Telecommunications Fundamentals

Duración: 5 Días    Código del Curso: GK3760

Temario:

A new era in telecommunications has exploded with the adoption of Voice over IP (VoIP), third generation (3G) mobile, and next-generation voice and data services. Telecom is undergoing a series of radical changes which is molded by the legacy of telephony and an Internet Protocol network.

This comprehensive course provides you with an in-depth understanding of the current telecom landscape and how voice is migrating from a circuit- to a packet-switched network. You will learn how to evaluate existing technology options to determine which will best meet your organization's data and telephony requirements, from mature digital transport/access services to emerging voice and data services using voice over packet technologies.

The technology, marketplace, and regulatory structure of telecommunications are in a continuous state of transition. This powerful course will ensure that you fully understand the service options available to your organization and how voice technologies integrate into your existing data networks.

Dirigido a:

This course is essential if you are new to the industry, have experience in data networking and are in the process of converging your telephony and data network infrastructures, or are responsible for implementing or supporting telephony services. This course is also highly recommended for voice professionals needing data training, and data professionals needing to know about voice over IP. It is also recommended for consultants, executives, IT managers, marketing/sales staff, and network analysts, designers, engineers, and technicians.

Objetivos:

- Enterprise connections (VoIP Islands) to the PSTN
- Different types of NATs
- VoIP defined including SIP, H.323, QoS, RTP, and NAT
- Carrier Data Services: Frame Relay, ATM, and MPLS
- Compare Ethernet services (E-Line vs. E-LAN)
- IPTV video technology
- 3G mobile wireless services (HSDPA, EV-DO, PoC)
- Fixed Mobile Convergence (FMC) service offerings
- WiMAX services and technology
- Functions and architecture of the IP Multimedia Subsystem (IMS)
- Routing calls with ENUM
- Wireline and wireless providers
- Codecs and voice compression
- Wireless mediums such as FSO, mobile cellular, and satellite systems
- Using fiber for local loop connections
- Broadband services: DSL, FTTP, PONs, and FSANs
- 911 and E911 service comparison
- 3G mobile wireless services (HSDPA, EV-DO, PoC)
- Fixed Mobile Convergence (FMC) service offerings
- WiMAX services and technology
- Functions and architecture of the IP Multimedia Subsystem (IMS)
- Wave Division Multiplexing (WDM)

Prerequisitos:

- There are no prerequisites for this course

Siguientes cursos recomendados:

- GK3150 - Understanding Network Fundamentals
- GK3277 - Voice over IP Foundations
- CVOICEv6 - Cisco Voice over IP version 6
1. The Current State of the Telecom Industry
   - Evolution of Analog Phone Service
   - Circuit Switching
   - The Public Switched Telephone Network (PSTN)
   - Analog Telephone In-Band Signaling
   - End-to-End Local Connections
   - Signaling System 7 (SS7)
   - Call Routing over a Long Distance Network Using SS7
   - SS7 Architecture
   - Enterprise Voice Connections
   - Enterprise Connections to the PSTN
   - Connecting VoIP Islands
   - VoIP Networks
   - Packet Network Signaling Protocols
   - VoIP Trunking Services
   - IP Telephony Service Providers (ITSPs)
   - Routing Calls with Electronic Numbering (ENUM)

2. Digitizing Voice
   - Frequency Ranges Related to Human Communication
   - Human Speech Explained
   - Digitizing Voice Signals Using Codecs
   - Sample Rates for Digitizing Waveforms
   - Coding the Signal
   - Transmitting the Signal
   - Decoding the Signal
   - Voice Compression
   - Synthesizing Speech
   - Silence Compression (SC)

3. Communication Mediums and Multiplexing
   - Communication Mediums
   - Copper Mediums
   - Fiber Mediums
   - Multi-Mode Fiber Coupled with LEDs
   - Single-Mode Fiber Coupled with Lasers
   - Photo detectors
   - Wireless Mediums
   - Free Space Optics (FSO)
   - Cellular Networks
   - Microwave Communications
   - Parabolic Antennas
   - Satellite Communications
   - Geosynchronous Earth Orbit (GEO)
   - Low Earth Orbit (LEO)
   - Highly Elliptical Orbit (HEO)
   - Satellite Communication Services
   - Satellite Phone Service
   - Satellite Radio Services
   - Multiplexing
   - Frequency Division Multiplexing (FDM)
   - Time Division Multiplexing (TDM)
   - Wave Division Multiplexing (WDM)
   - Air Interfaces
   - Frequency Division Multiple Access (FDMA)
   - Time Division Multiple Access (TDMA)

