



Teaching Telephony



Session Number: BRK-117T

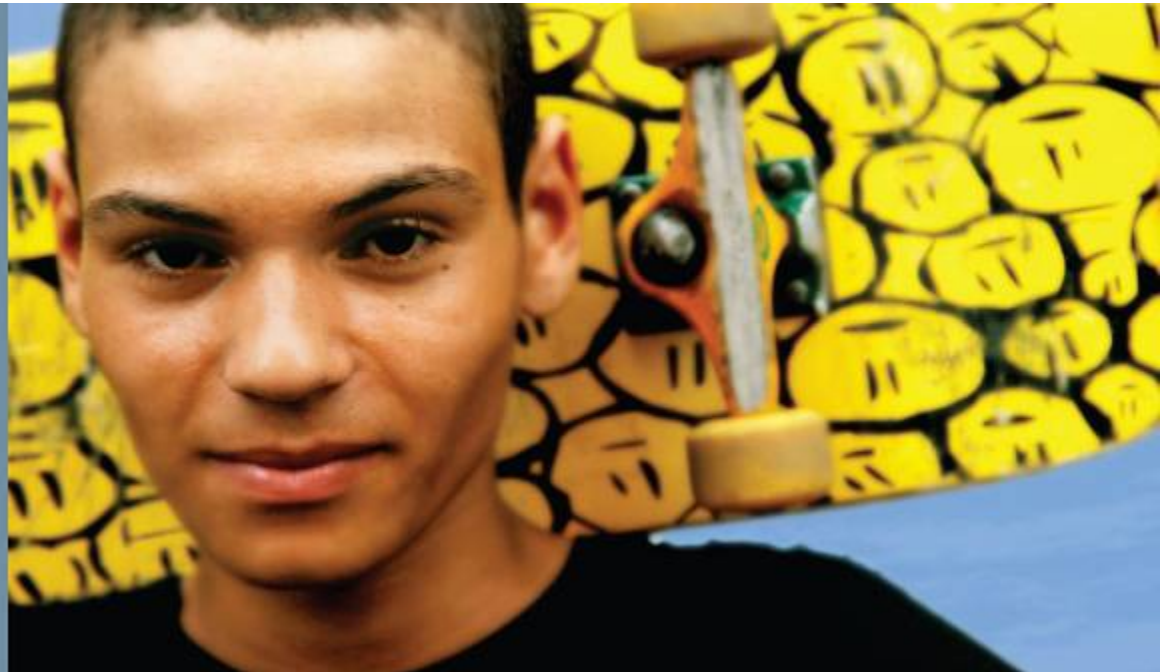
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Mind Wide Open™



Session Agenda

- IP Telephony Course
- Cisco Unified Communications Manager Solutions
- Classroom Setup
- Outline of Curriculum
- Supplemental Materials and Resources
- Challenge Labs
- Certifications

IP Telephony Course





Course Description

- An introduction to converged voice and data networks as well as the challenges faced by various technologies
- Presents Cisco solutions and implementation considerations to address those challenges
- The architecture, components, functionality and features of Cisco Unified Communications Manager Express
- Voice over IP (VoIP) and Quality of Service (QoS) technologies

Course Focus

- Cisco Unified Communications Manager Express
- Connecting to a simulated PSTN network
- Connecting from one UCME-enabled router to another UCME-enabled router



Supplemental Curriculum

- PDF format
- No online tests from Cisco Networking Academy
- Teach as a stand-alone course or incorporate topic(s) into CCNA®/CCNP® courses
- Slide shows available for each module
- No instructor training



Prerequisite Student Knowledge

- Students should have completed CCNA one through four
- The following prerequisites are beneficial, but not required:

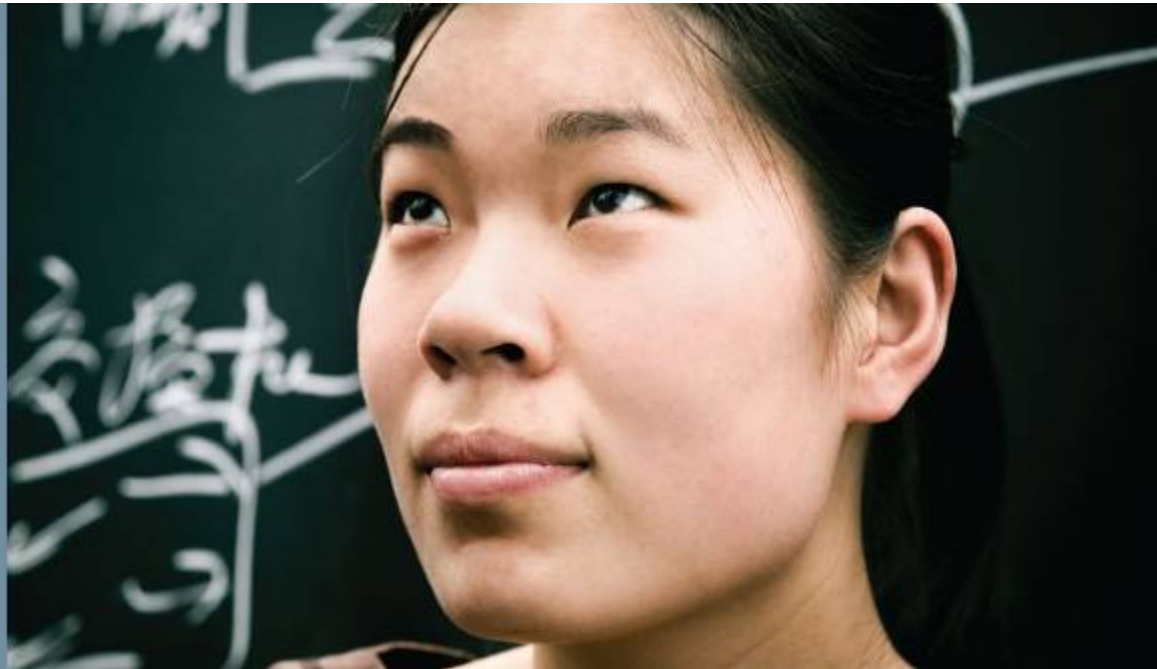
CCNA certification

Experience with computer hardware and command line

Work experience



Cisco Unified Communications Solutions





Cisco Unified Communications





Cisco Unified Communications Solutions

- Cisco Unified Communications Manager
- Cisco Unified Communications Manager Business Edition
- Cisco Unified Communications Manager Express
Used in the IP Telephony course
- Cisco Unified Communications 500 series
- Cisco Unity[®] Express and Cisco Unity



Cisco Unified Communications Manager

- Formerly Cisco CallManager®
 - Runs on server or appliance
 - Appliances are 7800 series
 - Large-scale solution, supports thousands of users
 - Provides redundancy

- Business Edition
 - Supports up to 500 users and 20 remote sites
 - No redundancy



Cisco Unified Communications Manager Express (UCME)

- Formerly Cisco CallManager Express
- Used in IP Telephony course and materials
- Configurable telephone system for <240 stations
- Router-based solution
 - Command Line Interface
 - Intuitive GUI
- Used in branch office or small business



Unified Communications 500 Series

- Smallest IP Telephony platform
- For smaller installations; tabletop or add-rack mounts
- Plug in and set up in 15 minutes
- Supports eight phones or soft clients
 - With companion switch can support 16, 24, 48 phones
- Has VPN capability to support teleworkers





Cisco Unity Express

- Voice mail for small or medium-sized business or branch offices
- Used with UCME
- Includes personal and general mailboxes, Auto Attendant
- Network module or can use AIM module on motherboard
- Cisco Unity: Enterprise-level, full-featured voice and messaging server used with Cisco Unified Communications Manager

Classroom Setup





Router

Models Supported

- 2600XM (only XM models)
- 2800 series
- 3700 and 3800
- 1700 and 1800
- Recommended Cisco IOS®:
 - Filename needs to include “ipvoice_ivs”
 - “ivs” files support gatekeeper
 - i.e.: c2800nm-ipvoice_ivs-mz.124-2.T5





Router

Other Components

- PVDM: Packet Voice/Data Module

Necessary to convert analog signals to be transmitted over the network

i.e. PVDM2-4, PVDM2-8, PVDM2-16, PVDM2-20

- Interface cards

FXO: Foreign Exchange Office

FXS: Foreign Exchange Station

Optional four-port POE switch for 2800 series (HWIC-4ESW)

