

# Implementing Cisco IOS Unified Communications

- **Course Number:** 640-460 (IIUC)
- **Course Length:** 5 Days

## Course Overview

This instructor-led course provides the student with Unified Communications concepts, component definition, and high level designs. This is also the core technology course in the certification path to achieve the CCNA Voice designation. Students will be able implement and configure small to medium sized IP Telephony solutions. UC products covered include the Cisco Unified Communications Manager Express / Cisco Unity Express and the UC500 Smart Business Communications System.

## Prerequisites

Students should complete Interconnecting Cisco Networking Devices Part 1 (ICND1) before taking this course.

## Certification Exam

640-460 Implementing Cisco IOS Unified Communications (IIUC) v1.0

## Course Outline

### Course Introduction

Course Introduction

3 min

### Module 1 - Cisco Unified Communications System Introduction

Cisco Unified Communications System Introduction

#### **Introducing the Cisco Unified Communications System**

Business Challenges Today

Benefits of Cisco Unified Communications

Cisco Unified Communications Layers

Infrastructure

1h 26m

Call Processing  
Call Processing—Cisco Smart Business Communications System  
Call Processing—Cisco Unified Communications Manager Express  
Call Processing—Cisco Unified Communications Manager Business Edition  
Call Control—Cisco Unified Communications Manager  
Endpoints  
Applications  
Lesson 1 Review  
**Understanding Cisco Unified Communications Applications**  
Cisco Messaging Choices  
Cisco Unity  
Cisco Unity Connection  
Cisco Unity Express  
Auto-Attendants  
Cisco IP IVR Overview  
Cisco Unified Contact Center Express  
Cisco Unified Communications Mobile Solutions  
Cisco Unified Personal Communicator  
Cisco Unified Mobile Communicator  
Cisco IP Communicator  
Cisco Unified Video Advantage  
Presence  
Cisco Unified Presence  
Cisco TelePresence Meeting  
Lesson 2 Review  
Module 1 Review

## **Module 2 - Traditional Telephony Operations**

2h 15m

Traditional Telephony Operations  
**Understanding Traditional Telephony**  
Public Switched Telephony Network  
Traditional Business Phone System  
What Is a PBX?  
What Is a Key System?  
Comparing Key Systems to PBXs  
Signaling Types  
Supervisory Signaling  
Address Signaling  
Informational Signaling Example  
Signaling System 7  
PSTN Call Setup  
Numbering Plans  
North American Numbering Plan  
NANP Numbering Assignments  
U.K. National Numbering Scheme  
Hong Kong Numbering Plan  
European Telephony Numbering Space  
E.164 Addressing  
Lesson 1 Review

## **Introducing Analog Circuits**

Components of an Analog Telephone

FXS Interface

FXO Interface

Loop-Start Signaling

Ground-Start Signaling

E&M Interface

E&M Signaling

E&M Signaling—Wink Start

Lesson 2 Review

## **Introducing Digital Circuits**

Digitizing Analog Signals

Step 1—Sample the Signal

Step 2—Quantize the Signal

Step 3—Encode the Signal in Binary

Step 4—Compress the Samples (Optional)

