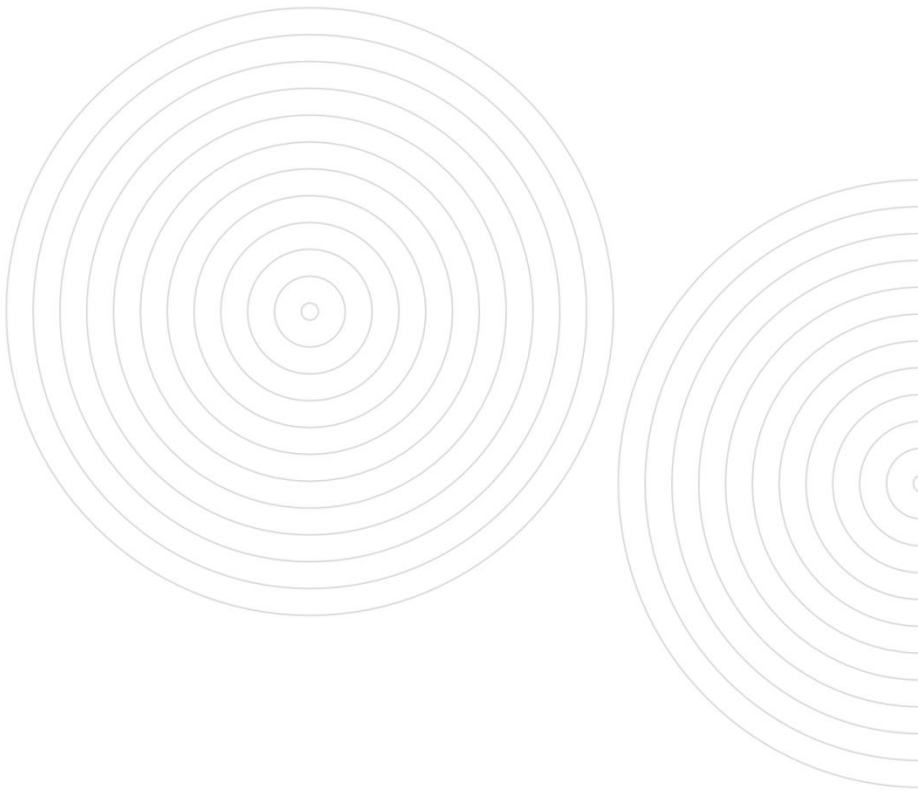




TRAINING CATALOG

Microwave Networks Training Catalog

Table of Contents

Microwave Networks Training Overview3

Networking Fundamentals and Cyber Security4

Fundamentals of Microwave Radio6

Proteus MX / MXD Operations and Maintenance8

Proteus MX / MXD Installation and Commissioning 11

Proteus UMX Operation, Maintenance and Installation 14

Proteus OIP Operation, Maintenance and Installation 16

SPARCS Network Management System 18

Microwave Networks Training Overview

Microwave Networks (MNI) training curriculum is built on providing our customer the necessary training to support a mission critical microwave network infrastructure. All product training includes both theory and hands on training labs conducted by certified Microwave Networks instructor with extensive practical field experience. MNI also believes training labs are essential with any product training to instill confidence with the students and to facilitate this training equipment are provide for all training location scenarios: at MNI facility, at customer facility or virtually via remote login to the equipment at MNI facility with real time video streaming.

Microwave Networks Training Benefits

- Opportunity to learn/ask question from experienced instructors who are also typically working/supporting on active projects. This allows the instructors to keep up with the latest MNI product offering and stay abreast with the latest in industry technology.
- Access to the latest electronic manual and Element Manager Application software used to communicate to the microwave equipment.
- Flexibility in location, dedicated or per seat classes and content that meet your needs.
- Availability of full product training suites designed to your specific training requirement.

Networking Fundamentals and Cyber Security

Overview:

The Networking Fundamentals and Cyber Security is an introductory course for anyone new to networking and looking to understand the basics. This course is conducted by certified Microwave Networks instructor with extensive practical field experience.



