eogogicsinc

Course ID	Course Title
EOIP	**Everything over IP (EoIP): Data, Voice, Video, Signaling and**
Course Duration	**Telemetry over IPv4/IPv6 Networks**
5 days	

Related Courses

- CompTIA Convergence +: Broadband VoIP Networking (CONVERGENCE, 5 days)
- VoIP: Protocols, Design, and Implementation (VOIP, 2-3 days)
- VoIP Security (VOIPSEC, 2 days)
- SIP Protocol, Architecture, and Design (SIP, 1 day)
- SIP Security: A Comprehensive Short Course (SIPSEC, 2 DAYS)
- State-of-the-art of VoIP Technology for Professionals, Managers, and Executives (VOIP-EXEC, 1 day)
- IMS: The Technology, Applications, and Challenges (IMS, 2 days)
- IP-Based Systems: TCP/IP and Mobile IP (IPSYS, 2-3 days)
- Multimedia Applications: IMS, SIP, and VoIP (MULTIMEDIA, 2 days)
- Internetworking with TCP/IP Version 6 (IPv6, 2-3 days)

Aimed At

All telecommunications and IT professionals, managers, consultants, engineers and supply chain personnel implementing, maintaining, supporting or procuring IP products and/or services.

Group Size

5-25

Prerequisites

Basic knowledge of the network layers and protocols including a rudimentary understanding of IP concepts.

Course in a Nutshell

Everything over IP is an intensive workshop that includes key EoIP concepts, architecture, and in-depth labs that reveal the intricacies and internal details of underlying protocols and systems.

Covered are: How to successfully use IPv4 and IPv6 networks to deliver data, voice, video, signaling and telemetry information (EoIP), migration, architectures and routing, Virtual Private Networks (VPN), Quality of Service (QoS) and Experience (QoE), IPsec and security, cryptography, VoIP and SIP, special challenges posed by voice and video over IP, unified communications, Web 2.0, fixed/mobile convergence, and emerging communications.

The course relies heavily on instructor/class interaction and lab exercises to make sure that you get the most out of the class and can apply the material back on your job. To be able to participate in the hands-on activities, please bring a wireless-enabled laptop to the class. If using a company computer, please make sure beforehand you have full administrative rights to load new software on the computer.

Customize It!   Customize this course to your exact requirements at little to no added cost. We can adjust the topics and level of details to suit your audience, whether technical, managerial, marketing/sales, or procurement -- and with or without prior exposure to the IP issues. If the participants are well versed in IPv4 and IPv6, the course can be shorthand to three days.

Learn How To
- Interpret and troubleshoot IPv4, IPv6 and related protocols
- Understand, explain, design and troubleshoot routed IP architectures
- Integrate data, voice, video, signaling and telemetry on a single IP infrastructure
- Secure IP sessions and streams in a multi-user IP network environment
- Assure that subscribers achieve desired Quality of Service (QoS) and Quality of Experience (QoE) goals
- Migrate existing networks into multimedia unified communications systems

Course Outline   **Day 1: IP Concepts & IPv4 Protocol**

Packet Networking Concepts

- Circuits, Packets and Cells
  - ° Multiplexing & Addressing
    - · TDM and Time Slots
    - · TDM and Frequencies
    - · Stat Muxing & Addresses: Virtual Connection Identifiers (VCIs), Classful and Classless IP Addressing
  - ° Error Handling
    - · Discard
    - · Retransmission
    - · Forward Error Correction (FEC)
  - ° Routing & Forwarding
- Packets, Flows and Sessions
- Broadband vs Narrowband
- (Very) Brief History of IP
- IPv4 & IPv6 Highlights
- NIST Profile for IPv6 in the US Government
- IP Global View & Future

IPv4 Protocol

- Lower OSI Layers
- Upper OSI Layers
- Layer 3 Functionality
  - ° End Systems
  - ° Intermediate Systems
- IP v4 Header Fields and Functions
- Protocol Processing
- ICMP

- ◦ PING
- ◦ TRACE ROUTE

Hands-on IPv4 Lab

- *Protocol Analyzer Overview*
- *Load and Run WireShark Protocol Analyzer*
- *WireShark Familiarity Exercise*
- *IPv4 Protocol Trace Analysis*
- *Analysis and Reporting Exercise*
- *Independent Discovery, Time Permitting*

Day 1 Review

Day 2: IPv6 Protocol, IP Routing and QoS

IPv6 Protocol Overview

- Need for IPv6
- Interim Fixes/Patches to IPv4
  - ◦ Dynamic Host Configuration Protocol (DHCP)
  - ◦ Network Address Translation (NAT) and Port Address Translation (PAT)
  - ◦ Classless Inter-Domain Routing (CIDR)
- Addressing, Structure and Address Space
- Unicast, Multicast and Anycast
- Discovery: Neighbor and Multicast Listener
- Autoconfiguration and Name Resolution
- ICMPv6 and Management Tools
- Header Format
- Migration

Hands-on IPv6 Lab

- *IPv6 Protocol Trace Analysis*
- *Analysis and Reporting Exercise*
- *Independent Discovery, Time Permitting*

IP Routing

- Routing Basics
- Topology Discovery
- Routing Tables
- Interior and Exterior Routing Protocols

Exercise: Welcome to the Human Network

- *Router Simulation Using Class Participants*
- *Router Functions, Routing Tables*
- *Route Failures and Route Resilience*

IP Quality of Service (QoS)

- General QoS Concepts

- IPv4 and IPv6 Variations
- QoS Models
  - Prioritization
  - Bandwidth Reservation
  - Route Optimization
  - Hybrid(s)
- QoS Issues in Multimedia Networks