Needs additional internal power supply

- Phone firmware and GUI files

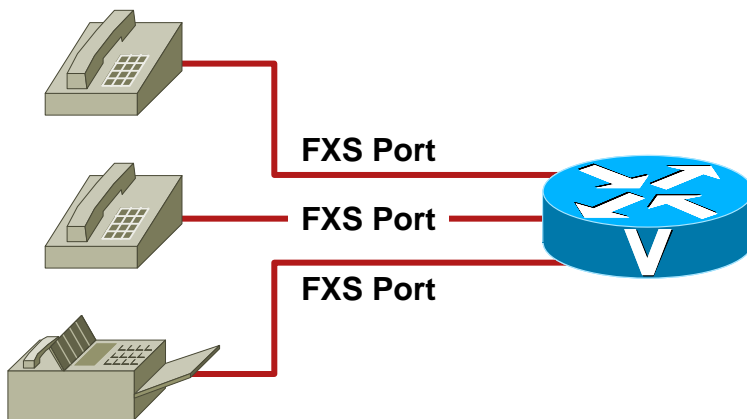
Download from www.cisco.com

Voice Interfaces: FXO and FXS

■ FXS

Foreign Exchange Station

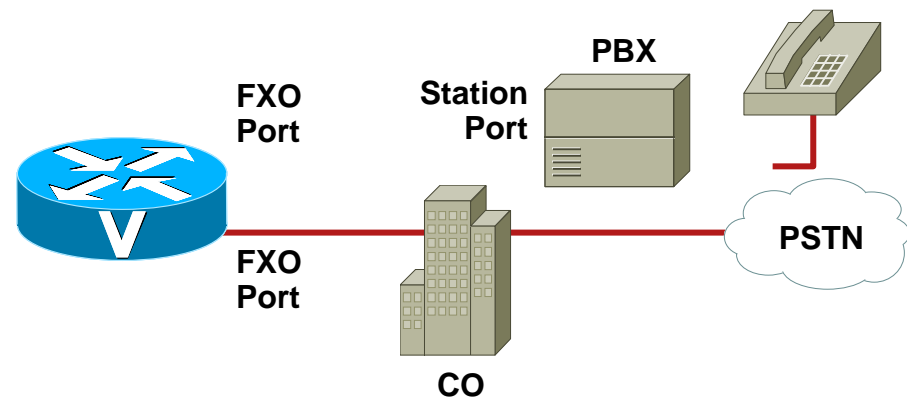
Used to connect analog devices directly to router (i.e. phone or fax machine)



■ FXO

Foreign Exchange Office

Connect to a PBX or phone company switch (in classroom, used to connect to Adtran)





Phones

- **Wired**

 - Two button: Model 7945 (7940/41)

 - Six button: Model 7965 (7960/61)

 - Color display: Model 7975 (7970/71)