Objective:

Understand basic networking concepts in Ethernet LANs, routing, IP addressing, WAN technologies and Transport Layer protocols

Prerequisites:

Entry level course, student should have basic understanding of digital electronics.

Logistics

Class Size:	up to 10
Course Duration:	1/2 day, between 9:00 AM to 4:00 PM
Location:	Stafford, TX or customer facility
Certification:	Yes
Materials Provided:	Student Handbook

Course Topics

What is a network?

- Network models
- How data flows from one computer to another
- Network addressing

Ethernet LANs

- How Ethernet networks operate
- Early Ethernet network devices, including hubs and bridges
- Today's Ethernet network devices, including switches and Virtual LANs (VLANs)
- Wireless LANs

Routing basics

- Layer 2 and 3 addressing
- Interconnecting different broadcast domains using routers
- Address resolution

- How data is sent from one broadcast domain or network to another

IP addressing

- Internet Protocol (IP)
- IP addressing
- Network masks
- Working with binary numbers
- Subnetting
- Routing data through a network using longest match routing
- IPv6 Addressing

WAN technologies

- Point-to-Point Protocol (PPP)
- Frame Relay and Asynchronous Transfer Mode(ATM)
- Multiprotocol Label Switching (MPLS)
- Carrier Ethernet

Transport Layer protocols

- User Datagram Protocol (UDP)
- Transmission Control Protocol (TCP)

Cyber Security

- Security Control Standards
- Proteus CyberShield
 - System Architecture
 - Where use application
 - Front panel layout

*Note – Course material subject to change.

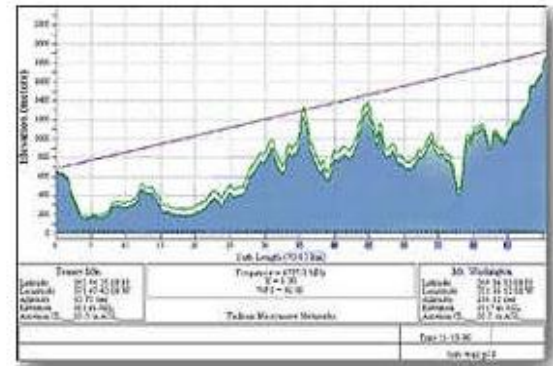
Fundamentals of Microwave Radio

Overview:

The Fundamentals for Microwave Radio is an introductory course designed for those who are new to microwave radio communications. This course is conducted by certified Microwave Networks instructor with extensive practical field experience.

Objective:

Understand basic concepts of microwave radio operations, essential parts of microwave radio systems and microwave communications applications



Prerequisites:

Entry level course, student should have basic understanding of radio communications and data networking.

Logistics

Class Size:	up to 10
Course Duration:	1/2 day, between 9:00 AM to 4:00 PM
Location:	Stafford, TX or customer facility
Certification:	Yes
Materials Provided:	Student Handbook

Course Topics

Basic Radio

- Electromagnetic Spectrum and Radio Waves
- Licensed and Unlicensed Frequencies and FCC Regulation
- RF Spectrum
- Decibels and Measurement – Power Output and Receive Sensitivity
- Carrier and Modulation
- Bandwidth and Capacity
- TDM and IP and Ethernet
- North American Digital Hierarchy
- Plesiochronous Digital Hierarchy
- Ethernet

Microwave Hardware Configurations

- Point-to-Point and Point-to-Multipoint
- Architecture – Indoor and Split Mount
- Antenna Systems, Coaxial Cable, Waveguides
- Examples of a radio shelter, racks, microwave tower, and antenna system

Microwave Frequency and Propagation

- Microwave Frequency Bands and Characteristics
- Polarization
- Propagation: free space loss, absorption, refraction, scattering, reflection, diffraction
- Fresnel Zones, LOS, non-LOS
- BER, AGC, System Gain, Fade Margins
- Link Budgeting

Network Topologies, Protection, and Diversity

- Topologies Overview: star, chain, mesh, ring, spur
- Access, Backhaul, Transport
- Hot Standby (1+1 versus 1+0 versus 1+n)
- Route Diversity
 - TDM Ring Protection
 - Ethernet Ring Protection
- Space Diversity

*Note – Course material subject to change.

