterprise
 - Configuring the VPN server and client
 - Setting up a Point-to-Point Tunneling Protocol (PPTP)
 - Assessing VPN alternatives
- Applying Firewalls
 - Isolating your wireless and Ethernet network
 - Choosing firewall options
 - Configuring an access point firewall
 - Completing the firewall configuration
- Enabling DMZ and port forwarding
- Restricting administrative access

FUTURE DEVELOPMENTS - A QUICK REVIEW

- WiMAX (802.16)
- Smart antennas
- Ultra wide band communication
- Orthogonal Frequency Division
- Software wireless systems

SUMMARY, OPEN FORUM & CLOSING