



Cisco Unified Communications System for Contact Center Release 9.0(1)

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CONTENTS

Home 1-1

- Welcome to the Cisco Unified Communications Contact Center Technical Information Site 1-1
 - The Critical Path to Successful Deployment 1-1
 - Audience 1-1
 - About This Release 1-2
 - Using This Information System 1-2
 - Cisco Documentation 1-5
 - Site Content Map 1-6

Prepare 2-1

- Introduction to Prepare 2-1
- Cisco Unified Communications Features and Benefits Overview 2-1
 - Service Offerings 2-2
 - Career Certifications 2-3
 - Solution Bundling 2-3
 - Intelligent Information Network 2-3
 - Business Productivity Applications 2-4
 - Customer Interaction Network 2-4
 - IP Communications 2-5
 - Security 2-6
 - Network Management 2-6
 - Deployment and Migration 2-7
- Contact Center Overview 2-7
 - Contact Center Deployment Models 2-9
 - System Features in This Release 2-10
- Additional Sites and Services 2-11

Plan 3-1

- Introduction to Plan 3-1
- Planning Concepts 3-1
 - Deployment Types 3-2
 - Cost of Ownership 3-3
 - Redundancy 3-3
 - Capacity and QoS 3-3

- Security 3-4
- Define Case Studies 3-5
- Understand Your Call Flows 3-7
- Planning Tasks 3-7
 - Determine Your Business Requirements 3-7
 - Use Planning Tools and Templates 3-9
 - Understand Your Deployment Options 3-10
 - Identify System Components 3-10
 - Collect and Analyze Data 3-11
 - Create High-Level Design 3-11
 - Plan and Prepare for Your System Installation 3-11
 - Plan and Prepare for Your System Upgrade 3-12
- Additional Sites and Services 3-13
 - Cisco Unified Communications System Demos 3-13
- Design 4-1**
 - Introduction to Design 4-1
 - Design Concepts 4-2
 - Using SRND Documents 4-2
 - Using Design Tools and Templates 4-3
 - Design Tasks 4-3
 - Identify the Components That You Need 4-4
 - Review Tested Deployment Models 4-5
 - Review System Caveats 4-6
 - Review System Test Results 4-6
 - Develop Traffic Engineering Specifications 4-6
 - Define Security Policies 4-7
 - Define Failover Behavior 4-7
 - Additional Sites and Services 4-8
- Implement 5-1**
 - Introduction to Implementation 5-1
 - Order Equipment 5-2
 - Install and Configure System Components 5-2
 - Performing Your System Installation 5-3
 - Component Installation and Configuration Guides 5-3
 - Installation and Configuration Checklists 5-10
 - Component Compatibility and Interoperability 5-11
 - Software Versions and System Caveats 5-11

Call Flow Configuration Examples	5-11
Introduction to Troubleshooting	5-11
System Troubleshooting Methodology	5-12
Preparing Your Network for Troubleshooting and Recovery	5-21
Conduct User Acceptance Test	5-25
Additional Sites and Services	5-26
Operate	6-1
Introduction to Operating the System	6-1
Managing Your System	6-1
Backing Up and Restoring Components	6-3
Cisco Unified Communications Manager	6-3
Cisco Unified Contact Express and Unified IP IVR	6-4
Cisco Unified Intelligent Contact Management Enterprise	6-4
Cisco Unified Presence	6-4
Using Network Monitoring Tools	6-4
Cisco Unified Operations Manager	6-4
Using Managed Services Documents	6-6
Operating Contact Center Systems	6-6
Test Bed 1	6-6
Test Bed 2	6-6
Test Bed 3	6-7
Failover and Redundancy	6-7
Troubleshooting Daily Operations	6-7
Common Problems Reported by Users	6-7
Failover and Recovery Procedures	6-13
Additional Sites and Services	6-13
Optimize	7-1
Optimizing Your System	7-1
Performing Your System Upgrade	7-1
Failover and Redundancy	7-2
Additional Sites and Services	7-2
Resource Library	8-1
Using the Resource Library	8-1
System Release Documentation	8-1
System Description	8-2
System Release Notes	8-2

- System Installation and Upgrade Manual 8-2
 - System Test Results 8-2
- Solution Reference Network Design 8-4
- Tested Deployment and Site Models 8-4
- Network Topology Diagrams 8-5
- Component Resources 8-9
 - Component Resources Documentation 8-9
 - Configuration Command Files 8-16
- Unified Communications Demos 8-19
- System Compatibility Tool 8-19
- Ordering Guides 8-19
- End-of-Sale and End-of-Life Products 8-19
- Cisco Unified Workspace Licensing 8-20
- Documentation Wiki 8-20

- Training Library 9-1**
 - Using the Training Library 9-1
 - General Training 9-1
 - Training Available to Partners 9-1
 - Training Available to Cisco Employees 9-3

INDEX



CHAPTER 1

Home

Welcome to the Cisco Unified Communications Contact Center Technical Information Site

This information site describes the Cisco Unified Communications contact center system, the Cisco IP solution for distributed contact center applications. The contact center system is an integral part of the Cisco Unified Communications solution. Cisco Unified Communications products provide enterprise-class solutions that integrate data and voice over converged networks.

This site contains system documentation that is presented in the network lifecycle process: Prepare, Plan, Design, Implement, Operate, and Optimize (PPDIOO). PPDIOO is a Cisco methodology that defines the continuous lifecycle of services that are required by the customer.

Each part of the network lifecycle process has a tab at the top of the page. When you click a tab, the table of contents (TOC) on the left navigation panel changes to show only the TOC for that tab. The opening page on each tab describes what is covered in that phase. You can also use the Index at the bottom of every TOC. To learn more about how to navigate through this site, see [Using This Information System](#).

You can also quickly access additional resources in the Resource Library and Training Library.

The Critical Path to Successful Deployment

The PPDIOO process is the critical path to launch and complete a successful customer deployment, from the request for information (RFI) proposal to successful training of operations personnel. The Cisco Unified Communications system documentation is designed to be used along with the PPDIOO methodology. Each tab on the web interface contains a complete task flow for each phase of the PPDIOO process. The [Site Content Map](#) shows you what type of content you will find on each process tab.

Audience

This technical information site is designed for people who are implementing the Cisco Unified Communications System:

- Cisco partners
- Cisco system engineers (SEs)
- Cisco Technical Assistance Center (TAC) engineers
- Cisco customers, especially decision makers, network designers, and operations personnel

About This Release

This documentation covers Cisco Unified Communications system applications through Release 9.0(1). If you are upgrading an existing Cisco Unified Communications system application, begin by reading the [System Release Notes for Contact Center: Cisco Unified Communications System, Release 9.0\(1\)](#) to familiarize yourself with functionality in this new release.

There are two information sites for Cisco Unified Communications Release 9.0(1): this site, for contact center systems and the site for [Cisco Unified Communications for IP Telephony](#) systems.

Using This Information System

This information system is designed to give you an easily navigable framework for accessing all documentation for your system, solution, or product. The following topics describe using the information system:

- [About the Technical Information Site Window](#)
- [Types of Topics](#)
- [Site Index](#)
- [Graphics with Hotspots and Popup Text \(Image Maps\)](#)
- [Where Information Is Located](#)
- [About the Secondary Browser Window](#)
- [Tips on Navigating the Information Site](#)

**Note**

Make sure your browser does not block popup windows for this site. If a popup link fails to open, check your browser settings. Alternatively, press **Ctrl** when you click the link to override your browser's settings.

About the Technical Information Site Window

The window is laid out so that you can easily navigate between topics, drill down to get detailed information, and directly access product and platform documentation, without ever losing your place or having to cope with a complex hierarchy of windows.

[Figure 1-1](#) shows an example of a window for a Cisco Unified Communications System solution. [Table 1-1](#) describes the numbered window elements.

Figure 1-1 Example of Technical Information Site Window

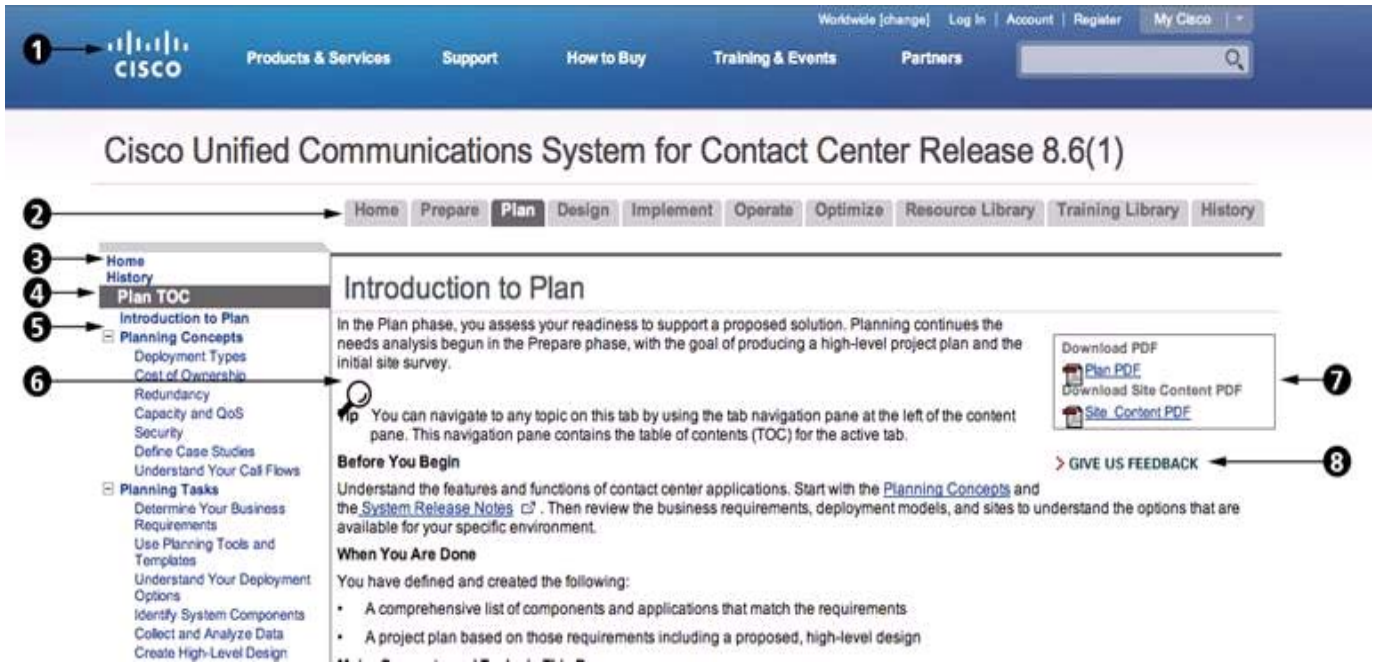



Table 1-1 Key to Window Illustration

1	Cisco logo. Click to go to the Cisco.com home page. Click the browser Back button to return to the information site window.	2	Tabs for global navigation between processes or other major categories. Click a tab to go to the home page for that tab. The table of contents (TOC) changes showing topics specific to that tab. The first content pane on a tab shows an overview of what is on the tab and the tasks and concepts covered.
3	Access-from-anywhere links to Home (main Unified Communications System Documentation page) and History.	4	TOC for navigation within a tab. The TOC changes when you click a different tab, or when you click a link that goes to a topic on a different tab. Click the Index link at the bottom of the TOC if you are not sure where to find a topic.

Table 1-1 Key to Window Illustration (continued)

5	<p>Main heading in a TOC, such as “Introduction to Plan.” A blue heading links to a topic in the content pane. A black heading is unlinked and simply a title for linked subtopics below.</p> <p>A highlighted heading in the TOC indicates the current topic displayed in the content pane.</p>	6	<p>Content pane, where the information resides. Two kinds of links in the content pane are:</p> <ul style="list-style-type: none"> • A link to another topic in the content pane looks like an ordinary link. Clicking the link switches the contents of the pane. • A link to a secondary topic is appended with a popup icon . Clicking the link opens a new browser window, offset from the current window. If the other window is already open, the topic replaces the current contents.
7	<p>Download an Adobe Acrobat PDF of the content of the current tab or the content of the entire site.</p>	8	<p>GIVE US FEEDBACK: Click to go the Feedback form at the bottom of the page to provide page-specific feedback.</p>

Types of Topics

When you see a reference to a topic, you can tell what type of topic it is by its name:

- “Doing” topics, such as “Performing a System Upgrade,” are *task topics*, and provide instructions for doing something.
- “Overview” or “About” topics are *concept topics* to help you understand and plan your deployment and carry out tasks knowledgeably.

Some tabs may group topics under headings such as “Planning Concepts” and “Planning Tasks.”

Site Index

Click the Index link at the bottom of a TOC to view a hyperlinked index to all the topics in the information site. Use this index if you are not sure where to find a topic.

If a topic appears only once in the site, the index displays the entry as a clickable link. If a topic appears more than once, the entry is followed by clickable numbers linked to successive occurrences, similar to a series of page numbers in a printed index. For example,

Visio diagrams, [1](#), [2](#)




Click 1 to go to the first occurrence, click 2 to go to the second. You can use the browser Back button to return to your place in the index.

Graphics with Hotspots and Popup Text (Image Maps)


Some graphics may be image maps. An image map may have hotspots that you can run your pointer over to view a popup description or that you can click to open a linked topic in a secondary window.

Where Information Is Located

Cisco systems and solutions encompass a range of products and technologies, and their documentation encompasses information that may reside in several locations:

- Overviews and high-level process and procedure information specific to your solution or system are included directly in the information site.
- Product and technology overviews, detailed requirements, task details, and other more generic topics are located outside the site. These topics have the appearance of standard Cisco documentation with which you may already be familiar. Links to these topics appear with a popup icon  appended, for example, [Performing Your System Installation](#) . Clicking the link opens the topic in a new, secondary browser window offset from the current window, rather than replacing the current topic in the content pane. You can click the link to view the information when you need it, and then return to your place in the information site.
- Links with this symbol () are available only to people with a Cisco login, such as Cisco partners or registered Cisco.com users with a [Cisco service contract](#). After clicking the link, log in when prompted. A secondary browser window opens. Keep the secondary window open in order to open other links without having to log in again.
- Links with **[Internal]** are available only to Cisco employees.

About the Secondary Browser Window

When a topic like [Performing Your System Installation](#) opens in a new, secondary browser window, that window stays open until you close it. (Click the **Close** button or choose **File > Close**.) If the window is open when you click another  link, the new topic replaces the current one. You can use the browser Back button if you want to retrace your steps in the secondary window.

Tips on Navigating the Information Site

- Use tabs to navigate between major process areas.
- Use the TOC at the left of the site window to navigate to major topics on a tab.
- In a secondary popup window:
 - When you are done with the window, click the **Close** button to close it. (It does not close automatically.)
 - You can go back to a previous topic by right-clicking and clicking **Back**.
 - You can view normal browser toolbars, the address bar, and any other browser items that you do not see by using commands on the View menu.
- Use the Index (click the link at the bottom of any TOC) if you are not sure where to find a topic.

Cisco Documentation

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS version 2.0.

Site Content Map

The Site Content Map shows the content on each process tab in this technical information site.

Prepare	Plan	Design	Implement	Operate	Optimize
System definition	Deployment types	Design documents	Order Equipment	System management tasks	Upgrade procedures
Contact center overview	Determine business requirements	Design tools and templates	Installation procedures	Backup and restore procedures	Failover options
Contact center deployment models	Planning tools and templates	Identify components	Component installation and configuration guides	Network Monitoring Tools	
System features	Deployment options	Tested deployment models	Installation and configuration checklists	Tested call flows	
	Plan and prepare system installation	System caveats	Component compatibility and interoperability	Troubleshoot common problems	
	Plan and prepare system upgrades	System test results	Configuration examples	Resource Library	Training Library
		Traffic engineering specifications	Introduction to troubleshooting methodology	System release documentation	General training
		Security policies		SRNDs	Training for partners
				System test results	Internal training
				Network topologies	
				Component resources documentation	
				Configuration command files	
				Ordering guides	
				Unified Communications demos	
				EOS and EOL information	
				Cisco Unified Workspace Licensing	
				DocWiki	



CHAPTER 2

Prepare

Introduction to Prepare

In the Prepare phase, you evaluate Cisco technologies that address your business needs. Gather information about your business and technical environment that will feed into the high-level design. Create a business case for the contact center solution that provides the best return on your investment.



Tip

You can navigate to any topic on this tab by using the tab navigation pane at the left of the content pane. This navigation pane contains the table of contents (TOC) for the active tab.

Before You Begin

Understand the features and functions of contact center applications. Start with the high-level information in the [Cisco Unified Communications Features and Benefits Overview](#) and the [Contact Center Overview](#), and then proceed to the more detailed and Unified Communications release-specific information in the [System Release Notes](#).

When You Are Done

You have defined and created the following:

- Your business and system requirements
- A basic list of components and applications that match the requirements

Major Concepts and Tasks in This Process

- [Cisco Unified Communications Features and Benefits Overview](#)
- [Contact Center Overview](#)

Cisco Unified Communications Features and Benefits Overview

The Cisco Unified Communications 9.0(1) system securely integrates voice, video, and other collaborative data applications into intelligent network communications solutions. This system, which includes IP telephony, unified communications, rich-media conferencing, IP video broadcasting, and customer contact solutions, takes full advantage of the power, resiliency, and flexibility of an IP network. The elements of this system were designed, developed, documented, and tested as part of a comprehensive, end-to-end Unified Communications System.

The Cisco Unified Communications system reduces the cost and complexity associated with managing multiple and remote sites, meets stringent quality of service (QoS) requirements, and provides optimal availability and security when deployed as part of a converged network. In addition, the solution interoperates with existing time-division multiplexing (TDM)-based systems and enterprise business applications, allowing organizations to migrate to full-featured IP communications while maintaining existing technology investments.

This topic provides an overview of the key features and benefits of Cisco Unified Communications. It includes these sections:

- [System Definition](#)
- [Service Offerings](#)
- [Career Certifications](#)
- [Solution Bundling](#)
- [Intelligent Information Network](#)
- [Business Productivity Applications](#)
- [Customer Interaction Network](#)
- [IP Communications](#)
- [Security](#)
- [Network Management](#)
- [Deployment and Migration](#)

System Definition

The Cisco Unified Communications system is designed for a single, secure, converged network. Part of an integrated, comprehensive Cisco architecture, the communications applications reside “in” the network, not “on” the network, and can easily incorporate emerging business processes, applications, and new devices. Applications can be deployed in a single instance, rather than in multiple instances, and managed services offerings further increase deployment flexibility. Standards-based Cisco Unified Communications products let organizations migrate based on business needs, not technical limitations, to keep pace with new technology.

The Cisco Unified Communications system offers the following solutions:

- Enterprise solution for large businesses, which supports 30,000 users with Cisco Unified Communications Manager as the call processing component.
- Mid-market solution, with support for up to 1000 users and 1200 phones with Cisco Unified Communications Manager Business Edition 6000 as the call processing component.
- Mid-market solution, with support for up to 500 users and 575 phones with Cisco Unified Communications Manager Business Edition 5000 as the call processing component.
- Mid-market solution, with support for up to 300 users and 400 phones with Cisco Unified Communications Manager Business Edition 3000 as the call processing component.
- Small and medium sized solution, with support for up to 450 users (depending on IOS platform) with Cisco Unified Communications Manager Express as the call processing component.

The Cisco Unified Communications System also includes a suite of network management applications that allow you to monitor, manage, and troubleshoot your system. It also includes tools that allow you to analyze the readiness of your infrastructure to support the Unified Communications system.

Service Offerings

Using the Cisco Lifecycle Services approach, Cisco Systems and its partners offer a broad portfolio of end-to-end services. These services are based on proven methodologies for deploying, operating, and optimizing Unified Communications solutions. Planning and design services, for example, can help you meet aggressive deployment schedules and minimize network disruption during implementation. Operate services reduce the risk of communications downtime with expert technical support. Optimize services enhance solution performance for operational excellence. Cisco and its partners offer a system-level service and support approach that can help you create and maintain a resilient, converged network that meets your business needs.

Cisco Unified Communications service offerings include:

- Cisco Unified Communications Software Subscription, which allows you to purchase major software version upgrades of various Cisco Unified Communications products at a reduced cost through a one-, two-, or three-year subscription.
- Cisco Unified Communications Essential Operate Service, which provides 24-hour, 365-day-a-year access to Cisco Systems engineers and certified partners who are highly trained and have a deep understanding of Cisco Unified Communications products and technologies.
- Cisco Unified Communications Select Operate Service, which provides a proactive support solution that combines 24-hour, 365-day-a-year access to technical support representatives plus a simple-to-install monitoring solution designed for Cisco Unified Communications.
- Cisco Unified Communications SMB Network Operate & Optimize Service, is a partner-led service offering (designed specifically for the medium-sized businesses) that enables the delivery of affordable, ongoing, high-availability network support.

Career Certifications

The Cisco Certified Network Professional Voice (formerly CCVP) certification and related certifications are designed for IT professionals who are responsible for integrating voice technology into underlying network architectures. Individuals who earn a CCNP Voice certification can help create a telephony solution that is transparent, scalable, and manageable. A CCNP Voice certification validates a robust set of skills in implementing, operating, configuring, and troubleshooting a converged IP network. The certification content focuses on many components of the Cisco Unified Communications system, including Cisco Unified Communications Manager, quality of service (QoS), gateways, gatekeepers, IP phones, voice applications, and utilities on Cisco routers and Cisco Catalyst switches.

Solution Bundling

In addition to providing traditional solution ordering, where you choose the individual components and quantities that you require, the Cisco Unified Communications system provides flexible bundling options. A bundled solution simplifies the way in which you order applications and services and makes it easy to add options.

Intelligent Information Network

The Cisco Intelligent Information Network facilitates the evolution of networking to systems. It allows the network to be used as a strategic asset and provides capabilities that include:

- Cisco Discovery Protocol (CDP)—A simple broadcast protocol that devices use to advertise their presence, it operates in the background and facilitates communication between a Cisco Unified IP Phone plugged into a network and the network switch.
- QoS—Cisco provides an end-to-end solution to ensure quality of service. QoS starts at the phone and LAN distribution layer, where packets are classified and marked as high priority traffic. Traffic markings originating from Cisco Unified IP Phones are automatically trusted by the Cisco switch infrastructure, which typically remarks traffic from nontrusted end user workstations. Configuration is made easier through Cisco AutoQoS, which automatically handles a range of tasks traditionally done manually, including classifying applications, generating policies, configuring the proper QoS configurations, monitoring and reporting to test QoS effectiveness, and enforcing service-level consistency.

As traffic flows through the access layer, priority queuing and buffer management ensure that real-time traffic is prioritized over less time-critical data. Where bandwidth is most restricted, across the WAN, the Cisco solution provides RSVP for reserving the bandwidth needed for voice. Fragmentation and interleaving of large blocks of data ensure a steady stream of voice traffic, and voice packet header compression minimizes bandwidth consumed.

- VLAN—When a Cisco Unified IP Phone boots up on the IP network, it advertises its presence using CDP, and it requests an IP address lease from a DHCP server. The Cisco LAN switch learns of the new phones via CDP and automatically reconfigures to add that port to the VLAN used for voice. With this feature, the LAN infrastructure can distinguish a phone from a PC and does not require manual configuration every time a phone is added, moved, or removed.
- Wireless—Cisco wireless access points allow Cisco wireless phone users to roam a campus without losing voice connectivity. If a user roams to a different site, the system will discover the new physical location for emergency 911 information purposes.
- Power over Ethernet (POE)—Eliminates the need for local power connections for every phone. Cisco switches can be configured with redundant power supplies connected to uninterruptible power supplies in a data center to ensure that the power to the phone is preserved, even when local power for other equipment at the desk is lost. Most Cisco Unified IP Phone models support the industry-standard 802.3af power and the Cisco pre-standard inline power.
- Gigabit Ethernet (GigE)—Allows certain Cisco Unified IP Phone models to take advantage of the emerging Gigabit Ethernet LAN infrastructure.

Business Productivity Applications

The Cisco Unified Communications system provides a wide array of applications that enhance business and organizational productivity and efficiency. These applications offer capabilities that include:

- Rich-media conferencing—Cisco Unified MeetingPlace provides intuitive interfaces for setting up, attending, and managing meetings. Extensive voice, video, and web conferencing capabilities enable a range of meeting applications, including highly-collaborative meetings, training sessions, and presentations.
- Messaging—For midsize organizations, Cisco Unity Connection provides voice messaging, speech recognition, call routing rules, and desktop PC message access in a system that is easy to manage and deploy. For small organizations, Cisco Unity Express offers a voice messaging solution that integrates with your router.
- Common interface—Cisco Unified Personal Communicator is a presence-based desktop application that provides a focal point for phone services, directory services, video, call management, presence, messaging, and web conferencing. The integrated applications include Cisco Unified

Communications Manager (Unified CM), Cisco Unified Communications Manager IM and Presence Service (formerly Cisco Unified Presence), Cisco Unity Connection, Cisco Unified MeetingPlace, and the Lightweight Directory Access Protocol (LDAP) version 3 (v3) server.

Unified Communications Manager IM and Presence Service—The focal point of all status processing, including attributes and capabilities. It links the various knowledge within each application to provide a ubiquitous and broad view of a defined user within the Cisco Unified Communications system.

Customer Interaction Network

The Cisco Customer Interaction Network component provides a single, integrated platform for all contact center locations. It is a distributed, IP-based customer-service infrastructure that easily integrates with legacy contact center platforms and networks, providing multi-channel services and integration with customer relationship management applications.

- Intelligent contact routing and multi-channel automatic call distribution (ACD)—Enables interaction with customers via phone (inbound or outbound), video, web, e-mail or chat. The application provides call handling tailored to different classes of customers and to individual customers, providing flexible contact center operational profiles based on varying business needs.
- Voice, Video, and web self-service—Extracts and parses web content and presents this data to customers through a telephony interface, allowing simple transactional requests to be handled by the interactive voice response (IVR) system instead of by agents. This application provides self-service automation with automatic speech recognition (ASR) and TTS. It also performs *prompt-and-collect* functions to obtain user data such as passwords or account identification that it can then pass to contact center agents, and it delivers proactive notification users through e-mail, fax, pager, and short message service (SMS).
- Agent and supervisor options—Provide full support for agent or supervisor interaction using chat capabilities. Instant messaging offers the capability to communicate with any or all the agents on a supervisor's team. Other options include:
 - Agent status monitoring
 - Agent Greeting
 - Whisper Announcement
 - Mobile agent deployment
 - Silent monitoring
 - Barge-in
 - Intercept
 - Real-time and historical reporting
 - ACD

IP Communications

IP communications provides powerful and efficient voice, data, and video communications, and related capabilities. Key features include:

- Video telephony—Allows video calls to be placed and received over an IP telephony network using the familiar phone interface. Video endpoints support common call features such as forward, transfer, conference, and hold. Use of a single infrastructure also enables a unified dial plan and user

directory for voice and video calls. This release of the Cisco Unified Communications system also includes Cisco Unified Conferencing for TelePresence, which is a new technology that combines rich audio, high-definition video, and interactive elements to deliver a unique in-person experience.

