

## BICSI CECs

This course has been approved for CEC credits by BICSI. Please read below for a breakdown of the credits that we offer for this course. For more information regarding BICSI please visit our website.

RCDD: 21	OSP: 21	Inst: 15	Tech: 18	Cert. Trainer: 21
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## Course Description

This Hands-On 3-day course orientates the telecom professional to the data and networking environment. The growth of the information age is being driven by Internetworking. This course will cover the essentials of data and networking environments and their concepts, components, applications, and many acronyms will be examined in detail as the overall picture of these technologies are simplified.

This course will provide practical Hands-On Set-Up, Configuration, Implementation and troubleshooting of These Basic and Complex Technologies.

## Students Will Learn

- Connections of Internet / Intranet & its Structure.
- Data and Networking Components Interconnect.
- LANs, WANs, MANs Work Together as a Network

- Ethernet LANs Gigabit, V-LANs & Wireless and their Components, Design Rules, Advantages & Disadvantages.
- Bridges, Switches, & Routers and How They are Currently Used Today
- Successfully Build & Test an Ethernet Network Using Hubs, Bridges, Routers & Switches
- Stress Test an Ethernet Network and Observe Results.
- Construct a Switched Ethernet Network
- View various Protocols, Data Packets & Traffic Analysis using a Protocol Analyzer.
- Engage in the Configuration of a TCP/IP Host.
- Construct a Router Network In-Class.
- Analyze Network Traffic in Class & Do Trend Analysis
- Track the Major Users of the Network Utilizing Sophisticated Monitoring Tools
- Configure the Router Network for Voice Over IP
- Various WAN Services like Frame Relay, ISDN, T1, T3 & ATM
- See the Issues between ATM & Connectionless Routed Networks.
- And more

## Target Audience

Anyone responsible or Interested in a Real-World hands on approach in Data Networking Technologies, Techniques, Applications and Design. Telecom professionals, outside plant / field, network operations, central office, technical marketing, help desk, project managers, network engineers, network administrators, voice engineers, and those in charge of converging voice and data networks.

## Prerequisites

None.

## Course Outline

## Module I: NETWORKING TECHNOLOGY REVIEW

- DATA NETWORKING
- CHARACTERISTICS OF OPEN SYSTEMS
- COMMUNICATIONS AMONG OPEN SYSTEMS
- LAYERING ARCHITECTURE BENEFITS
- OSI LAYERS
- STANDARDS BODIES
- OSI REFERENCE MODEL
- IMPORTANT PROTOCOL FUNCTIONS
- NETWORKING ARCHITECTURE LAYERS
- INTER-LAYER DEPENDENCIES
- PEER-TO-PEER COMMUNICATIONS
- OSI LAYERS - OVERVIEW OF FUNCTIONS
- DATA TRANSFER IN OSI MODEL
- DATA NETWORKS

## Module II: LAN CONCEPTS, STANDARDS AND SPECIFICATIONS

- EMERGENCE OF LANS
- ADVANTAGE OF LANS
- LANS FUTURE GROWTH??LANS AND THE OSI MODEL
- LAN INTERCONNECTION TO THE WAN
- LAN STANDARDIZATION
- MAJOR LAN STANDARDS
- 802.X PROTOCOL ARCHITECTURE & OSI
- 802.X PROTOCOL ARCHITECTURE
- IEEE 802.3 LAN SPECIFICATIONS
- IEEE 802.3 STANDARDS
- LAN LOGICAL/PHYSICAL TOPOLOGIES
- LAN ACCESS TECHNIQUES
- NETWORK OPERATING SYSTEMS

## Module III: LAN PROTOCOL CONCEPTS

- EVOLUTION OF ETHERNET
- CSMA/CD ACCESS
- ETHERNET SPECIFICATIONS
- ETHERNET (IEEE 802.3)
- 10 BASE 2
- 10 BASE 5
- 10 BASE T
- 100 BASE X
- ETHERNET DATA LINK LAYER
- LINK LAYER ADDRESSING
- MEDIA ACCESS CONTROL ADDRESSES
- UNDERSTANDING MAC ADDRESS
- ETHERNET FRAME FORMATS
- ETHERNET VERSION 2 FRAME STRUCTURE
- ETHERNET 802.3 FRAME STRUCTURE
- NETWARE 'RAW' FRAME STRUCTURE
- IEEE 802.3 SNAP
- 802.3 WITH 802.2 FRAME
- TOKEN RING SPECIFICATIONS
- IEEE 802.5 TOKEN RING
- TOKEN RING
- FDDI
- PROTOCOL STACK COMPARISONS

#### Module IX: LAN COMPONENTS AND IEEE DEFINITIONS

- INTERNETWORKING ELEMENTS
- NETWORK INTERFACE CARDS
- REPEATERS
- ETHERNET HUBS
- SHARED vs SWITCHED HUBS
- SHARED MEDIA HUBS
- SWITCHED MEDIA HUBS
- SHARED vs SWITCHED NETWORKS

- BRIDGES
- ROUTERS

## Module X: LAN/WAN INTERCONNECTION

- INTERNETWORKING
- INTERNETWORKING DEVICES
- INTERNETWORKING WITH BRIDGES AND ROUTERS AND SWITCHES
- ETHERNET BRIDGES
- HOW ETHERNET BRIDGES WORK
- STORE AND FORWARD
- ETHERNET BRIDGE FUNCTIONS
- BRIDGING LOOPS
- SPANNING TREE
- 802.1 SPECIFICATION
- TOKEN RING BRIDGES
- THE NEED FOR BANDWIDTH
- LAN PERFORMANCE
- SWITCHES
- SWITCH CONFIGURATION
- SWITCHED ETHERNET
- INTERNETWORKING WITH ROUTERS
- ROUTER CONNECTIVITY
- ROUTER PROTOCOL ARCHITECTURE
- CONNECTING LAN TO WAN - X.25
- CONNECTING LAN TO WAN - ATM/FRAME RELAY
- HIGH-SPEED SWITCH CONNECTIONS
- SWITCHES, BRIDGES, ROUTERS
- COMPARISON OF LAYER 3 SWITCHES
- APPLICATION GATEWAYS
- GATEWAYS
- CONNECTING LAN TO WAN - X.25
- LAN INTERCONNECTION TO THE INTERNET

