eogogicsinc

Course ID **CONVERGENCE+**	Course Title **CompTIA Convergence +: Broadband VoIP Networking**
Course Duration **5 days**	

Related Courses

- CompTIA A+ Certification: IT Essentials Training (A+ESSENT, 3 days)
- CompTIA A+ Certification - 220-602: IT Technician Training (A+602, 3 days)
- Principles of Network Security: CompTIA Security+ US DoD Directive 8570.1 (NETSEC, 3-4 days)
- VoIP: Protocols, Design, and Implementation (VOIP, 2-3 days)
- VoIP Security (VOIPSEC, 2 days)
- State-of-the-art of VoIP Technology for Professionals, Managers, and Executives (VOIP-EXEC, 1 day)
- SIP Security: A Comprehensive Short Course (SIPSEC, 2 days)
- IMS: The Technology, Applications, and Challenges (IMS, 2 days)
- Multimedia Applications: IMS, SIP, and VoIP (MULTIMEDIA, 2 days)
- MPLS: Integrated Routing with End-to-End QoS for the Next Generation Networks (MPLS, 2-3 days)

Aimed At

I/T and telecom professionals who are responsible for designing, implementing, and managing converged voice/data networks.

Group Size

5-15

Prerequisites

- CompTIA Network + Certification Training (NETWORK+, 5 days)

You should have a couple of years of experience in the IT industry and be familiar with IP networks and protocols. The Network+ Certification course is a recommended prerequisite.

**Course
in a Nutshell**

This course, intended to meet the requirements of the CompTIA Convergence+ certification, will help you take advantage of the growing demand for VoIP professionals. This certification is an internationally recognized vendor-neutral standard for validating voice/data networking skills.

Historically, voice and data networks have evolved separately, using circuit-switched and packet-switched technologies, respectively. However, the advances in digital signal processing have opened the door to an era where data networks, telephony, telecommunications, video, audio, teleconferencing, wireless, and broadcast multimedia technologies have "converged" into a single IP-based delivery system. This advanced networking course is aimed at

those who wish to gain an in-depth understanding of a broad array of evolving converged technologies issues such as voice transmission principles, telephony, end point devices, QoS, coding techniques, protocols, network hardware, and security.

Customize It!   We can customize this course at little-to-no additional cost to the distinct needs of audiences such as network design and optimization engineers, designers of applications for converged networks, and VoIP vendors and service providers. We can also tailor it to the needs of less technical audiences such as executives, business planners, sales/marketing specialists, and operations/support personnel.

Course Outline

Voice Transmission Fundamentals

- Development of Telephone Communications
- Elements of the Public Switched Telephone Network (PSTN)
- Voice Transmission Fundamentals
- Telephone Network and Subscriber Signaling
    o Network Signaling
    o Subscriber Signaling
    o Supervisory Signaling
    o Tones and Announcements
    o Special Information Tones
    o Ringing
    o PBX Call Control
- Voice Transmission Systems
- Voice Systems: Legacy, Hybrid, and VoIP
- Prioritization of Voice Traffic
- Trunking Requirements
- Traffic Shaping: Leaky-Bucket and Token Bucket Implementations

Endpoint Devices and Dialing Plans Used in a Converged Net

- Voice Terminals
- IP Phones
- TDM Phones
- Analog Phones and Adapters
- PC Based Softphones
- SIP Phones
- PDA SoftPhone
- WiFi Phone

- Number and Dialing Plans
- Number Prefixes
- IDD Prefix (International Direct Dialing)
- Number Formats
- The E.164 Recommendation
- E.164 and ENUM: How ENUM Works
- Digit Translation: ANI and DNIS Explained
- Toll Fraud and VoIP
- VoIP Service Features
- Number Blocking
- Federal Communications Commission's VoIP Regulation
- Local Number Portability
- Emergency Services
  - Location Registration Requirements
  - Communications Assistance for Law Enforcement Act (CALEA)

Quality of Service and Network Performance

- Quality of Service (QoS): Why Is It Needed?
- Quality of Service Implementation Techniques
  - QoS Practices
  - Internet Protocol (IP) Header and the TOS Field
  - IP Precedence
  - Differentiated Services and Explicit Congestion Notification (ECN) Field
  - Per Hop Behavior
  - Resource Reservation and Virtual Local Area Network (VLAN) Frame Tagging
- Multi Protocol Labeling Switching (MPLS) and Its QoS Advantages
- Analyzing Network Performance
- Jitter, Latency, Loss, Port Settings and Bandwidth on a Converged Network
  - Jitter
  - Bandwidth
  - Network Capacity Baselining
  - Network Throughput and Bottlenecks

Networking Technologies and Coding Techniques

- Switching
  - Ethernet LAN Segmentation
  - Physical and Logical Port Settings
- Network Topologies

- Local Area Network (LAN)
- Wide Area Networks (WAN)
- Metropolitan Area Networks (MAN)
- Global Area Networks (GAN)

- Routing with Network Address Translation and Port Address Translation
  - Network Address Translation
  - Port Numbers
  - Port Address Translation

- Network Protocols
  - TCP/IP: Addressing, Public/Private IP Addresses
  - UDP
  - Real Time Transfer Protocol (RTP)
  - RTP Packet Structure
  - The Real Time Control Protocol

- Network Transmission Media
  - Cable
  - Digital Subscriber Line (DSL)
  - Satellite Broadband Service
  - Wireless Broadband Services
  - Fiber-Optic Cable

- Virtual Private Networks (VPN)
  - Methods of Encoding/Decoding and Compression
  - Voice Compression Objective
  - Analog to Digital Conversion