4. Carrier Transport Services
   - How Synchronous Optical Network (SONET) Works
   - Introduction to SONET
   - SONET/Synchronous Digital Hierarchy (SDH) Multiplexing Rates
   - SONET Frame Structure
   - Using SONET for Carrier Backbones
   - Interconnecting SONET Networks
   - Using Virtual Tributaries for T1 Provisioning
   - Solving the Back-to-Back Multiplexer Problem
   - Legacy DS3 Multiplexers and Trunking Systems
   - Add/Drop Multiplexers (ADM)
   - Wave Division Multiplexing (WDM) Systems Defined
   - Using WDM
   - Optical Spectrum and Fiber Characteristics
   - Coarse WDM (CWDM) Channels
   - Dense WDM (DWDM) Channels
   - Using DWDM for Regional Backbone Networks
   - Optical Protection for WDM

5. Data Communications and Packet-Switched Networks
   - Network Protocols Compared
   - The Original Network Protocol for Data Transmission
   - Transmission Control Protocol/Internet Protocol (TCP/IP) Networks
   - Relationship Between Protocols for TCP/IP
   - Data Link Layer Protocols
   - Packaging a Message with TCP/IP using Ethernet at the Data Link Layer
   - Data Link Layer Addressing for LAN Interfaces
   - Comparison of Ethernet Hubs and Switches
   - Ethernet Switching Explained
   - Transporting Data Between Networks
   - Types of Interconnected Networks
   - Public and Private IP Addressing
   - Connecting Enterprise Networks to the Internet/IP
   - Addressing: Public and Private
   - Network Address and Port Translation
   - Network Address Translation (NAT)
   - Network Address : Port Translation (NAPT)
   - Interconnecting Networks Using NAT
   - Different Types of NATs
   - Full Cone
   - Restricted-Cone
   - Port Restricted-Cone
   - Symmetric

6. Migrating Voice from Circuit- to Packet-Switched Networks
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7. Carrier Transport Services
   - Video Services and Equipment
   - Analog : Digital Television Standards
   - Video Codecs
   - Video Conferencing Solutions
   - Integrated Services Digital Network (ISDN)
   - Video Applications
   - Web-Based Video Conferencing
   - Internet Protocol Television (IPTV)
   - Mobile Video Services

8. Current Mobile Wireless Services
   - Cellular Networks
   - The Concept of Cellular Networks
   - Call Initiation and Handoff (Handover)
   - Between Adjacent Cells
   - Growth of Cellular Services: 1985 - 2005
   - Global Frequency Spectrum Allocations
   - The Evolution of Cellular Standards and Technology
   - GSM/GPRS/EDGE Networks
   - International Mobile Telecommunications-2000 (IMT-2000)
   - Universal Mobile Telecommunications System (UMTS) Standards
   - CDMA2000 Standards
   - Mobile Radio Technologies
   - High-Speed Overlays: HSDPA ; EV-DO
   - Push-to-Talk over Cellular (PoC)
   - Subscriber Identity for Mobile Networks
   - Universal Integrated Circuit Card (UICC)
   - Subscriber Identity Module (SIM)
   - Universal SIM (USIM)
   - Removable User Identity Module (R-UIM)
   - International Mobile Subscriber Identity (IMSI)

9. Fixed Mobile Convergence (FMC)
   - Fixed Mobile Convergence (FMC)
   - FMC Defined
   - Seamless Roaming : Handover
   - Unlicensed Mobile Access (UMA)
   - Generic Access Network (GAN) Modes of Operation
   - GERAN-Only
   - GERAN-Preferred
   - GAN-Only
   - GAN-Preferred
   - Wireless Operator's Strategy for FMC
   - Securing FMC
   - Multi-Play Service Offerings
   - Service Rollout for FMC
   - FMC Implementation - Home Zone Operation
   - Application Benefits of FMC
   - Possibilities for Future Modes of Operation Incorporated in FMC

10. Worldwide Interoperability for Microwave Access (WiMAX)
    - Worldwide Interoperability for Microwave Access (WiMAX)
    - WiMAX Services : Technology Defined
4. Carrier Access: Customer-to-Carrier Connections

- ISDN Basic Rate Interface (BRI)
- T1 (DS1)/E1 used for Digital Trunking
- T1 Digital Access for Enterprise Networks
- T1 (DS1) Frame Format (North American Standard)
- E1 Frame Format (Global Standard)
- Distance Limitations for Digital Signals
- T3 (DS3)/E3 used for High-speed Connections
- SONET/SDH Optical Network Connections
- Using Fiber connections for the Local Loop
- Fiber-in-the-Loop (FITL)
- Fiber-to-the-Curb (FTTC)
- Fiber-to-the-Premise (FTTP)

5. Broadband Access

- Broadband Applications
- Digital Subscriber Line (DSL) Service
- "User-Installed" ADSL Service
- ADSL2 and ADSL2+
- Very-high-speed DSL (VDSL) and VDSL2
- FTTx
- Broadband Passive Optical Network (BPON)
- Gigabit Passive Optical Network (GPON)
- Ethernet Passive Optical Network (EPON)
- Passive Optical Networks (PONs)
- Fiber Topologies for PONs
- PON Example: Verizon’s FiOS (Fiber Optic System)
- PON Architecture with RF Video Overlay
- PON Downstream
- PON Upstream
- TDM Business Services over GPON
- Full Service Access Networks (FSANs)
- Cable Modem Service
- Broadband Cable Standards
- Cable Modem Service
- Current Cable Network Architecture
- New Cable Network Architecture