Proteus MX / MXD Operations and Maintenance

Overview:

The Proteus MX / MXD Operations and Maintenance course is an instructor lead theory and hands on training class. Along with theory of operations the students will work on a Proteus radio link on equipment configuration and troubleshooting. This course is conducted by certified Microwave Networks instructor with extensive practical field experience.



Objective:

Upon completion of the course the student will understand the Proteus MX / MXD operations and work with the Element Manager to configure, provision and troubleshoot radio.

Prerequisites:

Completion of Fundamental of Microwave Radio course or understanding of following:

- Basic microwave systems operations
- Basic RF knowledge: modulation, propagation, power and signal measurements
- Fundamentals of networking

Students must bring a Laptop with the following minimum system requirement:

- 2 GHz processor (recommended)
- 1 GB of RAM
- 200 MB free disk space (full installation)
- 400 MB free disk space for optimal performance
- Latest version of Java SE JRE from Java.com (but will work with Java 5, 6 and 7 as well.)
- Serial or Ethernet interface

Logistics

Class Size:	up to 10
Course Duration:	2 days, between 9:00 AM to 4:00 PM
Location:	Stafford, TX or customer facility
Certification:	Yes
Materials Provided:	Student Handbook and Element Manager

Course Topics

I. Proteus Microwave Radio – 1 Day

Overview of the Proteus MX / MXD Radio

- Key Features
- Native TDM and native Ethernet
- ACM (Adaptive Code Modulation)
- Software Defined Radio -License Keys
- Element Manager

Hardware Configurations

- Architecture – Indoor and Split Mount
- Signal Processing Unit (SPU)
- RF Unit
 - Outdoor RF Unit
 - Indoor RF Unit

Standard Data Interfaces

- DS1
- DS3
- OC3
- 1000BaseT

Other External Connections

- Power
- IF (Intermediate Frequency)
- TLI (TDM Line Interface)
- Optical
- Network Management System
- Ethernet

Integrated Traffic Management

- Microbus
- DACS
- SHARP (Self Healing Alternate Route Protection)
- RRP (Rapid Ring Protection)

Provisioning

- Data payload mapping
- CLI (Command Line Interface) versus Element Manager
- Network Management System (NMS)
- Simple Network Management Protocol (SNMPc)

Troubleshooting and Repair

- Alarms
- Firmware Download Process
- Configuration Backup and Restore

Protection and Diversity

- Hot Standby (1+1 versus 1+0 versus 1+n)
- SHARP (Self Healing Alternative Route Protection) – TDM
- Rapid Ring Protection – Ethernet
- Diversity: Space and Frequency

II. Hands On Practical Exercises – 1 Day

- Configuration Backup and Restore
- Hands-on troubleshooting and correction
- Remove and replace Transceiver and Channel Unit
- Payload Configuration
- Chart Recorder
- Software Updates

*Note – Course material subject to change.

Proteus MX / MXD Installation and Commissioning

Overview:

The Proteus MX / MXD Installation and Commissioning course is an instructor lead theory and hands on training class. Along with best practice installation standards the students will work on a Proteus radio link on equipment configuration and commissioning. This course is conducted by certified Microwave Networks instructor with extensive practical field experience.

Objective:

Upon completion of the course the student will be proficient with installation standards and commissioning a Proteus series microwave radio and work with the Element Manager to configure, provision and troubleshoot the radio. This course is a specialized track targeted at installers working on the Proteus MX / MXD radios.



Prerequisites:

Student needs to have successfully completed the following courses along with good understanding of radio communications and data networking.

- Fundamental of Microwave Radio
- Proteus MX / MXD Operation and Maintenance

Students must bring a Laptop with the following minimum system requirement:

- 2 GHz processor (recommended)
- 1 GB of RAM
- 200 MB free disk space (full installation)
- 400 MB free disk space for optimal performance
- Latest version of Java SE JRE from Java.com (but will work with Java 5, 6 and 7 as well.)
- Serial or Ethernet interface

Certification:

Student needs to successfully complete an assessment exam at the conclusion of the course and demonstrate that the student understands all materials present. Successful completion of this course is a prerequisite for the student to be certified as a Microwave Network Certified Installer.