Time-Division Multiplexing

T1 Circuits

E1 Circuits

Channel Associated Signaling

CAS—T1

CAS—E1

Common Channel Signaling

CCS—PRI T1

CCS—PRI E1

CCS—BRI

Lesson 3 Review

Module 2 Review

## **Module 3 - VoIP Fundamentals**

5h 57m

VoIP Fundamentals

### **Understanding Packetization**

Digital Signal Processors

Real-Time Transport Protocol

RTP Control Protocol

Packetization

Packetization—G.711 Example

Packetization—G.729 Example

Codecs

Codecs—G.729 and G.729A Comparison

Internet Low Bitrate Codec

iLBC—Packet Loss Comparison

Codecs—Bandwidth Implications

Codec—Overhead

Codec—Total Bandwidth Required

The Effect of VAD

Additional DSP Functions

Lesson 1 Review

### **Introducing VoIP Signaling Protocols**

VoIP Signaling Protocols

VoIP Signaling Protocols Comparison

Skinny Client Control Protocol

SCCP—Examples

H.323

H.323—Examples

Media Gateway Control Protocol

MGCP—Examples

Session Initiation Protocol

SIP—Examples

Lesson 2 Review

## **Implementing VLANs, Trunks, and Inter-VLAN Routing**

VLAN Overview

Guidelines for Applying IP Address Space

Network Traffic Types

Advantages of Voice VLANs

VLAN Operation

802.1Q Trunking

802.1Q Frame

Understanding Native VLANs

VTP Features

VTP Modes

VTP Operation

Configuring VLANs and Trunks

VTP Configuration Guidelines

Creating a VTP Domain

VTP Configuration and Verification Example

802.1Q Trunking Issues

Configuring 802.1Q Trunking

Verifying a Trunk

VLAN Creation Guidelines

Adding a VLAN

Verifying a VLAN

Assigning Switch Ports to a VLAN

Verifying VLAN Membership

Executing Adds, Moves, and Changes for VLANs

Redundant Topology

Broadcast Frames

Broadcast Storms

Multiple Frame Copies

MAC Database Instability

Loop Resolution with STP

Describing PortFast

Configuring and Verifying PortFast

VLAN-to-VLAN Overview

Dividing a Physical Interface into Subinterfaces

Routing Between VLANs with 802.1Q Trunks

Lesson 3 Review

## **Preparing the Network to Support Cisco Unified Communications**

Voice VLANs

Configuring Voice VLANs

Verifying Voice VLAN Configuration

DHCP Service

DHCP Service Options on a Router

Phone Bootup

Configuring DHCP Service

Configuring DHCP Example

DHCP Relay Service

Configuring DHCP Relay Service

Example of DHCP Relay Service

Network Time Protocol

Configuring the Time

Example of Router Set to PST with Daylight Saving Time Enabled

IP Phone Firmware and XML Configuration Files

Firmware

Device Configuration XML File

Default XML File

Power Over Ethernet

PoE—Cisco Prestandard

PoE—802.3af

IP Address—DHCP Process

Registration—Known IP Phone

Registration—Out-of-Date IP Phone Firmware

Registration—Unknown IP Phone

Registration Flow Chart

Demo - Layer 2 Prep

Lesson 4 Review

### **Connecting a VoIP System to a Service Provider Network**

Gateways

Gateway Function—Example on Cisco Unified Communications Manager Express

Voice Ports

Call Legs

Dial Peers

Dial Peers Example—Voice Gateway 1

Dial Peers Example—Voice Gateway 2

POTS Dial Peers

Destination Pattern Options

VoIP Dial Peers

Matching Inbound Dial Peers

Default Dial Peer 0

Example—Dial Peer 0

Matching Outbound Dial Peers

Preference

Internet Telephony Service Providers

Lesson 5 Review

### **Understanding Call Setup and Digit Manipulation**

Digit Consumption and Forwarding

Digit Collection

Digit Manipulation Commands

Digit Manipulation Examples

Configuring Voice Translation Profiles

PLAR Connection  
Verifying Dial Plans  
Verifying Signaling for POTS Call Legs  
Verifying POTS Call Legs  
Verifying Digits Sent and Received on a POTS Call Legs  
Lesson 6 Review  
**Describing QoS**  
Quality of Service Defined  
Converged Networks: Network Before Convergence  
Converged Networks: Network After Convergence  
Converged Networks: Quality Issues  
Lack of Bandwidth  
End-to-End Delay  
Packet Loss  
QoS Traffic Requirements: Voice  
QoS Traffic Requirements: Video-Conferencing  
QoS Traffic Requirements: Data  
QoS Policy  
Step 1: Identify Traffic and Its Requirements  
Step 2: Divide the Traffic into Service Classes  
Step 3: Define Policies for Each Service Class  
Cisco AutoQoS  
Cisco AutoQoS Equipment Support  
Trust Boundaries  
Configuring Cisco VoIP AutoQoS: Routers  
Configuring Cisco VoIP AutoQoS: Cisco Catalyst Switches  
Lesson 7 Review  
Module 3 Review

