Hands-On
Advanced Internetworking
TCP-IP / IPv6 / VoIP

BTS
Real-World Experience

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 todays 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
o   CIDR
o   VSLM
o   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

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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