## Module XI: EMERGING ETHERNET SOLUTIONS

- FAST ETHERNET
- HALF AND FULL DUPLEX TRANSMISSION
- SHARED vs SWITCHED ETHERNET
- BASIC LAN SWITCHING DEFINED
- STORE AND FORWARD LATENCY
- CUT-THROUGH SWITCHING
- FULL DUPLEX COMMUNICATION
- WHICH NETWORK HAS BETTER PERFORMANCE?
- OPTIMIZING SWITCHED NETWORKS
- SWITCHING EXAMPLES
- GIGABIT ETHERNET
- ETHERNET OVER 'DARK FIBER'
- VLANS
- VLAN CONCEPTS
- VLAN IMPLEMENTATION
- IEEE FRAME EXTENSION

## Module XII: INTERNET/INTRANET INTERCONNECTION

- INTERNET ORGANIZATIONS
- RFCS
- INTERNET ARCHITECTURE
- MORE ON INTERNETWORKING
- INTERNET
- AN IP NETWORK
- PROTOCOL ENCAPSULATION
- IP TECHNOLOGY
- IP STRUCTURE
- IP ADDRESSES
- IP ADDRESS CLASSES
- IP ADDRESS RANGES
- SPECIAL IP ADDRESSES
- SUBNET ADDRESSING

- DHCP
- IPV6
- IPV6 FEATURES
- IPV6 HEADER
- INTRANETS AND EXTRANETS

#### Module XIII: TCP/IP ARCHITECTURE

- LAYER 4 PROTOCOLS
- RELIABLE AND UNRELIABLE PROTOCOLS
- CONNECTION ORIENTED PROTOCOLS
- CONNECTIONLESS PROTOCOLS
- TCP/IP
- OSI
- TCP/IP PROTOCOL ARCHITECTURE
- APPLICATION PROTOCOLS
- TCP/IP CORE APPLICATIONS
- HTTP
- WWW

#### Module IX: TCP/IP ARCHITECTURE

- DNS
- DNS NAME FORMAT
- DOMAIN NAMES
- TOP LEVELS OF DOMAIN SPACE
- TOP LEVEL DOMAIN NAMES
- IPSEC
- AUTHENTICATION
- AUTHENTICATION PROTOCOLS
- FILTERING AND PROXY SERVICE

- OSI AND TCP/IP

## Module X: VOICE OVER IP (VOIP)

- VOIP
- IP TELEPHONY APPLICATION CATEGORIES
- IP TELEPHONY SERVICE TYPES
- IP TELEPHONY - BUSINESS APPLICATIONS
- TYPICAL ENTERPRISE IMPLEMENTATION
- VOICE TRANSPORT IN CIRCUIT SWITCHED NETWORKS
- VOICE TRANSPORT IN PACKET SWITCHED NETWORKS
- CHALLENGES OF PACKETIZED VOICE TRANSPORT
- VOICE PACKET SIZE
- VOICE AND DATA PACKETS
- PRIORITY AT NETWORK ACCESS
- QOS IN PACKETIZED VOICE TRANSPORT
- QOS - DELAY
- DELAY FACTORS
- JITTER
- PACKET LOSS
- ECHO
- VOICE GATEWAY SERVICES
- VOICE GATEWAY STANDARDS
- VOIP STANDARDS
- PACKETIZED VOICE - TRANSPORT TYPES
- VOICE OVER FRAME
- VOICE OVER FRAME RELAY
- VOICE OVER ATM

## Module XI: LAN/WAN NETWORK MANAGEMENT

- NETWORK MANAGEMENT ACTIVITIES
- NETWORK MANAGEMENT SOLUTIONS
- TRAP PDU
- SNMP FIELDS DEFINED
- WEB BASED NETWORK MANAGEMENT
- DIAGNOSTIC AND TEST EQUIPMENT

## Module XII: NETWORKING TRENDS AND FUTURES

- ATM INTERNETWORKING
- ATM STANDARDS ORGANIZATIONS
- ATM LAYERED ARCHITECTURE
- ATM ATTRIBUTES
- ATM CELLS
- ATM TRANSMISSION
- ATM EQUIPMENT
- VPNs - It's ALL ABOUT CONNECTIVITY
- WHAT IS A VPN?
- BENEFITS OF VPN'S
- VPNs - A GROWING MARKET SEGMENT
- VPN TYPES
- VPN APPLICATIONS
- MPLS BASED VPNs
- AN OVERVIEW OF MPLS
- MPLS ENABLED NETWORKS
- ADVANTAGES OF MPLS
- TRANSPORT NETWORKS IN VPNs
- VPN ACCESS OPTIONS
- LAN TO LAN TUNNELING
- TUNNELING PROTOCOLS
- TUNNELS
- QOS IN VPNS
- WIRELESS DATA NETWORKS
- EVOLUTION OF WLAN PRODUCTS

- WIRELESS LAN STANDARDS

## Delivery Method

Instructor led with numerous "Hands-On" demonstrations and exercises.

## Equipment Requirements

(This apply's to our hands-on courses only)

BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

## Course Length

3 Days