- Mobility—Provides for several forms of user mobility, including:
 - Extension Mobility—Allows users to access any phone within a Cisco Unified Communications deployment as their own, by simply logging in to the phone. After log in, the phone assumes all of the user profile information, including line numbers, speed dials and service links.
 - Site/campus mobility—Allows users to access the Cisco Unified Communications network through the wireless Cisco Unified Wireless IP Phones 7921G, 7925G and 7925-EX. In addition, this release includes enhanced mobile IP phone applications that allow users to:
 - Dynamically manage how and when mobile calls take place
 - Intelligently screen calls based on urgency, subject matter, and caller identity
 - Identify which users are available to talk and which users choose not to be disturbed
 - Increase accessibility of corporate calendar and contact information from mobile phones.

Emergency caller response/safety and security—Enables emergency calls in an IP network to be directed to the appropriate Public Safety Answering Point (PSAP). In this way, emergency agencies can identify the location of 911 callers without a system administrator needing to keep location information current.

Security

The Cisco Unified Communications system takes a layered approach to protecting against various attacks, including denial of service (DOS), privacy, and toll fraud. Security features include:

- Encryption of signaling and media—Ensures that the signaling and the actual phone conversations are protected against unintended interception by third parties.
- Catalyst Integrated Security Features (CISF)—Includes private VLANs, port security, DHCP snooping, IPSource Guard, secure Address Resolution Protocol (ARP) detection, and dynamic ARP inspection. These features protect the network against attacks such as man-in-the-middle attacks and other spoofing.
- Integration with firewalls—Ensures that system platforms are accessible only by authorized devices. The firewall acts as a guardian between all IP devices and the Cisco Unified Communications system platforms, ensuring that only specific transactions are allowed.
- Secure platforms—Provides features, such as host-based intrusion detection, optional security scripts, and anti-virus software, that ensure that the platform is hardened against intruders and malicious code.

Enhanced phone security features—Provides configurable levels of security. Options include configuring the phone to ignore Gratuitous Address Resolution Protocol (GARP) requests, disabling the PC port on the phone, disabling access to network configuration settings on a phone, and configuring a phone to accept only digitally signed firmware images.

Network Management

The Cisco Unified Communications system uses the following network management products to monitor the various devices deployed in the Unified Communications system:

- Cisco Unified Operations Manager—With real-time, graphical service-level views of the entire Cisco Unified Communications infrastructure, Cisco Unified Operations Manager facilitates efficient operations. It monitors the network using built-in rules, diagnoses problems, tracks changes to Cisco Unified IP Phone status, and tracks inventory of Unified Communications devices and IP phones. It provides contextual diagnostic tools to facilitate rapid troubleshooting and fault isolation. Service-level, real-time alerting and reporting is built in; in conjunction with Cisco Unified Service Monitor, it also supports alerts and reports on service quality.
- Cisco Unified Provisioning Manager—With automated processes for initial deployment and “day-2” moves, adds, and changes, Cisco Unified Provisioning Manager reduces both initial and ongoing costs of Unified Communications deployments. It is highly scalable, with batch provisioning that facilitates automated rollout to large numbers of subscribers and therefore reducing deployment time. Templates allow administrators define policy-based configurations for both initial deployment and ongoing administration to simplify and reduce the time to configure and change users.
- Cisco Unified Service Statistics Manager—With Cisco Unified Service Statistics Manager, operations personnel can generate call volume, service availability, call quality, and resource utilization reports with trending over time to identify growing operational issues before they become service-affecting. Historical reports improve security by identifying unusual call activity and can help reduce or eliminate costs associated with fraud. Utilization and capacity trend reports enable capacity planners to identify under utilized trunks, gateways and other resources to reduce costs.
- Cisco Unified Service Monitor—By supporting real-time tracking, evaluation, and reports about user experience metrics such as delay, loss, and jitter, Cisco Unified Service Monitor helps service providers achieve high user satisfaction and call quality. It measures service quality and calculates reports associated with active calls on the system. Administrators can establish alert thresholds based on device and codec types. Call quality metrics gathered from Cisco Unified IP Phones, Network Analysis Modules (NAMs) or 1040 sensors are available to Cisco Unified Operations Manager for alerting and to Cisco Unified Service Statistics Manager for capacity planning and trending.

Deployment and Migration

The Cisco Unified Communications system is designed to be deployed efficiently and effectively. The solution offers:

- Flexible deployment models—Cisco Unified Communications supports LAN and WAN connectivity and can be configured for single-site or multi-site networks. Headquarters, contact centers, branch offices, and telecommuter configurations can be interconnected without geographic constraints. Call processing and administration can be centralized or distributed.
- Integration with existing equipment and networks—Cisco Unified Communications provides gateway support to enable integration and interoperability with existing call processing equipment, phones, and TDM networks. This capability ensures compatibility with and migration from legacy systems, and supports:
 - Integration with PBXs through QSIG, Digital Private Network Signaling System (DPNSS), and PRI links
 - Integration with ACD platforms via CTI interface
 - Integration with legacy phones through gateways
 - Integration with TDM networks through gateways via T1, E1, and PRI links

- Open IP connectivity through SIP—Cisco Unified Communications provides enhanced support for SIP trunking and to a variety of SIP endpoints. An integrated Cisco Unified Presence provides user information and status and enables interconnection to popular messaging networks.

High availability—Cisco Unified Communications networks can be built to meet high availability requirements as business needs dictate. Networks can be designed to ensure no single point of failure in either network topology or applications. Cisco Unified Survivable Remote Site Telephony (SRST) allows remote branch offices to remain in service even when the WAN access link is lost. Cisco Survivable Remote Site Voicemail (SRSV) provides backup voicemail service in the centralized messaging and centralized call processing deployment.

Contact Center Overview

Contact center components are an integral part of Cisco Unified Communications family of products. The contact center functionality delivers intelligent contact routing, call treatment, network-to-desktop computer telephony integration (CTI), and multi-channel contact management over an IP infrastructure to call center agents anywhere in the enterprise.

The Cisco IP network infrastructure also permits rapid deployment of emerging applications such as desktop IP telephony, unified messaging, video telephony, desktop collaboration, and enterprise application integration with IP phone displays.

By combining multi-channel automatic call distributor (ACD) functionality with IP telephony in a unified solution, contact center products help to rapidly deploy a distributed contact center infrastructure. Contact center software profiles each customer using contact-related data such as dialed number and caller-entered digits (CED) and, simultaneously, monitors the resources at contact center to meet customer needs, including agent skills and availability, queue lengths, expected delay and so on. This combination of customer and contact center data is processed through user-defined routing scripts that graphically reflect a company's business rules, thus enabling contact center software to route each contact to the optimum resource anywhere in the enterprise.

Contact center software enables companies to deploy a complete network-to-desktop CTI strategy, including comprehensive capability at the agent's workstation. A contact center system delivers a uniquely rich set of data to business applications, providing enterprise-wide call-event and customer-profile information to a targeted agent's desktop.

As part of the Cisco Unified Communications system, Cisco Unified Contact Center Enterprise solutions enable organizations to create unique customer-centric experiences. By combining network elements with unified communications and customer contact applications, contact centers can readily handle large volumes of customer interactions, whether voice phone calls, video, email, or Web-based communications, to provide superior customer service.

The comprehensive portfolio of Cisco customer contact solutions, including Cisco Unified Intelligent Contact Management Enterprise (Unified ICME) and Cisco Unified Contact Center Enterprise (Unified CCE) offers more efficient, effective, and accurate service, resulting in increased customer satisfaction. Contacts are routed to the most appropriate agent, based on business rules and objectives. Advanced computer telephony integration capabilities provide call event and customer profile information to an agent's desktop. With the flexibility afforded by products such as the Cisco Unified Mobile Agent (Unified Mobile Agent), agents can work from home or while traveling.

With voice self-service solutions, including Cisco Unified Customer Voice Portal (Unified CVP), Cisco Unified Contact Center Express (Unified CCX) and Cisco Unified IP Interactive Voice Response (Unified IP IVR), many calls do not require agent assistance. Cisco voice self-service solutions use automated speech recognition (ASR) and text-to-speech (TTS) capabilities to enable callers to obtain

personalized answers to increasingly complex questions and conduct business in new and innovative ways. Customers can, for example, pay bills, order products, and track deliveries—all without the costs of interacting with a live agent. The open architecture of Unified CVP allows callers to access content also used in Web-based interactions, resulting in a consistent customer experience, regardless of the self-service media channel.

Cisco Unified Intelligence Center (Unified Intelligence Center) offers both a web-based Reporting application and an Administration interface. The Reporting application is designed for use with report templates that are populated by the report databases of Unified Contact Center Enterprise and Unified Customer Voice Portal. The Administration interface supports the Operations, Administration, Maintenance, and Provisioning (OAMP) of the Reporting application.

Cisco MediaSense is a media recording platform that can be used by compliance recording companies whose regulatory environment requires all conversations to be recorded and maintained.

The following Cisco hardware and software components make up a complete contact center deployment:

- Cisco Unified Communications Manager (Unified Communications Manager) for call routing
- Cisco Unified Intelligent Contact Management Enterprise (Unified ICME) software for contact center routing and agent management
- Cisco Unified IP Integrated Voice Response (Unified IP IVR) or Cisco Unified Customer Voice Portal (Unified CVP) for queuing and self-service
- Cisco Unified Border Element for session border controller (SBC), providing voice and video connectivity from the enterprise IP network to Service Provider SIP trunks.
- Cisco Finesse agent and supervisor desktop
- Cisco Agent Desktop (CAD) or Computer Telephony Integration Object Server (CTI OS) for agent desktop software
- Unified Intelligence Center for web-based reporting and administration
- Cisco MediaSense for media recording capabilities
- Cisco Unified IP Phones
- Cisco gateways and gatekeepers
- Cisco LAN/WAN infrastructure and components
- Cisco security components
- Network management tools
- Video components and endpoints

For more information on contact center features, go to [System Features in This Release](#).

Contact Center Deployment Models

A Cisco Unified Communications contact center system supports the deployment models in [Table 2-1](#).

Table 2-1 *Contact Center Deployment Models*

Deployment Model	Description
Single-Site Model	This model is designed for autonomous offices in which most or all employees are IPC users. This model can support up to 30,000 users.
Multisite Centralized Call Processing Model	This model is designed for distributed operations with a large central or headquarters site and multiple remote or branch sites. This model can support up to a total of 30,000 phones distributed among up to a maximum of 1000 sites. Based upon the bandwidth available, each site can support any number of users up to the overall total of 30,000 phones.
Multisite Distributed Call Processing Model	This model is designed for organizations with large user populations or large numbers of geographically distributed sites resulting in the need for more than a single call processing entity. This model is suited for deployments that require multiple Cisco Unified Communications Manager clusters or Cisco Unified Communications Manager Express platforms. Each call processing entity in this model is configured as a Single-Site Model or Multisite Centralized Call Processing Model and each has a common dial plan and feature set.
Clustering Over IP WAN Call Processing Model	This model is designed for organizations with large user populations across multiple sites that are connected by an IP WAN with the QoS features enabled. It supports the Local Failover Deployment Model and the Remote Failover Deployment Model.

System Features in This Release

The Cisco contact center system is a portion of the end-to-end system release for enterprise Cisco Unified Communications, which integrates telephony, conferencing, messaging, and contact center products for enterprise IP customers in a variety of deployment models using SIP and SCCP endpoints over IP networks. Cisco Unified Communications is centered on the latest Unified Communications Manager release.

For detailed contact center feature information, see the [System Release Notes for Contact Center: Cisco Unified Communications System, Release 9.0\(1\)](#). For configuration options, see [Release Notes for Cisco Unified Contact Center Enterprise Release 9.0\(1\)](#).

Base Components and Applications

The contact center includes these software components:

- Cisco Unified Communications Manager—Provides scalable, distributable, and highly available enterprise IP telephony call-processing capabilities.

- Cisco Unified Intelligent Contact Management Enterprise (Unified ICME)—Provides ACD functionality that includes monitoring and control of agent state, routing and queuing contacts, CTI capabilities, real-time data, and historical reporting.
- Cisco Unified Contact Center Enterprise (Unified CCE)—Creates an IP-based contact management solution that provides intelligent call routing, network-to-desktop CTI, and multimedia contact management.
- Cisco Unified Contact Center Express (Unified CCX)—Provides a multimedia (voice, data, and web), IP-enabled customer-care application environment that enhances the efficiency of contact centers. It provides an Integrated Automatic Call Distribution (ACD), Unified IP IVR, and Computer Telephony Integration (CTI) virtual contact center solution with support for up to 300 agents and 300 Unified ports.
- Cisco Agent Desktop (CAD)—Provides productivity tools for agents and supervisors. Allows supervisors to view agent states and call information and to send text messages to agents, record conversations, and provide advanced monitoring functions.
- Computer Telephony Integration Object Server (CTI OS)—Combines a powerful, feature-rich server and an object-oriented software development toolkit to enable rapid development and deployment of complex CTI applications.


The contact center offers two products that provide self-service call treatment capability:

- Cisco Unified IP IVR—Automates access to account information or user-directed call routing by processing user commands through touch-tone input or speech-recognition technologies. Unified IP IVR helps customers who are calling the contact center use voice commands to retrieve the information that they require without ever speaking with an agent, or to quickly navigate to a customer service agent who can help them the first time.
- Cisco Unified Customer Voice Portal (Unified CVP)—Integrates time-division multiplexing (TDM) with IP-based contact centers to provide audio and video call management and call treatment functions. Unified CVP includes a self-service IVR option that can use information that is available to customers on the corporate web server. With support for automated speech recognition (ASR) and text-to-speech (TTS) and self-service capabilities, callers can obtain personalized answers to complex questions and conduct business without the cost of interacting with a live agent.

Additional Product Information

- [Cisco Unified Customer Contact Solutions](#)
- [Cisco Unified Contact Center Enterprise](#)

Additional Sites and Services

Steps to Success is a Cisco methodology that outlines the tasks required to complete a successful customer engagement. Registered users can visit the [Steps to Success](#)  resource site for Cisco Unified Communications process flows.

Cisco Unified Communications Services is a Cisco service offering that provides engineering expertise and best practices.

- Registered users can visit the [Cisco Unified Communications Services](#)  partner site.
- Nonregistered users can visit the [Cisco IP Communications Services](#) site.



CHAPTER 3

Plan

Introduction to Plan

In the Plan phase, you assess your readiness to support a proposed solution. Planning continues the needs analysis begun in the Prepare phase, with the goal of producing a high-level project plan and the initial site survey.



Tip

You can navigate to any topic on this tab by using the tab navigation pane at the left of the content pane. This navigation pane contains the table of contents (TOC) for the active tab.

Before You Begin

Understand the features and functions of contact center applications. Start with the [Planning Concepts](#) and the [System Release Notes](#). Then review the business requirements, deployment models, and sites to understand the options that are available for your specific environment.

When You Are Done

You have defined and created the following:

- A comprehensive list of components and applications that match the requirements
- A project plan based on those requirements including a proposed, high-level design

Major Concepts and Tasks in This Process

- [Planning Concepts](#)
- [Planning Tasks](#)
- [Sample Business System Test Beds](#)

Planning Concepts

This topic presents planning concepts. It is assumed that your network will be a converged network that combines voice, data, and video and that you have decided on one of network types discussed in the [Internetwork Design Guide](#).

The primary planning considerations that drive the planning stage are: types of deployment, whether it will be a new installation, a migration to an installation with existing equipment, or an upgrade from a previous release to the current release; application availability based on your networking needs for multimedia and voice, security, redundancy, fault tolerance, and the costs associated with your needs.

Your goal is to minimize costs while delivering service that does not compromise established availability and performance requirements. These issues are essentially at odds. Any increase in availability and performance must generally be reflected as an increase in cost. As a result, you must carefully weigh the relative importance of resource availability, performance constraints, variables, and overall cost.

**Note**

The concepts discussed in this topic are meant to be a high-level overview of considerations and are not meant to be a definitive set of rules.

The concepts that you should review are as follows:

- [Deployment Types](#)
- [Cost of Ownership](#)
- [Redundancy](#)
- [Capacity and QoS](#)
- [Security](#)
- [Sample Business System Test Beds](#)
- [Understand Your Call Flows](#)

Deployment Types

The deployment types to consider are as follows:

- New installation
 - Greenfield—Completely new installation of the Cisco Unified Communications system, using no existing equipment.
 - Legacy—New installation of the Cisco Unified Communications system combined with existing legacy equipment, such as TDM PBXs and third-party adjuncts, which may require long-term co-existence and integration or eventual migration to the new installation.
 - Brownfield—Existing Cisco Unified Communications system, which requires an upgrade and migration from a previous system release to the current system release.
- Single-Stage Upgrade
 - Using existing hardware—All components in the network start at the base release set and all components can be upgraded to the target release set within a single maintenance window.
 - Using new hardware (flash-cut or shrink-and-grow)—A parallel network should be built using new hardware and pre-staged with configuration to support the existing production network.
- Multistage System Upgrade
 - Using existing hardware (hybrid system)—The components in individual sites can be upgraded from the base release set to the target release set in stages, during separate maintenance windows.
- Multisite Migration with Independent Site Upgrade
 - Using a hybrid network with interworking release sets—Components are upgraded on a site-by-site basis during separate maintenance windows. At the completion of each maintenance window, a hybrid network exists within the multiple sites that have components operating on the base release set; or components that are operating on the target release set; or components that are a hybrid system as described in Multistage System Upgrade.

For more information about deployment types, see the [System Installation and Upgrade Manual for Contact Center: Cisco Unified Communications System](#).

Cost of Ownership

Information system budgets can run into millions of dollars. As large organizations increasingly rely on electronic data for managing business activities, the associated costs of computing resources continue to rise. With this in mind, your basic network plan should include the following:

- Environmental consideration—Include the location of hosts, servers, terminals, and other end nodes; the projected traffic for the environment; and the projected costs for delivering different service levels.
- Performance constraints—Consider network reliability, traffic throughput, and host and client computer speeds. For example, network interface cards and hard drive access speeds.
- Internetworking variables—Include the network topology, line capacities, packet flow assignments, redundancy and fault tolerance factors, backward compatibility (co-existence and interoperability), and security.

Redundancy

Redundancy is critical considering the number of vital business applications running on the network. If you have a distributed network with several access layers to remote offices, and you have a failure from the distribution layer to the core without redundancy, you have loss of network service for a large number of people. If you have redundancy in the distribution layer and the core, you can potentially lose one or more circuits without disturbing service to any particular group of users. Depending on the application, you may also need some redundancy from the access layer to the distribution layer.

Because of redundancy, if you drop a link at any one point in the network, every remote group or user still has a path to get back to the core. Even if you cut off the connection from one of the distribution switches back to the core, you still have access to the core for every user.

For more information on redundancy planning, see the [Redundancy and Load Sharing Design Guide](#).

Capacity and QoS

Capacity and QoS are major considerations in a converged network and effect one another. QoS is needed to prevent applications from using more than a fair share of bandwidth and degrading the performance of other applications. At the WAN interface, QoS is needed to allocate expensive wide area capacity among applications.

Bandwidth and QoS requirements are easy to figure in a multilayered design because the traffic flow is fairly predictable. You can also have end-to-end QoS in a multilayered design. End-to-end QoS is critical when you have real-time applications, such as a voice conversation or video presentation, and you have non-real time applications that can interfere with the real-time applications. For example, if the real-time and non-real time applications arrive at the same layer at the same time, the network must pass the real-time packets first, as well as keep latency and jitter low. QoS end-to-end is the answer.

Consider Call Admission Control (CAC) as an alternative to QoS. CAC limits the amount of traffic allowed onto the network at the ingress point. Because you know that the network will be congested at various times during the day, you can disallow additional traffic by using CAC. Also consider using traffic-shaping techniques using a traffic-shaping devices. A combination of QoS, CAC and traffic shaping will provide optimal performance for applications on a converged network.

Managing link speed mismatches is the last element of traffic management. The mismatches, called chokepoints or bottlenecks, are a basic design issue whenever a large capacity link generates traffic destined for a low capacity link. To avoid the mismatches, carefully analyze the traffic and the device capabilities, then upgrade the interface (if needed) and apply a combination of CAC and QoS.

For more information on QoS, see the [Enterprise QoS Solution Reference Network Design Guide](#).

Security

Cisco recommends multiple layers of security technologies to prevent a single configuration error from jeopardizing the security of the network. Cisco also recommends operational processes that ensure prompt application of software patches, timely installation of new security technologies, and performance of regular security audits and assessments.

As you begin to design your network, rank the importance of your network assets and services by considering these factors:

- What keeps you in business?
- How do you make money?
- Does loss of data or privacy equal lost money?
- What about regulatory compliance?
- How do you protect your critical data?
- Where does voice fit?

Then consider the potential threats to your business, which may include:

- Toll fraud
- Eavesdropping
- Address spoofing
- Fake caller identity
- Media tampering
- Denial of service
- SPAM, SPIT (SPAM over IP telephony), and SPIM (SPAM over Instant Messaging)

In addition to the operational processes, advanced security technologies should be reviewed and considered. Security technologies can be categorized as follows:

- Network security
 - Virtual LANs (VLANs)
 - Access control lists (ACLs)
 - Stateful firewalls with protocol aware inspection
 - Virtual Private Networks (VPNs)
 - QoS

- Dynamic Address Resolution Protocol (ARP) inspection
- Dynamic Host Configuration Protocol (DHCP) snooping
- Port security
- Network intrusion prevention
- Host security
 - Cisco Security Agent
 - Third-party anti-virus software
 - Host-based firewalls
 - Hardened operating systems
- User authentication, authorization, and accounting security
 - Phone image authentication
 - Multilevel administration privileges
 - Call detail reporting

For more information about Cisco end-to-end security designs, see the Cisco SAFE guidelines at <http://www.cisco.com/go/safe>. For more details about Cisco integrated network security solutions, see the following resources:

- [Security Products and Solutions](#)
- [Secure Unified Communications](#)
- [Cisco Support Community for Security](#)

Sample Business System Test Beds

System testing defines and validates the interoperability and stability of components that comprise a complete and optimized Cisco Unified Communications system. The system test includes installing, configuring, and testing contact center hardware and software that are designed to work together in a predictable, effective, and reliable manner.

Use System Test Beds to Define Your Business Requirements

Cisco Systems has defined real-world business requirements in test beds that utilize the contact center system. The business requirements were created in a test environment to validate the contact center solution for these business models.

Test beds define business requirements, agent profiles, and call flows that are typically used by various business models.

Review these test beds to understand how the contact center system meets real-world business needs. For additional information on various industry solutions, such as financial markets, see the following URL:

<http://www.cisco.com/web/strategy/index.html>

Test Bed 1

This test bed includes the Unified CVP Post-Routed call flows in a contact center with local and remote agents. For more details, see:

- [Test Bed 1 site description](#)

Test Bed 2

This test bed includes the Unified CVP Post-Routed call flows in a local contact center. For more details, see:

- [Test Bed 2 site description](#)

Call Flow Models

The call flows that are deployed by the sample businesses are as follows:

- Test Bed 1—Unified CVP Post-Routed calls with Remote and Local Agents
- Test Bed 2—Unified CVP Post-Routed calls with Local Agents only

The case study methodology is continued for each PPDIOO process by using the deployment models and sites that were developed for testing.

- [Review Tested Deployment Models](#) is continued on the Design tab.
- [Install and Configure System Components](#) is continued on the Implement tab.
- [Operating Contact Center Systems](#) is continued on the Operate tab.
- [Failover and Redundancy](#) is continued on the Optimize tab.

Understand Your Call Flows

Call flow analysis is an important part of determining your business requirements. Call flows show you how your calls are handled physically, which drives your equipment requirements. Call flows also help to determine the network routing plan. For sample call flows, see the following:

- [Test Bed 1 call flows](#)
- [Test Bed 2 call flows](#)

Call flows were tested and verified in two separate test setups in the contact center environment: [Test Bed 1](#) and [Test Bed 2](#).

Planning Tasks

The following overview shows the high-level tasks of the planning process:

- [Determine Your Business Requirements](#)
- [Use Planning Tools and Templates](#)
- [Understand Your Deployment Options](#)
- [Identify System Components](#)
- [Collect and Analyze Data](#)
- [Create High-Level Design](#)
- [Plan and Prepare for Your System Installation](#)
- [Plan and Prepare for Your System Upgrade](#)

Determine Your Business Requirements

Consider the following factors in your call center:

- Collect requirements
 - Assess user requirements
 - Identify functionality requirements
- Call center operations
 - Number of sites
 - Agents and types of services
 - Types of calls, call treatment, and call handling
 - Busy hour calls attempts (BHCA) rate
- Call flows
- Installation and upgrade requirements
 - Installation and configuration information
 - Upgrade and migration information

Collecting Requirements

The following are suggested methods to use in gathering information to plan your network:

- Assess User Requirements—Users want applications to be available on demand in the network. The chief components of application availability are response time, throughput, and reliability. You can assess user requirements as follows:
 - Develop community profiles of what different user groups require. Although many users have roughly the same requirements of an electronic mail system, engineering groups using Windows terminals and Sun workstations in an NFS environment have different needs from PC users sharing print servers in a finance department.
 - Build a baseline for implementing an internetwork by interviewing groups, forming focus groups, or using surveys. Some groups might require access to common servers, while others might want to allow external access to specific internal computing resources. Formal surveys can be used to get a statistically valid reading of user sentiment regarding a particular service level or proposed internetworking architecture.
 - Conduct a test involving representative users in a lab environment. This is most applicable when evaluating response time requirements. As an example, you might set up working systems and have users perform normal remote host activities from the lab network. By evaluating user reactions to variations in host responsiveness, you can create benchmark thresholds for acceptable performance.
- Identify Functionality Requirements—After you understand your internetworking requirements, you can select the specific functionality that fits your environment, such as the level of application availability and the implementation costs for that availability. Fault tolerance and redundancy should be considered also.

Call Center Operations

Review the [Use System Test Beds to Define Your Business Requirements](#) topic for information on customer business requirements such as number of sites, agent profiles, types of calls, call handling and call treatment options, and sample call flows.