Logistics

Class Size:	up to 10
Course Duration:	1 day, between 9:00 AM to 4:00 PM
Location:	Stafford, TX or customer facility
Certification:	Yes, upon success completion and passing course exam
Materials Provided:	Student Handbook and Element Manager

Course Topics

Safety

- RF and Microwave safety
- Electrical hazards
- Laser and Fiber optic cable hazards
- Weather considerations
- ESD protection

Understanding Engineering Documentation

- Equipment List
- Block Diagrams
- Wiring List
- Rack Elevation
- Radio Data Sheet
- Survey Report
- PCN
- SAT Form

Antenna

- Antenna types
- Polarization
- Alignment

All indoor radios

- Feeder/waveguide installation
- Pressurization
- Testing

Split mount radios

- Outdoor unit installation
- Coax cable installation

Grounding

- Site grounding
- Equipment grounding
- Rack grounding
- Cable grounding
- Ground termination
- Testing ground connections

Cable Management

- Guidelines for cable management
- Cable installation

Commissioning

- Commissioning procedure
- Recommended commissioning test

*Note – Course material subject to change.

Proteus UMX Operation, Maintenance and Installation

Overview:

The Proteus UMX Operation, Maintenance and Installation course is an instructor lead theory and hands on training class. Along with theory of operations the students will work on a Proteus radio link on equipment configuration and troubleshooting. This course is conducted by certified Microwave Networks instructor with extensive practical field experience.



Objective:

Upon completion of the course the student will understand the Proteus UMX operations and work with the Link Manager to configure, provision and troubleshoot the radio.

Prerequisites:

Completion of Fundamental of Microwave Radio course or understanding of following:

- Basic microwave systems operations
- Basic RF knowledge: modulation, propagation, power and signal measurements
- Fundamentals of networking

Students must bring a Laptop with the following minimum system requirement:

- 2 GHz processor (recommended)
- 1 GB of RAM
- 200 MB free disk space (full installation)
- 400 MB free disk space for optimal performance
- Latest version of Java SE JRE from Java.com (but will work with Java 5, 6 and 7 as well.)
- Serial or Ethernet interface

Logistics

Class Size:	up to 10
Course Duration:	1 day, between 9:00 AM to 4:00 PM
Location:	Stafford, TX or customer facility
Certification:	Yes
Materials Provided:	Student Handbook and Link Manager

Course Topics

Overview of the Proteus UMX

- AIS (Auto Interference Sensibility)
- ACM (Adaptive Code Modulation)
- MIMO (multiple input, multiple output)
- ACS – Automatic Channel Selection

- DFS - Dynamic Frequency Selection

Hardware Configurations

- Architecture
- RFU Antenna
- 1000BaseT

Other External Connections

- Power
- Cat 5 cable

Provisioning

- Link Manager
- Network Management System (NMS)
- Simple Network Management Protocol (SNMPc)

Troubleshooting and Repair

- Alarms
- Firmware Download Process

Installation

- Cable and Gland
- Configuring the Radio
- Equipment grounding
- Testing ground connections

Commissioning

- Commissioning procedure
- Recommended commissioning test

Hands On Practical Exercises

- Configuration Backup and Restore
- Hands-on troubleshooting and correction
- RF Analyzer
- Payload Configuration
- Software Updates

*Note – Course material subject to change.

Proteus OIP Operation, Maintenance and Installation

Overview:

The Proteus OIP Operation, Maintenance and Installation course is an instructor lead theory and hands on training class. Along with theory of operations the students will work on a Proteus radio link on equipment configuration and troubleshooting. This course is conducted by certified Microwave Networks instructor with extensive practical field experience.

Objective:

Upon completion of the course the student will understand the Proteus OIP operations and work with the Element Manager to configure, provision and troubleshoot the radio.