## **Module 4 - Cisco Unified Communications Manager Express Implementation**

3h 23m

Cisco Unified Communications Manager Express Implementation

**Introducing Cisco Unified Communications Manager Express**

Key Features and Benefits

Key Features

Supported Platforms

Required Licensing and Software

Scalability and Memory Requirements

Seat Licenses

Cisco Unified IP Phones

Lesson 1 Review

**Defining Ephone-dn and Ephone**

Ephone and Ephone-dn Concepts

Ephone-dn Features

Configuring an Ephone-dn

Basic Ephone-dn Configuration

max-dn Command

Ephone Features

max-ephone Command

Configuring an Ephone

Button Separators  
Example: Basic Ephone Configuration  
Multiple Ephones  
Example: Configuration for Multiple Ephones  
Multiple Ephone-dns  
Ephone-dn Types  
Single-Line Ephone-dn  
Dual-Line Ephone-dn  
Dual-Number Ephone-dn  
Shared Ephone-dn  
Example: Shared Ephone-dn Configuration  
Multiple Ephone-dns on an Ephone  
Multiple Ephone-dns on One Ephone: huntstop channel Commands  
Example: Two Ephone-dns, One Number, Same Ephone  
Example: Configuration for Two  
Two Ephone-dns, One Number,  
Example: Configuration for Two Ephone-dns, One Number, Different Ephones  
Overlay Ephone-dn  
Example: Configuration for Overlay Ephone-dn  
Case Study: Overlay Sets  
Case Study: Overlay Sets (ephone-dns)  
Case Study: Overlay Sets (ephone)  
Lesson 2 Review

## **Configuring Cisco Unified Communications Manager Express to Support Endpoints**

Firmware  
Telephony Service Configuration  
Firmware Association  
Source IP and Port  
Automatic Registration  
Create XML Files  
Keepalive  
DID Configuration Commands  
Setup of Cisco Unified Communications Manager Express from the CLI  
Automated Deployment of Endpoints  
auto assign Command  
Example: auto assign Command  
Locale Parameters  
Router Configuration for Locale Parameters  
Date and Time Parameters  
Rebooting with the reset and restart Commands  
reset Command Configuration  
restart Command Configuration  
Troubleshooting Endpoint Overview  
Verify IP Addressing  
Verify Correct Firmware Files in Flash  
debug tftp events Command  
Verify Phone Firmware Installation  
Verify Locale-Specific Files  
Verify Cisco IP Phone Setup  
Verify Cisco Unified Communications Manager Express Phone Configuration

Lesson 3 Review

**Implementing Basic Voice Features**

Configuring MOH from a File

Forwarding a Call from an IP Phone

Configuring Call Forwarding

Transferring a Call from an IP Phone

Configuring Call Transfer

Call Park

Configuring Call Park

Call Park Examples

Intercom Example

intercom Command

Paging Function

Single Paging Group Commands

Single Paging Group Example

Combined Paging Group Command

Combined Paging Group Example

Call Pickup

Directed Call Pickup Example

Call Pickup (Cont.)

Local Call Pickup Example

Group Call Pickup Example

Call Blocking

Call Blocking Configuration

Example of Call Blocking

Call Blocking Exempt

Call Blocking Configuration Example

Accessing the Directory

Directory Commands

Acct Softkey

Lesson 4 Review

**Maintaining a Cisco Unified Communications Manager Express System**

Cisco Unified Communications Manager Express Files

Bundled Cisco Unified Communications Manager Express Files

Extracting a .tar File

Web-Based GUI

Cisco Unified Communication Manager Express GUI Prerequisite Tasks

Accessing the GUI

Cisco Unified Communications Manager Express Syslog Messages

Cisco Unified Communications Manager Express MIBs

Billing Support

Billing Support: AAA and Syslog Servers

Call Detail Record

Lesson 5 Review

Module 4 Review

**Module 5 - Cisco Unity Express Implementation**

Cisco Unity Express Implementation

**Introducing Cisco Unity Express**

Cisco Unity Express Positioning

1h 16m

Cisco Unity Express  
Voice-Mail Features  
Auto-Attendant Features  
Management Through the TUI  
Management Through the GUI and the CLI  
Example—GUI Screen  
Functions Available Through CLI Only  
Language Support  
Network Management Features  
Lesson 1 Review