Call Flows

See the [Understand Your Call Flows](#) topic.

Planning a System Installation

See the [Plan and Prepare for Your System Installation](#) topic.

For installation and configuration checklists and documents, see the [Installation and Configuration Checklists](#) topic on the Implement tab.

For a list of installation and configuration documents for the software and hardware components that are part of the Cisco Unified Communications family of contact center products, see the [Component Installation and Configuration Guides](#) topic on the Implement tab.

Planning a System Upgrade

See the [Plan and Prepare for Your System Upgrade](#) topic.

Use Planning Tools and Templates

This topic includes planning tools and links to documents that provide guidelines for designing and configuring your contact center system. It also includes information on quoting and ordering Cisco Unified Communications products.

Solution Reference Network Design Documents

Solution Reference Network Design (SRND) documents provide guidelines, recommendations, and best practices for implementing enterprise networking solutions. The following SRNDs are recommended for designing Cisco Unified Communications systems:


- [Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 9.x](#)
- [Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 8.x](#)
- [Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 7.x](#)
- [Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 6.x](#)
- [Cisco Unified Contact Center Enterprise SRND Release 9.x](#)
- [Cisco Unified Contact Center Enterprise SRND Release 8.x](#)
- [Cisco Unified Contact Center Enterprise SRND Release 7.x](#)
- [Cisco Unified Contact Center Express SRND Release 9.0](#)
- [Cisco Unified Contact Center Express SRND Release 8.5\(1\)](#)
- [Cisco Unified Contact Center Express SRND Release 7.0](#)

- [Cisco Unified Customer Voice Portal \(CVP\) 9.x SRND](#)
- [Cisco Unified Customer Voice Portal \(CVP\) 8.5\(x\) SRND](#)
- [Cisco Unified Customer Voice Portal \(CVP\) 8.x SRND](#)
- [Solution Reference Network Design for Cisco MediaSense Release 8.5\(4\)](#)
- [Cisco Unified Intelligence Center Solution Reference Network Design \(SRND\)](#)
- [Enterprise QoS System Reference Network Design](#)

**Note**


Additional SRND resources are available at <http://www.cisco.com/go/srnd>.

Solution Expert Tool

Solution Expert  is a web-based tool that assists in the design, configuration, quoting, and ordering of Cisco Unified Communications products. Solution Expert is available for Cisco sales and partner systems engineers who have Unified Communications specializations.

With the Solution Expert tool, users can generate a recommended solution based on their requirements. Users can modify the recommended configuration if desired. Solution Expert validates any changes when it presents the new solution. Solution Expert also generates a bill of materials with list pricing, a Visio diagram, and other design documentation. For an overview of how to use the tool, see the introductory PDF on the home page.

Ordering Guides

Ordering guides  for most Cisco Unified Communications products are available for Cisco partners, Cisco sales staff, and Cisco service providers.

Understand Your Deployment Options

Review the [Deployment Models](#) chapter in the *Cisco Unified Communications System Description* for a guide to site models that have been tested and verified for Cisco Unified Communications Release 9.0(1). See [Table 2-1](#) for a brief overview of each model.

The following deployment models were designed and tested as part of testing for the contact center environment:

- **Single site**—In this model, all the voice gateways, agents, desktops, IP Phones, and call processing servers such as Unified Communications Manager, Unified ICM, and Customer Response Solutions (CRS) and/or Unified CVP are located at the same site and have no WAN connectivity between any contact center software modules.
- **Multisite centralized**—In the multisite WAN model with centralized call processing, the Unified Communications Manager cluster resides at a central (or hub) campus and communication with remote offices occurs over the IP WAN. The central site or data center provides the call processing services and acts as the hub for the remote sites. This model also contains distributed voice gateways for locally dialed calls.

- **Multisite WAN distributed**—In the multisite WAN model with distributed call processing, typically some sites have their own Unified Communications Manager cluster and are interconnected with intercluster trunks (ICT Trunking). Similar to the multisite centralized model, sites in the multisite WAN distributed model are deployed with distributed voice gateways. Communication between sites occurs over the IP WAN.
- **Clustering over WAN**—In the Clustering over WAN (CoW) model, a single Unified Communications Manager cluster with its subscriber servers and Unified CCE components are split across multiple sites connected via a QoS-enabled WAN.

See also the [Sample Business System Test Beds](#) topic.

Identify System Components

For a brief description of all the components that are available with Cisco Unified Communications, see the [System Components](#) chapter in the *Cisco Unified Communications System Description*.

The [Component Installation and Configuration Guides](#) topic links to information that describes components that are specific to the contact center.

The Release Matrix (which includes the [Software Version Matrix](#) and the [Firmware Version Matrix](#)) lists all the components and their versions for a particular release. This is the recommended set of components and specific software versions that have been tested and verified for interoperability within a specific system release.

Use Bill of Materials (BOM) for hardware and software specifications that are compatible with contact center components:

- [Hardware and System Software Specification \(Bill of Materials\) for Cisco Unified ICM/Unified CC Enterprise & Hosted Editions](#)—Specifies the hardware and system software compatible with and required for Cisco Unified ICM and Cisco Unified Contact Center.
- [Hardware and System Software Specification for Cisco Unified Customer Voice Portal](#)—Provides platform hardware specifications and compatible third-party software version requirements across the major components of the Cisco Unified CVP solution.
- [Hardware and System Software Specification \(Bill of Materials\) for Cisco Unified Intelligence Center](#)—Specifies the hardware and software that have been qualified by Cisco Quality Assurance for use with Cisco Unified Intelligence Center (Unified IC).

Collect and Analyze Data

Using available tools, collect data on the network to assess network readiness. Tasks for data collection and analysis include:

- **Perform an infrastructure analysis**—Obtain floor plans and campus maps, including utilities and conduit systems, to identify deficiencies in infrastructure.
- **Perform a software gap analysis**—Do a software gap analysis to address network management tools for the IP network.
- **Perform an initial traffic analysis**—Collect data on all potential converged infrastructure traffic flows. Use station message detail recording (SMDR) and billing records to determine legacy call volumes and use network management tools to collect key statistics on your IP data network.

Create High-Level Design

Once data is collected and analyzed, record the results in the site survey and high-level design documents.

The [Understand Your Call Flows](#) topic shows you how to use call flow data for your design.

Plan and Prepare for Your System Installation

This topic provides the system-level information required to install contact center components in Cisco Unified Communications System Release 9.0(1).

- [Planning Your System Installation](#)
- [Preparing for Your System Installation](#)

Planning Your System Installation

This topic provides an overview of the primary components typically deployed in a contact center environment and the installation processes for contact center components. It also describes the types of installations and various installation strategies.

This topic contains the following sections:

- [Cisco Unified Communications System Overview](#)
- [Scope of this Installation Documentation](#)
- [System Installation Overview](#)
- [System Installation Strategies](#)
- [Interoperability and Compatibility Portals](#)

When you have reviewed preinstallation planning, installation approach, and dependencies, go to [Preparing for Your System Installation](#).

For information about the installation order and process for contact center components, go to [Performing Your System Installation](#) on the Implement tab.

Preparing for Your System Installation

This topic provides information that you should review before the actual installation process such as the general installation approach, release set software and firmware versions of the contact center components being installed, and dependencies impacting system installation.

This topic contains the following sections:

- [Before You Begin](#)
- [System Installation Approach](#)
- [Release Set Versions](#)
- [System Installation Dependencies](#)

When your installation plans are in place and you are ready to install components, go to [Performing Your System Installation](#) on the Implement tab.

Plan and Prepare for Your System Upgrade

This topic provides the system-level information required to upgrade contact center components from previous Unified Communications releases to Release Release 9.0(1).

- [Planning Your System Upgrade](#)
- [Preparing for Your System Upgrade](#)

Planning Your System Upgrade

This topic provides an overview of the upgrade process for contact center components, the software releases that are involved in the upgrade process, and the different upgrade strategies that can be used based on the size of the customer network.

**Note**

There may be more than one upgrade path based on the software deployed in your specific environment. For more information, see [Upgrade Paths](#).

This topic contains the following sections:

- [Cisco Unified Communications System Overview](#)
- [Release Sets](#)
- [Upgrade Roadmap](#)
- [Upgrade Overview](#)
- [System Upgrade Strategies](#)

To ensure that you have completed upgrade prerequisites for additional approach and dependencies, see [Preparing for Your System Upgrade](#).

For information about the upgrade order and process for contact center components, go to [Performing Your System Upgrade](#) on the Optimize tab.

Preparing for Your System Upgrade


This topic discusses information to be aware of before the actual upgrade process such as the general upgrade approach for the different contact center components, upgrade release versions of components involved in the upgrade, and upgrade dependencies and considerations.

This topic contains the following sections:

- [System Upgrade Approach](#)
- [System Upgrade Dependencies](#)
- [Upgrade Release Versions](#)

When your upgrade plan is in place and you are ready to upgrade, go to [Performing Your System Upgrade](#) on the Optimize tab.

Additional Sites and Services

Steps to Success is a Cisco methodology that outlines the tasks required to complete a successful customer engagement. Registered users can visit the [Steps to Success](#)  resource site for Cisco Unified Communications process flows.

Cisco Unified Communications Services is a Cisco service offering that provides engineering expertise and best practices.

- Registered users can visit the [Cisco Unified Communications Services](#)  partner site.
- Nonregistered users can visit the [Cisco IP Communications Services](#) site.

Cisco Unified Communications System Demos

Tools are available to demonstrate the collaboration features of a Cisco Unified Communications System:

- For Cisco partners: [Cisco Remote Demonstrations for Partners](#) 
- For Cisco sales teams: [Global Customer Demonstrations](#) **[Internal]**



CHAPTER 4

Design

Introduction to Design

Using the project plan that was developed in the Plan phase, your team should have enough information to develop a detailed design for each site and the entire network. The network design should contain, at a minimum:

- Routing and switching component connectivity
- WAN connectivity intra- and inter-sites
- Software applications and configurations for routers and switches
- Power and environment
- Security
- Redundancy and failover
- Disaster recovery

For each site, in addition to the above, your design should include telephone circuitry, equipment racks with cabinet locations, and layouts. Each site should have a design that encompasses your network call processing, conferencing, and messaging requirements. The design should be scalable for future growth.



Tip

You can navigate to any topic on this tab by using the tab navigation pane at the left of the content pane. This navigation pane contains the table of contents (TOC) for the active tab.

Before You Begin

Review information about the [Cisco Validated Design Program](#). Cisco Validated Designs consist of systems and solutions that are designed, tested, and documented to facilitate and improve customer deployments.

Review Solution Reference Network Design (SRND) documents and design tools. Gather requirements and data, which can include:

- Business and system requirements
- Service-level agreements (SLAs)
- Capacity (bandwidth) requirements
- Site survey and proposal from the project plan

When You Are Done

The main deliverable of the Design phase is the detailed design, including:

- Deployment models that you can use at your site (see [Review Tested Deployment Models](#))
- Network diagrams (see [Network Topology Diagrams](#) in the Resource Library for editable Microsoft Visio network drawings)
- Routing strategy
- Redundancy
- Call flows
- Traffic flows
- Equipment list
- Bill of materials

Major Concepts and Tasks in This Process

- [Design Concepts](#)
- [Design Tasks](#)

Design Concepts

Read these conceptual, overview topics for the background knowledge you need to build an intelligent design.

- [Using SRND Documents](#)
- [Using Design Tools and Templates](#)

Using SRND Documents

Solution Reference Network Design (SRND) documents provide guidelines, recommendations, and best practices for implementing enterprise networking solutions.

The following SRNDs are recommended for designing Cisco Unified Communications systems:

- [Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 9.x](#)
- [Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 8.x](#)
- [Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 7.x](#)
- [Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 6.x](#)
- [Cisco Unified Contact Center Enterprise SRND Release 9.x](#)
- [Cisco Unified Contact Center Enterprise SRND Release 8.0](#)
- [Cisco Unified Contact Center Enterprise SRND Release 7.x](#)
- [Cisco Unified Contact Center Express SRND Release 9.0](#)
- [Cisco Unified Contact Center Express SRND Release 8.5\(1\)](#)
- [Cisco Unified Contact Center Express SRND Release 7.0](#)
- [Cisco Unified Customer Voice Portal \(CVP\) 9.x SRND](#)

- [Cisco Unified Customer Voice Portal \(CVP\) 8.5\(x\) SRND](#)
- [Cisco Unified Customer Voice Portal \(CVP\) 8.x SRND](#)
- [Solution Reference Network Design for Cisco MediaSense Release 8.5\(4\)](#)
- [Cisco Unified Intelligence Center Solution Reference Network Design \(SRND\)](#)
- [Enterprise QoS System Reference Network Design](#)

**Note**

Additional SRND resources are available at <http://www.cisco.com/go/srnd>

Using Design Tools and Templates

Use these design tools to assist you in sizing your network.

- [IPC Voice Tools](#)

These tools, such as the IPC Resource Calculators, are intended to simplify and automate the process of sizing contact center resources that are required for specific contact center business operations. The tools are also useful for verifying and troubleshooting existing installations. The output from these tools can also be used as input to the [Cisco Unified Contact Center Express Configuration and Ordering Tool](#) .

- [Solution Expert Tool](#)

A web-based tool that assists in the design, configuration, quoting, and ordering of Cisco Unified Communications products. Solution Expert is available for Cisco sales and partner systems engineers who have Cisco Unified Communications specializations. With the Solution Expert tool, users can generate a recommended solution based on their requirements. Users can modify the recommended configuration if desired. Solution Expert validates any changes when it presents the new solution. Solution Expert also generates a bill of materials with list pricing, a Visio diagram, and other design documentation. For an overview of how to use the tool, see the introductory PDF on the home page.

- [Cisco Unified Communications Sizing Tool](#)

A web-based tool that assists users with hardware sizing of large or complex Cisco Unified Communications solutions by calculating the call processing requirements for products that have a major impact on performance and scalability. With the Cisco Unified Communications Sizing Tool, system engineers with Cisco Unified Communications solution experience or individuals with equivalent abilities can design and model solutions for existing and prospective customers. The tool requires various types of information to calculate the minimum size and type of devices required for a solution, such as the type and quantity of IP phones, gateways, and media resources. For most device types, the tool also requires the average number of call attempts per hour per device during the busy hour (known as busy hour call average or BHCA) and the average utilization time. The resulting calculations produced by the tool can be saved, copied, and sent to other users.

For additional information on design tools such as the Cisco Unified Communications Sizing Tool, as well as other system design topics, see the documentation wiki (DocWiki) at: http://docwiki.cisco.com/wiki/Unified_Communications_System_Design

Design Tasks

The following list is an overview of the design process and is not meant to represent an ordered sequence of tasks:

- [Identify the Components That You Need](#)
- [Review Tested Deployment Models](#)
- [Review System Caveats](#)
- [Review System Test Results](#)
- [Develop Traffic Engineering Specifications](#)
- [Define Security Policies](#)
- [Define Failover Behavior](#)



Identify the Components That You Need

This topic provides links to descriptions of components, component documentation, and matrixes.

- [Contact Center Overview](#)—Describes the primary Cisco software components in the contact center system.
- [Release Matrix Information](#)—Identifies the components and their software versions that you need.
- [Component Resources Documentation](#)—Lists the component documentation.
- [Cisco Unified Communications Compatibility Tool](#)—Provides tables that identify the compatible software release version(s) for each product element in each Cisco Unified Communications release.
- The [Software Advisor Tool](#) will help you to find software releases that are compatible with your hardware configuration, find information about a particular software release, find a software release that supports specific features you want, or compare the features in two software releases.
- [Cisco Interoperability Portal](#) provides information about configuring Cisco technologies with third-party products and lists features that interoperate between Cisco solutions and other vendors.
- Bill of Materials (BOMs):
 - [Hardware and System Software Specification \(Bill of Materials\) for Cisco Unified ICM/Contact Center Enterprise & Hosted](#)—Specifies the hardware and system software compatible with and required for Cisco Unified ICME and Cisco Unified Contact Center Enterprise.
 - [Hardware and System Software Specification for Cisco Unified Customer Voice Portal \(Unified CVP\)](#)—Provides platform hardware specifications and compatible third-party software version requirements across the major components of the Cisco Unified CVP solution.
 - [Hardware and System Software Specification \(Bill of Materials\) for Cisco Unified Intelligence Center](#)—Specifies the hardware and software that have been qualified by Cisco Quality Assurance for use with Cisco Unified Intelligence Center.

For an additional overview of primary components that can be installed and configured in the contact center environment, see [Components Installation Overview](#).

Ordering Tools

- [Solution Expert](#)  is a web-based tool that assists in the design, configuration, quoting, and ordering of Cisco Unified Communications products. Solution Expert is available for Cisco sales and partner systems engineers who have Cisco Unified Communications specializations.
- [Cisco Unified Contact Center Express Ordering tool](#) 



Note

The Cisco Unified Contact Center Express Ordering tool can also be used to generate BOMs for Cisco Unified IP IVR.

- [Ordering guides](#)  for most Cisco Unified Communications products for Cisco partners, Cisco sales staff, and service providers

Review Tested Deployment Models

The tested deployment models reflect the business requirements that were introduced on the Prepare and Plan tabs that require a contact center system.

Typically, a model deploying centralized call processing servers or voice gateways is adequate for an enterprise with small remote sites or offices in a metropolitan area. However, a distributed deployment model is more efficient as sites become larger or more geographically disperse.

Two test beds were set up based on an multisite distributed, Clustering over WAN (CoW) deployment model encompassing one or more multisite centralized deployment models, including two single-site deployment models. For ease of use, we will use Test Bed 1 and Test Bed 2 to refer to the two test beds described below:

- Test Bed 1 which is designed to replicate a 4000 agent inbound and outbound contact center in multiple sites where agents are located locally, as well as in remote sites and Cisco Unified Customer Voice Portal (Unified CVP) provides call handling and call treatment functions.
- Test Bed 2 which is designed to replicate a 1000 Agent inbound call center in a single site where all agents are local and Unified CVP is deployed for call handling and call treatment functions.

Each deployment model was installed, configured, and tested with hardware and software designed to work together seamlessly and to provide a complete and optimized contact center solution. The tested deployment models provide you with guidance for your design and implementation. Compare your design to these models to see if they have similar characteristics. Where your requirements are different, do a risk analysis. See [Using SRND Documents](#) to help you with your design decisions.

Refer to this content map for an overview of the deployment models that are implemented in the contact center environment.

Topic	Description
Test Bed Software Implementation	Describes how the contact center software, network management, security and Unified CVP were implemented at the test sites.

Topic	Description
Test Bed 1: Unified CVP, Local and Remote Agents Test Sites	Provides component lists, topologies, and site definitions for Unified CVP sites that are testing Unified CVP Post-Routed local and remote call flows.
Test Bed 2: Unified CVP Local Agents Test Sites	Provides an equipment list, topologies, and site information for Unified CVP sites that are testing Unified CVP Post-Routed local call flows.

Review System Caveats

System caveats describe unexpected behavior, defects, and product limitations discovered during system-level testing of Cisco Unified Communications components. Check the [Limitations and Restrictions](#) section in the latest release notes to make sure that your design has taken all system caveats into consideration.

Review System Test Results


System test results show the scope and extent of the testing conducted for Cisco Unified Communications systems in a test environment that is modeled on real-world deployments.


Depending on the network you are designing and your specific environment, use the system test results as a guide and supplement for your own site test and turn-up plan.

For the results of testing for this Cisco Unified Communications Release 9.0(1) release, see [System Test Results](#) in the Resource Library.

Develop Traffic Engineering Specifications

- [Traffic Analysis for Voice over IP](#)—Provides background information on various traffic analysis concepts and features that are applicable to Voice over IP (VoIP). This document presents fundamental traffic theory, several statistical traffic models, application of traffic analysis to VoIP networks, and an end-to-end traffic analysis example.
- [Bandwidth Calculators](#) —The following tools are available to calculate bandwidth for contact center systems.
 - [Cisco Agent Desktop \(CAD\)](#)
 - [Cisco Unified Intelligence Suite and Intelligence Center Bandwidth Calculator](#)
 - [HDS WebView](#)

The output from these tools can also be used as input to the [Cisco Unified Contact Center Express Configuration and Ordering Tool](#) .

- [Cisco Unified Contact Center Enterprise Sizing Tool](#)  —This tool is available to Cisco partners and employees only, with proper login authentication. This tool helps size the Unified CCE resources required to meet the needs of a specific contact center. It also provides data that can be used as input for other capacity planning and sizing tools, such as the Cisco Unified Communications Manager Capacity Tool, and the Unified CVP and Cisco IP IVR sizing tools.

In addition, these third-party traffic engineering tools are provided for your reference:

- [VoIP Bandwidth Calculator](#)
- [Online Erlang traffic calculators](#)

The [Cisco Unified Contact Center Enterprise SRND Release 9.x](#) also includes information on sizing your contact center components.

Define Security Policies

Refer to security policies in these guides:

- [Cisco Unified Communications Manager Security Guide](#)
- Specific component documentation is available in the [Component Resources Documentation](#) topic in the Resource Library.

Additional security information is included here for your reference:


- [Cisco Self-Defending Network](#)
- [Design Zone for Security](#)
- [Cisco Security Intelligence Operations](#)

Define Failover Behavior

Specific test cases were executed as a part of Cisco Unified Communications System Release 9.0(1) failover testing. For detailed information on the failover testing performed during this release, see the failure, failover, and recovery details for each test bed:

- [Test Bed 1 failover](#)
- [Test Bed 2 failover](#)

Additional Sites and Services

Steps to Success is a Cisco methodology that outlines the tasks required to complete a successful customer engagement. Registered users can visit the [Steps to Success](#)  resource site for Cisco Unified Communications process flows.

Cisco Unified Communications Services is a Cisco service offering that provides engineering expertise and best practices.

- Registered users can visit the [Cisco Unified Communications Services](#)  partner site.
- Nonregistered users can visit the [Cisco IP Communications Services](#) site.

For a solution that may fit your network design requirements, see Industry Solutions at <http://www.cisco.com/web/strategy/index.html>.



CHAPTER 5

Implement

Introduction to Implementation

The goal of implementation is to introduce the new system into the network with the least amount of disruption and the highest level of interoperability with the existing network. An essential component of this process is the implementation plan.



Tip

You can navigate to any topic on this tab by using the tab navigation pane at the left of the content pane. This navigation pane contains the table of contents (TOC) for the active tab.

Before You Begin

You should understand how to implement Cisco Unified Communications. For more information, see [Cisco Unified Communications Implementation](#).

You should have a completed implementation plan from the detailed design. Use the equipment list and site specification from the detailed design to do the following:

- Order and stage equipment
- Perform a detailed site survey
- Create site-specific installation guidelines

Your implementation plan should include:

- Deployment strategy
- Network maps and topology diagrams
- Installation and commissioning tests
- Site survey results
- List of all devices to be installed
- Installation guidelines
- Configuration worksheets
- Test and turn-up plan

When You Are Done

All components are installed and ready to configure.


Major Tasks in This Process

- [Order Equipment](#)
- [Install and Configure System Components](#)
- [Introduction to Troubleshooting](#)
- [Conduct User Acceptance Test](#)

Order Equipment


This topic includes links to ordering guides and descriptions of tools that you need to choose your ordering options.

Solution Expert Tool

[Solution Expert](#)  is a web-based tool that assists in the design, configuration, quoting, and ordering of Cisco Unified Communications products. Solution Expert is available for Cisco sales and partner systems engineers with Cisco Unified Communications specializations.

With the Solution Expert tool, users can generate a recommended solution based on their requirements. Users can modify the recommended configuration if desired. Solution Expert validates any changes when it presents the new solution. Solution Expert also generates a bill of materials with list pricing, a Visio diagram, and other design documentation. For an overview of how to use the tool, see the introductory PDF on the home page.

Ordering Guides

[Ordering guides](#)  for most Cisco Unified Communications products are available for Cisco partners, Cisco sales staff, and Cisco service providers.

Install and Configure System Components

When implementing a new Cisco Unified Communications system, create a site-specific installation plan for your team. Describe what needs to be installed and configured. Your plan should reference product-specific installation and configuration guides that can be used during the implementation process.

Your plan will help you manage timelines for implementing equipment and scheduling outages. Include an installation schedule, as well as a test plan that will verify that the operation conforms to the design objectives.

[Performing Your System Installation](#) provides guidance for the installation order of components for a Cisco Unified Communications System Release 9.0(1) contact center deployment. It does not describe installation procedures for individual components. For links to the complete documentation set for each contact center system component, see the [topic](#) on the Resource Library tab.

The following topics provide additional information for installing and configuring individual contact center products:

- [Component Installation and Configuration Guides](#) provides a complete list of components and links to related installation and configuration documents.

- [Installation and Configuration Checklists](#) provides checklists for installing and configuring some of your contact center components.
- [Component Compatibility and Interoperability](#) provides links to information about compatibility between Cisco products and with third-party systems or a hardware platform.

For system configuration examples, as well as other system implementation topics, see the documentation wiki (DocWiki) at:

http://docwiki.cisco.com/wiki/Unified_Communications_System_Implementation

When You Are Done

Components are configured and ready to test:

- For basic standalone operation
- For interoperability in your application(s)
- Acceptance Test Plan is completed

Performing Your System Installation

Before You Begin

See [Plan and Prepare for Your System Installation](#) to plan your overall strategy.

Install Contact Center Software Components

Once you have your installation plan and preparations in place, perform your system installation by following the guidelines and sequence in [Performing Your System Installation](#):

- See [Deployment Models](#) for the general installation sequence for the various components in the different generic deployment models, including Single Site, Multisite Centralized, Multisite Distributed, and Clustering over IP WAN. For a description of the deployment models tested in this system release, see the following:
 - [Unified CVP Local and Remote Agent Test Sites](#)
 - [Unified CVP Local Agent Test Sites](#)
- See [Component Installations](#) for more detailed installation information for each major installation strategy: single-stage system installation, multistage system installation, and multisite phased installation.
- See [Related Documentation](#) for links to component installation and upgrade documentation.

Component Installation and Configuration Guides

[Table 5-1](#) provides references to installation and configuration documents for the software and hardware components that are part of the Cisco Unified Communications System Release 9.0(1) solution. This information includes component names and related documentation.

