Design an Ethernet network with switches and routers
Select appropriate Industrial Ethernet components
Troubleshoot Ethernet and TCP/IP by means of a protocol analyzer
Deploy Ethernet in Intrinsically Safe environments
Configure and troubleshoot IPv4 & IPv6
Set up a DHCP or BootP server
Design IP subnets
Troubleshoot TCP connection issues
Set up a managed Ethernet switch
Set up an IEEE802.1 p/0 VLAN
Set up an Industrial router
Add an Access Control List to a router
Extend an Ethernet network with wireless technologies
Select appropriate Ethernet-based field buses for real-time applications

YOU WILL LEARN HOW TO:

Enrol Now: Fax the enrolment form to us, or email enquiries@eit.edu.au
PRESENTED BY
DEON REYNDERS
BSc Eng (Hons)(Elec), MBA

Deon has had over 38 years experience in automation, data communications (with a focus on industrial applications) and Ethernet TCP/IP networks. He has specific experience in Systems Engineering, Project Management and software and hardware development, and has been involved with efficiency studies (related to underground operations) in the gold mining industry in South Africa.

Currently he is retained as a consultant in the TCP/IP, industrial Ethernet networking, OPC and the industrial data communications areas. Deon is a practical, hands-on person and a highly entertaining speaker. He has received excellent reviews from his thousands of program participants in regions ranging from Europe, North America, Africa and Australia. He takes great pride in demystifying difficult concepts and presents them in a simple-to-understand manner. He is a passionate, enthusiastic and knowledgeable professional engineer.

Please note: Lecturers are subject to change.

12 MODULES OVER 3 MONTHS

OVERVIEW:

This program is for engineers and technicians who need practical and extensive knowledge of the design and troubleshooting of industrial Ethernet networks, as well as the selection, installation, and configuration of components such as routers and switches.

It deals in-depth with the underlying TCP/IP protocols, and specifically addresses both design and configuration issues related to IPv4 and the more recent IPv6. This program extends your skills and knowledge well beyond that covered in our fundamental programs in Ethernet and TCP/IP.

The program also covers the more advanced aspects and applications of Ethernet such as advanced switching and routing, CCTV over IP, Modbus, Industrial Security, Intrinsically Safe applications, switched rings (including the latest IEC 62439-3 redundant ring standard), and highly-deterministic Ethernet-based field buses (e.g. for servo control) capable of 1 millisecond repetition rates and jitter of less than 1 microsecond. A strong, practical, hands-on focus with real equipment ensures you apply and test your knowledge and skills.

INCLUDES 4 FREE REFERENCE MANUALS

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YOU WILL RECEIVE 4 OF OUR UP-TO-DATE TECHNICAL E-BOOKS TO ADD TO YOUR LIBRARY.

• Advanced TCP/IP-Based Industrial Networking
• Practical Troubleshooting of TCP/IP Networks
• Practical Data Communications & Networking for Engineers and Technicians
• Practical Routers & Switches (including TCP/IP and Ethernet) for Engineers and Technicians

Received upon completion.

All materials required for the program will be provided electronically, in smaller, easy-to-read sections.

Please Note: e-Books are available in hard copy at 50% of the recommended retail price. Contact us for pricing details.
PROGRAM OUTLINE

MODULE 1: Network Interface Layer: Ethernet
- Frame structure and MAC addresses
- Bluebook (V2) vs. IEEE 802.3
- Variants (10 Mbps Ethernet, Fast Ethernet, GbE, 100bE, 10GbE)
- Industrial Ethernet
- Intrinsically safe (Ex) Ethernet
- Power over Ethernet (PoE) (IEEE 802.3af, IEEE 802.11at)
- Point-to-Point Protocol over Ethernet (PPPoE)

MODULE 2: Network Layer Protocols: IPv4
- Datagram structure and protocol header
- Address structure and classes
- Subnet mask and default gateway
- Private addressing schemes
- ARP and ICMP

MODULE 3: Network Layer Protocols: IPv6
- Datagram structure, protocol header and header extensions
- Address structure: multicast, unicast and anycast addresses
- Address scope
- ICMPv6

MODULE 4: Host-to-Host and Application Layer Protocols
- Connectionless vs. connection-oriented communication
- Ports and sockets
- TCP operation, connections, header structure
- UDP operation, header structure
- HTTP and FTP
- DNS and DynDNS
- SNMP
- DHCP, BootP and APIPA

MODULE 5: Switching
- Mechanics of switching
- Hubs vs. switches
- Bridging vs. switching
- Managed vs. unmanaged switches
- L2 vs. L3 switching
- Spanning Tree Protocols (STP, RSTP, MSTP, SPB)

MODULE 6: ADVANCED SWITCHING
- VLANs and port prioritization (IEEE 802.1p/0)
- DoS and DiffServ
- Switch rings and associated protocols
- Parallel Redundancy Protocol (IEEE 62439-3)
- Port-based authentication (IEEE 802.1X)
- Link aggregation/trunking (Etherchannel, IEEE 802.3ad)

MODULE 7: ROUTING
- Mechanics of routing
- VLSM and CIDR
- Subnetting
- Virtual mapping (NAT) and masquerading
- Port forwarding

MODULE 8: ADVANCED ROUTING
- Autonomous Systems (ASSs)
- Routing metrics
- Interior Gateway Protocols (rIPv2, EIGRP, IS-IS, OSPF)
- Exterior Gateway Protocols (BGPv4)
- Multi-Protocol Label Switching (MPLS)

MODULE 9: CCTV OVER IP
- Analog vs. IP cameras
- Compression (JPEG, MPEG4, H.264)
- Bandwidth requirements
- LAN/WAN infrastructure

MODULE 10: ETHERNET IN INDUSTRIAL APPLICATIONS
- Modbus serial over Ethernet
- Modbus/TCP
- OPC
- Ethernet-based Field buses:
  - CC-Link IE
  - EtherCAT
  - Ethernet/IP
  - EPL
  - Profinet
  - Sercos III

MODULE 11: SECURITY
- Access Control Lists (ACLs)
- MAC address, port, and protocol filtering
- Stateful Packet Inspection (SPI)
- VPNs (IPSec and VtUN)
- Authentication: IEEE 802.1x/EAP, LEPS
- Security Data Sheets (SDSs)
- Encryption: AES, TKIP
- Secure Shell (SSH) tunneling
- Firewalls
- DoS (Denial of Service) protection

MODULE 12: WIRELESS
- Wireless Ethernet backhauls
- Ethernet modems for P2P and P2MP applications
- IEEE 802.11: Industrial WLANs
- IEEE 802.15.4: Industrial mesh networks
- Authentication: IEEE 802.11i (WEP, WPA, WPA2)

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