 - Others: 7902, 7905, 7910, 7911, 7912

 - Need power blocks if not using POE



- **Wireless**

 - Model 7921 is color

 - Model 7920 is black and white

- **IP Communicator (soft phone)**



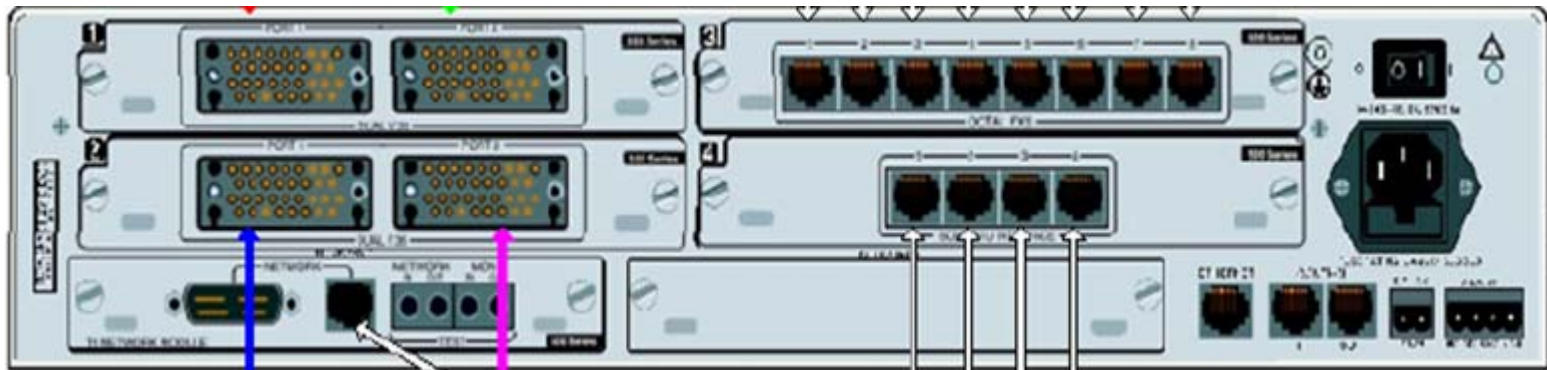
IP Communicator



Other Equipment



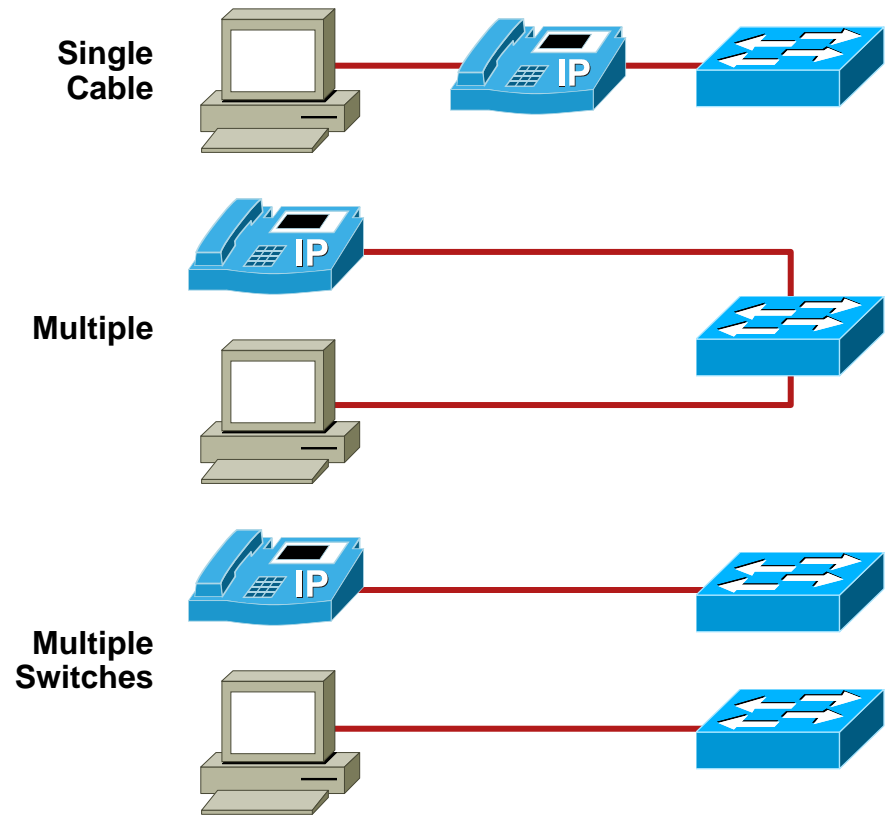
- Adtran Atlas 550
Eight analog ports
- Analog phone(s)





Typical Classroom Setup

- One pod consists of:
 - Two IP phones
 - i.e. 7940 series
 - Router and switch
 - i.e. 26xxXM and 2950 or 2811 and 2950 or 2811 and HWIC-4ESW
 - FXO and FXS cards
- Need two pods to connect together
- Adtran, analog phone(s)



Outline of Curriculum





Introduction to Packet Voice Technologies

Module 1

- Basic telephony functions and devices
- Analog and digital connections
- Compression schemes
- Traditional telephony vs. packetized telephony
 - More efficient use of bandwidth and equipment
 - Lower transmission costs
 - Consolidated network expenses
 - Increased revenue from new services
 - Access to new communications devices



Introduction to Voice over IP

Module 2

- VoIP: Carry voice traffic over an IP network
- Fundamentals of VoIP, codecs, calculating bandwidth requirements, implementation solutions
- Real-time transport protocol
 - Provides end-to-end network functions and delivery services for delay-sensitive, real-time data, such as voice and video
 - Works with queuing to prioritize voice traffic over other traffic



Configuring Cisco Unified Communications Manager Express

Module 3

- Overview of UCME, features, functionality, benefits
- Ways to set up phones
 - Manually
 - Partially automated
 - Automated
- Phone requires
 - Power, IP Address, firmware