Table 5-1 Component Installation and Configuration Documentation

Product Category	Product Technology	Components	Documentation Title
Call Control	Cisco Unified Communications Manager	<ul style="list-style-type: none"> • Cisco Unified Communications Manager • Cisco Real-Time Monitoring Tool • Music on Hold • Cisco Security Agent (only as a standalone agent) • Third-party Antivirus 	<ul style="list-style-type: none"> • Installing Cisco Unified Communications Manager • Replacing a Single Server or Cluster for Cisco Unified Communications Manager • Cisco Unified Communications Operating System Administration Guide, Release 9.0(1) • Cisco Unified Communications Manager Administration Guide • Cisco Unified Serviceability Administration Guide • Cisco Unified Communications Manager System Guide • Cisco Unified Communications Manager Bulk Administration Guide

Table 5-1 Component Installation and Configuration Documentation (continued)

Product Category	Product Technology	Components	Documentation Title
Contact Center	Cisco Unified Intelligent Contact Management Enterprise	<ul style="list-style-type: none"> • Cisco Unified Intelligent Contact Management Enterprise • Cisco Unified Contact Center Enterprise • Progger (Peripheral Gateway, CallRouter, and Logger) • Rogger (CallRouter and Logger) • Generic Peripheral Gateway • Cisco Unified Contact Center Gateway Enterprise • Cisco Unified Contact Center System Gateway • Media Routing Peripheral Gateway • CTI Server • Real-Time Admin Workstation (RTAW) • Historical Data Server • Cisco Outbound Option • Cisco Unified Mobile Agent • Cisco Security Agent • Windows 2003 Active Directory • Third-party Antivirus 	<ul style="list-style-type: none"> • Pre-installation Planning Guide for Cisco Unified ICM Enterprise and Hosted • Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise & Hosted • Installation Guide for Cisco Unified ICM/Contact Center Enterprise & Hosted • Installation and Configuration Guide Cisco Unified Contact Center Enterprise • Upgrade Guide for Cisco Unified ICM/Contact Center Enterprise & Hosted • Cisco Contact Center Gateway Deployment Guide for Cisco Unified ICME/CCE/SCCE/CCX • Configuration Guide for Cisco Unified ICM/Contact Center Enterprise & Hosted • Administration Guide for Cisco Unified ICM/Contact Center Enterprise & Hosted • Administration Guide for Cisco Unified Contact Center Enterprise & Hosted • Mobile Agent Guide for Cisco Unified Contact Center Enterprise & Hosted • Cisco Security Agent Installation/Deployment Guide for Cisco Unified Intelligent Contact Management Enterprise/Hosted • Outbound Option Guide for Cisco Unified Contact Center Enterprise
	Cisco Unified IP IVR	<ul style="list-style-type: none"> • Cisco Unified IP IVR • Cisco Security Agent • Third-party Antivirus 	<ul style="list-style-type: none"> • Installation Guide for Cisco Unified CCX and Cisco Unified IP IVR • Upgrade Guide for Cisco Unified CCX and Cisco Unified IP IVR • Administration Guide for Cisco Unified CCX and Cisco Unified IP IVR

Table 5-1 Component Installation and Configuration Documentation (continued)

Product Category	Product Technology	Components	Documentation Title
	Cisco Unified Customer Voice Portal	<ul style="list-style-type: none"> • Cisco Unified Customer Voice Portal • Unified CVP Call Servers • Cisco Unified CVP Reporting Server • Cisco Unified CVP Operations Console • HTTP Media Server/Web Server • Cisco Unified Call Studio • Nuance OSR • Nuance OSMS • Cisco Security Agent • Third-party video components • Third-party Antivirus 	<ul style="list-style-type: none"> • Installation and Upgrade Guide for Cisco Unified Customer Voice Portal • Getting Started with Unified CVP • Configuration and Administration Guide for Unified CVP • Cisco Security Agent Installation/Deployment Guide for Cisco Unified Customer Voice Portal • Reporting Guide for Unified CVP
	Cisco Agent Desktop	<ul style="list-style-type: none"> • Cisco Agent Desktop Server • Cisco Supervisor Desktop • CAD Agent Desktop • Cisco Security Agent (on desktop) • Voice over IP (VoIP) Monitor Server 	<ul style="list-style-type: none"> • Cisco CAD Installation Guide • Cisco Desktop Administrator User Guide • Cisco Supervisor Desktop User Guide • Cisco Agent Desktop User Guide

Table 5-1 Component Installation and Configuration Documentation (continued)

Product Category	Product Technology	Components	Documentation Title
Contact Center (continued)	Cisco Telephony Integration Object Server	<ul style="list-style-type: none"> • Cisco Telephony Integration Object Server • Cisco Supervisor Desktop • CTI OS Agent Desktop • Cisco Security Agent (on desktop) 	<ul style="list-style-type: none"> • CTI OS System Manager's Guide for Cisco Unified ICM/Contact Center Enterprise & Hosted • CTI OS Supervisor Desktop User Guide for Cisco Unified Contact Center Enterprise & Hosted • CTI OS Agent Desktop User Guide for Cisco Unified ICM/Contact Center Enterprise & Hosted
	Cisco Unified Contact Center Express	<ul style="list-style-type: none"> • Cisco Unified Contact Center Express • Cisco Agent Desktop • Cisco Agent Desktop—Browser Edition • Cisco Supervisor Desktop • Cisco Desktop Administrator 	<ul style="list-style-type: none"> • Installation Guide for Cisco Unified CCX and Cisco Unified IP IVR • Upgrade Guide for Cisco Unified CCX and Cisco Unified IP IVR • Getting Started with Cisco Unified Contact Center Express • Cisco CAD Installation Guide • Administration Guide for Cisco Unified CCX and Cisco Unified IP IVR
	Cisco Unified Intelligence Center	<ul style="list-style-type: none"> • Cisco Unified Intelligence Center 	<ul style="list-style-type: none"> • Installation Guide for Cisco Unified Intelligence Center • User Guide for the Cisco Unified Intelligence Center Reporting Application • Hardware and System Software Specification (Bill of Materials) for Cisco Unified Intelligence Center
	Cisco Media Sense	<ul style="list-style-type: none"> • Cisco Media Sense 	<ul style="list-style-type: none"> • Installation and Administration Guide for Cisco MediaSense
	Cisco Finesse	<ul style="list-style-type: none"> • Cisco Finesse 	<ul style="list-style-type: none"> • Installation and Getting Started Guide for Cisco Finesse
	Cisco SocialMiner	<ul style="list-style-type: none"> • Cisco SocialMiner 	<ul style="list-style-type: none"> • Cisco SocialMiner Release and General Information

Table 5-1 Component Installation and Configuration Documentation (continued)

Product Category	Product Technology	Components	Documentation Title
Applications	Cisco Unified Communications Manager IM and Presence Service (formerly Cisco Unified Presence)	<ul style="list-style-type: none"> Cisco Unified Communications Manager IM and Presence Service 	<ul style="list-style-type: none"> Installing Cisco Unified Communications Manager Upgrade Guide for Cisco Unified Communications Manager Deployment Guide for IM and Presence Service User Guide for IM and Presence Service Cisco Unified Serviceability Administration Guide
	Cisco Unified SIP Proxy	<ul style="list-style-type: none"> Cisco Unified SIP Proxy 	<ul style="list-style-type: none"> CLI Configuration Guide for Cisco Unified SIP Proxy GUI Configuration Guide for Cisco Unified SIP Proxy Cisco Unified SIP Proxy Command Reference

Table 5-1 *Component Installation and Configuration Documentation (continued)*

Product Category	Product Technology	Components	Documentation Title
End Points and Clients	Cisco IP Communicator	<ul style="list-style-type: none"> Cisco IP Communicator 	<ul style="list-style-type: none"> Cisco IP Communicator End-User Guides Cisco IP Communicator Maintain and Operate Guides
	Cisco Unified IP Phones 6900 Series	<ul style="list-style-type: none"> Cisco Unified IP Phones 6921, 6941, 6945, 6961 	<ul style="list-style-type: none"> Cisco Unified IP Phone 6900 Series End-User Guides Cisco Unified IP Phone 6900 Series Maintain and Operate Guides
	Cisco Unified IP Phones 7900 Series	<ul style="list-style-type: none"> Cisco Unified IP Phones (SIP) 7970 Cisco Unified IP Phones (SCCP) 7940, 7960, 7970, Cisco Unified IP Phone 7921G (Wireless) 	<ul style="list-style-type: none"> Cisco Unified IP Phone 7900 Series Install and Upgrade Guides Cisco Unified IP Phone 7900 Series End-User Guides Cisco Unified IP Phone 7900 Series Maintain and Operate Guides
	Cisco Unified IP Phones 8900 Series	<ul style="list-style-type: none"> Cisco Unified IP Phone (SIP) 8961 Cisco Unified IP Phones 8941, 8945 	<ul style="list-style-type: none"> Cisco Unified IP Phone 8900 Series Install and Upgrade Guides Cisco Unified IP Phone 8900 Series End-User Guides Cisco Unified IP Phone 8900 Series Maintain and Operate Guides
	Cisco Unified IP Phones 9900 Series	<ul style="list-style-type: none"> Cisco Unified IP Phones (SIP) 9951, 9971 	<ul style="list-style-type: none"> Cisco Unified IP Phone 9900 Series Install and Upgrade Guides Cisco Unified IP Phone 9900 Series End-User Guides Cisco Unified IP Phone 9900 Series Maintain and Operate Guides
	Cisco Virtualization Experience Clients	<ul style="list-style-type: none"> Cisco Virtualization Experience Clients 	<ul style="list-style-type: none"> Virtualization Experience Clients
	Cisco IP Video Phone	<ul style="list-style-type: none"> Cisco IP Video Phone E20 	<ul style="list-style-type: none"> Cisco IP Video Phone E20 Install and Upgrade Guides
	Cisco TelePresence System EX Series	<ul style="list-style-type: none"> Cisco TelePresence System EX 90 Cisco TelePresence System EX 60 	<ul style="list-style-type: none"> Cisco TelePresence System EX Series Install and Upgrade Guides

Table 5-1 Component Installation and Configuration Documentation (continued)

Product Category	Product Technology	Components	Documentation Title
Wireless	Cisco Aironet 3502 Access Point	<ul style="list-style-type: none"> Cisco Aironet 3502 Access Point 	<ul style="list-style-type: none"> Cisco Aironet 3500 Series Install and Upgrade Guides Cisco Aironet 3500 Series Configuration Examples and TechNotes
	Cisco Aironet 1142 Access Point	<ul style="list-style-type: none"> Cisco Aironet 1142 Access Point 	<ul style="list-style-type: none"> Cisco Aironet 1140 Series Install and Upgrade Guides Cisco Aironet 1140 Series Configure
Security	Cisco ASA 5500 Series Adaptive Security Appliances	<ul style="list-style-type: none"> Cisco ASA 5520, ASA 5540, ASA 5580 	<ul style="list-style-type: none"> Cisco ASA 5500 Series Adaptive Security Appliance Install and Upgrade Guides Cisco ASA 5500 Series Adaptive Security Appliance Configuration Guides Cisco Security Modules for Security Appliances Configuration Guides
	Cisco Security Agent for Unified Communications Manager	<ul style="list-style-type: none"> Cisco Security Agent for Unified Communications Manager 	<ul style="list-style-type: none"> Installing Cisco Unified Communications Manager
	Cisco Security Agent for Unified IP IVR	<ul style="list-style-type: none"> Cisco Security Agent for Unified IP IVR 	<ul style="list-style-type: none"> Cisco Unified Contact Center Express Install and Upgrade Guides
	Cisco Security Agent for Unified Contact Center Express	<ul style="list-style-type: none"> Cisco Security Agent for Unified Contact Center Express 	<ul style="list-style-type: none"> Cisco Unified Contact Center Express Install and Upgrade Guides
	Cisco Security Agent for Unified Intelligent Contact Management Enterprise	<ul style="list-style-type: none"> Cisco Security Agent for Unified Intelligent Contact Management Enterprise 	<ul style="list-style-type: none"> Cisco Security Agent Deployment Guide
	Cisco Security Agent for Unified Customer Voice Portal	<ul style="list-style-type: none"> Cisco Security Agent for Unified Customer Voice Portal 	<ul style="list-style-type: none"> Cisco Security Agent Deployment Guide
Network Management	Cisco Unified Operations Manager	<ul style="list-style-type: none"> Cisco Unified Operations Manager 	<ul style="list-style-type: none"> Installation Guide for Cisco Unified Operations Manager User Guide for Cisco Unified Operations Manager
Communications Infrastructure	Cisco 7800 Series Media Convergence Servers	<ul style="list-style-type: none"> Cisco 7800 Series Media Convergence Servers 	<ul style="list-style-type: none"> Cisco 7800 Series Media Convergence Servers Install and Upgrade Guides
	Catalyst 3700 Series	<ul style="list-style-type: none"> Cisco Catalyst 3750 multilayer switch 	<ul style="list-style-type: none"> Cisco Catalyst 3750 Series Switches Install and Upgrade Guides Cisco Catalyst 3750 Series Switches Configuration Guides

Table 5-1 Component Installation and Configuration Documentation (continued)

Product Category	Product Technology	Components	Documentation Title
Communications Infrastructure (continued)	Catalyst 6500 Series	<ul style="list-style-type: none"> • Cisco Catalyst 6506, 6509 • Cisco Catalyst 6506, 6509 (MSFC) 	<ul style="list-style-type: none"> • Cisco Catalyst 6500 Series Switches Install and Upgrade Guides • Cisco Catalyst 6500 Series Switches Configuration Guides
	Gateways/Gatekeepers	<ul style="list-style-type: none"> • Unified CVP, VXML Voice/data, H.323, SIP, and MGCP Gateways: Cisco 3725 and 3745 • Unified CVP, VXML Voice/data, H.323, SIP, and MGCP Gateways: Cisco 3825 and 3845 • Cisco 3900 series routers • Unified CVP, VXML voice, H.323, and PSTN Gateways: AS5400 • Cisco Unified Border Element Enterprise Edition for Cisco ISR Series • Cisco Unified Border Element Enterprise Edition for Cisco ASR 1000 Series • Cisco VGD 1T3 Voice Gateway • RSVP Agent: Cisco 38xx Platforms 	<ul style="list-style-type: none"> • Cisco 3700 Series Multiservice Access Routers Install and Upgrade Guides • Cisco 3700 Series Multiservice Access Routers Configuration Guides • Cisco 3800 Series Integrated Services Routers Install and Upgrade Guides • Cisco 3800 Series Software Configuration Guide • Cisco 3900 Series Integrated Services Routers Install and Upgrade Guides • Cisco 3900 Series Integrated Services Routers Configuration Guides • Cisco AS5400 Series Universal Gateways Install and Upgrade Guides • Cisco AS5400 Series Universal Gateways Configuration Guides • Cisco Unified Border Element Configuration Guides • Cisco VGD Series Voice Gateways Install and Upgrade Guides • Cisco VGD 1T3 Voice Gateway Software Configuration Guide
	Routers	<ul style="list-style-type: none"> • Cisco 7206VXR • Cisco 881 router (teleworker access router) 	<ul style="list-style-type: none"> • Cisco IOS Software Releases 15.1 Configuration Guides • Cisco 7206 Installation and Configuration Guide • Cisco 860 Series, Cisco 880 Series, and Cisco 890 Series Integrated Services Routers Hardware Installation Guide • Cisco 860, Cisco 880, and Cisco 890 Series Integrated Services Routers Software Configuration Guide

Installation and Configuration Checklists

Use the checklists from the following documents to install and configure the required components for your applications.

**Note**

The order in which you install components depends on your site. Follow the order recommended in your site-specific implementation plan.

- [Installing Cisco Unified Communications Manager](#)
- [Installation Guide for Cisco Unified ICM/Contact Center Enterprise & Hosted](#)
- [Installation and Configuration Guide Cisco Unified Contact Center Enterprise](#)
- [Cisco Contact Center Gateway Deployment Guide for Cisco Unified ICME/CCE/SCCE/CCX](#)
- [Getting Started with Cisco Unified Contact Center Express](#)

Component Compatibility and Interoperability

Use the following links to access commonly used interoperability and compatibility information for Cisco products with each other, with a third-party system, or with a computer hardware platform.

- [Cisco Unified Communications Compatibility Tool](#)
- [Cisco Unified Communications Manager Compatibility Information](#)
- [Cisco Unified Contact Center Enterprise Software Compatibility Guide](#)
- [Cisco Unified Contact Center Express Software and Hardware Compatibility Guide](#)
- [Cisco Interoperability Portal](#)
- [Hardware and System Software Specification \(Bill of Materials\) for Cisco Unified ICM/Contact Center Enterprise & Hosted](#)
- [Cisco Unified Communications Manager Server Support Matrix](#)
- [Cisco Unified Communications System Release Summary Matrix for Contact Center](#)

Software Versions and System Caveats

For specific information on the product software versions used, including system limitations and known caveats, see the [System Release Notes for Contact Center: Cisco Unified Communications System, Release 9.0\(1\)](#).

Call Flow Configuration Examples

Sample configuration commands for infrastructure components that are involved in the call flows are in downloadable zip files for all test bed components in the Resource Library.

System-level configuration examples are available on the Cisco DocWiki at: http://docwiki.cisco.com/wiki/Category:Contact_Center_System_Configurations

Introduction to Troubleshooting

This topic describes how to develop a system-level troubleshooting methodology as you install and configure a Cisco Unified Communications network for the first time. It also provides recommendations for preparing and documenting the network that may assist you in diagnosing and isolating problems when they occur. This topic contains the following sections:

- [System Troubleshooting Methodology](#)
- [Preparing Your Network for Troubleshooting and Recovery](#)

For more information about system-level troubleshooting, see the Cisco Unified Communications category on the documentation wiki (DocWiki) at:

http://docwiki.cisco.com/wiki/Unified_Communications_System_Troubleshooting

System Troubleshooting Methodology

The Implementation phase of your network deployment is an excellent time to develop a methodology for troubleshooting the network as a whole. Troubleshooting networking equipment at a system level requires solid detective skills. When a problem occurs, the list of potential suspects is long. You must collect detailed information and systematically narrow the list of potential causes to determine the root problem. This topic does not provide step-by-instructions for resolving problems that occur during network installation. Instead, this topic describes sound methods for troubleshooting your network using the following general steps:

1. [Gather Information on the Problem.](#)
2. [Isolate Point\(s\) of Failure.](#)
3. [Apply Tools to Determine the Problem's Root Cause.](#)

Gather Information on the Problem

Problems are typically discovered and reported by one of the following types of users:

- External customers dialing into a call center to order products, obtain customer service, and so forth.
- Internal agents receiving incoming calls from a call queue or initiating outbound collection calls to customers.
- Internal users using administrative phones to call employees in other company locations or PSTN destinations, and perform basic actions such as call transfers and dialing into conferences.

As the network administrator, you must collect sufficient information from these users to allow you to isolate the problem. Detailed, accurate information will make this task easier. [Table 5-2](#) lists recommended questions to ask users when they report a problem. As you turn up your network, you may consider putting these questions in an on-line form. A form will encourage users to provide more details about the problem and also put them into the habit of looking for particular error messages and indicators. Capturing the information electronically will also permit you to retrieve and re-examine this information in the future, should the problem repeat itself.

Table 5-2 **Questions to Ask Users When They Report Problems**

Ask this Question...	To Determine...
Did something fail or did it simply perform poorly?	Whether the issue relates to system degradation or a connectivity failure. An example of a failure is when a user dials a phone number and hears fast busy tone. An example of a performance problem is when a user dials into a conference call and hears “choppy” audio when other parties speak. Quality of service or performance issues require a different approach than connectivity or operational problems. You must still isolate the potential sources of the problem, but you will typically use performance management tools instead of log files.
What device were you trying to use?	The device type, model and version of software installed. It is also critical to capture the IP address assigned to the device, as well as its MAC address. In the case of IP phones, determining the phone’s active Cisco Unified Communications Manager server is also important. On Cisco Unified IP phones, these important network values can be displayed by pressing the Settings button and choosing the Network Configuration option from the menu.
Did it ever work?	If a device was recently installed and the problem occurred while making it work for the first time, or if the device was operating normally before the problem occurred. If the device was newly installed, the problem is most likely due to improper configuration or wiring of that particular device. Problems with devices that are already up and running can typically be traced back to one of two causes: (a) the user modifying their device, such as changing their configuration or upgrading software, or (b) a change or failure elsewhere in the network.
Exactly what action(s) did you perform?	The steps that led up to the problem, including which buttons were pressed and in which order. Capturing this information in detail is important so that you can consistently reproduce the problem.
What error message(s) appeared or announcements did you hear?	The visual and audio indicators of the problem. Ask users to provide the exact text that appears and any error codes in either an E-mail or on-line form. If the error indication was audible, ask the user to write down the announcement they heard, the last menu option they were able to successfully choose or the tone they heard when the call failed.

Table 5-2 Questions to Ask Users When They Report Problems (continued)

Ask this Question...	To Determine...
What time did the problem occur?	The date and time to compare against entries in log files. If the problem occurred on a Cisco Unified IP phone, make certain the user provides the timestamp that appears on their phone's display. Several Cisco components in a network may capture the same problem event in separate log files, with different ID values. In order to correlate log entries written by different components, you must compare the timestamps to find messages for the same event. Cisco Unified IP phones synchronize their date and time with their active Cisco Unified Communications Manager server. If all Cisco components in the network use Network Time Protocol (NTP) to synchronize with the same source, then the timestamps for the same problem messages will match in every log file.
What is the number of the phone you used and what was the phone number you called?	If the problem relates to a WAN or PTSN link, or a Cisco Unified Communications Manager dial plan issue. Ask the user the phone number he or she dialed (called number) and determine if the destination was within his or her site, another site within the corporate network, or a PSTN destination. Because the calling number (the number of the phone used) also affects call routing in some cases, capture this number as well.
Did you try to perform any special actions, such as a transfer, forward, call park, call pickup, or meet-me conference? Is the phone set up to automatically perform any of these actions?	If the problem is not directly related to the calling number or called number but rather to the supplementary service setup on Unified Communications Manager or the problem is at the destination phone the user tried to reach by transferring or forwarding the call.
Did you attempt the same action on another device?	If the problem is isolated to that user's device or represents a more widespread network problem. If the user cannot make a call from his or her phone, ask the user to place a call to the same destination using a phone in a nearby office.

Isolate Point(s) of Failure

After collecting information on the symptoms and behavior of the problem, to narrow the focus of your efforts you should:

- Identify the specific devices involved in the problem.
- Check the version of software running on each device.
- Determine if something has changed in the network.
- Verify the integrity of the IP network.

Identify Devices Involved in the Problem

In large- to medium-sized networks, it is crucial to identify the specific phones, routers, switches, servers and other devices that were involved in a reported problem. Isolating these devices allows you to rule out the vast majority of equipment within the network and focus your time and energy on suspect devices. To help you isolate which devices were involved in a problem, two types of information can prove invaluable:

- **Network topology diagrams:** It is strongly recommended that you have one or more diagrams that show the arrangement of all Cisco Unified Communications products in your network. These diagrams illustrate how these devices are connected and also capture each device's IP address and name (you may want to also have a spreadsheet or database of the latter information). This information can help you visualize the situation and focus on the devices that may be contributing to the reported problem. See [Network Topology Diagrams](#) for recommendations on how to prepare these diagrams.
- **Call flow diagrams:** Cisco equipment, including Unified Communications Manager servers, typically provide detailed debug and call trace log files. To interpret these log files, however, it is useful to understand the signaling that occurs between devices as calls are set up and disconnected. Using the network topology and call flow diagrams in conjunction with the log files, you can trace how far a call progressed before it failed and identify which device reported the problem. Examples of using call flow diagrams for problem isolation are shown in [Troubleshooting Daily Operations](#).

Check Software Release Versions for Compatibility

After you have identified which devices may be involved in the problem, verify that the version of software running on each device is compatible with the software running on every other device. As part of Cisco Unified Communications Release 9.0(1) verification, Cisco Systems has performed interoperability and load testing on simulated network environments running specific software versions. The [System Release Notes for Contact Center: Cisco Unified Communications System, Release 9.0\(1\)](#) lists the combination of software releases that were tested.

However, if the combination of releases installed in your network does not match the values in the System Release Notes, it does not necessarily mean the combination is invalid. To check interoperability for a specific device and software release, locate and review its individual Release Notes. Release Notes contain up-to-date information on compatibility between the product and various releases of other products. This document also describes open caveats, known issues that may cause unexpected behavior. Before beginning extensive troubleshooting work, examine the Release Notes to determine if you are experiencing a known problem that has an available workaround.



Tip

The open caveat information in the Release Notes contains links to the Bug Toolkit. The Bug Toolkit requires that you are a Cisco partner or a registered Cisco.com user with a Cisco service contract. To access the Bug Toolkit, go to the <http://tools.cisco.com/Support/BugToolKit/>.

Determine if Network Changes Have Occurred

Before focusing on the particular device or site where the problem occurred, it may be useful to determine if a change was made to surrounding devices. If something has been added, reconfigured or removed from elsewhere in the network, that change may be the source of the problem. It is recommended that you track changes to the network such as:

- New agent phones added
- Modifications to Cisco Unified Communications Manager call routing settings, such as new directory numbers, route patterns and dial rules to support new sites or devices
- Changes to port configurations on switches, routers or gateways (new equipment, wiring changes or new port activation)
- Changes to IP addressing schemes (such as adding new subnets) that may have affected route tables

Verify the IP Network Integrity

Always remember that Cisco Unified Communications equipment relies on a backbone IP network. Many connectivity problems are not caused by configuration errors or operational failures on Cisco devices, but rather by the IP network that interconnects them. Problems such as poor voice quality are typically due to IP network congestion, while call failures between locations may be the result of network outages due to disconnected cables or improperly configured IP route tables.

Before assuming that call processing problems result from Cisco Unified Communications devices themselves, check the integrity of the backbone IP network. Keep the OSI model in mind as you perform these checks. Start from the bottom, at the physical layer, by checking that end-to-end cabling. Then verify the status of Layer 2 switches, looking for any port errors. Move from there to confirm that the Layer 3 routers are running and contain correct routing tables. Continue up the OSI stack to Layer 7, the application layer. To resolve problems occurring at the top levels of the stack, a protocol analyzer (or “sniffer”) may be useful. You can use sniffer to examine the IP traffic passing between devices and also decode the packets. Sniffers are particularly useful for troubleshooting errors between devices that communicate using Media Gateway Control Protocol (MGCP) or Session Initiation Protocol (SIP).

Apply Tools to Determine the Problem’s Root Cause

After you have eliminated the IP network as the source of the problem and you have isolated the specific Cisco Unified Communications components involved, you can start applying the many diagnostic tools provided by Cisco components.

[Table 5-3](#) lists the diagnostic tools and supporting troubleshooting documentation available for most components in a contact center network. Note that this summary table is provided for reference only. The procedures in [Troubleshooting Daily Operations](#) specify when to use each tool and provide links to the troubleshooting instructions where appropriate.