Prerequisites:

Completion of Fundamental of Microwave Radio course or understanding of following:

- Basic microwave systems operations
- Basic RF knowledge: modulation, propagation, power and signal measurements
- Fundamentals of networking

Students must bring a Laptop with the following minimum system requirement:

- 2 GHz processor (recommended)
- 1 GB of RAM
- 200 MB free disk space (full installation)
- 400 MB free disk space for optimal performance
- Latest version of Java SE JRE from Java.com (but will work with Java 5, 6 and 7 as well.)
- Serial or Ethernet interface

Logistics

Class Size:	up to 10
Course Duration:	1 day, between 9:00 AM to 4:00 PM
Location:	Stafford, TX or customer facility
Certification:	Yes
Materials Provided:	Student Handbook and Link Manager

Course Topics

Overview of the Proteus OIP

- ACM (Adaptive Code Modulation)
- Software Configurable Bandwidths
- Protection Configuration
- ATPC and FEC



Hardware Configurations

- Architecture
- RFU Antenna
- Ethernet v2, VLAN, Q-in-Q, SyncE

Other External Connections

- Power
- Optic Fiber SFP; RJ-45 GigE
- Optic Fiber SFP for 1+1 and 2+0

Provisioning

- Web Graphic User Interface
- Serial Connection

Troubleshooting and Repair

- Alarms
- Firmware Loading Process

Installation

- Cable and Gland
- Configuring the Radio
- Equipment grounding
- Testing ground connections

Commissioning

- Commissioning procedure
- Recommended commissioning test

Hands On Practical Exercises

- Configuration Backup and Restore
- Hands-on troubleshooting and correction
- Payload Configuration
- Software Updates

*Note – Course material subject to change.

SPARCS Network Management System

Overview:

The SPARCS Network Management System course provides theory and hands on training on Microwave Networks' Network Management System (NMS). The course includes classroom lectures and practical exercises. During the course students will use the SPARCS NMS to configure, monitor, and trouble shoot radios. This course is conducted by certified Microwave Networks instructor with extensive practical field experience.

Objective:

Upon completion of the course, technicians will understand the SPARCS NMS and work with the Element Manager to configure, provision and troubleshoot the radio.



Prerequisites:

Completion of Fundamental of Microwave Radio course along with the completion of a Proteus course as it relates to the students radio requirement

- Proteus MX / MXD Operation and Maintenance
- Proteus UMX Operation, Maintenance and Installation

Students must bring a Laptop with the following minimum system requirement:

- 2 GHz processor (recommended)
- 1 GB of RAM
- 200 MB free disk space (full installation)
- 400 MB free disk space for optimal performance
- Latest version of Java SE JRE from Java.com (but will work with Java 5, 6 and 7 as well.)
- Serial or Ethernet interface

Logistics

Class Size:	up to 10
Course Duration:	1 day, between 9:00 AM to 4:00 PM
Location:	Stafford, TX or customer facility
Certification:	Yes
Materials Provided:	Student Handbook and Element Manager

Course Topics

Network Management System Introduction and Overview

- Introduction to Network Management Fundamentals

- Proteus Network Management
- Mobile Network Health App
- Simple Network Management Protocol (SNMP)

PC Set Up and Configuration

- Install Remote Console and EM on student laptops
- Adding Icons (Sites, Devices) Naming Standards, Moving and Deleting Icons
- Navigating the Map
- Right-click menus
- Polling, Traps, Events, Alarms, Severity, how to use alarm logs
- Creating Links that show radio link status
- More about Icon Attributes, Configuration
- Isolating Faults, Finding Devices
- Launching Element Manager (EM), telnet, SSH, Web Browser
- Event Filters (Changing Severity of Device Down to Orange)
- Alarm Alerts: E-Mail

Maintenance Operation and Performance Supervision

- Additional Server Setup tasks (Text log archive, daily backup)
- Ongoing Maintenance Tasks: (Exporting/Importing) the map, checking log archive and backups, shutdown and startup
- Overview of Performance/Trend Reporting
- Overview of Element Manager and Chart Recorder

Miscellaneous

- Overview of other possibilities (custom menus, graphing RSL, 3rd-party device management, etc.)
- Overview of Standalone Utilities (NetReporter, NetReconfig, etc.)
- Documentation, Support
- Questions, Customer-specific issues

*Note – Course material subject to change.