- Voice Encoding/Decoding Standards
  - Mu-LAW and A-LAW

- Motion Picture Experts Group
  - The MPEG Family of Standards

Networking Applications

- Messaging Applications

- Collaboration Applications

- Audio Conferencing

- Video Conferencing

- Data Sharing

- Contact Center Components
  - Computer Telephony Integration
  - Call Center Management
  - Call Routing and Queuing
  - Web Chats
  - Call Recording
  - Interactive Voice Response: Components of Mobility and SoftPhone

- Presence
  - Common Presence and Instant Messaging (CPIM)
  - Presence Information Document Format (PDIF)
  - Session Initiation Protocol (SIP)
  - Cellular Integration Services
  - Find me _ Follow Me Feature
- Methods Used for Rich Media Transmission
  - Webcasting
  - Audio and Video Streaming
  - Real-time Streaming
  - Progressive Streaming
  - Multicasting and Unicasting (Audio and Video)
- Compression Standards: Benefits and Performance
  - Advanced Audio Coding (AAC)
  - JPEG
  - The MPEG Family of Standards
  - H.323 and H.320 Video Conferencing Standards
  - Video Codecs H.261, H.263, H.263+ and H.264
  - CIF, SIF, QCIF, FCIF and H
  - Audio Codecs G.711, G.722, G.724 and G.729a
    G.711 PCM (Pulse Code Modulation) and 722 Codec
  - G.724 ADPCM
  - G.729 Conjugate Structure - Algebraic CELP (CS-ACELP)
  - T.120 Series of Protocols and Services
  - NTSC, PAL and SECAM; NTSC Objectives and roles
- High Definition Television (HDTV) Standards and the ATSC

Networking Components and Architecture

- Origins of the International Organization for Standardization (ISO)
- The OSI Reference Model and Converged Networks
- The Seven Layers of the OSI Reference Model
- Network Models
  - Centralized vs. Decentralized Networks
  - Branch-Edge Network Solutions; Edge Routers and Switches
  - Network Flattening vs. Tier Networks
- Hardware Components as Used on a Converged Network
  - Routers (Multimedia Routers)
  - Switches (Managed, Unmanaged)
  - Differences between a Hub and a Switch
  - Store and Forward
  - Cut Through
  - Fragment Free
  - Adaptive Switching
- Servers

- Gateways
  - TDM / IP Gateway
  - SIP Gateway
  - H.323 Gateway
- Gatekeepers
- PBX (TDM, IP Only & Hybrid): Key Systems
- Private Branch Exchange or PBX
  - Hosted PBX
  - PBX Market Segments
- MCU (Multipoint Conferencing Unit)
- Firewall
- CSU/DSU (Channel Service Unit / Data Service Unit)
- NT1
- Traffic Shapers
- Session Border Controller
- Session Border Controllers and Regulatory Issues
- In-line Power Components (Power over Ethernet)
- Power over Ethernet (PoE) Modes
- Wireless Access Points and Wireless Routers Using NAT
- Modems (e.g., Cable, DSL
  - Dial Up Modems
  - Digital Subscriber Line (DSL)
  - Cable Modems

Management and Security

- Trouble-Ticketing Process
  - Log the Problem
  - Confirm the Problem
  - Troubleshoot the Problem
  - Troubleshooting Connectivity Problems
  - Escalate if Required
  - Close the Log
- Symptoms of Converged Network Problems
  - Poor Voice Quality
  - No Dial Tone
  - Loss of Feature Sets
- Converged Network Problems
  - Bandwidth Restrictions
  - Media Errors, Data Loss, Packet Loss and Rerouting
  - Protocol Mismatch
  - Jitter

- o Hardware Failure
- o MTU Issues
- o QoS Tags Being Dropped
- Tools and Commands to Monitor Network Performance in a Converged Environment
- Simple Network Management Protocol (SNMP)
- Remote Network Monitoring
  - o Ping
  - o Pathping
  - o Traceroute
- QoS Monitoring Tools
- Bandwidth Monitoring Tools
- Data Analyzers and Protocol Analyzers
- WAN Monitoring Tools
- Voice/Video Quality Monitoring Tools
- Traffic Management
- Quality of Service (QoS) and Router Parameters
- Load Balancing
- Traffic Shaping
  - o Leaky Bucket Traffic Shaping
  - o Token Bucket Traffic Shaping
- MOS (Mean Opinion Score)
- Monitoring Log File
- Reporting and Managing Configuration Changes
- Admission Controls
  - o Registration
  - o Registration and Emergency Services
- MAC (Moves, Adds, Changes)
- Call Detailed Records
- Concepts and Components of Security Design and How They Affect the Converged Network
- Firewalls
- Authentication
- Proxies
- Virtual Private Networks (VPN)
- Site-to-Site VPN
- Remote Access VPN
- Network Address Translation (NAT) and Port Address Translation (PAT)
  - o Encryption and Encryption Primary Functions

- Intrusion Detection System
  - Protocol and Application-based Intrusion Detection Systems
  - IDS and Firewall Comparisons
  - IPS (Intrusion Prevention System)
  - Network-based IPS
- Computer Viruses and Antivirus Recommendations
- VLAN (Separation of Voice, Video and Data); Demilitarized Zone (DMZ)
- Wrap-up: Course Recap, Q/A, and Evaluations

How You Will Learn

- An experienced professional, well versed in both IT and telecommunications technologies, will teach this class in interactive lecture format.
- We will offer real-life examples and applications to help you understand the subject matter and relate it to your job.
- If you come from a less technical background, we will use analogies and examples to drive home the important points. If you already know something about voice or data networks, our instruction will build on that knolwdge.
- We will provide you with a participant manual containing a copy of the instructor presentation along with supplementary educational material.

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