Table 5-3 Contact Center Component Troubleshooting Tools and Documentation

Category	Component	Diagnostic Tools Available	Information Available In...
Call Control	Cisco Unified Communications Manager	Serviceability System tools: <ul style="list-style-type: none"> • Alarms • Real-Time Monitoring Tool window Trace log files <ul style="list-style-type: none"> • Communications Manager trace log • SDL trace log (under TAC direction) 	<ul style="list-style-type: none"> • Troubleshooting Guide for Cisco Unified Communications Manager • Cisco Unified Communications Manager Managed Services Guide • Cisco Unified Serviceability Administration Guide • Cisco Unified CDR Analysis and Reporting Administration Guide • Disaster Recovery System Administration Guide for Cisco Unified Communications Manager • Troubleshooting Guide for Cisco Unified Communications Manager
	Cisco Unified SIP Proxy	IOS command line tools (such as Show commands)	<ul style="list-style-type: none"> • Configuring Cisco Unified SIP Proxy Version 1.1.4 for an Enterprise Network, “Troubleshoot” section

Table 5-3 Contact Center Component Troubleshooting Tools and Documentation (continued)

Category	Component	Diagnostic Tools Available	Information Available In...
Contact Center	Cisco Unified Intelligent Contact Management Enterprise	Distributed Diagnostics and Services Network (DDSN) Support Tools Dashboard (requires additional software)	<ul style="list-style-type: none"> • Administration Guide for Cisco Unified ICM/Contact Center Enterprise • Scripting and Media Routing Guide Cisco Unified ICM/Contact Center Enterprise & Hosted, “Troubleshooting Tools for Internet Script Editor” section • Cisco Support Tools User Guide for Cisco Unified Software • Troubleshooting TechNotes
	Cisco Unified Contact Center Enterprise	Log files: <ul style="list-style-type: none"> • Error/event logs • Agent desktop activity logs • Debugging logs Test programs: <ul style="list-style-type: none"> • Chat Service • Enterprise Service • IP Phone Agent Service • Packet Capture Driver • Recording and Statistics Service • Voice Over IP Monitor service Sniffing Adapter Update Utility	<ul style="list-style-type: none"> • Mobile Agent Guide for Cisco Unified CC Enterprise & Hosted, “Configuration and Troubleshooting Appendix for Remote Agent” appendix • DocWiki: Troubleshooting Tips for Unified CCE 9.0 • Troubleshooting TechNotes
	Cisco MediaSense	Log files Alarms	<ul style="list-style-type: none"> • Troubleshooting Tips for Cisco MediaSense 8.5
	Cisco Unified Customer Voice Portal	Error messages Alarms Support Tools Dashboard (requires additional software)	<ul style="list-style-type: none"> • Troubleshooting Guides for Cisco Unified Customer Voice Portal • Cisco Support Tools User Guide for Cisco Unified Software • Troubleshooting TechNotes
	CTI Object Server (CTIOS)	Log files: <ul style="list-style-type: none"> • CTI OS Server logs • CTI Toolkit logs Error messages in the CTI OS Server console window Support Tools Dashboard (requires additional software)	<ul style="list-style-type: none"> • Cisco Support Tools User Guide for Cisco Unified Software • Troubleshooting TechNotes

Table 5-3 Contact Center Component Troubleshooting Tools and Documentation (continued)

Category	Component	Diagnostic Tools Available	Information Available In...
Contact Center (continued)	Cisco Agent Desktop (CAD)	Log files: <ul style="list-style-type: none"> • Error/event logs • Agent desktop activity logs • Debugging logs Test programs: <ul style="list-style-type: none"> • IP Phone Agent Service test program • Voice Over IP Monitor service test program Support Tools Dashboard (requires additional software)	<ul style="list-style-type: none"> • Cisco Support Tools User Guide for Cisco Unified Software • Cisco CAD Troubleshooting Guide for Cisco Unified Contact Center Express, Cisco Unified Communications Manager Edition • Cisco CAD Troubleshooting Guide for Cisco Unified Contact Center Express, Cisco Unified Communications Manager Express Edition • Troubleshooting TechNotes
	Cisco Unified Intelligence Center	FAQs Troubleshooting Tips	<ul style="list-style-type: none"> • Installation Guide for Cisco Unified Intelligence Center, “Frequently Asked Questions about the Installation” chapter • Troubleshooting Tips for Unified Intelligence Center
	Cisco Unified Contact Center Express Cisco Unified IP Interactive Voice Response (Unified IP IVR)	Log files Alarms	<ul style="list-style-type: none"> • Cisco Unified Real-Time Monitoring Tool Administration Guide for Cisco Unified CCX and Cisco Unified IP IVR • Cisco Unified Serviceability Administration Guide • Disaster Recovery System Administration Guide for Cisco Unified CCX and Cisco Unified IP IVR • Cisco Unified CCX Serviceability Administration Guide For Cisco Unified CCX and Cisco Unified IP IVR • Cisco CAD Troubleshooting Guide for Cisco Unified Communications Manager • Troubleshooting TechNotes • Cisco CAD Troubleshooting Guide for Cisco Unified Contact Center Express, Cisco Unified Communications Manager Edition • Cisco CAD Troubleshooting Guide for Cisco Unified Contact Center Express, Cisco Unified Communications Manager Express Edition • Troubleshooting TechNotes

Table 5-3 Contact Center Component Troubleshooting Tools and Documentation (continued)

Category	Component	Diagnostic Tools Available	Information Available In...
Applications	IM and Presence Service (formerly Cisco Unified Presence)	Configuration Troubleshooter Trace log files Alarms	<ul style="list-style-type: none"> • Deployment Guide for IM and Presence Service on Cisco Unified Communications Manager • Database Setup for IM and Presence Service on Cisco Unified Communications Manager • Instant Messaging Compliance for IM and Presence Service on Cisco Unified Communications Manager • Interdomain Federation for IM and Presence Service on Cisco Unified Communications Manager • Partitioned Intradomain Federation for IM and Presence Service on Cisco Unified Communications Manager • Microsoft Exchange for IM and Presence Service on Cisco Unified Communications Manager • Microsoft Office Communicator Call Control with Microsoft OCS for IM and Presence Service on Cisco Unified Communications Manager • Remote Call Control with Microsoft Lync Server 2010 for IM and Presence Service on Cisco Unified Communications Manager • Disaster Recovery System Administration Guide for Cisco Unified Communications Manager

Table 5-3 Contact Center Component Troubleshooting Tools and Documentation (continued)







Category	Component	Diagnostic Tools Available	Information Available In...
Endpoints and Clients	Cisco Unified IP phones	Network configuration, status and phone model information on Settings menu	<ul style="list-style-type: none"> • End-User Guides <ul style="list-style-type: none"> – Cisco Unified IP Phone 6900 Series – Cisco Unified IP Phone 7900 Series – Cisco Unified IP Phone 8900 Series – Cisco Unified IP Phone 9900 Series • Cisco Unified IP Phone Administration Guides for Cisco Unified Communications Manager, “Troubleshooting and Maintenance” chapters <ul style="list-style-type: none"> – Cisco Unified IP Phone 6900 Series – Cisco Unified IP Phone 7900 Series – Cisco Unified IP Phone 8900 Series – Cisco Unified IP Phone 9900 Series • Error Message Decoder  • Output Interpreter  • Troubleshooting TechNotes <ul style="list-style-type: none"> – Cisco Unified IP Phone 7900 Series
	Cisco IP Communicator	Diagnostic tools, how to resolve installation, start up, security and general application problems, and quality issues	<ul style="list-style-type: none"> • Administration Guide for Cisco IP Communicator “Troubleshooting Cisco IP Communicator” chapter
Wireless	Cisco Aironet 3502 Access Point	Diagnostic and configuration tips	<ul style="list-style-type: none"> • Getting Started Guide: Cisco 3502P Access Points “Troubleshooting” chapter • Cisco Aironet 3500 Series Troubleshooting TechNotes
	Cisco Aironet 1142 Access Point	Diagnostic and configuration tips	<ul style="list-style-type: none"> • Getting Started Guides “Troubleshooting” chapter • Cisco Aironet 1140 Series Troubleshooting TechNotes

Table 5-3 Contact Center Component Troubleshooting Tools and Documentation (continued)

Category	Component	Diagnostic Tools Available	Information Available In...
Communications Infrastructure	Cisco Catalyst 3750 Access Switch	IOS command line tools (such as Show commands and Debug trace utilities)	<ul style="list-style-type: none"> • Catalyst 3750 Switch Software Configuration Guide, “Troubleshooting” chapter • Catalyst 3750 Switch System Message Guide, “Catalyst 3750 Switch Debug Commands” chapter • Error Message Decoder  • Output Interpreter  • Troubleshooting Tech Notes
	Cisco Catalyst 6506, 6509 Switches	IOS command line tools (such as Show commands and Debug trace utilities)	<ul style="list-style-type: none"> • Catalyst 6500 Series Switch Installation Guide, “Troubleshooting” chapter • Catalyst 6500 Series Error and System Message Guides • Error Message Decoder  • Output Interpreter  • Troubleshooting TechNotes
	Cisco VGD-1T3 Voice Gateway	LEDs IOS command line tools (such as Show commands and Debug trace utilities) ROM Monitor	<ul style="list-style-type: none"> • Cisco VGD 1T3 Voice Gateway Card Installation Guide, “Troubleshooting” chapter • Cisco VGD 1T3 Voice Gateway Chassis Installation Guide, “Troubleshooting” chapter • Cisco VGD 1T3 Voice Gateway Software Configuration Guide, “Using the ROM Monitor” chapter

Preparing Your Network for Troubleshooting and Recovery

Before your network becomes operational, you can take several proactive steps to make troubleshooting easier, including:

- Produce network topology diagrams to help you isolate potential sources of problems.
- Synchronize the date and time on all servers.
- Set trace/logging levels on key devices so that diagnostic information is available when problems occur.
- Create IVR flowcharts that illustrate how calls are routed between agents and sites.

Network Topology Diagrams

One of the first lines of defense is possessing current topology information. One of the most important pieces of topology information is a detailed network diagram (usually created using Microsoft Visio or a similar application). At a minimum, your network topology diagrams should include the following information:

- The name assigned to each major device (typically the DNS name)
- IP addresses for all devices in the network
 - Addresses for each router, core and access switch
 - Addresses for all telephony and application servers, including the IP address for each server in a Cisco Unified Communications Manager cluster
 - DHCP address range for addresses assigned to endpoints such as IP phones and agent workstations
- Phone extension number ranges assigned to sets of agents or users, as well as the main inbound dial-up numbers for each location. This information is useful in resolving dial plan configuration errors.
- WAN IP and PSTN links between sites.

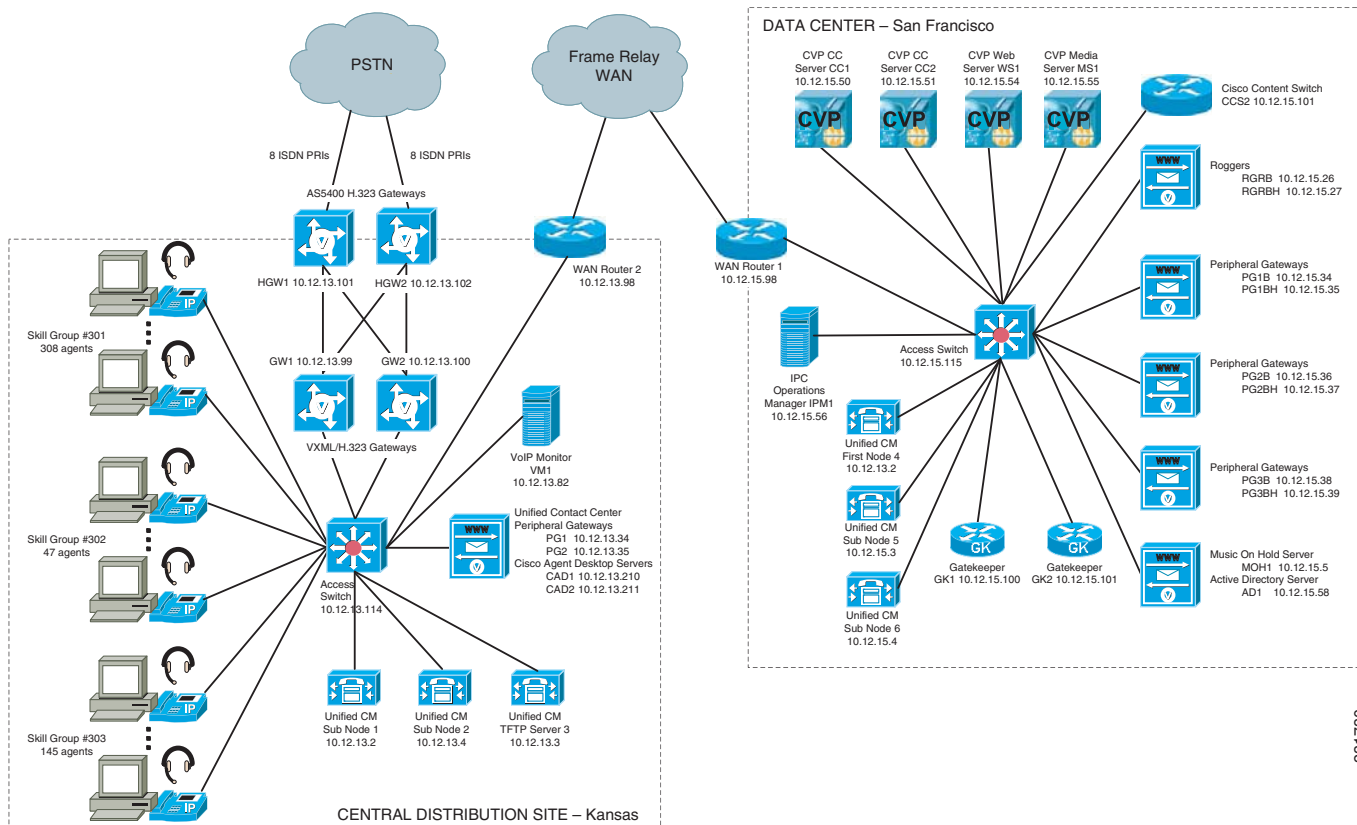
This information is critical for isolating which components are involved in a particular problem. For medium- to large-sized networks, you may want to take a “layered” approach in your diagrams. Create a high-level diagram that illustrates the overall physical layout of your network, including all sites and the links between them. Then for each site create additional diagrams that show detailed addressing information, port numbers and dial plan configurations.

**Tip**

Frequent adds, changes and upgrades to your network can quickly make these diagrams out-of-date. Inaccurate diagrams slow down the troubleshooting process and may lead to misdiagnosing the problem. Remember to keep these diagrams as current as possible.

[Figure 5-1](#) shows a typical high-level topology diagram for a two sites in a contact center network. Agents accepting calls from customers are located in a central distribution site in Kansas, while the equipment supporting interactive voice is located in a data center in San Francisco.

Figure 5-1 Contact Center Network Topology Diagram Example



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Synchronizing Server Date and Time

The best resources for diagnosing problems within your network are the debug and trace log files produced by individual Cisco devices. Tracing can be enabled on multiple devices and the log file output compared to isolate problems. In order to correlate messages for the same activity in different log files, you must compare the message timestamps and the source device MAC and IP addresses (there is no universal call ID value shared between Cisco devices). You should synchronize every device to the same date and time source so that the timestamps match. To accomplish this synchronization, set each device to obtain its date and time from the same Network Time Protocol (NTP) source.

For Cisco IOS-based devices (switches, routers or voice gateways), you can configure each device to act as a NTP client and periodically poll a master NTP source using the following command:

```
ntp server ip-address [version number] [key keyid] [source interface] [prefer]
```

Additional IOS commands are available to establish a device as a NTP peer (operating as the master source for other devices), as well as setting up NTP broadcasting instead of polling. See the [Cisco IOS Configuration Fundamentals Command Reference](#) for details on these IOS commands.

Recommended Trace/Logging Settings

In order to have diagnostic information available when you begin to research problems, you must configure devices in your network to capture signaling, processing and other activity in log files.

Cisco Unified Communications Manager Trace Settings

Trace settings for Cisco Unified Communications Manager servers are maintained using the Cisco Communications Manager Serviceability graphical interface. There are two ways to set trace logging levels for Unified Communications Manager services:

- **Customize trace levels for individual parameters:** This approach offers a high-degree of control and flexibility over the trace output. However, in order to use this approach you should understand not only the significance of each parameter, but also the impact of tracing on Unified Communications Manager server performance. For example, setting trace levels to “Error” has a minimal impact to CPU cycles while leaving the “Detail” level set for long periods of time may impact call processing. For instructions on setting individual trace levels, see the [Cisco Unified Serviceability Administration Guide, “Configuring Trace” chapter](#).
- **Apply predefined trace levels:** This approach allows you to quickly enable and disable tracing for each Unified Communications Manager service based on predefined levels. You can also use these default troubleshooting trace settings in combination with customized settings to temporarily override the your custom settings. For instructions on using the Troubleshooting Trace Settings option in the Cisco Unified Communications Manager Serviceability interface, see the [Cisco Unified Serviceability Administration Guide, “Configuring Troubleshooting Trace Setting Configuration” chapter](#).

Debug Trace Settings for Unified IP IVR System

If you encounter any problems with the Unified CCX platform and Unified IP IVR system, activate the following debug trace settings to generate debug logs:

- For Unified CCX platform issues: SS_TEL, SS_ICM, and LIB_ICM.
- For JTAPI Client issues: Enable all Trace Levels and select all debug levels except MISC_DEBUGGING.

However, deactivate the above trace settings if you experience any degradation in performance during heavy load situations.

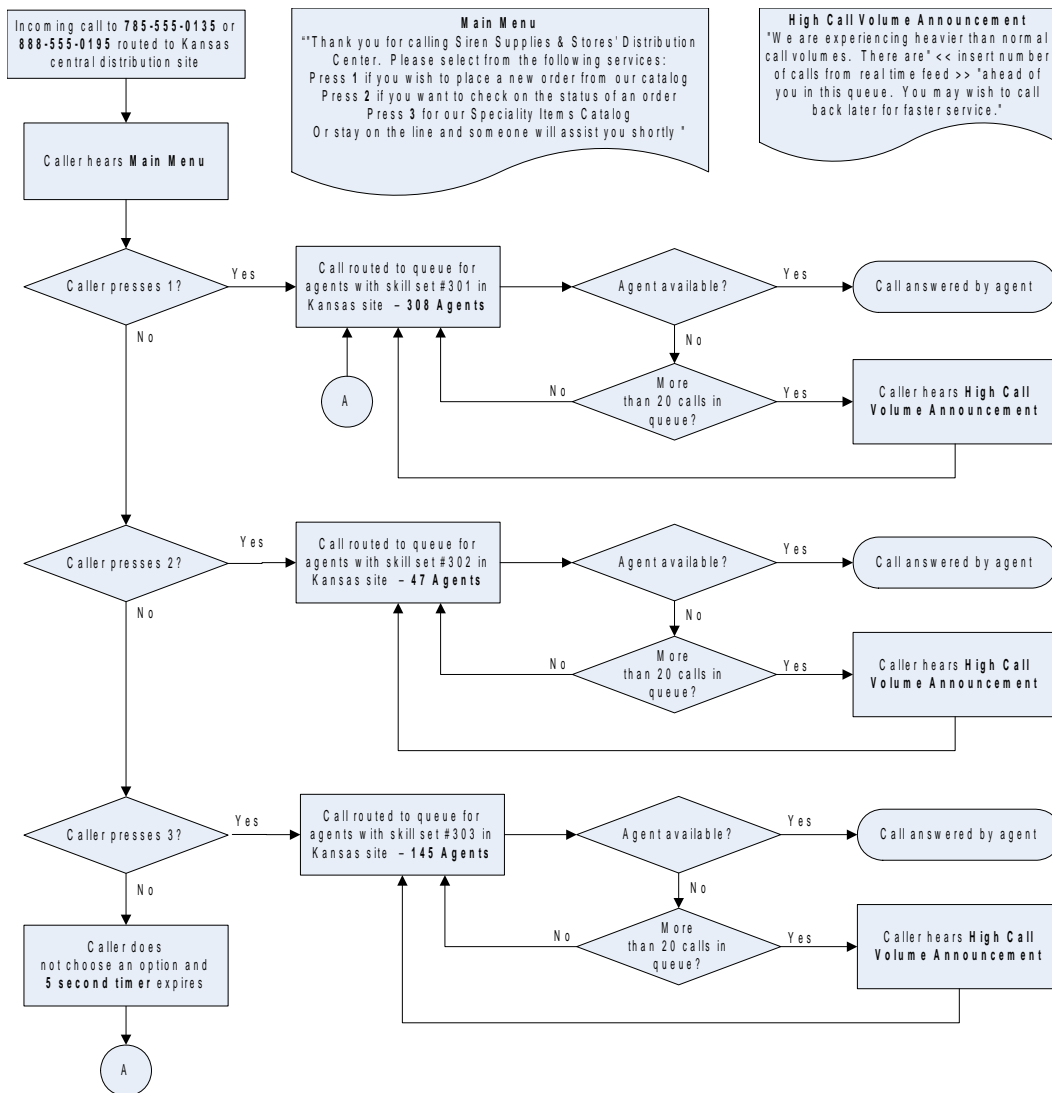
IVR Flowcharts

In a contact center environment, another tool that can help you troubleshoot call processing problems is a flowchart that traces the call routing process based on the interactive voice response (IVR) menu choices that callers make. [Figure 5-2](#) traces the processing of an incoming call received by a central distribution site. The call receives a voice treatment prompting the call to select between three menu options or hold for an agent. The flowchart indicates which set of agents receives the call based on the menu option selected, as well as describing the capacity (number of agents) in the particular skill set group.

For calls received during high traffic periods, with more than 20 calls queued up for agents, the flowchart indicates the announcements played to the callers and how the calls are routed. This type of flowchart is useful for troubleshooting problems reported by external users (customers). While [Figure 5-2](#) shows a fairly simple example, where calls stay within a particular site, some contact center applications may

overflow calls to other sites. In those cases, the overflow calls may traverse an IP WAN to a secondary site and may be handled by additional devices. In situations like that, you need to also view a network topology diagram for the secondary site to trace the call processing.

Figure 5-2 Interactive Voice Response Flowchart Example



Conduct User Acceptance Test

After the components are configured and integrated with other Cisco contact center applications, the field engineer prepares the system for the user acceptance test. Test scripts are run and compared against expected results. Any variability in network performance is noted and addressed before the user acceptance test.

Testing the customer solution involves the following tasks:


- Determine the user acceptance test parameters and deliverables and record these in the user acceptance test plan.
- Conduct a prelaunch test—Using an incremental approach, test the solution against the system design in a low-risk environment with limited users. If the system is stable, the rollout pace is increased until the full implementation is operational.
- The customer signs the Ready-for-Use Acceptance Letter acknowledging that the acceptance test yielded satisfactory results.

Train End Users

The final stage of the Implement phase is to help ensure that the customer's system administration team and end users are trained to take over management of the new system.

Cisco Systems offers several training and certification programs for customers to maximize the usage of their newly adopted systems. See the [Training Library](#) for more information on Cisco training websites and videos on demand (VODs).

Additional Sites and Services

Steps to Success is a Cisco methodology that outlines the tasks required to complete a successful customer engagement. Registered users can visit the [Steps to Success](#)  resource site for Cisco Unified Communications process flows.

Cisco Unified Communications Services is a Cisco service offering that provides engineering expertise and best practices.

- Registered users can visit the [Cisco Unified Communications Services](#)  partner site.
- Nonregistered users can visit the [Cisco IP Communications Services](#) site.



CHAPTER 6

Operate

Introduction to Operating the System

To ensure that your network operates efficiently and reliably, you should maintain system and performance management practices as part of your daily operations. These practices include scheduled routine maintenance; keeping maintenance records; and maintaining up-to-date upgrade, troubleshooting, and recovery strategies.



Tip

You can navigate to any topic on this tab by using the tab navigation pane at the left of the content pane. This navigation pane contains the table of contents (TOC) for the active tab.

Before You Begin

User acceptance testing is completed and any problems that surfaced have been resolved. Users have been trained in using the new system.

Output of This Process

The Operations phase produces data and performance criteria that provide crucial information for optimizing your system.

Major Tasks in This Process

- [Managing Your System](#)
- [Backing Up and Restoring Components](#)
- [Using Network Monitoring Tools](#)
- [Using Managed Services Documents](#)
- [Operating Contact Center Systems](#)
- [Troubleshooting Daily Operations](#)

Managing Your System

This topic provides a high-level summary of the ongoing tasks that are required for managing your system and the options for how these tasks can be performed. For detailed maintenance and operation guides for each component in your Cisco Unified Communications system, see the product documentation listed in in the Resource Library.

System Management Tasks

Managing a Cisco Unified Communications system consists of performing the following activities:

- Integrating monitoring and management tools—Select, order, configure, integrate, and test a set of tools for monitoring and managing the Cisco Unified Communications system.
- Monitoring—Set thresholds, monitor events, and generate notifications when service-impacting events occur.
- Ticketing—Generate and track system trouble tickets for each event.
- Diagnosing incidents—Analyze and troubleshoot incidents to determine the cause.
- Resolving incidents—Define and execute an action plan which can include performing break and fix activities, applying software updates and patches, managing hardware replacements, and executing change management processes.
- Managing changes in the network—Define a change management process for performing moves, adds, changes, and disconnects (MACDs) for your Cisco Unified Communications system including network devices, phones/endpoints, software upgrades, voice-mail boxes, dial plan updates, security patches, OS applications, and voice applications.
- Archiving configurations—Back up device configurations daily and restore device configurations when necessary.
- Managing voice as a network service—Track, measure, and resolve quality of service (QoS) issues such as jitter, delay, and dropped packets, and monitor service level agreements (SLAs) with service providers.
- Managing security posture—Detect, analyze, and address security events.
- Reporting—Define, develop, and generate performance, availability, event, and inventory reports.
- Backing up and restoring system components—Define backup methodologies and schedules, define a verification process for backups, secure storage of backups, and document backup processes.