Voice Dial Plans, Configuring Voice Interfaces and Dial Peers

Module 4

- Dial Plan

 - Allows phone calls

 - Includes access codes, area codes, prefixes

- Configuring FXO and FXS interface cards

- Dial Peers

 - Establish logical connections, called call legs, to complete an end-to-end call

 - Two types of dial peers taught in the course:

 - POTS dial peers: connect to a traditional telephony network

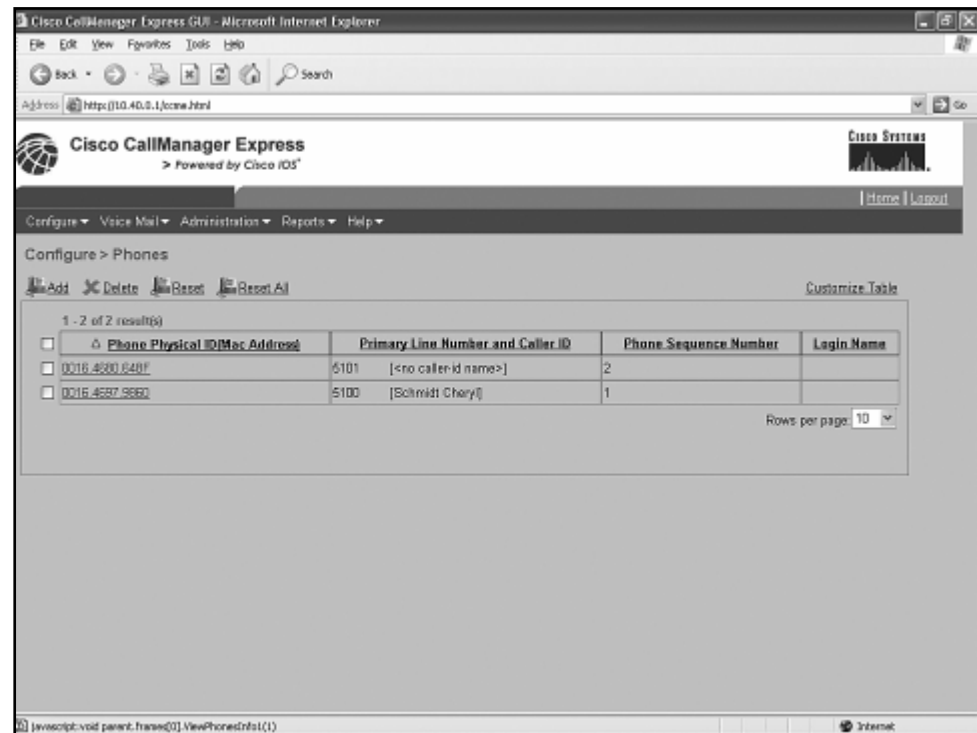
 - VoIP dial peers: connect over a packet network



Configuring Additional Features

Module 5

- Many additional features are available for successful deployment of UCME
- Examples:
 - GUI
 - Intercom
 - Paging
 - Call transfer
 - Phone display
 - Music on Hold



VoIP Signaling and Call Control

Module 6

- VoIP Signaling

 - Endpoints (IP Phones) need to manipulate audio

 - Common control components

 - Call status

 - Address registration and resolution

 - Admission control

- Intersite VoIP

 - H.323—protocol suite used to connect multiple sites

 - SIP—has advantage over H.323: it separates inter-site calls from external calls

 - MGCP—not applicable with UCMExpress



Improving and Maintaining Voice Quality

Module 7

- QoS

Classification, Marking, Congestion Management, Traffic Shaping, Compression, Link Efficiency

