

## Course Description

In this Hands-On 3-day course, gives a deeper understanding of internetworking and routed network protocols. The focus of the course is the design, operation, implementation and analysis of newer application and routing scenarios in today's IP network environments.

Since secure, efficient, and reliable communications is imperative to internetworks, this course also goes into IP addressing, Voice Over IP and IPv6. Emphasis will be on end-to-end issues including all protocol layers, how to design IP sub-networks on a live network constructed in class to reinforce concepts, techniques, terminology, conventions, and components of Advanced Internetworking.

## Students Will Learn

- Accomplish hands-on experiments using PC's, successfully reinforcing discussed material.
- Analyze IP Subnetting examples and understand the various approaches and alternatives of each.
- Design and configure different types of addressing and masking schemes for specific network implementations
- Become aware of TCP/IP routing using the in-class router network.
- Configure their TCP/IP client software to successfully communicate with other subnets.
- See the Successful Business Aspects of VoIP.
- Know the Components necessary for Successful VoIP.
- View Voice / Video alternatives using Frame Relay, ATM and IP
- Interconnect Web CAM to LAN for Video Services.
- Generate Voice/Video calls using NetMeeting.

- Generate Voice calls using VoIP Gateways Connected to the LAN.
- Configure & Interconnect Phones Over the Router Environment you Build in class.
- Construct & Configure Router Network for Successful Sub-Netting and VOIP.
- Create Voice and Video calls using the Integrated Gateway capabilities within the Network.
- And Much More...

## Target Audience

This course is for network managers, engineers, and technicians responsible for designing, installing, configuring, and maintaining TCP/IP networks. It is also for software engineers who need to understand TCP/IP protocol structures and functions.

This course is also appropriate for communications specialists / managers, consultants, design engineers (hardware & software), IT managers, marketing, network designers, network engineers, network operations center (NOC) staff, routing specialists, systems administrators, technical sales engineers, telecom managers, webmasters.

## Prerequisites

A Basic understanding of DataCommunications and/or Networking. This information can be obtained in our course

Hands-On Internetworking Essentials

## Course Outline

Module I: The Internet

- Internet characteristics

- Internet connections

## Module II: Internet Addressing

- Internet addressing Introduction
  - Classes of addresses
  - Address notation
  - Address Assignments
  - Single Address per Interface
  - Multi-homed Devices
  - Multi-netting – Multiple Addresses per Interface
  - Network and Broadcast addresses
  - Reserved and Restricted Addresses
  - Sub-netting
  - The Subnet Mask
  - Masks for various Problems
  - Determining Ranges of Addresses Within Subnets
  - Private Addressing and Sub-netting
  - Strategies to Conserve Addresses
    - CIDR
    - VLSM
    - Private Addresses
  - Reserved Addressing and NAT
  - Network Address Translation (Static)
  - Double NAT
  - Network Address Translation (Dynamic)
  - Port Address Translation (PAT)
  - Proxies and Firewalls
  - Variable-Length Subnet Masking
  - Right-sized Subnets
  - Routing and VLSM
  - The Class C VLSM Problem
- \*Classless Inter Domain Routing (CIDR)
- Using CIDR
  - Contiguous Subnets

\*Managing IP Addresses

- BOOTP
- DHCP

Multicast Addressing

IP next generation, Version 6 Addressing

Module III: Voice Over IP (VOIP) Introduction

- VoIP Applications, Market Drivers and Negative Drives
- Approaches for IP-Based Voice Systems
- Voice Servers Approach
- IP Voice and Video Phones

Module IV: Overview of IP, IPOATM, MPLS and RTP

- Internet Protocol
- IP switching
- IP Datagrams
- Support of Voice and Video in Routers
- IPV6
- Network alternatives for VOIP
- IP over ATM
- ATM and VOIP
- VOIP and Ethernet
- Multi-protocol Label Switching (MPLS)
- MPLS Features
- MPLS Forwarding/Label-Switchng and Label -Distribution
- VOIP Packets over SONET and DWDM

Module V: Quality of Service for Successful VOIP

- Quality of service defined
- QOS Approaches
- QOS policy management
- Per Flow QOS
- Class-Based QOS

- MPLS -Based QOS
- QOS Details
- IETF Integrated Service (INT-Serv)
- IETF Differentiated Service (Diff-Serv)
- Additional Details on queuing
- Mapping ATM QOS to alternatives
- o IP lack of real time services
- IP Version 6
- Reservation Protocol (RSVP)
- Real TimeTransport Protocol (RTP)
- IP multicast
- IP Switching

#### Module VI: Internet Call Processing

- H.323 Standards
- H.323 Basics and Functional Elements
- H.323 communication and Signaling
- Encoding audio and video
- Signaling System 7 and Internet Call Processing
- Session Initiated Protocol (SIP)
- SIP Protocol Components
- SIP-T
- Media Gateway Control Protocol (MGCP)
- Other IETF Signaling Efforts
- PINT and SPIRITS
- ENUM
- TRIP
- MEGACO/H.248
- Soft Switch Solutions
- Number Portability
- Types of NP
- NP-Enabled Number Conservation Methods
- E.164 Numbers and DNS
- o VoIP Future

## Module VII: TCP/IP Developments and Futures

- The Shape of IP Version 6 - Next Generation
- IPv6 Implementation and Applications
- The IPv6 Address - Big addresses
- IPv6 Extension Headers
- Traffic flow for multimedia support
- IPv6 Routing
- Authentication and Security
- Related Next-Generation Protocols
- IPv6 Transition and Future

### Delivery Method

Instructor led with numerous "Hands-On" 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