System Management Options

There are two options for managing a Cisco Unified Communications System:

- Do It Yourself—In this model, you are responsible for managing the entire Cisco Unified Communications System. This approach requires developing business processes; integrating, provisioning and maintaining network management tools; and developing data and voice management skills and knowledge. Cisco offers tools as a means for monitoring your network; see [Using Network Monitoring Tools](#) for more information.
- Outtasking Hybrid Model—Using the [Cisco Lifecycle Services](#) approach, Cisco and its partners provide a broad portfolio of end-to-end services and support that can help increase your Cisco Unified Communications system's business value and return on investment. This approach includes two services that provide different levels of management:
 - [Cisco Unified Communications Essential Operate Service](#) combines Cisco award-winning maintenance support with basic voice applications monitoring and reporting.
 - [Cisco Unified Communications Remote Management Service](#) includes monitoring and reporting plus managing day-to-day system issues such logical moves, adds, changes, and disconnects; resolving incidents; performing configuration backups; and reporting.

For more information about the Cisco Unified Communications Essential Operate Service, Cisco Unified Communications Remote Management Service or other Cisco Unified Communications services, see <http://www.cisco.com/go/ipcservices> or contact your Cisco service account manager.

Backing Up and Restoring Components

This topic provides details on backup and restore for Cisco Unified Communications components. First and foremost, the backup of Cisco Unified Communications components needs to be incorporated into your corporate-wide backup operations. It is an important aspect of disaster recovery and is also essential before doing component upgrades. If you do not have a process in place, you must develop and document a backup and recovery management process. Some items to consider for this process are the following:

- Provide proper storage of operating system and Cisco Unified Communications application CDs.
- Define incremental and full backup methodologies and schedules, assign an owner for each Unified Communications component and database server.
- Define a verification process for backups:
 - Monitor backup logs on a daily basis for errors.
 - Periodically restore backup images to ensure validity.
- Secure onsite and offsite storage of backups.
- Develop well documented processes for system and configuration restoration.
- Ideally, provide central location(s) (for example, SFTP servers) for backup of data from all the Cisco Unified Communications components.

The following topics provide backup and restore details on a component basis along with links to the appropriate component documentation:

- [Cisco Unified Communications Manager](#)
- [Cisco Unified Contact Express and Unified IP IVR](#)
- [Cisco Unified Intelligent Contact Management Enterprise](#)
- [Cisco Unified Communication Manager IM and Presence Service](#)

For additional information on backing up and restoring Unified Communications system components, as well as other system operations topics, see the documentation wiki (DocWiki) at http://docwiki.cisco.com/wiki/Unified_Communications_System_Operations.

Cisco Unified Communications Manager

Cisco Unified Communications Manager provides the Disaster Recovery System (DRS) for full backup and restore for all servers in a Unified Communications Manager cluster. The DRS performs a cluster-level backup, which means that it collects backups for all servers in a Unified Communications Manager cluster to a central location and archives the backup data to a physical storage device (tape or SFTP). For customers with multiple clusters, DRS must be configured per cluster.

DRS is invoked via the Unified Communications Manager Platform Administration. It allows you to perform scheduled (daily, weekly, monthly) automatic or user-invoked backups. DRS only supports a single backup schedule at a time. It provides a history (last 20 operations) of backup and restore operations.

**Note**

DRS does not support hostname or IP address change during restore. For more information about the Disaster Recovery System, see the [Disaster Recovery System Administration Guide for Unified Communications Manager](#).

Cisco Unified Contact Express and Unified IP IVR

Unified Contact Center Express (Unified CCX) and Unified IP Interactive Voice Response (Unified IP IVR) uses the Disaster Recovery System (DRS) for full data backup and restore capabilities. For more information on DRS for these two products, see the [Disaster Recovery System Administration Guide for Cisco Unified Contact Center Express](#).

Cisco Unified Intelligent Contact Management Enterprise

For Cisco Unified Intelligent Contact Management Enterprise, the MicroSoft backup strategies for SQL Server are recommended. In addition, the AW Database should not require a backup as it is populated by the Logger. When backing up the Logger, the Logger process should be stopped to prevent read/write conflicts. For more information, see the [Installation Guide for Cisco Unified ICM/Contact Center Enterprise & Hosted](#).

Also, when upgrading the Unified ICM Enterprise, see [Back Up the ICM Registry for Comparison](#) for backing up the Windows registry for comparison.

Cisco Unified Communication Manager IM and Presence Service

Cisco Unified Communication Manager IM and Presence Service (formerly Cisco Unified Presence) uses the Disaster Recovery System (DRS) for full data backup and restore capabilities of all Unified Presence Administration functions. For more information, see the IM and Presence Disaster Recovery System chapter in [Disaster Recovery System Administration Guide for Unified Communications Manager](#).

Using Network Monitoring Tools

The Cisco Unified Communications Management Suite allows businesses to actively monitor their Cisco Unified Communications solution to discover potential problems, maintain quality and user satisfaction, and help minimize service downtime. The following network monitoring tool is available for contact center deployments:

- [Cisco Unified Operations Manager](#)

For more information about network monitoring, as well as other system operations topics, see the Cisco Unified Communications category on the documentation wiki (DocWiki) at: http://docwiki.cisco.com/wiki/Cisco_Unified_Communications.

Cisco Unified Operations Manager

Cisco Unified Operations Manager provides comprehensive monitoring with proactive and reactive diagnostics for the entire Cisco Unified Communications system, including the underlying transport infrastructure. Its built-in rules, which provide contextual diagnostics, enable rapid troubleshooting of key service-impacting outages.

Cisco Unified Operations Manager provides a real-time, service-level view of the entire Cisco Unified Communications system and presents contextual tools to look at the current alert status, historical information, and service impact of any outages. It continuously monitors the different elements such as

Cisco Unified Communications Manager, Cisco Unified Contact Center Enterprise, Cisco Unified Contact Center Express, and Cisco Unified Presence, as well as Cisco gateways, routers, switches, and IP phones. For a complete list of devices that can be monitored, see the appropriate [Device Support Table for Cisco Unified Operations Manager](#).

Other Cisco Unified Operations Manager capabilities include:

- Synthetic tests that replicate end-user activity and verify gateway availability as well as other configuration aspects of the Cisco Unified Communications infrastructure. Tests may be run on synthetic phones or real IP phones (both SIP- and SCCP-based phones) deployed in the network.
- Cisco IOS IP Service Level Agreement (SLA)-based diagnostic tests that can be used to troubleshoot network-related issues, determine paths, and proactively monitor voice quality across WAN links.
- Tools to discover and report on the status of different video-enabled IP endpoints (for both SIP- and SCCP-based phones) in the Cisco Unified Communications system, as well as additional contextual information to locate and identify the IP phones. It can also track the status of these endpoints, such as when IP phones in your network that have become disconnected from the switch, are no longer registered to a Unified Communications Manager server, or have gone into SRST mode.
- Test probes to run dial-plan tests, acceptance tests, and phone-feature tests. Such phone-testing capabilities may be used to rapidly troubleshoot issues related to connectivity (signaling/media stream) and voice quality as well as call processing/dial-plan management issues.
- Visibility into key performance metrics of different Cisco Unified Communications elements, such as resource usage (CPU, memory, MTP resources, transcoder resources), call statistics (active calls), and trunk statistics (trunk usage, port usage, and gateway statistics) that aid in troubleshooting and capacity planning.
- Correlation and presentation of voice-quality alerts using the information available through Cisco Unified Service Monitor (when the latter is also deployed). Cisco Unified Operations Manager displays mean opinion scores associated with voice quality between pairs of endpoints (IP phones, Cisco Unity messaging systems, or voice gateways) at specified times involved in the monitored call segment and other associated details about the voice-quality problem. It can also trace a probable path between the two endpoints and report on any outages or problems on intermediate nodes in the path.
- Tracking of Cisco Unified Communications devices and IP phone inventory, including IP phone status changes, and creation of reports that document move, add, and change operations on IP phones in the network.

Because Cisco Unified Operations Manager does not deploy any agent software on the devices being monitored, it is completely nondisruptive to system operations. For more information on Cisco Unified Operations Manager, see the documentation available at:

http://www.cisco.com/en/US/products/ps6535/tsd_products_support_series_home.html

Using Managed Services Documents

Managed Services documents provide essential information to ensure the continuous operation of a Cisco Unified Communications System by monitoring faults, configuration, performance, and security. These documents define a component's Management Information Base (MIB) structure and also explain the syslogs, alerts, and alarms elements that service providers can incorporate in their managed services. They also describe the component's system architecture while outlining basic concepts such as Simple Network Management Protocol (SNMP) and presenting the capabilities of the management tools available for that component.

A up-to-date list of Managed Services documents is available at [Cisco Unified Communications Managed Services](#).

Operating Contact Center Systems

Sample call flows were tested and verified for the two test beds in the contact center system:

- [Test Bed 1](#): Unified CVP with Local and Remote Agents
- [Test Bed 2](#): Unified CVP with Local Agents

Sites for the two test beds are defined in [Review Tested Deployment Models](#) on the Design tab.

Test Bed 1

Test Bed 1: Unified CVP with Local and Remote Agents, handles the following:

- Unified CVP post-routed call flows
- MediaSense call flows
- Finesse call flows
- Unified Border Element call flows

For more information, see [Tested Call Flows](#).

Test Bed 2

Test Bed 2: Unified CVP with Local Agents, handles Unified CVP post-routed call flows.

For more information, see [Tested Call Flows](#).

Failover and Redundancy

Failover testing was done to verify the redundancy and failover capabilities of specific components such as gatekeepers, WAN access routers, and the private connection between the Roggers in the data centers. Failover testing was done with:

- Contact center components that have redundancy capabilities in the event of a failure
- Contact center components that did not have redundancy capabilities in the event of a failure

For detailed information on the failover testing performed during this system release, see the failure, failover, and recovery details for each test bed:

- [Test Bed 1](#)
- [Test Bed 2](#)

Troubleshooting Daily Operations

This topic describes how to diagnose and resolve system-level problems that occur during daily operations of a Cisco Unified Communications network. It contains the following sections:

- [Common Problems Reported by Users](#)
- [Failover and Recovery Procedures](#)

For an expanded list of general problem areas, as well as other system troubleshooting topics, see the documentation wiki (DocWiki) at:

http://docwiki.cisco.com/wiki/Unified_Communications_System_Troubleshooting

Common Problems Reported by Users


This section describes basic approaches to diagnose and resolve common problems reported by end users. Note that this section demonstrates various tools and diagnostic approaches available in the context of specific problems, but does not provide a comprehensive list of all possible problems that may occur. Problems described in this section include:

- [One-Way Audio](#)
- [Poor Voice Quality](#)

One-Way Audio

One-way audio and no audio at all (no-way audio) are problems that are fairly common during a new network installation. The majority of these problems are caused by misconfigurations. For one-way audio problems, always pay attention the direction in which the one-way audio is occurring. For no audio in either direction, the troubleshooting methodology is the same. You might need to repeat the procedure for each direction of audio, but more likely you will find the source of the problem when trying to troubleshoot one direction. There are several steps you can take to troubleshoot a one-way/no-way audio problem:

1. [Verify Bidirectional IP Connectivity](#).
2. [Check Cisco IOS Software Gateway Configurations](#).
3. [Check for NAT or Firewall Restrictions](#).

For additional directions on troubleshooting one-way audio problems, refer to the [Troubleshooting One-Way Voice Issues Tech Note](#) .

Verify Bidirectional IP Connectivity

You should verify IP connectivity as the first step in troubleshooting a one-way or no-way audio problem because IP connectivity must be present for voice packets to be exchanged between two devices. A large number of one-way or no-way audio problems are caused by lack of IP connectivity. Check that:

- If the two endpoints involved in the call are on different IP subnets, each endpoint has the correct default gateway and subnet mask settings

- If one of the endpoints is a Unified IP phone, the DHCP scope has an incorrectly configured default gateway parameter.
- If one of the endpoints is a Cisco IOS software gateway, the default route is correct. Also, ping the other endpoint from the gateway. If the ping is successful, you know that you have IP connectivity. If the ping is unsuccessful, perform a **tracert** to determine where the problem lies.

**Note**

Remember that signaling packet traffic is always between Unified Communications Manager and the endpoint, whereas the RTP voice packet traffic is directly between the endpoints. So just because the endpoints are registered to Unified Communications Manager and can set up a call through Unified Communications Manager does not mean that the endpoints have proper IP connectivity between them.

Another useful tool for troubleshooting such a problem is the help (**i** or **?**) button on Cisco Unified IP phones. Press the help (**i** or **?**) button twice in quick succession during an active call. The display shows you receive and transmit statistics for the call. If you do not see the receive counter (RxCnt) incrementing, the packets are probably not arriving on that IP phone. If you go to the originating IP phone and the transmit count (TxCnt) is incrementing, the packets are probably being lost somewhere in the network. If a ping or traceroute does not provide enough information about where the packets are being lost, you may need to connect a sniffer to the network and perform the following steps:

1. Connect the sniffer to the back of the originating IP phone and make verify that the phone is actually transmitting packets.
2. On the originating phone, verify that the IP address and MAC address information is correct.
3. If the network settings on the originating phone are correct, go to the terminating IP phone to verify that the packets are not arriving.
4. If the voice packets are not arriving at the terminating phone, move the sniffer from network hop to network hop to isolate where the packets are being dropped. A common reason for a problem such as this is a missing or improperly configured IP route.

Check Cisco IOS Software Gateway Configurations

There are various reasons why you might encounter one-way audio on calls to a Cisco IOS software gateway. Most of these problems can be solved using simple configuration commands.

1. Check if IP routing is enabled on the gateway that you are using—You do not need to be running a routing protocol such as RIP, EIGRP, or OSPF, but IP routing must not be disabled. Make sure that the **no ip routing** command is not in your configuration. If it is, be sure to eliminate it by configuring the **ip routing** command. You can also issue the **show ip route** command to see if IP routing is enabled. If IP routing is disabled, there are no routes listed in the output, and the list of routing protocols is not present.
2. Determine if the VoIP subsystem is enabled—The VoIP subsystem in Cisco IOS software uses the IP routing code to aid in encapsulating and transmitting the VoIP packets, so the subsystem must be enabled to transmit and receive VoIP packets. It does not need the IP routing code to perform signaling such as H.323 or MGCP, so the signaling still works with IP routing disabled.
3. Check IP address configurations on gateway interfaces—Another common occurrence of one-way audio appears on Cisco IOS software H.323 voice gateways that have more than one data interface, such as a gateway that has both an Ethernet connection to the LAN and a serial connection to the WAN. When an H.323 gateway is configured in Cisco Unified Communications Manager Administration, you configure a specific IP address. Cisco Unified Communications Manager always uses this IP address for all its signaling to the gateway; however, Cisco IOS software voice gateways by default use the IP address of the interface that is closest to the destination. This could be a problem if Unified Communications Manager is connected via one interface and the device to

which the RTP audio stream is destined for is connected to a different interface. To force the voice gateway to always use the same IP address, configure the **h323-gateway voip bind srcaddr ip-address** command on the interface that you are using for signaling on the Cisco IOS software voice gateway. Make sure this is the same IP address configured in Cisco Unified Communications Manager Administration. Failure to do so could result in one-way audio when the gateway tries to use a different source interface than the one configured in Unified Communications Manager.

4. Configure **voice rtp send-recv** on the gateway—Sometimes you have one-way audio problems only when calling specific numbers, such as 411 or 911 in the North American numbering plan (NANP) or after you transfer a call or put it on hold. If you are having these problems when going through a Cisco IOS software voice gateway, be sure that the **voice rtp send-recv** command is configured on the gateway. Numbers such as 411 and 911 sometimes do not send back answer supervision (that is, an ISDN connect message) when the remote end answers. As a result, the Cisco IOS software voice gateway does not cut through audio in both directions to prevent toll fraud. Configuring the **voice rtp send-recv** command forces the voice gateway to cut through audio in both directions immediately.
5. If you are using a Cisco AS5350 or AS5400 as a gateway, configure the **no voice-fastpath enable** command in global configuration mode—When enabled, this command causes the voice gateway to cache the IP address and UDP port number information for the logical channel opened for a specific call and forwards the packets using the cached information. This helps marginally reduce CPU utilization in high-call-volume scenarios. Because of how Cisco Unified Communications Manager opens and closes logical channels to redirect RTP audio streams, such as in the case of a transfer or music on hold (MOH) server, the Cisco AS5350 and AS5400 cache the IP address information of the old IP address. Therefore, you end up with one-way audio when the call gets redirected to a new IP address because the voice gateway still uses the cached information instead of the newly negotiated information.

Check for NAT or Firewall Restrictions

One common cause of one-way or no-way audio is when Network Address Translation (NAT), Port Address Translation (PAT), or firewalls exist between two endpoints. The SCCP protocol embeds IP addresses in the IP packet's payload to signal which IP address to send RTP packets to. If the device performing NAT or PAT is unaware of this fact, the embedded IP addresses are not translated. Therefore, one-way or no-way audio results.

Firewalls can also be a problem if they are unaware of the voice traffic passing through them. Firewalls often are configured to block all UDP traffic going through them. Because voice traffic is carried over UDP, it might be blocked while the signaling carried over TCP is passed. A sniffer is the best tool for debugging such a scenario. If both devices appear to be transmitting audio but the audio is not reaching the opposite side, take a sniffer trace at each hop along the way until you find the hop where the audio is not passing through. If the firewall is blocking UDP packets, you might need to open a hole in it to allow the voice traffic to pass through.

Problems Occurring After the Call Connects Successfully

The scenarios discussed so far are cases in which you have one-way audio or no-way audio from the beginning of the call or after a hold/transfer. Occasionally, however, you might encounter scenarios in which a call is up and suddenly becomes one-way or audio disappears entirely. Network problems are largely to blame for failures of this sort. Ensure that network connectivity between the two endpoints still exists and that nothing on the network might be causing intermittent network connectivity. An example would be a *flapping* network connection—a network connection that is transitioning between up and down states over and over again—or a routing protocol that cannot converge correctly. Again, a sniffer is the best tool for diagnosing this kind of problem. The best place to start is on the device that

originates the RTP stream to ensure that the stream is still being generated when the loss of audio occurs. If you discover that the originating device stops sending packets for no reason, you might be dealing with a software or hardware problem on the originating device.

A common cause of such a failure is a Digital Signal Processor (DSP) crash. If the end device is a Cisco IOS software voice gateway, you see an error displayed on the console that looks similar to the following:

```
%VTSP-3-DSP_TIMEOUT: DSP timeout on event 6: DSP ID=0x2312: DSP error stats
```

This message is also sent to a Syslog server if the Cisco IOS software voice gateway is configured to send Syslog information to a Syslog server. On a Cisco VG200, 2600, or 3600, you can issue the following command to check the status of the DSPs:

```
test dsprm slot #
```

The **show voice dsp** command displays which port and time slot are allocated to each DSP. If the **test dsprm slot #** command detects a DSP that has crashed, you can compare this with the information obtained from a **show call active voice** command (or a **show call history voice** command if the call has been disconnected) to see if the time slot of the failed call is the same as the slot of the DSP that is no longer available. Unfortunately, the only way to recover from this condition is to reload the gateway.

Poor Voice Quality

Nearly all voice quality problems can be attributed to some kind of degradation on the IP network that the voice traffic traverses. Network problems that might not be noticeable for normal data traffic are very apparent in a voice conversation because of the need to minimize packet loss and variable delay in an IP telephony network.

A variety of issues can result in poor voice quality:

- [Packet Drops](#)
- [Queuing Problems](#)

In addition to the information in this section, refer to the [Troubleshooting QoS Choppy Voice Issues](#) document on Cisco.com for additional techniques on resolving voice quality issues.

Packet Drops

IP telephony demands that voice packets reach their destination within a predictable amount of time and without being dropped somewhere along the path from the source to the destination. In a properly designed network with appropriate QoS provisioning in place, packet loss should be near zero. All voice codecs can tolerate some degree of packet loss without dramatically affecting voice quality. Upon detecting a missing packet, the codec decoder on the receiving device makes a best guess as to what the waveform during the missing period of time should have been. Most codecs can tolerate up to five percent random packet loss without noticeable voice quality degradation. This assumes that the five percent of packets being lost are not being lost at the same time, but rather are randomly dropped in groups of one or two packets. Losing multiple simultaneous packets, even as a low percentage of total packets, can cause noticeable voice quality problems.

**Note**

You should design your network for zero packet loss for packets that are tagged as voice packets. A converged voice/data network should be engineered to ensure that only a specific number of calls are allowed over a limited-bandwidth link. You should guarantee the bandwidth for those calls by giving priority treatment to voice traffic over all other traffic. For more information on prioritizing voice over data, refer to the [Voice Quality](#) information available on Cisco.com.

There are various tools that you can use to determine whether you are experiencing packet loss in your network and where in the network the packets are getting dropped. The starting point to look for lost packets is the call statistics screen on Cisco Unified IP Phones.

1. Do one of the following:
 - If you are troubleshooting at the phone experiencing the problem, access these statistics by pressing the help (i or ?) button on the IP phone twice in quick succession during an active call.
 - If you are working with a remote user, open a web browser on your computer and enter the IP address of the user's phone. During an active call, choose the **Streaming Statistics > Stream 1** options from the display.
2. Examine the counters RxDisc and RxLost shown on the IP phone (or Rcvr Lost Packets if you are viewing the statistics remotely using a web browser).
 - RxLost measures the number of packets that were never received because they were dropped in the network somewhere. By detecting a missing RTP sequence number, the IP phone can determine that a packet has been lost.
 - RxDisc corresponds to packets that were received but were discarded because they could not be used at the time they arrived. RxDisc can come from an out-of-order packet or a packet that arrived too late.
3. If either of these two counters increments, you should investigate to learn why packets are being lost or discarded.

Regardless of how low your packet loss is, if it is not zero, you should investigate the root cause because it might be a sign of a bigger problem that will get worse with higher call volume. Also, although small packet loss might not be perceptible in a conversation between two people, it can be detrimental to fax and modem transmissions. The packet loss can be occurring at any layer of the OSI model, so be sure to check for all possibilities for each hop. For example, if there is a Frame Relay connection over a T1 between two sites, you should:

- Make certain that there are no errors at the physical layer on the T1.
- Determine if you are exceeding your committed information rate (CIR) on the Frame Relay connection.
- Verify that you are not dropping the packets at the IP layer because you are exceeding your buffer sizes.
- Check that you have your QoS improperly configured.
- Ensure that your service provider not only guarantees packet delivery but also guarantees a low-jitter link. Some service providers may tell you that they do not provide a CIR but guarantee that they will not drop any packets. In a voice environment, delay is as important as packet loss. Many service providers' switches can buffer a large amount of data, thereby causing a large amount of jitter.

One common cause of drops in an Ethernet environment is a duplex mismatch, when one side of a connection is set to full duplex and the other side is set to half duplex. To determine if this is the case, perform the following steps:

1. Check all the switch ports through which a given call must travel and ensure that there are no alignment or frame check sequence (FCS) errors. Poor cabling or connectors can also contribute to such errors; however, duplex mismatches are a far more common cause of this kind of problem.
2. Examine each link between the two endpoints that are experiencing packet loss and verify that the speed and duplex settings match on either side.

Although duplex mismatches are responsible for a large number of packet loss problems, there are many other opportunities for packet loss in other places in the network as well. When voice traffic must traverse a WAN, there are several places to look. First, check each interface between the two endpoints, and look for packet loss. On all Cisco IOS software platforms, you can find this information using the **show interface** command. If you are seeing dropped packets on any interface, there is a good chance that you are oversubscribing the link. This could also be indicative of some other traffic that you are not expecting on your network. The best solution in this case is to take a sniffer trace to examine which traffic is congesting the link.

Sniffers are invaluable in troubleshooting voice quality problems. With a sniffer, you can examine each packet in an RTP stream to see if packets are really being lost and where in the network they are being lost. To troubleshoot using a sniffer, perform the following steps:

1. Start at the endpoint that is experiencing the poor-quality audio where you suspect packet loss.
2. Take a sniffer trace of a poor-quality call and filter it so that it shows you only packets from the far end to the endpoint that is hearing the problem. The packets should be equally spaced, and the sequence numbers should be consecutive with no gaps.
3. If you are seeing all the packets in the sniffer trace, continue taking traces after each hop until you get a trace where packets are missing.
4. When you have isolated the point in the network where the packet loss is occurring, look for any counters on that device that might indicate where the packets are being lost.

Queuing Problems

Queuing delay can be a significant contributor to variable delay (*jitter*). When you have too much jitter end-to-end, you encounter voice quality problems. A voice sample that is delayed over the size of the receiving device's jitter buffer is no better than a packet that is dropped in the network because the delay still causes a noticeable break in the audio stream. In fact, high jitter is actually worse than a small amount of packet loss because most codecs can compensate for small amounts of packet loss. The only way to compensate for high jitter is to make the jitter buffer larger, but as the jitter buffer gets larger, the voice stream is delayed longer in the jitter buffer. If the jitter buffer gets large enough such that the end-to-end delay is more than 200 ms, the two parties on the conference feel like the conversation is not interactive and start talking over each other.

Remember that every network device between the two endpoints involved in a call (switches, routers, firewalls, and so on) is a potential source of queuing or buffering delays. The ideal way to troubleshoot a problem in which the symptoms point to delayed or jittered packets is to use a sniffer trace at each network hop to see where the delay or jitter is being introduced.

For more information on jitter, refer to the [Understanding Jitter in Packet Voice Networks](#) document on Cisco.com.

Failover and Recovery Procedures

The Disaster Recovery System (DRS), which can be invoked from Cisco Unified Communications Manager Administration, provides full data backup and restore capabilities for all servers in a Cisco Unified Communications Manager cluster. The Disaster Recovery System allows you to perform regularly scheduled automatic or user-invoked data backups. DRS supports only one backup schedule at a time.

The Cisco Disaster Recovery System performs a cluster-level backup, which means that it collects backups for all servers in a Cisco Unified Communications Manager cluster to a central location and archives the backup data to physical storage device.

When performing a system data restoration, you can choose which nodes in the cluster you want to restore.

The Disaster Recovery System includes the following capabilities:

- A user interface for performing backup and restore tasks.
- A distributed system architecture for performing backup and restore functions.
- A scheduling engine to initiate tasks at user-specified times.
- Archive backups to a physical tape drive or remote sftp server.

The Disaster Recovery System contains two key functions, Master Agent (MA) and Local Agent (LA). The Master Agent coordinates backup and restore activity with all the Local Agents. The system automatically activates both the Master Agent and the Local Agent on all nodes in the cluster. However, you can only access the Master Agent functions on the first node of the cluster.

For more information on the Cisco Unified Communications Manager Disaster Recovery System, see the [Disaster Recovery System Administration Guide for Unified Communications Manager](#).

Additional Sites and Services

Steps to Success is a Cisco methodology that outlines the tasks required to complete a successful customer engagement. Registered users can visit the [Steps to Success](#) resource site for Cisco Unified Communications process flows.