AutoQoS

- Delay

Fixed—components add directly to the overall delay on the connection

Variable—delays from queuing and buffers on the serial port

- Jitter

Variation in the delay of received packets

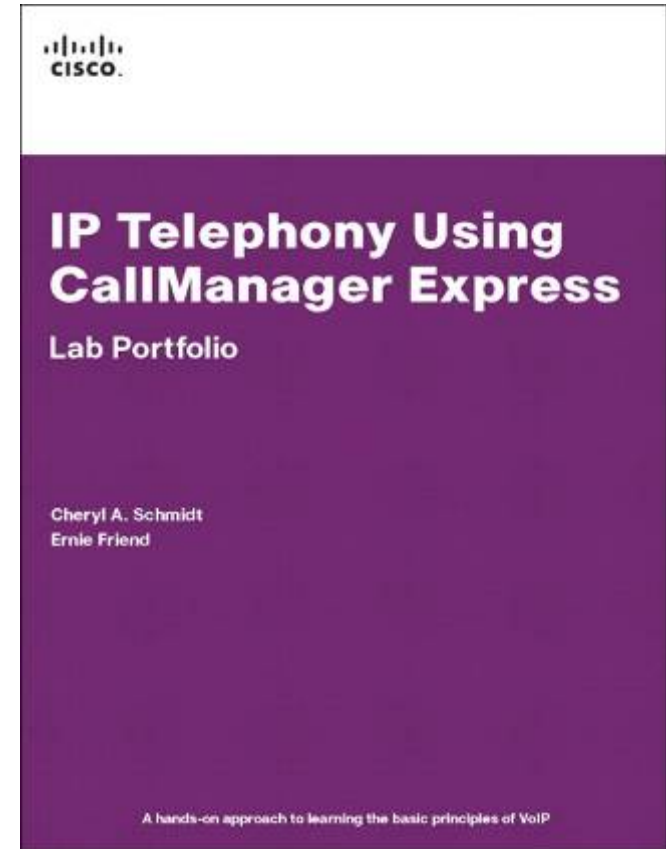
Supplemental Materials and Resources





IP Telephony Using Cisco CallManager Express Lab Portfolio

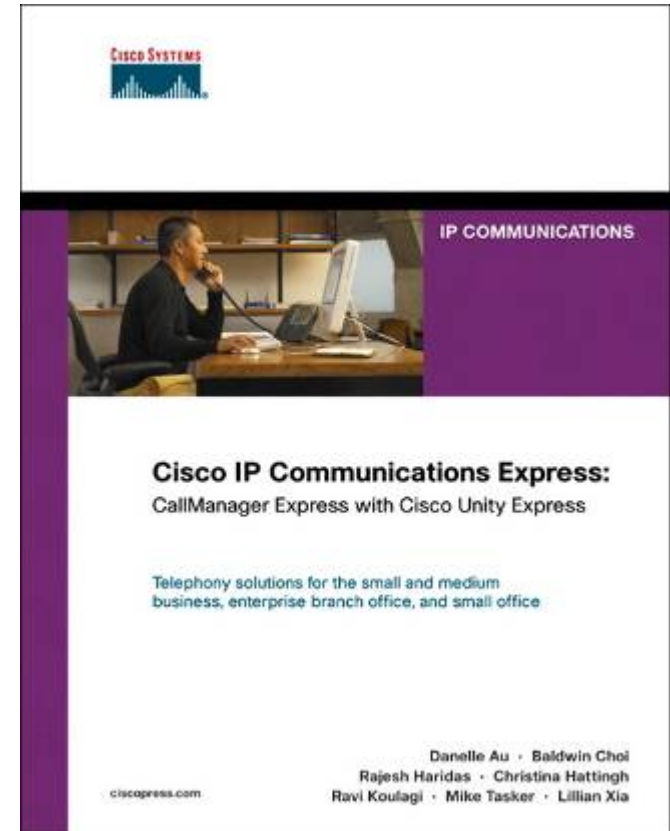
- Authors: Cheryl A. Schmidt and Ernie Friend
- ISBN: 1-58713-176-5
- Includes three case studies
- Many instructors prefer over labs provided with curriculum





Cisco IP Communications Express

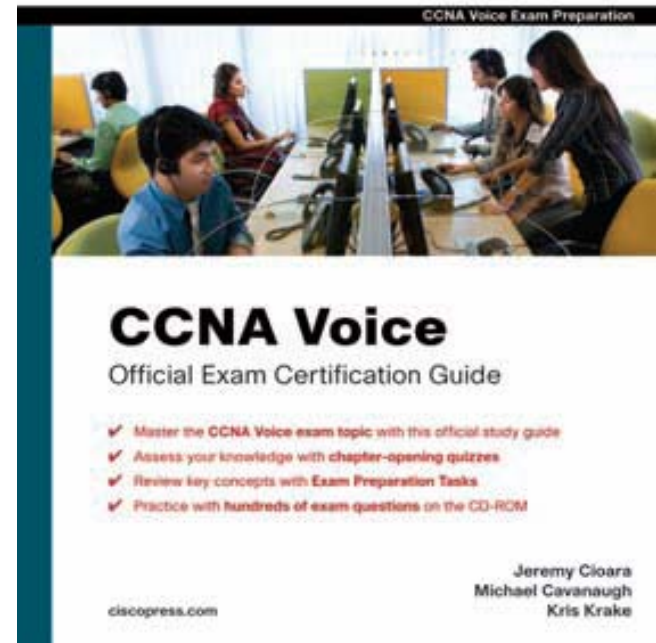
- Authors: Danelle Au, et al.
- ISBN: 1-58705-180-X
- Comprehensive book for Express platforms
- Use for reference