6. Enterprise Networks

- Corporate Phone Systems
- Electronic Key Systems
- Private Branch Exchange (PBX) Ports and Connections
- PBX Trunking
- Identifying callers from outside the organization
- ISDN Primary Rate Interface (PRI)
- Comparing ISDN PRI with QSIG
- Enterprise VoIP
- Circuit-Switched PBX with VoIP Trunking
- Integrated IP-PBX
- IP-PBX Environment
- 911 and E911 Service Comparison
- Standard 911 Service Deficiency
- Enhanced 911 (E911) Highlights
- E911 in a Day-to-Day Environment
- Converged Hosted Services

Packet-Switched Networks

- IP-PBXs in VoIP Networks
- IP-PBXs for Enterprise Networks
- IP-PBX Systems
- Unified Communications
- Device Independent Applications
- Presence Information for SIP Networks
- SignalingProtocols Used for VoIP
- H.323
- H.225
- H.245
- SessionInitiation Protocol (SIP)
- Session Description Protocol (SDP)
- H.248/MEGACO
- Media Transport: QoS Measurements
- Media Transport: Real-time Transport Protocol (RTP)
- Quality-of-Service (QoS) Measurements: Real-Time Control Protocol (RTCP)
- Payload Types for RTP Media Sessions
- Session Initiation Protocol (SIP)
- SIP Overview
- SIP Clients and Servers Defined
- SIP Registration
- Using a SIP Proxy/Registrar (Location Server)
- QoS
- Security with SIP and RTP
- SIP Security
- Secure RTP (SRTP)
- VoIP; NAT Traversal
- The Problem with VoIP and NAT Traversal
- Simple Traversal of UDP Through NAT (STUN)
- Traversal Using Relay NAT (TURN)
- Interactive Connectivity Establishment (ICE)

10. Carrier Data Services

- IP-Based Routing
- How Routers Route IP Packets
- Routing IP Packets Between Networks
- Customer Routing Table Examples for IP Routed Networks
- Customer Routing Table Examples for Connecting to Frame Relay Networks
- Frame Relay
- Switching Frames Through the Network
- Connecting to a Frame Relay Network
- Data Link Connection Identifiers (DLCIs)
- Using ATM as a Backbone for Frame Relay
- Asynchronous Transfer Mode (ATM)
- Defining ATM
- ATM Cells
- Virtual Path and Channel Identifiers
- ATM QoS Parameters
- Summary of ATM Service Categories
- Multiprotocol Label Switching (MPLS)
- Introduction to Label Switching
- MPLS Terminology and Components
- Establishing an MPLS Tunnel
- Using the MPLS Tunnel

- Broadband Options and Service Consolidation
- Network Topology and Spectrum Used
- 802.16 Broadband Wireless Access (BWA) Standardization
- Mesh Networks
- Markets for WiMAX
- WiMAX and QoS

17. IP Multimedia Subsystem (IMS)

- Reasons, Functions, and Architecture of IMS
- Carrier Adoption of IMS
- Initial Development of IMS GSM/UMTS Standards
- Connecting Users with Applications and Services
- The IMS Architecture Defined
- Applications and Services Supported
- PoC
- Unified Messaging
- Instant Messaging (IM)
- Web-Based Audio/Video Conferencing
- Reusable Framework
- Application Requirements
- Simplified Access to Services

Other topics covered include:
- SONET/SDH Optical Network Connections
- T1 (DS1)/E1 used for Digital Trunking
- Comparing ISDN PRI with QSIG
- Enterprise VoIP
- Phone Systems
- Key Systems
- Private Branch Exchange (PBX) Ports and Connections
- PBX Trunking
- Identifying callers from outside the organization
- ISDN Primary Rate Interface (PRI)
- Comparing ISDN PRI with QSIG
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11. Ethernet Services

- Carrier-Grade Ethernet Speeds
- Key Attributes to a Carrier-Grade Ethernet Service
- Comparison of Ethernet Services
- E-Line: Point-to-Network
- E-Line: Point-to-Point
- E-LAN: Multipoint-to-Multipoint
- Network Topologies used for Ethernet Services
- Scaling Ethernet for Carrier Networks
- Q-in-Q
- Virtual LAN (VLAN) Tags
- MAC-in-MAC
- Ethernet over MPLS
- Provider Backbone Transport (PBT)

12. Remote Access Virtual Private Networks (VPNs)

- Types of VPNs
- Internet-Based Remote VPNs
- Internet Protocol Security (IPSec)
- Encryption Modes for IPSec: Transport and Tunneling
- Secure Sockets Layer (SSL)
- How SSL Works
- Wireless Remote Access VPNs
- Mobile VPNs

Más información:
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