Cisco Unified Communications Services is a Cisco service offering that provides engineering expertise and best practices.

- Registered users can visit the [Cisco Unified Communications Services](#) partner site.
- Nonregistered users can visit the [Cisco IP Communications Services](#) site.



CHAPTER 7

Optimize

Optimizing Your System

Optimization covers any changes to an existing system, including hardware and software upgrades, that enhance the functionality and performance of your network.

Collecting and analyzing data from your system's performance reports will provide crucial information for optimizing your system. By maintaining the routine system management procedures that you set up for your operations lifecycle, you will know when your traffic load increases and when to expand capacity.



Tip

You can navigate to any topic on this tab by using the tab navigation pane at the left of the content pane. This navigation pane contains the table of contents (TOC) for the active tab.

Input to This Process

Your network has been operational for some period of time and is ready to be optimized based on system performance criteria. Your daily operations and growing business needs provide continuous feedback for optimization.

Output of This Process

User feedback, audits, and test results provide data to continue optimizing the system.

Major Tasks in This Process

- [Performing Your System Upgrade](#)
- [Failover and Redundancy](#)

Performing Your System Upgrade

Before You Begin

See [Plan and Prepare for Your System Upgrade](#) on the Plan tab to plan your overall strategy.

Upgrade Contact Center Software Components

Once you have your upgrade plan and preparations in place, perform your system upgrade by following the guidelines and sequence in [Performing Your System Upgrade](#).

- See [Deployment Models](#) for the general upgrade sequence for the various components in the different deployment models, including Unified Contact Center Enterprise Single Site, Unified Contact Center Enterprise Multisite Centralized, Unified Contact Center Enterprise Multisite Distributed, and Clustering over WAN. For a description of the tested deployment models, see:
 - [Test Bed 1: Unified CVP with Local and Remote Agents](#)
 - [Test Bed 2: Unified CVP with Local Agents](#)
- See [Upgrading Components](#) for more detailed upgrade procedures for each major upgrade strategy: single-stage system upgrade, multistage system upgrade, and multisite migration upgrade. For site-specific upgrade information, see [Upgrading Contact Center Test Beds](#).
- See [Verifying Multistage System Upgrades](#) for interoperability verification procedures you need to perform as you exit each system upgrade stage.
- See [Related Documentation](#) for links to component installation and upgrade documentation.

Failover and Redundancy


Failover testing was done to verify the redundancy and failover capabilities of specific components such as gatekeepers, WAN access routers, and the private connection between the Roggers in the data centers. Failover testing is typically done with:

- Contact center components that have redundancy capabilities in the event of a failure
- Contact center components that did not have redundancy capabilities in the event of a failure

For detailed information on the failover testing, see:

- [Test Bed 1](#)
- [Test Bed 2](#)

Additional Sites and Services

Steps to Success is a Cisco methodology that outlines the tasks required to complete a successful customer engagement. Registered users can visit the [Steps to Success](#)  resource site for Cisco Unified Communications process flows.

Cisco Unified Communications Services is a Cisco service offering that provides engineering expertise and best practices.

- Registered users can visit the [Cisco Unified Communications Services](#)  partner site.
- Nonregistered users can visit the [Cisco IP Communications Services](#) site.



CHAPTER 8

Resource Library

Using the Resource Library

On this tab you find an assortment of resources to help you learn more about Cisco Unified Communications System.

- [System Release Documentation](#)
- [Solution Reference Network Design](#)
- [Tested Deployment and Site Models](#)
- [Network Topology Diagrams](#)
- [Component Resources](#)
- [Unified Communications Demos](#)
- [System Compatibility Tool](#)
- [Ordering Guides](#)
- [End-of-Sale and End-of-Life Products](#)
- [Cisco Unified Workspace Licensing](#)
- [Documentation Wiki](#)

System Release Documentation

The following system-level documents are produced for Unified Communications System releases:

- [System Description](#)
- [System Release Notes](#)
- [System Installation and Upgrade Manual](#)
- [System Test Results](#)

System Description

This document provides an overview of the Cisco Unified Communications System Release 9.0(1). It describes the Cisco Unified Communications system-level approach, lists key features of the Cisco Unified Communications components, and illustrates the various Cisco Unified Communications deployment models.

- [System Description for Cisco Unified Communications System, Release 9.0\(1\)](#)

System Release Notes

These documents described the tested functionality, new and changed features, and limitations and restrictions for each of the following Cisco Unified Communications System Release 9.0(1) solutions:

- Contact Center
 - [System Release Notes for Contact Center: Cisco Unified Communications System, Release 9.0\(1\)](#)
- IP Telephony
 - [System Release Notes for IP Telephony: Cisco Unified Communications System, Release 9.0\(1\)](#)

System Installation and Upgrade Manual

These documents provide installation and upgrade information about the components and configurations that were tested and verified as a part of Cisco Unified Communications System Release 9.0(1) testing for each of the following solutions:

- Contact Center
 - [System Installation and Upgrade Manual for Contact Center: Cisco Unified Communications System, Release 9.0\(1\)](#)
- IP Telephony
 - [System Installation and Upgrade Manual for IP Telephony: Cisco Unified Communications System, Release 9.0\(1\)](#)

System Test Results

These documents described the system-level test cases executed on each of the following Cisco Unified Communications System Release 9.0(1) solutions:

- Contact Center
 - [System Test Results for Contact Center: Cisco Unified Communications System, Release 9.0\(1\)](#)
- IP Telephony
 - [System Test Results for IP Telephony: Cisco Unified Communications System, Release 9.0\(1\)](#)

Test Results Information

[Testing Objectives](#) give information on the intent of system testing

The test results contain the following information:

- **ID**—Identifier for the test.
- **Features Tested**—Component feature tested.
- **Case Title**—Title of the test.
- **Description**—Description of the purpose of the test.
- **Call Component Flow**—Indicates the sequence of components involved in the test.
- **Status**—Result of the test and any defects related to the test case. Possible values are:
 - Passed—Test case passed as described in the table.
 - Failed—Test case failed and the reason is described in the listed defect.
 - Passed with exception—Test case as described passed but an anomaly occurred that was not directly related to the functionality being tested. Possible anomalies are as follows:
 - The test *steps* were modified based on the actual feature implementation.
 - The test *setup* was modified based on the actual feature implementation.
 - The test results did not exactly match what was expected although the feature performed as required.
- **Defects**—Identifier for any defect that was opened against the test. If you have an account with Cisco.com, you can use the Bug Toolkit to view information about defects.

To access the Bug Toolkit, go to this URL:

- <http://tools.cisco.com/Support/BugToolKit/> 

Testing Objectives

Cisco Systems validates Cisco Unified Communications System systems by designing, installing, configuring, and testing hardware and software to achieve a predictable, effective, and reliable system. The intent of system testing is to validate the seamless interoperability and stability of the components that make up a complete and optimized Cisco Unified Communications System system.

Testing performed for Cisco Unified Communications System includes (but is not limited to) the following:

- **Installation, Upgrade, and Usability Testing**—To verify software installation and upgrades at the system level and usability for system components
- **End-to-End Functionality Testing**—To verify the end-to-end functionality of system components
- **Basic Functionality and Feature Testing**—To verify basic call flows and component features
- **Customer Assurance Program (CAP) Scenario Testing**—To re-create and test CAP scenarios based on TAC input
- **Interoperability Testing**—To verify the interoperability among system components
- **Scalability Testing**—To verify system functionality during scalability tests
- **Performance, Load, and Stress Testing**—To verify system functionality during performance, load, and stress tests

- **Failover, Recovery, and Redundancy Testing**—To verify system behavior during failover and recovery, and behavior in redundant configurations

Solution Reference Network Design

Solution Reference Network Design (SRND) guides provide considerations and guidelines for deploying components for the Cisco Unified Communications System. SRND resources are available at <http://www.cisco.com/go/srnd>.

Tested Deployment and Site Models

Cisco Unified Communications Systems Release 8.6(1) testing was designed to test the hardware and software components that work together in a multisite distributed deployment. For this testing, several site models were created. Each site model was designed to test a specific set of features and interactions. For information about the components, configurations, and environment tested in this Cisco Unified Communications Release, see [Table 8-1](#).

Table 8-1 Tested Deployment and Site Models

Deployment Model	Description
Single-Site Model	This model is designed for autonomous offices in which most or all employees are IPC users. This model can support up to 30,000 users.
Multisite Centralized Call Processing Model	This model is designed for distributed operations with a large central or headquarters site and multiple remote or branch sites. This model can support up to a total of 30,000 phones distributed among up to a maximum of 1000 sites. Based upon the bandwidth available, each site can support any number of users up to the overall total of 30,000 phones.
Multisite Distributed Call Processing Model	This model is designed for organizations with large user populations or large numbers of geographically distributed sites resulting in the need for more than a single call processing entity. This model is suited for deployments that require multiple Cisco Unified Communications Manager clusters or Cisco Unified Communications Manager Express platforms. Each call processing entity in this model is configured as a Single-Site Model or Multisite Centralized Call Processing Model and each has a common dial plan and feature set.
Clustering over WAN Call Processing Model	This model is designed for organizations with large user populations across multiple sites that are connected by an IP WAN with the QoS features enabled. It supports the Local Failover Deployment Model and the Remote Failover Deployment Model.

Network Topology Diagrams

This topic provides topology resources that you can use to document network plans.

- For contact center solutions:
 - [Network Topology Diagrams for Contact Center](#)
- For IP telephony solutions:
 - [Network Topology Diagrams for IP Telephony](#)

You can download zip files containing Visio drawings of the logical and physical topologies.


Note

You need Microsoft Visio 2003 to open the files. For more information, see [How to Use Microsoft Visio Drawings Efficiently](#).

If you need to create new Visio drawings, you can use the Cisco Visio stencils located at the [Visio Stencils resource page](#).

Network Topology Diagrams for Contact Center

Table 8-2 *Network Topology Diagrams for Contact Center*

Description	Filename
Zip file includes logical and physical drawings in Test Bed 1 as listed below.	CC_UC901_TestBed1_Topologies.zip (right-click to download zip) 3 MB Note If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use your Back button to return to this window.
All Unified CVP Sites in Test Bed 1	UC901 UCCE CVP Local and Remote.vsd
Zip file includes logical and physical drawings in Test Bed 2 as listed below.	CC_UC901_TestBed2_Topologies.zip (right-click to download zip) 537 KB If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use your Back button to return to this window.
All Unified CVP Sites in Test Bed 2	UC901 UCCE CVP Local.vsd

Network Topology Diagrams for IP Telephony

Table 8-3 Network Topology Diagrams for IP Telephony

Description	Filename
Zip file includes the site model topology drawings listed below.	IPT_UC901_Site_Models.zip (9) MB Note If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use your Back button to return to this window.
Small Campus Multisite H.323 based Cisco Unified Communications Manager Express sites	SiteModel_EUEM_MultiH323_WAW.vsd
Medium Site Dual-stack Centralized with Unified SRST	SiteModel_EUEM_DualStackCentralized_BRU_New.vsd
Medium Site Centralized with Unified SRST	SiteModel_EUEM_MediumSite_GVA_New.vsd
Mid-Market Multi-Site Centralized (Cisco BE 6000)	SiteModel_EUEM_Midmarket_MAN_New.vsd
Mid-Market Multi-Site Centralized (Cisco BE 3000)	SiteModel_EUEM_MidMarketMultiCentral_BLR.vsd
Large Multisite Centralized with Unified SRST	SiteModel_EUEM_MultiCentral_CDG_New.vsd
Cisco Unified Communications Manager Interoperability Site (Cisco SIP CME Site Aggregated by Cisco Unified SIP Proxy)	SiteModel_EUEM_SIPSite_RKV.vsd
Cisco Unified Communications Manager Session Management Edition	SiteModel_EUEM_SME_Topology.vsd
Zip file includes component topology drawings listed below.	IPT_UC901_Topologies.zip (1.8) MB Note If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use your Back button to return to this window.
Multisite with Centralized Call Processing with Remote Site Survivability (SRST Router)	SiteModel_MultiCentralized_SFOORD.vsd
Campus	SiteModel_LargeCampus_SJCRFD.vsd SiteModel_LargeSIP_DFW.vsd
Cisco Unified Communications Manager - Session Management Edition Site	SiteModel_SessionMgmt_MCILAX.vsd
Small Campus SIP and H.323 Unified Communications Manager Express Sites (ATL and YYZ) site model	SiteModel_SmallCampus_ATLYYZ.vsd

How to Use Microsoft Visio Drawings Efficiently

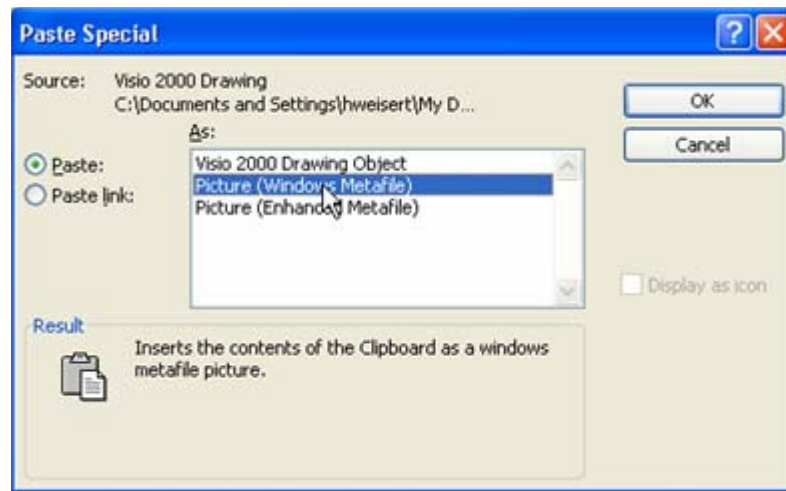
Microsoft Visio allows you to bring drawings into several applications (for example, Microsoft Word, Powerpoint). Unfortunately, the default method is to insert the whole “Visio object” into a file. This can cause problems.

When you copy and paste a Visio drawing into another application, the Visio object includes all the application data with the drawing. This object information is needed if you want to be able to double-click the drawing from Word or Powerpoint and have it open up in Visio for editing. But pasting as an object adds many megabytes to the size of your file. With only a few such drawings, a Word document can bloat from 300 KB to 12 MB, making it troublesome to share among authors or reviewers, and a trial for partners or customers to download. (They might even give up before it is done.) In addition, very large documents are more problem-prone.

Bringing a Visio Drawing into a Document

Unless you really need the live editing capability, avoid unnecessary file bloat by performing an extra step when you paste:

-
- Step 1** In Visio, copy the drawing as you normally do. Tip: **Ctrl-C** copies the whole drawing.
- Step 2** At the desired location in the destination document, choose **Edit > Paste Special**. In the Paste Special dialog box, choose **Picture (Windows Metafile)**.



- Step 3** Click **OK**. The drawing pastes as an ordinary picture. If it is not positioned properly, choose **Format > Picture**, click the **Layout** tab and select **In line with text**. This is generally the most reliable layout option.
-

The Bottom Line

Do not use the paste default (**Edit > Paste** or **Ctrl-V**) to paste Visio drawings. Always use **Paste Special**.

Downsizing Existing Drawings

If a document is larger than it should be, you can check to see if the Visio drawings are the reason and, if so, fix the problem.

-
- Step 1** With the drawing selected in the Word or Powerpoint document, choose **Edit**. At the bottom of the Edit menu, you will see one of the following:

- Edit Object, if the drawing was inserted by simple pasting. It is a Visio object and taking up much more file space than it needs to. Go on to step 2.
- Edit Picture, if the drawing was inserted properly, as a picture. It is not the source of the large file size.

Step 2 If the drawing is an object, cut it (**Ctrl-X**), then repaste it as in [Bringing a Visio Drawing into a Document](#).



Tip

You can easily click through the document to check each picture by using Word's handy **Go To** feature: Where you want to start searching, press **Ctrl-G**. In the **Go to what** list, select **Graphic** and click **Next**. You go to the next graphic. Click it to select, and then check as in step 1. If needed, repaste as in step 2. Click **Next** and continue these steps for other graphics.

Component Resources

For Cisco Unified Communications System Release 9.0(1), there are two types of resources that provide descriptive information on each component in the solution:

- [Component Resources Documentation](#)
- [Configuration Command Files](#)

Component Resources Documentation

Depending on your Unified Communications solution type, choose one of the following sets of component resources documentation:

- [Component Resources Documentation for Contact Center](#)
- [Component Resources Documentation for IP Telephony](#)

Component Resources Documentation for Contact Center

[Table 8-5](#) provides links to the main page for documentation on various Cisco Unified Communications components, from which you can navigate to individual documents.

For documentation on specific tasks, see [Component Installation and Configuration Guides](#) on the Implement tab. For documentation on all other Cisco products, go to <http://www.cisco.com/cisco/web/psa/default.html?mode=prod>

Table 8-4 *Component Resources Documentation*

Category	Component	Documentation URLs
Call Control	Cisco Unified Communications Manager	http://www.cisco.com/en/US/products/sw/voicesw/ps556/tsd_products_support_series_home.html

Table 8-4 **Component Resources Documentation**

Category	Component	Documentation URLs
Contact Center	Cisco Unified Intelligent Contact Management Enterprise	http://www.cisco.com/en/US/products/sw/custcosw/ps1001/tsd_products_support_series_home.html
	Cisco Unified Contact Center Enterprise	http://www.cisco.com/en/US/products/sw/custcosw/ps1844/tsd_products_support_series_home.html
	Cisco Unified IP IVR	http://www.cisco.com/en/US/products/sw/custcosw/ps1846/tsd_products_support_series_home.html
	Cisco Unified Customer Voice Portal	http://www.cisco.com/en/US/products/sw/custcosw/ps1006/tsd_products_support_series_home.html
	Cisco Unified Intelligence Center	http://www.cisco.com/en/US/products/ps9755/tsd_products_support_series_home.html
	Cisco Unified Contact Center Express	http://www.cisco.com/en/US/products/sw/custcosw/ps1846/tsd_products_support_series_home.html
	Cisco Finesse	http://www.cisco.com/en/US/products/ps11324/tsd_products_support_series_home.html
	Cisco SocialMiner	http://www.cisco.com/en/US/products/ps11349/tsd_products_support_series_home.html
	Cisco MediaSense	http://www.cisco.com/en/US/products/ps11389/tsd_products_support_series_home.html
Voice Mail and Unified Messaging	Cisco Unity Connection	http://www.cisco.com/en/US/products/ps6509/tsd_products_support_series_home.html
Applications	Cisco Unified Communications Manager Im and Presence Service (formerly Cisco Unified Presence)	http://www.cisco.com/en/US/products/ps6837/tsd_products_support_series_home.html
	Cisco Unified SIP Proxy	http://www.cisco.com/en/US/products/ps10475/tsd_products_support_series_home.html
Conferencing	Cisco TelePresence MCU MSE Series	http://www.cisco.com/en/US/products/ps11447/tsd_products_support_series_home.html
	Cisco TelePresence Content Server	http://www.cisco.com/en/US/products/ps11347/tsd_products_support_series_home.html

Table 8-4 **Component Resources Documentation**

Category	Component	Documentation URLs
Endpoints and Clients	Cisco Unified IP Phone 6900 Series	http://www.cisco.com/en/US/products/ps10326/tsd_products_support_series_home.html
	Cisco Unified IP Phone 7900 Series	http://www.cisco.com/en/US/products/hw/phones/ps379/tsd_products_support_series_home.html
	Cisco Unified IP Phone 8900 Series	http://www.cisco.com/en/US/products/ps10451/tsd_products_support_series_home.html
	Cisco Unified IP Phone 9900 Series	http://www.cisco.com/en/US/products/ps10453/tsd_products_support_series_home.html
	Cisco IP Communicator	http://www.cisco.com/en/US/products/sw/voicesw/ps5475/tsd_products_support_series_home.html
	Cisco Unified Video Advantage	http://www.cisco.com/en/US/products/sw/voicesw/ps5662/tsd_products_support_series_home.html
	Cisco TelePresence System EX90 and Cisco TelePresence System EX60	http://www.cisco.com/en/US/products/ps11327/tsd_products_support_series_home.html
	Cisco IP Video Phone E20	http://www.cisco.com/en/US/products/ps11329/tsd_products_support_series_home.html
Wireless	Cisco Aironet Access Point 3502	http://www.cisco.com/en/US/products/ps10981/tsd_products_support_series_home.html
	Cisco Aironet Access Point 1142	http://www.cisco.com/en/US/products/ps10092/tsd_products_support_series_home.html
Security	Cisco ASA 5500 Series Adaptive Security Appliances (ASA 5520, ASA 5540, ASA 5580)	http://www.cisco.com/en/US/products/ps6120/tsd_products_support_series_home.html
Network Management	Cisco Unified Operations Manager	http://www.cisco.com/en/US/products/ps6535/tsd_products_support_series_home.html

Table 8-4 **Component Resources Documentation**

Category	Component	Documentation URLs
Communications Infrastructure	Cisco IOS Software Release 15.1	http://www.cisco.com/en/US/products/ps10592/tsd_products_support_series_home.html
	Cisco 3800 Series Integrated Services Routers (Unified CVP VXML, voice/data, H.323, SIP, and MGCP gateways)	http://www.cisco.com/en/US/products/ps5855/tsd_products_support_series_home.html
	Cisco 3900 series routers	http://www.cisco.com/en/US/products/ps10536/tsd_products_support_series_home.html
	Cisco AS5400XM (Unified CVP VXML voice, H.323, and PSTN gateways)	http://www.cisco.com/en/US/products/hw/univgate/ps505/tsd_products_support_series_home.html
	Cisco Unified Border Element	http://www.cisco.com/en/US/products/sw/voicesw/ps5640/tsd_products_support_series_home.html
	Cisco SRE 910 Service Module	http://www.cisco.com/en/US/products/ps10598/tsd_products_support_series_home.html
	RSVP Agent (on 38xx platforms)	http://www.cisco.com/en/US/products/ps6832/tsd_products_support_series_home.html
	Cisco ASR 1002 Router	http://www.cisco.com/en/US/products/ps9343/tsd_products_support_series_home.html
	Cisco 881 Integrated Services Router	http://www.cisco.com/en/US/products/hw/routers/ps380/tsd_products_support_series_home.html
	Cisco Catalyst 3750 Series Switches	http://www.cisco.com/en/US/products/hw/switches/ps5023/tsd_products_support_series_home.html
	Cisco Catalyst 6500 Series Switches	http://www.cisco.com/en/US/products/hw/switches/ps708/tsd_products_support_series_home.html
Unified Computing	Cisco Unified Computing System	http://www.cisco.com/en/US/products/ps10477/tsd_products_support_series_home.html
	Cisco UCS B-Series Blade Servers	http://www.cisco.com/en/US/products/ps10280/tsd_products_support_series_home.html
	Cisco UCS C-Series Rack-Mount Servers	http://www.cisco.com/en/US/products/ps10493/tsd_products_support_series_home.html

Component Resources Documentation for IP Telephony

Table 8-3 provides links to the main page for documentation on various Cisco Unified Communications components, from which you can navigate to individual documents.

For documentation on specific tasks, see [Component Installation and Configuration](#) on the Implement tab. For documentation on all other Cisco products, go to <http://www.cisco.com/cisco/web/psa/default.html?mode=prod>.