### **Implementing Cisco Unity Express**

Cisco Unity Express Software Download  
Cisco Unity Express Software Download: Files Needed  
Clean Install of the Cisco Unity Express  
Cisco Unity Express Prerequisite Configuration  
Cisco Unified Communications Manager Express Prerequisite Configuration—IP Addresses  
Cisco Unified Communications Manager Express Prerequisite Configuration—Dial Peer  
Cisco Unified Communications Manager Express Prerequisite Configuration—Ephone-dn  
Cisco Unified Communications Manager Express Prerequisite Configuration Example  
Connecting to the Cisco Unity Express Module  
Restoring the Factory Defaults  
Initial Configuration  
Cisco Unity Express Initialization Wizard  
Cisco Unity Express Initialization Wizard Login Page  
Cisco Unity Express Initialization Wizard Entry Page  
Step 1: Cisco Unified Communications Manager Express Login  
Step 2: Importing Users  
Step 3: System Defaults  
Step 4: Call Handling  
Step 5: Commit  
Final Window: Committed Information  
Customizing Cisco Unity Express AutoAttendant  
Using the AvT to Record New Auto-Attendant Prompts  
System-Level Troubleshooting on Cisco Unified Communications Manager Express  
Interpreting debug Output on Cisco Unified Communications Manager Express  
Cisco Unified Communications Manager Express debug Commands  
System-Level Troubleshooting on Cisco Unified Communications Manager Express (Cont.)  
Cisco IOS debug Commands  
Lesson 2 Review  
Module 5 Review

## **Module 6 - Cisco Smart Business Communications System Implementation**

56m

Cisco Smart Business Communications System Implementation  
**Introducing the Cisco Smart Business Communications System**  
Cisco Smart Business Communications System Solution  
The Cisco Unified Communications 500 Series for Small Business  
Cisco Unified Communications 500 Series-8/16 User Configuration  
Cisco Unified Communications 500 Series-32/48 User Configuration  
Cisco Catalyst Express Switches  
Cisco Unified IP Phones

Telephony Features

Security Features

Wireless Features

Cisco Configuration Assistant

Cisco Smart Assist

Lesson 1 Review

### **Implementing the Cisco Smart Business Communications System Voice Features**

Cisco Smart Business Communications System Default Configuration

Installing Cisco Configuration Assistant

Device Setup Wizard—Step 1

Device Setup Wizard—Steps 2 and 3

Device Setup Wizard—Steps 4 and 5

Device Setup Wizard—Steps 6 and 7

Device Setup Wizard—Steps 8 and 9

Using the Cisco Configuration Assistant to Connect

Creating a Community

Connecting to a Device

Menus

Using the Topology View

Device Properties—IP Addresses

Device Properties—Host Name

Device Properties—System Time

Device Properties—Users and Passwords

Upgrading the System Files

File Management

Upgrading Firmware

Deleting Firmware

Voice Settings—Device Parameters

Voice Settings—System Parameters

Voice Settings—Network Parameters

Voice Settings—AA & Voice Mail

Voice Settings—SIP Trunk Parameters

Voice Settings—Voice Features Parameters

Voice Features—Dial Plan Parameters

Voice Settings—User Parameters

Lesson 2 Review

### **Implementing Additional Cisco Smart Business Communications System Features**

Port Settings

Security

VLANs

Smartports

Wireless

Routing

DHCP Server

Internet Connection

Saving the Configuration

Lesson 3 Review

### **Maintaining a Cisco Smart Business Communications System**

Monitoring

Event Notification

System Messages  
Filtering System Messages  
Backing Up the Configuration  
Restoring the Configuration  
Resetting to Factory Default  
Lesson 4 Review  
Module 6 Review  
Course Closure

**Total Duration:** 15h 20m