CCNA Voice Exam Certification Guide

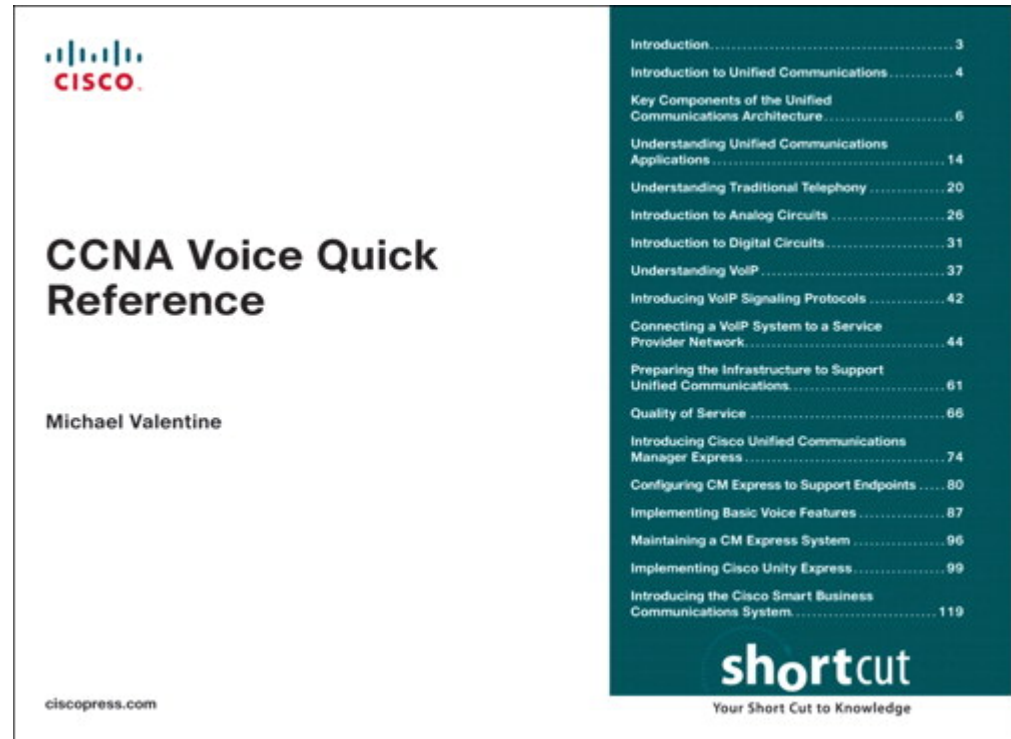
- Authors: Jeremy Cioara, et al.
- ISBN: 1-58720-207-7
- Maps to the new CCNA Voice certification
- Publishes October 2008





CCNA Voice Quick Reference

- Author:
Michael Valentine
- ISBN:
1-58705-767-0
- Maps to the new
CCNA Voice
certification
- Availability
June 24, 2008



Voice over IP First Step

- Author: Kevin Wallace
- ISBN: 1-58720-156-9
- Logical, step-by-step approach to VoIP
- No IP telephony experience required
- Only used for basic concepts





Videos from Cisco

Available at <http://newsroom.cisco.com>

- Click on Videos
- Filter by Technology: Unified Communications
- Choose year
- Can be viewed in the player or downloaded as Windows Media, Real Player, Flash
- Examples:
 - Burger King
 - NFL Films
 - NHL Columbus Blue Jackets
 - Subway



Unified Communications Discussion Board

- Download the teaching and learning materials
- Post syllabi, labs, skills exams, web links, book reviews, and presentations
- Ask or answer questions
- To enroll:

