

Hands-On

# Internetworking Essentials



## 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**
- **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
- GIGABIT ETHERNET
- 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
- 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.x SPECIFICATION  
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  
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

#### **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 - Its 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