Table 8-5 *Component Resources Documentation*

Category	Component	Documentation URL
Call Control	Cisco Unified Communications Manager	http://www.cisco.com/en/US/products/sw/voicesw/ps556/tsd_products_support_series_home.html
	Cisco Business Edition 3000	http://www.cisco.com/en/US/products/ps11370/tsd_products_support_series_home.html
	Cisco Unified Communications Session Management Edition	http://www.cisco.com/en/US/products/ps10661/tsd_products_support_series_home.html
	Cisco Unified Communications Manager Express	http://www.cisco.com/en/US/products/sw/voicesw/ps4625/tsd_products_support_series_home.html
	Cisco Unified Survivable Remote Site Telephony (SRST)	http://www.cisco.com/en/US/products/sw/voicesw/ps2169/tsd_products_support_series_home.html
	Cisco Intercompany Media Engine	http://www.cisco.com/en/US/products/ps10669/tsd_products_support_series_home.html
Contact Center	Cisco Unified Contact Center Express	http://www.cisco.com/en/US/products/sw/custcosw/ps1846/tsd_products_support_series_home.html
Applications	Cisco Unified Communications Manager IM and Presence Service (formerly Cisco Unified Presence)	http://www.cisco.com/en/US/products/ps6837/tsd_products_support_series_home.html
	Cisco Emergency Responder	http://www.cisco.com/en/US/products/sw/voicesw/ps842/tsd_products_support_series_home.html
	Cisco Unified Application Environment	http://www.cisco.com/en/US/products/ps7058/tsd_products_support_series_home.html
	Cisco Unified Attendant Consoles	http://www.cisco.com/en/US/products/ps7282/tsd_products_support_series_home.html
	Cisco Unified SIP Proxy Software	http://www.cisco.com/en/US/products/ps10475/tsd_products_support_series_home.html
Conferencing	Cisco Unified MeetingPlace	http://www.cisco.com/en/US/products/sw/ps5664/ps5669/tsd_products_support_series_home.html
Telepresence	Cisco TelePresence Endpoints	http://www.cisco.com/en/US/products/ps7060/products.html
	Cisco TelePresence Infrastructure	http://www.cisco.com/en/US/products/ps7060/products.html#N618533

Table 8-5 **Component Resources Documentation**

Category	Component	Documentation URL
Voice Mail and Unified Messaging	Cisco Unity Express	http://www.cisco.com/en/US/products/sw/voicesw/ps5520/tsd_products_support_series_home.html
	Cisco Unified Messaging Gateway	http://www.cisco.com/en/US/products/ps8605/tsd_products_support_series_home.html
	Cisco Unified Survivable Remote Site Voicemail	http://www.cisco.com/en/US/products/ps10769/tsd_products_support_series_home.html
	Cisco Hosted Collaboration Solution (HCS)	http://www.cisco.com/en/US/products/ps11363/tsd_products_support_series_home.html
Endpoints and Clients	Cisco Unified SIP Phone 3900 Series	http://www.cisco.com/en/US/products/ps7193/tsd_products_support_series_home.html
	Cisco Unified IP Phone 6900 Series	http://www.cisco.com/en/US/products/ps10326/tsd_products_support_series_home.html
	Cisco Unified IP Phone 7900 Series	http://www.cisco.com/en/US/products/hw/phones/ps379/tsd_products_support_series_home.html
	Cisco Unified IP Phone 8900 Series	http://www.cisco.com/en/US/products/ps10451/tsd_products_support_series_home.html
	Cisco Unified IP Phone 9900 Series	http://www.cisco.com/en/US/products/ps10453/tsd_products_support_series_home.html
	Cisco Virtualization Experience Clients	http://www.cisco.com/en/US/products/ps11295/Products_Sub_Category_Home.html
	Cisco Cius	http://www.cisco.com/en/US/products/ps11156/product_literature.html
	Cisco IP Communicator	http://www.cisco.com/en/US/products/sw/voicesw/ps5475/tsd_products_support_series_home.html
	Cisco Unified Personal Communicator	http://www.cisco.com/en/US/products/ps6844/tsd_products_support_series_home.html
	Cisco UC Integration™ for Microsoft Lync	http://www.cisco.com/en/US/products/ps10317/tsd_products_support_series_home.html
	Cisco Unified Communications for RTX	http://www.cisco.com/en/US/products/ps11241/tsd_products_support_series_home.html
Wireless and Mobility	Cisco Aironet 1142, 3502 Series Access Points	http://www.cisco.com/en/US/products/hw/wireless/index.html
	Cisco Mobile for Nokia	http://www.cisco.com/en/US/products/ps11766/tsd_products_support_series_home.html
	Cisco Jabber for Mac	http://www.cisco.com/en/US/products/ps11764/tsd_products_support_series_home.html
	Cisco Jabber for iPad	http://www.cisco.com/en/US/products/ps12430/tsd_products_support_series_home.html
	Cisco Jabber for iPhone	http://www.cisco.com/en/US/products/ps11596/tsd_products_support_series_home.html
	Cisco Jabber for Windows	http://www.cisco.com/en/US/products/ps12511/tsd_products_support_series_home.html

Table 8-5 *Component Resources Documentation*

Category	Component	Documentation URL
Security	Cisco ASA 5500 Series Adaptive Security Appliances (ASA 5520, ASA 5540, ASA 5580)	http://www.cisco.com/en/US/products/ps6120/tsd_products_support_series_home.html
	Cisco ASA Advanced Inspection and Prevention Security Services Module (AIP-SSM)	http://www.cisco.com/en/US/products/ps9774/prod_module_series_home.html
	Cisco Security Agent	http://www.cisco.com/en/US/products/sw/secursw/ps5057/tsd_products_support_eol_series_home.html
	Cisco Enterprise Policy Manager	http://www.cisco.com/en/US/products/ps9529/tsd_products_support_series_home.html
Network Management	Cisco Unified Operations Manager	http://www.cisco.com/en/US/products/ps6535/tsd_products_support_series_home.html
	Cisco Unified Service Monitor	http://www.cisco.com/en/US/products/ps6536/tsd_products_support_series_home.html
	Cisco Unified Service Statistics Manager	http://www.cisco.com/en/US/products/ps7285/tsd_products_support_series_home.html
	Cisco Unified Provisioning Manager	http://www.cisco.com/en/US/products/ps7125/tsd_products_support_series_home.html

Table 8-5 **Component Resources Documentation**

Category	Component	Documentation URL
Communications Infrastructure	Cisco IOS Software Release 15.1	http://www.cisco.com/en/US/products/ps10592/tsd_products_support_series_home.html
	Cisco 870, 881 Integrated Services Routers	http://www.cisco.com/en/US/products/hw/routers/ps380/tsd_products_support_series_home.html
	Cisco 1861 Integrated Services Router	http://www.cisco.com/en/US/products/ps5853/tsd_products_support_series_home.html
	Cisco 2800 Series Integrated Services Routers	http://www.cisco.com/en/US/products/ps5854/tsd_products_support_series_home.html
	Cisco 2900 Series Integrated Services Routers	http://www.cisco.com/en/US/products/ps10537/tsd_products_support_series_home.html
	Cisco 3800 Series Integrated Services Routers	http://www.cisco.com/en/US/products/ps5855/tsd_products_support_series_home.html
	Cisco 3900 Integrated Services Routers	http://www.cisco.com/en/US/products/ps10536/tsd_products_support_series_home.html
	Cisco Unified Border Element	http://www.cisco.com/en/US/products/sw/voicesw/ps5640/tsd_products_support_series_home.html
	Cisco VGD 1T3 Voice Gateway	http://www.cisco.com/en/US/products/ps9890/tsd_products_support_series_home.html
	Cisco VG30D Voice Gateway	http://www.cisco.com/en/US/products/ps10601/products_data_sheets_list.html
	Cisco Catalyst 3750 Series Data Center Switches	http://www.cisco.com/en/US/products/hw/switches/ps5023/tsd_products_support_series_home.html
	Cisco Catalyst 4500 Series Access Switches	http://www.cisco.com/en/US/products/hw/switches/ps4324/tsd_products_support_series_home.html
	Cisco Catalyst 6500 Series Access Switches	http://www.cisco.com/en/US/products/hw/switches/ps708/tsd_products_support_series_home.html
	Cisco Catalyst 6600 Series Voice Gateways	http://www.cisco.com/en/US/products/hw/switches/ps700/tsd_products_support_eol_series_home.html
	Cisco VG200 Series Analog Voice Gateways	http://www.cisco.com/en/US/products/hw/gatecont/ps2250/tsd_products_support_series_home.html
Cisco ATA 180 Series Analog Telephone Adaptors	http://www.cisco.com/en/US/products/hw/gatecont/ps514/tsd_products_support_series_home.html	
Unified Computing	Cisco Unified Computing System	http://www.cisco.com/en/US/products/ps10477/tsd_products_support_series_home.html
	Cisco UCS B-Series Blade Servers	http://www.cisco.com/en/US/products/ps10280/tsd_products_support_series_home.html
	Cisco UCS C-Series Rack-Mount Servers	http://www.cisco.com/en/US/products/ps10493/tsd_products_support_series_home.html

Configuration Command Files

To understand how various components were configured during Unified Communications system testing, review the contents of the ZIP archives described in one of the following sections:

- [Configuration Command Files for Contact Center](#)
- [Configuration Command Files for IP Telephony](#)

Additional system-level configuration examples are available on the Cisco DocWiki at: http://docwiki.cisco.com/wiki/Category:Unified_Communications_System_Implementation

Configuration Command Files for Contact Center

Table 8-6 describes the contents of three ZIP files that you can download. Each ZIP file contains text files that contain the output from issuing a **show running-config** IOS command on various infrastructure components in the contact center test beds.

Table 8-6 Configuration Command Files for Contact Center

Description	Filename
Test Bed 1 Local and Remote Agent Call Flows: Cisco Unified Customer Voice Portal (CVP) Post-Routed Call Flow Components	CC_UC901_TestBed1_Configs.zip (right-click to download zip) includes the files below. Note If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use your Back button to return to this window.
VPN Cisco Adaptive Security Appliances	VPN-ASA.txt
Cisco 3925 Integrated Services Router	PBL-PSTN-VXML-A.txt
Cisco 3945 Integrated Services Router	PBL-PSTN-VXML-B.txt
Cisco 3945 Integrated Services Router	PBL-REM01.txt
Cisco MediaSense	PBL-REM02-MediaSense.txt
VPN HUB	VPN-HUB.txt
Cisco 881 Integrated Services Router VPN Spoke	CVO-Spoke-881.txt
Stand-by Cisco Unified Border Element	Stand-by Unified Border Element.txt
Active Cisco Unified Border Element	Active Unified Border Element.txt
Test Bed 2 Local Agent Call Flows: Cisco Unified CVP Post-Routed Call Flow Components	CC_UC901_TestBed2_Configs.zip (right-click to download zip) includes the files below. Note If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use your Back button to return to this window.
Unified CVP Post-Routed Cisco Unified SIP Proxy 1	cvppr-cusp1.txt
Unified CVP Post-Routed Ingress Gateway 1	cvppr-combo1.txt

Configuration Command Files for IP Telephony

Table 8-7 describes the contents of a ZIP file with sample IP telephony configurations that you can download. Each ZIP file contains text files that contain the output from issuing a **show running-config** IOS command on various components in the IP telephony tested deployments.

Table 8-7 Configuration Command Files for IP Telephony

Description	Filename
Zip file includes Cisco device configurations listed below: Note Some parameters, such as passwords, have been removed from the configuration files for security reasons.	IPT_UC901_Configs.zip (right-click to download zip) includes the files below. Note If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use your Back button to return to this window.
Paris (CDG) Remote Site Router	CDG-RemoteSite15.txt
Paris (CDG) Cisco Unified Border Element (CUBE) Configured for Cisco Unified Communications Manager Express	CDG-CUBE.txt
Geneva (GVA) H.323 Gatekeeper	GVA-H.323-Gatekeeper.txt
Paris (CDG) Remote Site Distribution Switch	CDG-RemoteSite-DistributionSwitch.txt
Warsaw (WAW) Cisco Unified Communications Manager Express Site	WAW_CME_Site8.txt
Atlanta (ATL) Unified CME Router	atl-cme1.txt
Dallas (DFW) RSVP Agent and gateway	DFW-RSVP-AGENT.txt
Los Angeles (LAX) Cisco Unified Border Element	LAX-CUBE-1.txt
CUSP module configuration running on Los Angeles (LAX)-Cisco Unified Border Element	LAX-CUSP-1.txt
Kansas City (MCI), Los Angeles (LAX) Service Advertisement Framework Router	MCI-LAX-WAN.txt
San Francisco (SFO) Survivable Remote Site Telephony and Voice Gateway	SFO-ORD-201-2921.txt and SFO-ORD-251-2921.txt
San Jose (SJC) H.323 Gatekeeper	SJC-RFD-GK-1.txt

Unified Communications Demos


Tools are available to demonstrate the collaboration features of a Cisco Unified Communications System:

- For Cisco partners: [Cisco Remote Demonstrations for Partners](#) 
- For Cisco sales teams: [Global Customer Demonstrations \[Internal\]](#)

System Compatibility Tool

The [Cisco Unified Communications Compatibility Tool](#) provides tables that identify the compatible software release versions for each product element in each Cisco Unified Communications release.

Ordering Guides

[Ordering guides](#)  for most Cisco Unified Communications products are available for Cisco partners, Cisco sales staff, and Cisco service providers.

End-of-Sale and End-of-Life Products

The end-of-sale (EOS) date is the last date to order the product through Cisco point-of-sale mechanisms. The product is no longer for sale. There is also an end-of-life (EOL) process that guides the final business operations associated with the product life cycle.

The EOL process consists of a series of technical and business milestones and activities that, once completed, make a product obsolete. Once obsolete, the product is not sold, manufactured, improved, repaired, maintained, or supported.

For information about recommended replacements, see the comprehensive list of announcements at the following URL:

http://www.cisco.com/en/US/products/prod_end_of_life.html

For information on specific products, choose a product from the following URL:

<http://www.cisco.com/en/US/products/sw/voicesw/index.html>

Then click on the End-of-Life and End-of-Sale Notices link in the Product Literature section.

For an overview of the Products and Services EOL policy, see the information at the following URL:

http://www.cisco.com/en/US/products/products_end-of-life_policy.html

Cisco Unified Workspace Licensing

[Cisco Unified Workspace Licensing](#) is an easy, affordable program for procurement of a broad range of Cisco Unified Communications applications and services. Unified Workspace Licensing facilitates consistent deployment of multiple applications to all users in their workspaces and helps organizations maximize the potential of unified communications.

This program streamlines pricing, licensing, and deployment of Cisco Unified Communications solutions and enables organizations to implement a media-rich unified communications experience at a cost-effective user basis.

Documentation Wiki

The Cisco documentation wiki ([DocWiki](#)) contains information on a number of Cisco product-related topics. Among these is a category for Cisco Unified Communications Systems, which currently includes topics for:

- **Unified Communications System Design:** This topic includes information and tutorials on design tools such as the Cisco Unified Communications Sizing Tool, which can be used to design and model solutions for existing and prospective customers.
- **Unified Communications System Implementation:** This topic includes information on configuring system components, and provides detailed configuration examples based on tested deployment models.
- **Unified Communications System Operations:** This topic includes information on the tasks you need to perform to maintain your system and keep it operating as trouble-free as possible. These tasks are broken down into two areas: one-time and infrequent tasks, and regular and scheduled tasks.
- **Unified Communications System Optimization:** This topic includes information on the tasks you need to perform to optimize your system and keep it operating as trouble-free as possible.
- **Unified Communications System Troubleshooting:** This topic includes information that will assist you with isolating and resolving problems you may have with Unified Communications system components. This topic offers sections for system troubleshooting methodology and commonly encountered problems.
- **Unified Communications System Virtualization:** This topic includes information on running Unified Communications applications on a virtual machine in a Unified Computing System (UCS) environment.

For additional Cisco Unified Communications topics posted on the Cisco documentation wiki, see http://docwiki.cisco.com/wiki/Cisco_Unified_Communications.



CHAPTER 9

Training Library

Using the Training Library

This tab includes training resources to help you learn more about Cisco Cisco Unified Communications. The training resources are organized by audience:

- [General Training](#) contains links to courses and videos on demand (VoDs) for a general audience.
- [Training Available to Partners](#) contains resources for Cisco authorized partners and resellers.
- [Training Available to Cisco Employees](#) contains resources available for internal use only.

These categories list both online and instructor-led courses, downloadable VoDs, and links to online events and webcasts.

Play the short [Cisco Unified Communications Simulation Challenge](#) to see if you can become a champion migrator.

General Training

These Cisco training websites provide training on all Cisco products and technologies and are available to a general audience.

- [The Cisco Learning Network](#)
- [Global Learning Locator](#)
- [Featured Virtual Events and Webcasts](#)
- [Cisco Press self-study resources](#)

Training Available to Partners

Cisco offers a variety of training resources to partners. This topic describes some courses that are specific to Cisco Unified Communications System Release 9.0(1).

Some Cisco Unified Communications training VoDs are available from the [Cisco Unified Communications System Release Technical Readiness](#) page. Click the Tools & Training tab on the readiness page for more information on partner training.

For training information on all Cisco products and technologies, see the following sites.

**Note**

To access these sites, you must be registered as an employee of a Cisco Channel Partner company.

- [Partner Education Connection](#)
- [Global Learning Partner Locator](#)

Partner Education Connection Courses

Partner Education Connection (PEC) courses are the primary learning source for Cisco Channel Partners. PEC provides training on products, tools, and solutions.

Use the following e-learning modules for information on Cisco Unified Communications System Release 9.0(1):

- QuickStart modules
These web-based modules prepare partners to sell Cisco Unified Communications System solutions. This course covers selling strategies, pricing, and customer testimonials.
- Partner Beta Training
The PEC site typically contains a VoD which provides information on what is new in the latest Cisco Unified Communications System.
- Cisco Unified Communications Architecture and Design
These web-based modules address identifying the features of the Cisco Unified Communications system and teaching the Cisco methodology for implementing voice over data networks.

Cisco Learning Partner Courses

[Training from Cisco Learning Partners](#) provides a comprehensive set of training resources, from instructor-led courses to remote access labs and e-learning solutions. These companies are the only organizations to employ Certified Cisco Systems Instructors and deliver Cisco authorized and approved content, including product-specific training, technology training, and certification-preparation courses.

Cisco Unified Communications Courses

This section contains descriptions of Cisco Unified Communications courses for account managers, systems engineers, and other sales personnel.

ASPIRE Cisco Unified Communications Workshops

For more information on ASPIRE workshops, go to http://www.aspiregroup.com/knowledge_center.html.

ANI Cisco Unified Communications Courses

- [Basics of Unified Communications \(BUC\)](#)
This five-day course is intended to be a technical introduction to Unified Communications and converged Internet Protocol (IP) networks. The course presents an incremental approach to designing, deploying and supporting an IP infrastructure for Unified Communications. The range of topics includes network technologies, Virtual LANs, Ethernet, Frame-Relay, MAC Addresses, IP



Addresses and TCP/IP. The discussion encompasses not only these topics but also how they specifically relate to the successful operation of a complex converged network as typically used in most corporate enterprise environments today.

- [Advanced Unified Communications for Cisco Account Managers](#)

This course is designed exclusively for Cisco Channel Partners and Account Managers and prepares you for the Advanced Unified Communications for Account Managers exam (646-230 AUCAM), a component of Cisco's Advanced IP Communications Sales Specialist certification track. Achieving this advanced Unified Communications certification, with an emphasis on voice solutions for the enterprise, demonstrates that you have the knowledge and skills necessary to effectively assess, recommend, and guide implementation of IP communications solutions tailored to address specific customer needs.

Training Available to Cisco Employees

Cisco offers a variety of training resources to employees. These Cisco Unified Communications system launch page and training websites provide training on all Cisco products and technologies:

- [Partner Education Connection](#) 
- [Global Learning Partner Locator](#)
- [Cisco Unified Communications System Release 8 Technical Readiness](#) 



INDEX

A

about

Index 1-4

agent interaction 2-5

automatic call distribution (ACD) 2-4

automatic speech recognition (ASR) 2-4

B

Bill of Materials (BOM) 3-10

BOM 3-10

business model

financial 4-5

retail 4-5

business requirements

determining 3-7

C

call flow example 5-15

call flows

samples 3-7, 6-6

understanding 3-7

Catalyst Integrated Security Features (CISF) 2-6

caveats, system 4-6

Cisco Agent Desktop

troubleshooting tools and information 5-18

Cisco Catalyst 3750 Access Switch

troubleshooting tools and information 5-21

Cisco Catalyst 6506, 6509

troubleshooting tools and information 5-21

Cisco Certified Voice Professional (CCVP) 2-3

Cisco Customer Interaction Network 2-4

Cisco Disaster Recovery System (DRS) 6-13

Cisco Discovery Protocol (CDP) 2-3

Cisco Extension Mobility 2-5

Cisco Intelligent Information Network 2-3

Cisco Lifecycle Services 2-2

Cisco Sales Demo 8-19

Cisco Unified Communications Essential Operate Service 6-2

Cisco Unified Communications Manager

Disaster Recovery System (DRS) 6-13

troubleshooting tools and information 5-16

Cisco Unified Communications Remote Management Service 6-2

Cisco Unified Communications system

deployment 2-7

migration 2-7

security 2-6

solution bundling 2-3

Cisco Unified Communications system demonstration 3-13

Cisco Unified Contact Center Enterprise

troubleshooting tools and information 5-17

Cisco Unified Contact Center Express

troubleshooting tools and information 5-18

Cisco Unified Customer Voice Portal

troubleshooting tools and information 5-17

Cisco Unified Intelligence Center

troubleshooting tools and information 5-18

Cisco Unified Intelligent Contact Management

troubleshooting tools and information 5-17

Cisco Unified IP Interactive Voice Response (Unified IP IVR). See Unified IP IVR

Cisco Unified IP IVR

- troubleshooting tools and information [5-17, 5-18](#)
 - Cisco Unified IP Phone
 - advertising presence [2-3](#)
 - power methods [2-4](#)
 - traffic markings [2-3](#)
 - Cisco Unified IP phone
 - troubleshooting [6-8](#)
 - troubleshooting tools and information [5-20](#)
 - Cisco Unified MeetingPlace
 - overview [2-4](#)
 - Cisco Unified Operations Manager [6-4](#)
 - troubleshooting tools and information [5-20](#)
 - Cisco Unified Personal Communicator
 - overview [2-4](#)
 - Cisco Unified Presence
 - troubleshooting tools and information [5-19](#)
 - Cisco Unified Presence Server
 - overview [2-4, 2-7](#)
 - Cisco Unified Survivable Remote Site Telephony
 - See* Unified SRST
 - Cisco Unified Videoconferencing [2-4](#)
 - Cisco Unified Wireless IP Phone 7921G
 - mobility [2-5](#)
 - Cisco Unity
 - overview [2-4](#)
 - Cisco VGD-1T3 Voice Gateway
 - troubleshooting tools and information [5-21](#)
 - committed information rate (CIR) [6-12](#)
 - compatibility
 - components [5-11](#)
 - component
 - configuration [5-3](#)
 - installation [5-3](#)
 - components
 - compatibility [5-11](#)
 - contact center [2-10](#)
 - identifying [3-10](#)
 - installation and configuration guides [5-3](#)
 - installing [5-3](#)
 - upgrading [7-1](#)
 - components in the contact center [2-10](#)
 - configuration checklists [5-10](#)
 - configuration files [8-16](#)
 - configuration guides
 - links to [5-3](#)
 - contact center
 - applications [2-10](#)
 - components [2-7, 2-8, 2-10](#)
 - overview [2-7](#)
 - Test Bed 1 [4-5](#)
 - Test Bed 2 [4-5](#)
 - contact center components [2-10](#)
 - identifying [4-4](#)
 - sizing [4-6](#)
 - contact center deployment types
 - multisite [3-2](#)
 - multistage upgrade [3-2](#)
 - new install [3-2](#)
 - single-stage upgrade [3-2](#)
 - contact center systems
 - operating [6-6](#)
 - CRS [4-5](#)
 - CTI Object Server (CTIOS)
 - troubleshooting tools and information [5-17](#)
-
- D**
 - data collection and analysis [3-11](#)
 - deployment
 - overview [2-7](#)
 - deployment models [2-9, 3-10](#)
 - multi-site centralized [4-5](#)
 - multi-site distributed [4-5](#)
 - deployment options [3-10](#)
 - design concepts [4-2](#)
 - design guides
 - security [4-7](#)
 - SRNDs [4-2](#)

design templates [4-3](#)
 design tools [4-3](#)
 device, advertising presence [2-3](#)
 diagrams

 Visio [8-5, 8-6](#)

Digital Signal Processor (DSP) status [6-10](#)

downloadable Visio diagrams [8-5, 8-6](#)

E

emergency caller response [2-5](#)

employee training [9-3](#)

encryption

 media encryption [2-6](#)

 signaling encryption [2-6](#)

end-of-life [8-19](#)

end-of-sale [8-19](#)

F

failover testing [4-7, 6-7, 7-2](#)

features in this release [2-10, 3-1](#)

financial case study

 business model [4-5](#)

firewall [2-6, 6-10](#)

frame check sequence (FCS) errors [6-12](#)

H

high availability [2-7](#)

I

Index

 using [1-4](#)

installation checklists [5-10](#)

installation guides [5-3](#)

 links to [5-3](#)

integration

 with existing equipment [2-7](#)

 with existing network [2-7](#)

intelligent contact routing [2-4](#)

interactive voice response (IVR) [2-4](#)

interoperability

 system components [5-11](#)

IP telephony system

 site for [1-2](#)

J

jitter [6-12](#)

L

links

 login required [1-5](#)

 restricted access [1-5](#)

login required

 links [1-5](#)

M

maintenance support [6-2](#)

media encryption [2-6](#)

messaging

 overview [2-4](#)

Microsoft Visio [8-7](#)

migration, to Cisco Unified Communications system [2-7](#)

mobility

 Cisco Extension Mobility [2-5](#)

 overview [2-5](#)

 site and campus mobility [2-5](#)

model

 parent and child [4-5](#)

monitoring tools [6-4](#)

N

Network Address Translation (NAT) [6-10](#)
network management [6-1](#)
 Cisco Unified Operations Manager [6-4](#)
network monitoring tools [6-4](#)
network readiness, assessing [3-11](#)
Network Time Protocol (NTP) [5-23](#)
network topology diagram [5-15, 5-21](#)
network topology resources [8-5](#)

O

one-way audio problems [6-7](#)
ordering guides [5-2, 8-19](#)
ordering tools [4-4, 5-2](#)
Overview [8-9](#)

P

packet drops [6-11](#)
partner training [9-1](#)
planning concepts [3-1](#)
 capacity and QoS [3-3](#)
 contact center deployment types [3-2](#)
 ownership costs [3-3](#)
 redundancy [3-3](#)
planning tools [3-9](#)
Port Address Translation (PAT) [6-10](#)
power over Ethernet (POE) [2-4](#)
PPDIOO process [1-1](#)

Q

QoS [2-3, 6-12](#)

R

release notes [2-10](#)
resources
 network topology [8-5](#)
restricted access
 links [1-5](#)
retail case study
 business model [4-5](#)
rich-media conferencing [2-4](#)

S

secure platforms [2-6](#)
security
 Catalyst Integrated Security Features (CISF) [2-6](#)
 firewall integration [2-6](#)
 overview [2-6](#)
 phone security features [2-6](#)
 secure platforms [2-6](#)
 signaling encryption [2-6](#)
security documents [4-7](#)
security policies
 defining [4-7](#)
signaling encryption [2-6](#)
site and campus mobility [2-5](#)
sizing the network
 tools [4-3](#)
software versions
 compatibility [5-15](#)
solution bundling [2-3](#)
SRNDs [3-9, 4-2](#)
supervisor interaction [2-5](#)
synchronizing server date and time [5-23](#)
system [6-1](#)
 monitoring [6-1](#)
 test results [4-6](#)
system caveats [4-6](#)
system management

- options [6-2](#)
- tasks [6-2](#)
- system upgrade
 - performing [7-1](#)

T

- templates [3-9](#)
- Test Bed 1
 - contact center [4-5](#)
 - CRS (Unified IP IVR) [4-5](#)
- Test Bed 2
 - contact center [4-5](#)
 - Unified CVP Post-Routed calls [4-5](#)
- tested deployment models [4-5](#)
- test results, system
 - reviewing [4-6](#)
- text-to-speech (TTS) [2-4](#)
- tips
 - on using Visio drawings [8-7](#)
- tools
 - for ordering [4-4](#)
 - for sizing networks [4-3](#)
- traceroute [6-8](#)
- traffic engineering specifications [4-6](#)
- training
 - Cisco employees [9-3](#)
 - partners [9-1](#)
- troubleshooting
 - common user problems [6-7](#)
 - daily operations [6-7](#)
 - jitter [6-12](#)
 - methodology [5-12](#)
 - NAT firewall traversal problems [6-10](#)
 - network topology diagrams [5-21](#)
 - one-way audio [6-7](#)
 - questions to ask users [5-13](#)
 - recommended trace settings [5-24](#)
 - voice quality [6-11](#)

U

- Unified Customer Voice Portal. See Unified CVP
- Unified CVP
 - deployment [4-5](#)
- Unified IP IVR
 - deployment [4-5](#)
- upgrade
 - planning [3-12](#)
- user acceptance tests [5-25](#)
- using
 - Index [1-4](#)
 - Visio drawings [8-7](#)
- Using, this system [1-2](#)

V

- video telephony [2-5](#)
- Visio [8-7](#)
- Visio diagrams [8-5, 8-6](#)
- VLAN [2-3](#)
- voice quality problems [6-10](#)

W

- wireless devices [2-3](#)
 - See also* Cisco Unified Wireless IP Phone 7921G