Log in to the Cisco Academy at <http://cisco.netacad.net>

From the Instructor Home page, click 'Forums and Chat' under the Resources menu

Under the 'Private Community Groups' section, click on 'Unified Communications'

Challenge Labs





Configure Cisco Unity Express

- Voice mail; not included in supplemental curriculum
- Three labs in Lab Portfolio (Schmidt and Friend)
 - Accessing Cisco Unity Express
 - Configuring Cisco Unity Express
 - Configuring additional features
- Phones need to be attached and registered
- Lab book uses: Advanced Integration Module AIM-CUE
 - Appendix C shows how to install
- Other option: Network Module NM-CUE



Connect Wireless Phone(s)

- Phone: CP-7921G-A-K9
- Battery: CP-BATT-7921G-STD
- Charger: CP-MCHGR-7921G-BUN
- Card for Router: HWIC-AP-G-A





Connect Lab Equipment to Outside Line

- Replace the Adtran in the lab book with a “real” outside connection (i.e. connect router to a live phone jack)
- Objective:
 - From the VoIP phone (and analog phone connected to router’s FXS port) place call to an outside phone
 - Outside phone can call the router (by dialing the phone number of the wall jack)
- If phone jack is connected to an internal PBX, additional configuration may be required



Convert .wav Files for Ringtone

- Can choose specific song to play when phone “rings”
- File needs to be converted to .raw format
- Use Windows Sound Recorder (or standard audio editing package)
 - Need to choose CCITT u-Law format
- Edit RingList.xml file to include name of ringtone file
- Ringtone needs to be stored in router’s flash
- Instructions: <http://www.chetnet.co.uk/tones.html>



Choose a Song to Play as Music on Hold

- Use Windows Sound Recorder (or standard audio editing package)
 - Need to choose CCITT u-Law format
- Save file as .wav file
- Song stored in router's flash
- Information and router commands:
<http://www.cisco.com/univercd/cc/td/doc/product/voice/its/cmeadm/feat/cmehoh.htm>



Cisco Unified Video Advantage

- PC camera to show video on laptop or PC
Used in conjunction with IP Communicator or IP phone
- Personal Desktop Video Phone 7985



Additional Labs and Topics

Examples:

- Block 1-900, 10-10-xxx PICs and international calls
- Set up multiple phones to share the same lines (overlay DN)
- Set up UCME so users do not have to dial a 9 for an outside call
- Set up XML services to get the weather, news and airline information
- Connect multiple Cisco CallManager Express systems
- Set up a basic automated attendant on a UCME router
- Information: http://www.voip-info.org/wiki/view/CallManager+Express&view_comment_id=15944

Certifications





Voice Certifications

- Three certifications are related to this curriculum
 - Specialist Level: IP Communications Express Specialist
 - Associate Level: CCNA Voice
 - Professional Level: CVOICE



Specialist Level

- The Cisco IP Communications Express Specialist certification validates the fundamental Voice over IP (VoIP) technology skills required to install and maintain multi-service network solutions.
- Cisco Unified Communications Manager Express and Cisco Unity Express are emphasized in this foundational IP Communications program.
- Exam: IP Telephony Express (IPTX)—642-144
- Renews CCNA certification, does not renew CCNP

http://www.cisco.com/web/learning/le3/le2/le41/le79/le457/learning_certification_type_home_extra_level.html



Associate Level

- The Cisco® CCNA Voice certification the required skill set for specialized job roles in voice technologies such as voice technologies administrator, voice engineer, and voice manager.
- It validates skills in technologies such as PBX, IP telephony, handset, call control, and voicemail solutions; the Cisco Unified Communications architecture and design covering mobility, presence, and TelePresence applications.
- Exam: 640-460, Implementing IOS Unified Communications

http://www.cisco.com/web/learning/le3/le2/le0/le3/learning_certification_type_home.html



Professional Level

- Close to CVOICE exam (642-436)
 - One of the CCVP™ exams
- This exam tests a candidate's knowledge of the foundational elements of VoIP calls, and the description of dial plans, and the implementation of gateways, gatekeepers and IP-IP gateways.
- Requires additional study beyond the supplemental curriculum
- Does renew CCNP certification

http://www.cisco.com/web/learning/le3/current_exams/642-436.html

Q and A



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