Day 2 Review

Day 3: IP Security and IPSec

IP Security and IPSec Concepts

- Introductions: Bob, Alice, Malory & Eve
- Crypto Concepts
- Keys and Key Management
- Public/Private Key Infrastructure
- Key Recovery
- Tunnels and L2TPv3
- Virtual Private Networks (VPNs)
- IPSec Architectural Model

Hands-On L2TPv3 Lab

- *L2TPv3 Tunnel Setup*
- *Logical Multimedia Connections*
- *Lab Includes PPP, L2TPv3, PAP and CHAP*

IPSec Overview

- Encapsulating Security Payload (ESP)
- Authentication Header (AH)
- Internet Key Exchange (IKE)

IPSec Architecture

- IETF IPSec Roadmap
- IPSec Implementation
- IPSec Modes
- Security Associations (SAs)
- IPSec Processing

Encapsulating Security Payload (ESP)

- ESP Header
- ESP Modes
- ESP Procedures

Authentication Header (AH)

- AH Header
- AH Modes

- AH Procedures

The Internet Key Exchange

- ISAKMP
- Public/Private Key Exchange Systems
- Diffie-Hellman and Variations
- Internet Key Exchange (IKE)
- ISAKMP Domain of Interpretation (DOI)

Hands-on IPSec Lab

- *ESP & AH Headers*
- *ISAKMP/IKE and Security Associations*
- *Independent Discovery, Time Permitting*

Day 3 Review

Day 4: Everything over IP

Data, Voice, Video, Signaling & Telemetry

Brief History

- H.323 vs SIP vs Skinny vs TIPHON
- SIP Wins!

Architectural Models

- H.323
- SIP / SIP-T
- Skinny
- Megaco
- MGCP

Session Initiation Protocol (SIP)

- SIP in Multimedia
- SIP Servers
  - Proxy Servers
  - Redirect Servers
  - Location and Directory Servers
  - Registration
  - Locating SIP Servers
- SIP Messages and Procedures
  - Message Structure
  - Requests and Responses
  - Addressing
  - Completion/Error Codes
- Basic Call Flows and Service Examples
  - Media Streams/Packets in SIP Sessions
  - RTP/RTCP

- - Media Coding
  - Session Description Protocol (SDP)
  - SIP Protocol Operation
- Call Set-Up
  - Invite
  - SDP
- Media Streams/Packets
  - RTP/RTCP
  - Media Coding
  - Content Monitoring
- Call Tear-Down
- SIP Trunking
  - Uses
  - Protocol and Operation

Hands-on SIP Lab

- *Load and Run ClearSight Protocol Analyzer*
- *Call Set-Up, Media Transfer and Tear-Down*
- *Independent Discovery, Time Permitting*

Day 4 Review

Day 5: Unified Communications and QoE

Unified Communications Overview

Inside UC Part 1: Sessions

- Session Initiation Protocol (SIP)
- SIP SIMPLE
- Session Description Protocol (SDP)
- RSVP
  - Call Admission Control
  - Quality of Service (QoS)
  - Quality of Experience (QoE)
- Location Tracking
- Presence Applications/SIP Presence Engine (SPE)
- User Location
- Session Border Controller (SBC)

Inside UC Part 2: Data

- HTTP/sHTTP
- HTML/XML
- FTP/TFTP

Inside UC Part 3: Voice

- SIP Voice
- SCCP/Cisco Skinny
- H.323

- MGCP

Inside UC Part 4: Video

- Videoconferencing Rooms
- Unified IP Phones
- Unified Video Advantage
- Multipoint/Multimedia Control Unit
- H.320 / H.323
- SCCP
- SIP

Inside UC Part 5: Rich Media Conferencing

- Integration
  - SMTP
  - Jabber
  - Outlook
- Webex and Web Conferencing
- TelePresence

Inside UC Part 6: Security

- Privacy and Security
- Certificates and Certificate Authorities
- Encryption
- Key Management, PKI, pKI
- SIP Proxy/Secure Authentication
- HTTP Digest Authentication
- Secure Real Time Protocol
- Cisco Remote Party ID (RPID)

Quality of Experience

- QoS vs QoE and Importance of both
- Expectations
- Age/Gender of Speaker/Listener
- Speaker/Listener Familiarity
- Native Language
- Prior Experience
- Network Requirements

Factors affecting QoE

- Voice Algorithm
- Voice Compression
- Silence Suppression
- Echo Cancellation
- Tandem Hops/Multiple Encoding

Day 5 Review

Course Wrap-up: Final Words, Q/A, Evaluations

How You Will Learn
- A subject matter expert/instructor will present the course in a workshop format that will involve highly interactive lecture combined with both individual and group exercises.
- Side-bars", "off-line discussions", "huddles", and informal "chalk talks" will be used to address topic of interest to a smaller subset of the class or topics that may be of a sensitive or of secure nature.
- You will receive a course book including images of the slides presented in class along with the notes, URLs and additional information often taken as notes by the participant. This will allow you to concentrate on understanding and internalizing information during the class. The course book also includes book recommendations for additional reading and a full listing of a dozen or more "take away" points for each section covered in the lecture.
- You will also receive a comprehensive lab and exercise guide which will allow you to successfully complete labs and exercises and to repeat the labs after class for reinforcement and for further investigative learning, if desired.
- If you already know something about the IP technology, we will build on that knowledge. If your background is less technical, we will use time-tested examples and analogies to simplify the complex subject matter.

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